PROJECT REVIEW PAPER (PRP)

SMALL SCALE IRRIGATION SYSTEMS

306-51-120-137

KABUL, AFGHANISTAN
January 22, 1975

PROJECT REVIEW PAPER (PRP)
SMALL SCALE IRRIGATION SYSTEMS
306-51-120-137

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
II.	SUMMARY	2
	A. Summary Information	2
	B. Project Description	2
	C. Financial Data	3
III.	PROJECT DESIGN	4
	A. Program Goal and Phase I Targets	4
	B. Project Purpose, Targets, Intended Beneficiaries, Assumptions	4
	C. Project Outputs	6
	D. Inputs	6
IV.	PROJECT ANALYSIS	7
	A. Project Background	7
	B. Project Description	8
	C. Previous Activities of USAID and Other Aid Donors	10
V.	SOCIO-ECONOMIC FACTORS	11

PROJECT REVIEW PAPER (PRP)

SMALL SCALE IRRIGATION SYSTEMS
306-51-120-137

FY 76 - 79

PART I. INTRODUCTION

In its plan for 1353 (roughly FY 75) the GOA has defined rehabilitation of small-scale irrigation systems as its number one priority. This priority designation is consistent with the recommendations made by World and Asian Bank teams for several years. At the instigation of the Ministry of Planning, USAID/A has developed this PRP for rehabilitation and improvement of Small-Scale Irrigation Systems. Extensive conversations have been held with the Department of Irrigation in the past several months and although no final agreements have been reached on the details of a project, we believe this document reflects in large measure the form the project will ultimately take. It is hoped that the first implementation will take place in the latter half of FY 76.

Afghanistan's major source of moisture is from snowfall and it is post-winter runoff from the snowpack which provides the water source for the vast majority of the nation's food production. Afghan farmers have traditionally relied on communal irrigation systems tapping surface and underground water sources. These systems are constructed in large measure with a technology little changed for centuries. Design is primitive and construction is with local, short lifetime materials (log flumes, twig, stone and mud diversion structures, etc.). As a consequence there is frequent failure, high maintenance, and inefficient use of water. The productive potential of the people dependent on such irrigation systems can be significantly increased and a better distribution of productivity obtained if the systems can be redesigned and rehabilitated to a more nearly modern set of technical standards. High benefit/cost ratios will flow from investments in such systems improvements.

Previously AID has provided assistance to the Department of Irrigation. As a consequence considerable technical capability exists in this organization. Due

to administrative and to some extent budgetary reasons, this technical potential is not being used. This project proposes to assist the Department of Irrigation in converting its potential into a reality. It will be done by providing a limited degree of technical assistance and by using fixed-cost reimbursement of system rehabilitation costs to help overcome budgetary and motivational limitations.

We view this as an intermediate project. Some people will be benefited in the areas served by the systems improved. However, the long-range objective is to establish conditions whereby a larger, more meaningful effort is possible.

PART II. SUMMARY

A. Summary Information

Country: Afghanistan, Executing Agency: Ministry of Agriculture and Irrigation, Department of Irrigation

Obligation from FY 1976 thru FY 1979

Implementation from FY 1976 thru FY 1979

B. Project Description

This project will identify, redesign and reconstruct 45 to 55 small to medium size, operating irrigation systems over a three-year time period. It will also provide a very limited amount of technical assistance to the Department of Irrigation (DI) by providing two more experienced irrigation engineers to supplement the young DI staff. Preliminary exploration will be made on developing better water-use technicians.

The project, if it is successful, will provide: 1) better water services to 4,000 to 5,000 families (35,000 to 45,000 people), 2) for the growth of DI capability to the point where, given funds (probably from donors), this institution can handle rehabilitation of 40 to 60 irrigation systems per year in contrast to the current capability of two to four systems, 3) will establish a habit of accomplishment at Afghan initiative, and 4) provide guidance on methods to improve water-use efficiency.

This project, in responding to the GOA's highest priority, is a key element in the overall Mission strategy of helping the Afghan Government move into a position in which significant rural development can take place. In arid Afghanistan better use of water is probably the key prerequisite to increased agricultural productivity. In order to reach significant numbers of average farmers it is mandatory that we address the existing irrigation systems which service the vast majority of the farmers.

