A Project Design for:

THE LOGAR INTEGRATED
RURAL DEVELOPMENT PROJECT
MOHAMMED AGHA DISTRICT
AFGHANISTAN

FIELD REPORT
Prepared for USAID/Afghanistan

28 November 1976

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PREFACE

A previous DAI team, headed by Dr. Alan Roth, completed an evaluation of the Rural Works component of AID support to the Rural Development Department during a seven-week study in April/May 1976. Included in the final report submitted in August (after receiving mission comments and recommendations) was an outline for an integrated rural development project, based at the district level.[1] It was proposed that RDD would provide more coordination of other ministries' functional responsibilities and less direct involvement in specialities beyond planning, coordinating, monitoring, and evaluating except as they involved increasing the participation of the rural population in the setting of priorities and the commitment of local resources to agreed development undertakings.

Based upon this report, USAID requested a design team to complete the datacollection and analysis, and provide inputs into a revised Rural Works Project Paper. Alan Roth returned to Kabul October 3, to lead the design team, joined a week later by Dr. David D. Gow, a development anthropologist, and Harvey C. Neese, agriculturist. Donald R. Mickelwait, who had written the original district-level integrated rural development proposal, joined the team on 14 November to assist in the final compilation of material and formulation of the details of the project design.

The DAI team worked in close collaboration with both RDD and USAID personnel to develop the project design. President Sediq assigned two professionals (Mr. Naim Kabir and Mr. M. Ibrahim) full-time to advise and

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[1] Final Report, Evaluation of the Rural Works Project, Phase I, for USAID/Afghanistan, Development Alternatives, Inc., August 23, 1976.

assist in the design effort. Mr. Sediq gave a considerable amount of his own time to discussions with the design team which provided a basis of mutual RDD/USAID support for the project concepts that finally emerged.

In USAID, Mr. Ernest J. Barbour, Chief of the Rural Development Division, provided continuous support to the design effort in terms of his personal contributions to project concept devlopment, participation in discussions with high-level GOA officials, and logistical support that allowed the design team to work more efficiently. Mr. Albert Nehoda worked full-time with the team providing invaluable insights and advice at all stages in the design development. Mr. Martin Kumorek was invaluable in developing the structural framework of the project design. Mr. George Carner and Mr. Barnett Chessin also made important contributions to the design effort. Ms. Grace Langley of NESA/Tech was in Kabul for two weeks providing assistance to the team in development of the project concepts and contributed the major share of health and education sector inputs. Mr. Shairzay provided considerable assistance in developing the questionnaires. Mr. Ghulam Sakhi Ahmadzai, a full-time USAID staff member, is a part-time farmer in the project area and helped the design team with his vast knowledge of the area.

CARE/Medico made a major contribution on the women's survey, with Mrs. Belques Shah and four female interviewers spending long hours in the project area conducting interviews.

For the household and village surveys, Mr. Ashraf Ghani Ahmadzai, an anthropologist from Kabul University, provided assistance, under special

contract, in developing and administering the two questionnaires. Able assistance in interviewing and coding from Messrs. Sayed Abdul Majid, Moh'd. Omar Yadgari, Hafizullah Sadiqi, and Moh'd. Waheed, also under special contract, was appreciated. Mrs. Pamela Alam provided excellent service to the team as secretary and general office manager. Miss Lakshmi Nagarajan and Mr. Ramesh Kumar worked long hours typing this report.

This is a field report, written, typed and completed in Kabul, over the Thanksgiving holiday, under the usual time constraints that attend such intensive design activities. Our appreciation to the support staff of the mission for their diligent cooperation. We believe the effort valuable, and that the project can make a difference to rural Afghanistan.

Alan Roth
Donald R. Mickelwait

Kabul, 27 November 1976

Part I: SUMMARY AND RECOMMENDATIONS

A. Description of the Project

The Logar Integrated Rural Development project is an experiment in local development with three major components:

- Joint planning and coordinated implementation of a district development program by agencies of the Government of Afghanistan that have ongoing or potential personnel and/or activities at the district level. The project would provide for a provincial planning team under the Rural Development Department (RDD) to develop an agreed district plan, as well as for village level field workers to monitor the implementation of the plan and its impact on the rural population. This is the structural component of the project.