C. Financial Data

1. Total Project Cost Table ($000)

	FY 1976	FY 1977	FY 1978	FY 1979
GOA	150	240	300	120
USAID	511	473	553	50
Other Donors	-	-	-	-
	661	713	853	170

2. AID Project Cost Table ($000)

	FY 1976	FY 1977	FY 1978	FY 1979
1. Personnel				
a. Direct Hire (1)	61	43	68	50
b. Contract/PASA (2) (6 man of short term consultants) (55)	230	130	65	0
c. Cost-Sharing Engineer Imp & Monitoring	20	25	40	0
2. Participants	10	15	0	0
3. Commodities (5 vehicles + misc.)	30	20	0	0
4. Other Costs	160	240	380	0
	511	473	553	50

PART III. PROJECT DESIGN

A. Program Goal and Phase I Targets

1. Program Goal

To enable the Afghan Department of Irrigation to develop a significant operational capability for rehabilitating and upgrading the nation's small, communal irrigation systems as a means to provide better productivity and income to the nation's small farmers.

2. Phase I. (End of Project) Targets

a. Rehabilitated and improved systems are operating in such a way as to improve income among system users.

b. The Department of Irrigation will have the capacity and will to annually select redesign and construct improvements on 40 to 60 irrigation systems of 600 to 1,000 acres each.

B. Project Purpose, Targets, Intended Beneficiaries, Assumptions

1. Project Purpose

a. To implement construction to standards of 45 to 55 improved irrigation systems and thereby increase the income of users.

b. To upgrade the DI's systems survey, design and construction implementation capability.

2. Targets

	FY 1977	FY 1978	FY 1979
a. Acres affected	7,500	11,250	18,000
b. Families Benefiting (cumulative)	938	2,344	4,594
c. Construction Teams	4	6	10
d. An Afghan organization capable of implementing system upgrading from beginning to end.			

3. Indicators

a. Increase in income
b. Increase in production
c. Reliability of water supplies
d. Reduction in annual maintenance costs
e. Rate of construction
f. Rate of system survey and redesign

4. Intended Beneficiaries

The beneficiaries of the construction element of this project are intended to be the common farmers of Afghanistan. Certainly relatively large landholders will benefit in some systems; however, ownership patterns will influence the decision to undertake system upgrading.

It is expected that the poorest farmers will be those on the fringes of irrigation system (because of poor water supply). Provision of improved water supplies should have a tendency to weigh benefits more heavily toward the poorest by increasing the reliability of supply where it has been the worst, at the fringes. Throughout the system, benefits will accrue because of:

a. Increased yields resulting from a more dependable water supply
b. Increased double-cropping
c. Increased amount of land annually cropped under the systems
d. Reduced annual cost of maintaining the systems because installment of permanent structures, control gates, better canals, etc.

5. Assumptions

a. The Afghan farmer will make a contribution toward the cost of upgrading his irrigation system.

b. The Afghan farmer will behave in such a manner that the improved system will lead to increased production/income.

c. Water usage and availability is such that productivity increases are possible in one system without detrimentally influencing production in downstream systems.

d. The DI will respond to the incentive/discipline elements of the FCR approach.

C. Project Outputs

1. Sixty to seventy system surveys and redesigns
2. Ten trained and motivated construction teams
3. Two survey and design teams
4. Procedures for system survey redesign and construction implementation.
5. Procedures for construction cost estimation
6. Trained personnel at DI headquarters

D. Inputs

1. GOA

The GOA will finance 30 percent of the construction costs of system upgrading and will provide the necessary equipment for implementation of the projects. In addition, the DI will provide ten construction teams of five men each and eight members for two survey and redesign teams. The GOA will cover salaries and other expenses for all DI personnel involved.

2. USAID

The USAID will cover 70 percent of the construction costs on a fixed-cost reimbursement basis. USAID will also fund a two-man team (Contract or PASA) to assist in system surveys and to advise the DI on general design and construction problems.

Limited observational training will be provided for selected DI employees. USAID will also purchase five vehicles for use by the construction and survey teams and certain limited other key equipment.

Provision will be made for a short-term consultant to advise on water use methods.

PART IV. PROJECT ANALYSIS

A. Project Background

The Government of Afghanistan has long recognized the need for an organization in the Ministry of Agriculture and Irrigation (MAI), the Department of Irrigation, which could plan, design and construct small irrigation systems and improve existing systems. This organization exists and has considerable potential capability resulting from past technical assistance. However, currently very little field work is taking place. Administrative and budgetary limitations are felt to be the prime causes of this inaction.