- The systematic identification, testing and adaptation of new technology to increase agricultural productivity, production and income. The technology would include all agricultural activities: water supply, distribution, management, genetic varieties, cultural practices, processing, storage, consumption, marketing, etc. This is the technological component of the project.

- The establishment of viable local institutions to insure, a) effective participation of the community in establishing priorities and development plans; b) self-perpetuating gains in agricultural production; and c) broad distribution of the benefits of these gains in income to the villagers. In addition, local institutions will be the keystone to insure that the benefits of government services in education, health, nutrition, child care, family planning, adult education, etc., reach the target population. A specific portion of the project will concentrate on increasing options for women to participate in the economic life of the community. This is the organizational component of the project.

This is the first of two planned phases of the IRD project. In Phase I, experimentation will be undertaken by establishing a range of potential activities, programs and program implementation techniques, and learning by systematic data collection and analysis, the most effi-

cient processes to bring development to rural Afghanistan. The objective of the project is to define a replicable rural development methodology within the financial capability of the government of Afghanistan which, in a second phase, can be extended to other districts within the same province, and to other provinces.

The prime implementing agency will be the Rural Development Department, under the office of the Prime Minister, Government of Afghanistan. Complementary implementing agencies will be Ministry of Interior (local government at the provincial and district level); Agriculture (extension and cooperative development); Education (formal and Functional Literacy and Adult Education programs); Public Health (hospitals, polyclinics and basic health programs); and other government agencies, such as the Afghan Fertilizer Company (wheat variety and fertilizer response testing) as they provide development opportunities within the designated district in Logar Province.

B. Summary Findings

This experimental project is a natural follow-on to proven successes in the establishment of the rural works component of the Rural Development Department. It is an attempt to demonstrate to the Government of Afghanistan that there are viable answers to the problems inherent in bringing change and modernization to the countryside without assigning all responsibility, personnel and budget to RDD -- an approach presently being attempted in several other IRD projects. Most observers here believe it is unrealistic to expect RDD to assume all functions of government in the rural areas. Yet at present there is no known mechanism, no proven methodology, for generating a joint ministry development plan and then providing the wherewithall to implement the plan at the district or provincial level. This project is designed to provide such a tested and proven methodology for creating rural development.

An extensive data collection effort has established the existing conditions in the district of Mohammed Agha, Logar Province, as well as the government programs ongoing or planned to intervene in this traditional agricultural area. The findings have led to a project design with structural, technological and organizational components. The process of convincing RDD and the line ministries of the possibilities of active cooperation has been started, and must be continued for the forseeable future. This is neither an uncomplicated nor an easy task, but one which is necessary if the rural areas are to receive more than token, "pilot" development activities now underway. The objective of replicability,

that is realistic human and material costs of duplication, has been matched with the need for a learning and testing process to design a project which has high front-end costs which disappear once the appropriate knowledge has been gained.

This portion of the project is a necessary complement to both Rural Works and Community Irrigation Systems, and should be approved to allow optimization of the efforts already begun in promoting rural development in Afghanistan.

C. Project Issues

Three issues are of critical importance to the design of the Logar Integrated Rural Development project.

First, there is a clear trade off between the rapid achievement of production, productivity, and income changes in Logar (as well as the institutional changes required by local communities to perpetuate and distribute benefits) and the potential replicability of the model throughout rural Afghanistan. There is little history of successful local development activity by personnel from the line ministries. In Logar's Mohammed Agha District, the 75-plus government representatives from development agencies have contributed only marginally to change and modernization at a pace generally deemed unacceptable by the national leadership. One approach to rapid change is to assign to RDD a large budget, conscript line ministry personnel, and give RDD the clear authority to create integrated rural development in every functional area, from child care through health and formal education to agricultural extension.

There are several reasons why this is not a useful approach:

- Since seconded personnel are, according to President Sediq, usually below the mean level of competence, this personnel shift would likely diminish rather than increase the human resource bank in the target district.[1]

[1] In Ghorband District, Parwan Province, RDD has been able to acquire its own extension workers, doctors, teachers, etc., seconded from their home agencies. RDD President Sediq acknowledges that this seconding process provides an incentive for the line ministries to send their lower talented personnel to RDD. The survey suggests that personnel assigned to Mohammed Agha district by the line ministries are as individually capable as could be expected. What is lacking is an institutional structure which promotes, encourages and supports developmental activities. See the Final Report, Evaluation of the Rural Works Project, Phase I, For USAID/Afghanistan, Development Alternatives, Inc. August 23, 1976, pp. 61-67.

- While the Ministry of Public Health may assign a few doctors to RDD on a pilot basis, they have no intention of assigning all their rural doctors to RDD -- an attitude held with equal fervor in the Ministries of Agriculture, Education, etc. Thus the success of the pilot project would not provide a model for the success of many such district development schemes. Instead, it would reduce the possibility of replication.

- Such assumption of responsibility by RDD allows the complete abdication of concern for rural activities by the line ministries in RDD's other "pilot" districts. This further prevents the institutional and attitudinal changes necessary before the line ministries become capable development agencies.

However, in terms of AID's own objectives, it should be clear that opting for "replication" in a district development model means struggling with all the difficulties of coordinating various line ministries activities; leading, rather than controlling, developmental change. This is a slow learning process which will not deliver quick benefits to the target population in Mohammed Agha District. Measurable changes in the quality of life should only be in the later years of Phase I, when the appropriate lessons have been learned, and a methodology tested which will bring the desired rural developmental impact.[1]

Second, there is an apparent anomoly between a project designed to produce a replicable model of affordable district and provincial development, and the resources suggested for Phase I of this project -- a bevy of direct hire, contract, Peace Corps and CARE Medico foreign advisory personnel, plus numerous professional staff positions for RDD -- all for a district which may have as few as 10,000 households. The issue at stake is the necessity of high-level personnel to identify and test various approaches to a process of rural development, the ability to select out

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[1] Benefits to the target population are necessary to "prove" the methodology. In early years, benefits will likely be measurable only through proxy indicators of behavior changes among the target population.

from the many activities under consideration for testing, implementation and data collection, the few which are critical for replication. The thrust of the project is for: (1) experiments which call for testing of various approaches on a host of different activities which appear to be critical to development; (2) continuing interaction with both the bureaucracies and the local population, and (3) an extensive data collection and analysis system.

From Phase I we expect to narrow the range of activities, the number of permutations recommended for testing selected approaches, and the amount of data to be collected and reviewed before clear conclusions can be reached. It is a process of stripping away the unknowns in a systematic fashion until the critical elements emerge, and then insuring that the few critical activities are correctly carried out. Phase I is an expensive identification and testing process to find a bargain basement model which evens out the cost/benefit ratio over time. Before Phase II is requested, some conclusive results will need to be in on the success of this process.

Third, the project requires a solid commitment to local institutional development, building upon the informal elder/malik groups which resolve conflicts and have insured permanence of the society. In the complex social structure of Afghanistan this will not be accomplished by dramatically increasing the membership in the local fertilizer/credit cooperative. Rather, it is a process of institutionalizing the broadest possible participation in the setting of priorities, the decisionmaking leading to commitment of external and local resources and the distribution

of benefits from development activities. This is necessary to insure the continuation of initiated development programs, as well as to prevent exploitation of the lowest and least privileged members of the rural society.

The local population has readily demonstrated its willingness to accept government services which are in its own interest. They will also adopt new behavior when it suits their understanding of "gut" issues. Water supply, control and management is one such issue and, along with contributions to the mosque, there is no other area of more fundamental importance to their continued existence in rain-scarce Afghanistan.

However, the distribution of benefits from self-regulated, local agreements, such as water agreements, remains unclear. According to the best sources, there is a wide range of latitude of individual initiative -- the Malik and the council of elders may act to insure a relatively broad-based distribution of water, or other benefits. In other circumstances, the Malik may act (according to the local population) to further his own and his immediate coteries interests at the expense of the majority of his own community. We do not know the reasons for such judgements (obtained from local interviewees) which likely involve the breaching of complex reciprocal relationships. We also do not know the cause of such action other than to attribute it to individual whims of local leadership, a trait of Afghan society which extends from a local community through the bureaucracy to the provincial level. Government leaders' own performance can be publicly or privately oriented with high variability depend-

ing, seemingly, upon the makeup of the individual.