Most of the small-scale irrigation systems in Afghanistan were developed many years ago, and some are several centuries old. Most of these small systems are built to the inefficient standards and designs of may years ago. For example, stick and grass mat structures are used for diverting water into the canals and such structures are periodically washed out and even when in place are inefficient. Canal intakes are washed away; canal banks ruined due to excessive water entering the canal; and canals are destroyed by flashfloods in cross-drainage channels, washes and drains which the irrigation canals must cross. Repairs of such repeated failures are time-consuming and costly and often more importantly cause interruption in the delivery of water at critical times during the irrigation season. This causes considerable loss in crop yields. Also, these small-scale irrigation systems generally contain more irrigable land than is actually irrigated in any one year. Due to lack of adequate design, there is not enough water in most of them to adequately irrigate all the land available.

There is no accurate inventory of irrigation systems which need improvement; however a U.S. Bureau of Reclamation team in 1971 estimated there were four to six million acres in the cohntry served by inadequate irrigation systems. From separate sources the MAI indicates there are 7,822 small irrigation systems in the country dependent on canal/river diversions, 5,558 dependent on springs, 6,741 dependent on karezes and 6,595 dependent on wells and other sources. These data though approximate show that the problem is huge and the potential returns due to more efficient use of the limited available water are major.

An example of a system rehabilitation effort which might be undertaken is the Solor Canal Project for which a reconnaissance report was prepared under USAID's previous project 005. The report reads:

At the present time, about 50 percent of the area is double cropped in summer corn. Local people state that with adequate irrigation facilities, this could be increased by 30 percent. This represents an increased net farm revenue of afs. 1,425,000. This benefit does not include the savings in loss of yield on the areas now cropped, which depending on the growth stage of the corn at the time of the outage, could be from 5 to 25 percent.

Each year the project experiences great difficulty in maintaining the canal in operating condition. The diversion structure and the canal at eleven major cross drains are destroyed by high runoff during the months of May through August. Until flood waters recede, the diversion structure cannot be rebuilt. In the summer of 1969, a total of 600 people worked 27 days trying to rebuild the diversion dam and maintain the ditch. This represents a cost of afs. 500,000.

The annual construction costs, with a 10-year amortization at six and one-half percent is afs. 1,040,000. Thus a savings on this project would be some afs. 885,000 per year.

B. Project Description

This project is focused on the rehabilitation and upgrading of an entire irrigation system. It will involve: 1) a survey of a complete system, 2) the making of expert judgments on the system elements needing to be replaced and/or redesigned, and 3) the implementation of the suggested system reconstruction. It differs from the irrigation system construction work to be performed under the Rural Works project in that the latter focuses only on single elements of systems, which elements have proven to be major bottlenecks -- for example, a flume which washes out frequently. The Rural Works effort is not designed to consider overall system upgrading.

The project is to be divided into several elements:

1. Element I. The Department of Irrigation (DI) will provide two survey teams consisting of Afghan engineers and agriculturists assisted by the U.S. contract team members in irrigation planning, soils and engineering design. Each team will make a mini survey of selected small irrigation systems in which farmers had requested help. In the surveys the teams will review the total water resources available to this and nearby systems; the amount now used for irrigation, the soils in the irrigation system; the degree of salinity; the economic and tenure condition of the farmers; the use to which the

water is being put; the production potential of the area; and other factors concerning the present status and potential of the irrigation system as a project area. The survey teams will, if the area is suitable as a rehabilitation and improvement project, prepare plans for the needed improvements.

The teams will continue to move to new systems and prepare improvement plans until sufficient work for the scope of this project has been defined. On most existing small-scale irrigation systems a survey team should complete their investigation and prepare design plans for the improvements within two to three weeks. The plans will be for engineering and agricultural improvements such as diversions, canal alignments, land leveling, etc., which would lend themselves to rapid development. Two teams will be required to conduct such surveys to keep ahead of the ten construction teams.

If the system proves workable, projects selected will be on the basis of requests from the local farmers in the system. The teams would use the farmers and agricultural extension personnel as their main sources of information. The intent is that this approach would lead to the farmers helping the project personnel improve the water supply on their own farms. All farmers in the system will be contacted and the project discussed with them individually and as a group. The final decision also will rest with the farmers on whether to go ahead and how the system will be maintained.

2. Element II. Upon completion of the subproject plans, and agreement with the farmers of the system as to their inputs (labor, local material, etc.), the plans will be turned over to the construction force. The construction force will provide the equipment and materials needed and supervise the project construction. It is planned that the actual on-the-ground implementation, using practically all local labor and materials, will begin within two to three weeks after receiving the detail plans. In most cases, it should not take more than three to six months from the time that the initial planning is started to the completion of the work.

Several construction teams will be required to keep pace with the planning and design teams. These teams will use available DI construction equipment.

3. Element III. The USAID advisory team will, during its stay, assist the DI in developing procedures for system survey, design and construction. The advisory team will also critique the efforts of still-junior DI personnel to provide the maximum on-the-job learning.

4. Element IV. A major concern of many irrigation experts in Afghanistan is that of inefficient utilization of irrigation water and the low level of maintenance

of the small-scale irrigation systems. During the second year of this project a short-term consultant will be brought in to work out with Afghan counterparts ways to develop water users' associations in each completed subproject. The goal of the water users' association would be an institutional framework of the subproject farmers for further development of the subproject area, better utilization of irrigation water, and making sure that proper procedures for the control and maintenance of their system have been developed.

For the construction element of this project, it is proposed to use the fixed cost reimbursement approach. The survey/design team will provide a cost estimate for the proposed work. The DI will be wholly responsible for project construction with only advice supplied by the USAID advisory team on request.

The USAID has devised a plan for the monitoring and inspection of structures which will be constructed under the Rural Works, Rural Schools, and Basic Health Services projects beginning in FY 1975. A third-country engineering firm will be employed to provide this service to USAID and the total cost will be pro-rated among these projects according to the estimated man-months of services required for each. The Small-Scale Irrigation project might also use the services of this third-country contractor for monitoring and inspection. The estimated pro-rata costs would be approximately seven percent of direct project construction costs.

C. Previous Activities of USAID and Other Aid Donors

The IBRD provided $800,000 to the Agriculture Development Bank (Ag Bank) to loan for the improvement of irrigation systems. The IBRD also provided a team of two expatriate engineers and a farm planner to help the DI check requests of farmers for loans. The team departed from Afghanistan in the Spring of 1974. Due to the problems mentioned under Socio-Economic Factors, only two loans out of more than 100 applications were approved. The Ag Bank has, however, provided over 200 loans for pumps.

USAID, through a PASA with the Bureau of Reclamation, in Project 005, provided assistance to improve existing irrigation systems from 1968 to 1971. This assistance was reasonably successful in building a capability in the Department of Irrigation, but it is now apparent that the project was terminated too soon. A potential capability based on a nucleus of trained personnel resulted from this project; but the potential is not being used. The proposed new project will build on Project 005. The new project will aid the GOA to make its potential operational with the use of the fixed cost reimbursement method to provide budgetary support and economic motivation.

PART V. SOCIO-ECONOMIC FACTORS

A. The small-scale irrigation systems in the country are built through the cooperative effort of the people within the particular system. The landowners in the system select a mirab, or watermaster, who controls the irrigation water distribution. The landowners tax themselves to pay the mirab's salary. In the larger irrigation systems, the mirab may have several assistants, who are also paid by the landowners. Each year, under the direction of the mirab, the farmers clean the system's canals of silt and do the necessary maintenance work. In emergencies the farmers also are called upon to pitch in and make repairs.

Although there is usually a good spirit of cooperation among the farmers within a system, there are limits to this cooperation. For example, it is generally believed that farmers do not trust the mirab to collect money from them to pay for improvements in the system. Along these lines the Agricultural Development Bank of Afghanistan states that the main reasons for the failure of the IBRD program to make significant loans to finance improvement of irrigation systems were: 1) the requirement of handling cash and 2) the complicated Ag Bank loan procedures.

Despite this failure the farmers in an irrigation system are aware of their problems and desire improvements. Many are also aware of the water control methods and structures used in large "Government-built" irrigation schemes. Therefore, the technology to be used in the small-scale irrigation systems would not be entirely new to some of the farmers assisted by the project. We believe that in many areas the farmers will be eager to accept this type of assistance.