This project attempts to formalize, institutionalize and make standard a set of behavior patterns among the leadership, at all levels of society, which promotes broad-based development. There are apparently only two mechanisms for achieving this, although the project during Phase I will obviously seek more alternatives. The first is the incorporation of more and more individuals into the decisionmaking, monitoring and evaluation process, under the hypothesis that more broadly-based decisionmaking leads to more equality in benefit distribution. The second is to instill within the system a set of written and agreed plans, complete with funding levels, activities and expected outputs, and to measure adherence to the plan in the public domain, that is, where many can see and review the results. Together, these two interrelated activities may help modify the highly individualistic process of decisionmaking and resource commitment into a more structured and more consistently egalitarian task/output oriented society. We recognize the long term nature of the task, but see no viable alternative. This is one important thrust of the project, and one reason for the concentration on local participation, planning, monitoring and evaluation as steps along the road to equitable development.

BACKGROUND

EARLY RDD HISTORY

A rural development program was first established in Afghanistan in 1953 with the commencement of a pilot project in two villages. From this experiment, the Government established a full fledged program that had, among its objectives, the following:

> To raise the productive output and income of the villagers by bringing to them the help of modern technique in agriculture, sanitation and health, cooperatives, handicrafts and small-scale village industries, etc.
>
> To create a spirit of self-help, initiative, leadership and cooperation among the villagers to provide a foundation for self-perpetuating economic and social progress.
>
> To organize a rural extension framework through which the associate Ministries can pool their resources to help the villagers to improve their living standards. (First Five Year Plan)

Expansion was slow in the 1950's but by 1966 the program included 23 projects that covered 3,050 villages and a population of an estimated 1,100,000. An evaluation of the program in 1966 clearly indicated that the major objectives were not being achieved. Instead of the line ministry participation identified initially as a major part of the program, RDD undertook all substantive activities in the development areas. The Second Five Year Plan criticized this by stating

> This would create an unhappy and anomolous position which would virtually amount to the shrinkage of authority, responsibilities and jurisdiction of technical ministries and undue expansion of the department at their cost and could not, as such, find acceptance from any quarters.

There was clear conflict over the RDD role, and the manpower necessary for effective expansion of this department was not made available. The evaluation also indicated that the interface between the government and the villages was troublesome because the project personnel did not understand the intravillage dynamics.

The second project undertaken in this program was called Logar I and covered the Mohammed Agha District. Although the program was active in this area until 1969, survey work for this IRD project design identified no lasting institutional effect of the program activities.

A NEW START

The rural development program was terminated in 1969 but experienced a reincarnation with the new RDD Charter. The former program activities have all been abandoned and RDD was without staff for other than rural works projects when the AID Rural Works Project offered assistance to RDD "to develop and start experimentation with an integrated rural development pilot program for three districts of three provinces,...."

The plan was to have the GOA identify six districts of six provinces for an initial situation survey and site selection. The Planning Teams that were to undertake the surveys never materialized. USAID initiated support of an IRD experiment in Ghorband District of Parwan Province but this project had been surveyed and planned by Indian Advisors to RDD and did not fully meet the criteria for a USAID-financed experiment. The

Rural Works Project is continuing support to Ghorband in the form of FAR funding for rural works but does not regard this project as a USAID experiment.

SELECTION OF MOHAMMED AGHA DISTRICT

The plan to experiment in three districts of three provinces proved to be unrealistic in the original time frame and USAID requested the GOA to identify one district for experimentation in integrated rural development. In September, 1976, the Cabinet chose Mohammed Agha District of Logar Province as the site for the experiment. The District's suitability as an experimental site was assessed by AID and found satisfactory. One possible liability was the plan to construct a new international airport in Mohammed Agha District to serve the city of Kabul. It is unlikely that the airport will be built in the near future. If construction does begin in the next few years the effect of the construction on the project activities should be minimal (see Annex Three for a detailed assessment of the airport's impact on the project area).

GOA INTENT

It is difficult to assess RDD's policy intention regarding the implementing of rural development projects. The RDD Charter does not provide a clear definition of the RDD role in rural development. It gives RDD the task of coordination and implementation but does not identify the role of the line ministries except as to their membership on the coordinating

councils. The Prime Minsitry and the Ministry of Planning have encouraged RDD to undertake full implementation of rural development activities in the selected regions. RDD has adopted this approach in Ghorband, Katawaz and Nangahar. The Ghazni/Wardak experiment proposal of FAO/IBRD puts RDD in the role of implementor of rural works with some coordinating responsibilities. The UNDP proposed project in Badakshan provides two options: (1) RDD as major implementor and (2) RDD as rural works implementor and coordinator for the other development activities.

The GOA willingness to experiment with a variety of approaches to rural development might reflect, (a) their acceptance that they do not yet know the best approach to use and are looking to learn more; or (b) they have already made a policy determination but are willing to permit other approaches because the experiments are tied to needed financial and technical assistance. Efforts at coordination in rural development in the past have been minimal (in light of the former RDD implementor role). Coordination attempts of various governmental agencies at the national level have apparently been less than satisfactory. A hypothesis of this project is that coordination is possible with the emphasis on decentralized planning and a supportive information system, providing coordination mechanisms as yet untried in Afghanistan.

Rather than an acceptance of this hypothesis by the GOA before the results of the experiment are in, what is important is a willingness to conduct the experiment, some political support to legitimize the project in the bureaucracy, and an interest in the results. The Project appears

to have this support and interest and any clearer assessment of GOA intent can only be made through actual implementation of the project.

DESCRIPTION OF THE AREA

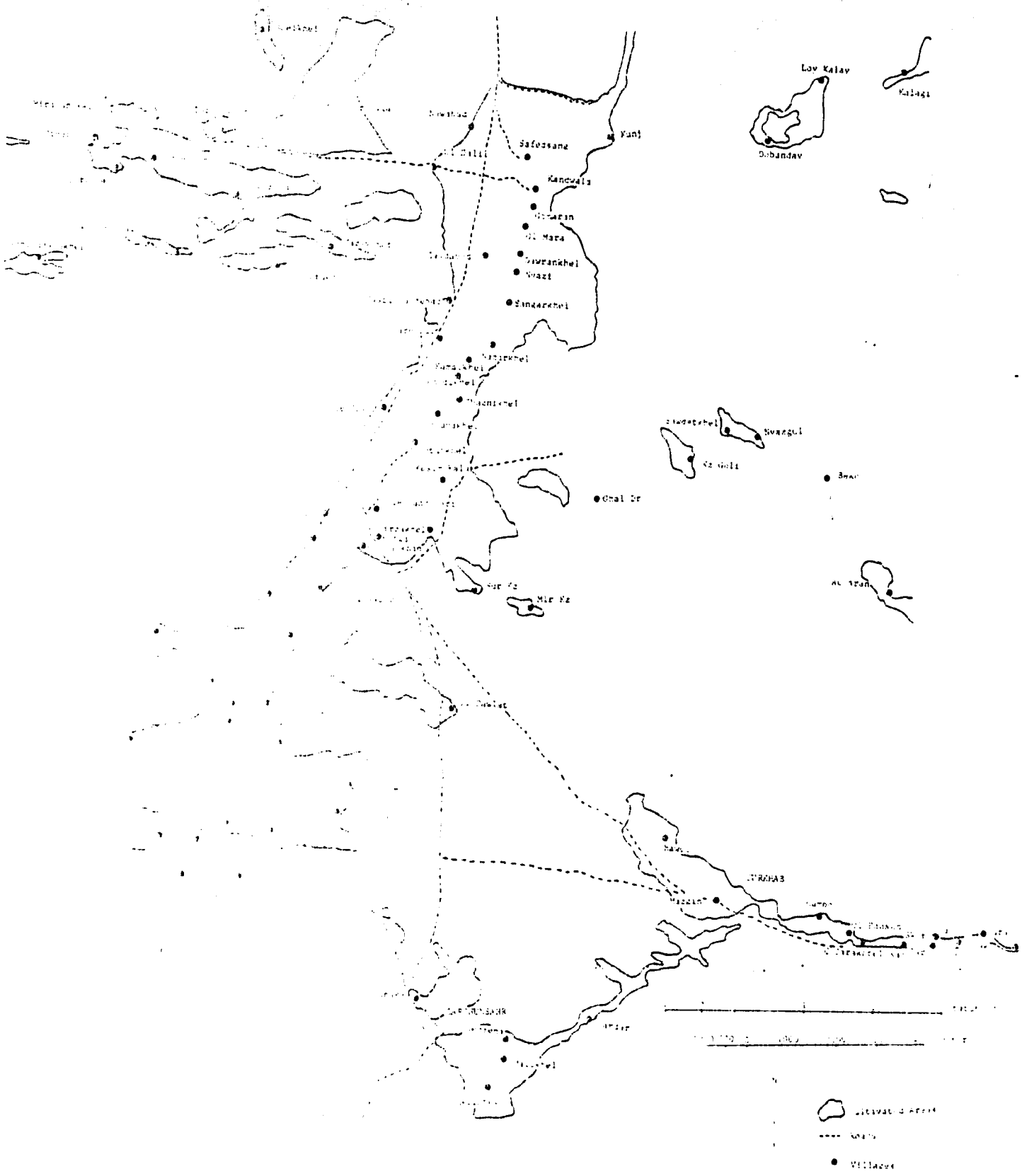
Mohammed Agha is the northernmost district of Logar Province located due south of Kabul. The primary feature of the district is the Logar river, forming an inhabitable valley approximately two miles across and 12 miles in length. Besides this populated area, based upon canal irrigation from the Logar River, there are pockets of cultivation made possible by well/spring irrigation between the river and the surrounding hills.