B. What is important for this project is to build on the cooperative tradition in Afghanistan and to avoid demanding changes which may ultimately lead to conflict because of conflict with a strongly-held tradition. The plans envision farmer contributions in kind so that money will not be handled. Long-term maintenance procedures will be studied as part of the project.

As noted, the efficiency of many of the traditional irrigation systems of the country is low because of poor design. Partly because of this, these systems require excessive maintenance. Repeated failures are time consuming and costly to repair and cause interruption in the delivery of water at critical times during the season, resulting in considerable loss in production. There are in most irrigation systems or sub-systems in Afghanistan relatively simple improvements which could be made that would yield attractive returns on the investments. These are the sorts of activities that this project envisages and which are to be identified by the survey teams.

Not all persons in an irrigation system will be equal beneficiaries of such rehabilitation activities. To illustrate, assume the rehabilitation is that of constructing a permanent improved river diversion canal intake to increase the canal flow. This construction will probably provide the greatest benefits to the farmers on the outer reaches of the system (where water was previously scarce). We accordingly envisage construction activities that would significantly affect perhaps 50 percent of the farmers or an average of 750 acres of farms for each system reconstructed.

With the increased and more assured water supply which would result from the irrigation improvements one could expect an increase in yield, an increase in double cropping, perhaps an increase in the area placed in higher value crops (that consume more water), and also an increase in the use of fertilizer (because of more water and reduced risk stemming from a more assured water supply) might occur. It is risky to assume all such linkages. The survey team will be looking for projects which would be feasible with existing cropping and management practices. In calculating project benefits we are conservatively not including the productivity that one might expect to be forthcoming from double cropping, higher value crops, and improved cultural practices. Thus, the benefits computed for planning purposes are only associated with increased yields on already cultivated land.

The project's intended major beneficiaries are small farmers (i.e., those operating less than 15 acres of crop land). Irrigated farms are predominantly small and owner-operated in may parts of the country. By selecting irrigation systems in those areas where such conditions exist and with the survey team also screening possible subprojects partially on the basis of farm size and tenure relations, the dominant project beneficiaries will be small farmers.

The project impact on the intended major beneficiaries will be that of increasing their net farm income through the provision of more irrigation water and increasing the assurance of its timely provision. It is expected that about 10 irrigation systems or subsystems will be rehabilitated/improved in FY 1977; 15 in FY 1978; and 24 in FY 1979. The amount of irrigated land per farm in the project areas is expected to average about eight acres. The average family size is estimated to be nine members. Direct expenditures (U.S. and GOA) for the three years -- 1977, 1978 and 1979 -- are projected at $225,000, $340,000, and $540,000 respectively. While there is likely to be a wide variation from one subproject to another, it is estimated that an average of 750 acres will be significantly affected by each of the above 49 subprojects. These estimates are summarized the table immediately following:

FY	Number of Subprojects	Cost ($000's)	Total Acres	Number of Farms	People Benefitted (Directly)	Cumulative Net Income Due to Project ($)
1977	10	225.0	7,500	938	8,438	33,750
1978	15	337.5	11,250	1,406	12,656	84,374
1979	24	540.0	18,000	2,250	20,250	165,374
	49	1102.5	36,750	4,594	41,344	283,498

About 40,000 persons would receive benefits from the project. The completion of a subproject yields benefits averaging close to $4 per person annually.

On the above estimates, the net farm income during the project period would be about $283,000 greater than in the absence of the project. The internal rate of return under this conservative assumption is slightly over 15 percent. Income per acre is estimated to increase by about seven percent. To the extent that the project is successful, it should increase the rate of savings and investments of the participants. If successful, it should have some spread effect on the surrounding farmers, encouraging them to undertake improvements on their own land. The capability of the Department of Irrigation in the Ministry of Agriculture and Irrigation should be enhanced and should instill in the Department a sense of accomplishment and confidence.

The country's output of food crops should increase, making it less dependent upon imports. Activities of the magnitude envisaged for this project will have, however, a negligible impact on the general level of prices. If the larger follow-up project materializes the price impact will have to be considered.

The total cost of the project is estimated at $2.4 million, with the U.S. contribution being $1.6 million and the GOA share being $800,000. The largest outlay for the GOA in any one year is estimated at $300,000, or afs. 17.1 million. This is less than one-half of one percent of projected budgetary development expenditures by the GOA for that year. Thus, it would seem that the GOA share of the project is clearly manageable if the Government wants the project.