During six-months of the growing season, only 1.5 inches of rain falls in this portion of the valley, making agriculture dependent upon irrigation. Wheat, the least water-demanding of the local crops, is grown on 80 percent of the available lands. Approximately 50,000 inhabitants may farm 10,000 hectares, perhaps one-third intensively, the remaining two-thirds occasionally as the water is rotated across more land than can be irrigated.[1] The area is not self-sufficient in grain staples, with purchases required by the average farm family.

[1] Among the unknowns in Mohammed Agha are the total population, which is estimated at 53,000 by counting the registration certificates (Tizkara), dividing by 2.5 to obtain household size, and multiplying by 6 -- according to a formula determined in a previous population study in rural Afghanistan. The irrigated hectare figure was calculated from total irrigated land in the Logar valley. Neither is presumed accurate.

MOHAMMAD AGHA DISTRICT

INTEGRATED RURAL DEVELOPMENT EXPERIMENTAL PROJECT



A major highway runs through the district, allowing travel to Kabul within 45 minutes. Most families interviewed had at least one member working in Kabul. Preliminary and tentative survey results place the farm family income at approximately $400 per year, and the "good" land holdings well below two irrigated hectares. The farm population is innovative, and responds well to economic incentive. They hold a relatively negative attitude toward government intervention in all areas except water availability -- where they have standing requests for assistance from RDD. The predominant ethnic group is Pushtun, with some recent settlement by previously nomad families providing strong kinship ties to the herders, who have ill-defined but recognized rights to grazing land between the irrigated valley and the nearby mountains. About twenty-five percent of the population is Dari-speaking, Tajic.

The district office defines 37 population centers (villages), while the 1/50,000 maps show more than 80. The people themselves have complex definition of a village, relating more to kinship groups than to geographic proximity. The government ends at the district seat, and the local population resolves conflicts, sets standards, and administers its own law with minimal outside interference. While the negative attitude toward most government interaction extends to the five officially established cooperatives in the district, farmers do express interest in cooperating to improve farm yields and income.

The areas problems are readily identified, and noted by the local population -- beginning with water availability and extending through

management and use to the cropping patterns. High yielding fruit trees have made an appearance in the valley, and a few farmers have apparently become rich from vineyards -- with grapes picked and packaged for export to India and Pakistan.

The district does have one advantage over more isolated areas. Because of the relatively good transportation network and the presence of commuters to Kabul, significantly more students are enrolled in school than the national average. A household survey taken in the major population centers suggests that more than 80 percent of the males, 6 through 15, are attending school, compared to a Logar Provincial average of 46 percent. Females attended school at a rate of 15 percent of those between 6 and 16, compared to the Logar average of 4 percent. The average distance from home to school was less than 2 kilometers, and the majority of the students walked. This suggests that changes may be introduced into the area which would be more difficult in areas where formal education is still relatively unknown.

ROLE OF OTHER DONOR ORGANIZATIONS IN RDD

The ability of RDD to respond to the demands of this experimental project depends to a large extent on the level of competing demands of other donor projects. Up to the present time RDD has had a relatively small input level from foreign donor funding with a total of $1,075,000 in Afghan year 1354 (3/75 to 3/76) and $1,737,000 in the current year. Starting in 1977, foreign donor funding will increase drastically and

this will put a heavy demand on RDD to provide support for the proposed projects.

The United Nations Development Programme (UNDP) is in the final stages of negotiating a new project in 1977 entitled "Strengthening the Rural Development Department". The project will last for five years and will cost an estimated $3,211,300, providing 414 man-months of expert services, and 678 man-months of training Fellowships. The UNDP is also in the process of planning an integrated rural development project in the province of Badakshan. A Finnish consulting team recently finished a socio-economic survey of the province and have proposed a project that would cost $9,920,000 and 496,000,000 Afs between 1977 and 1982. This project would be under the auspices of RDD but the degree to which RDD would implement the project has not been determined.

The United Nations Capital Development Fund has been requested by the GOA to provide $1,400,000 in equipment to RDD for construction of tertiary roads and minor irrigations systems ($800,000 and $600,000 respectively). One unit of each would arrive in early 1978, the rest at an undetermined time in the future. The minor irrigation system units are targeted for use in Badakshan, Parwan, Farah, Ghor, Bamian, and Urosgan. The road construction units are targeted for these same provinces except Badakshan where the Capital Development Fund is supplying a separate $560,000 unit.

Construction targets for the CDF equipment have been set over a period of five years as follows:

- 52 minor irrigation systems (estimated cost - 65 million Afs)
- 445 kms. tertiary roads (34 million Afs)
- 46 bridges (44 million Afs)
- 1400 culverts (22.5 million Afs)

An FAO/IBRD planning team recently finished a survey of the provinces of Ghazni and Wardak for preparing the design of a five-year $20,000,000 IRD project. Before departing Kabul the team communicated to the USAID Rural Development Division a very tentative, approximate picture of the basic plans. With the emphasis that many changes were still possible, the following targets were mentioned:

- 400 kms. of secondary and tertiary roads
- 100 kms. of feeder roads
- 150 irrigation intakes (rehabilitation)
- 180 drilled wells
- short-term credit line on agricultural inputs to cover 15,000 hectares
- medium-term credit for water pumps, oxen, orchards, etc.
- strengthening of extension services
- Agricultural Research sub-station of 20-30 hectares

The initial emphasis would be on small-scale rural works which would be the responsibility of RDD. Line ministry operations would not be turned over to RDD.

RDD has drawn heavily on the World Food Programme's "Multipurpose Development Project" that is supplying $11,655,000 in WFP food to the GOA from July, 1975 through May, 1979. RDD is the coordinating department of

the project and has used approximately 60% of the food assistance, worth 5.4 million man-days through June, 1976.

An Indian technical assistance team has been providing support for RDD's integrated rural development project in Ghorband District of Parwan Province. The team currently has three members but this number is expected to increase over time. The Indian team has surveyed Katawaz District of Ghazni Province where an IRD project will soon be implemented. The same team will be doing a survey of one district in Nangahar Province and is expected to play a major role in providing the technical assistance for both the Katawaz and Nangahar projects. These two projects and the Ghorband project are all geared to the approach whereby RDD takes over the functions of all the line ministry development operations, and the line ministries withdraw their personnel.

Thus, if the projects are funded as planned, RDD will expand its operations from a comprehensive role in one IRD project to a comprehensive role in three IRD projects plus a major role in three other IRD projects (in four provinces). This is in addition to an expanded rural works program (nationwide) and a new minor irrigation system program.

If all of the above projects are approved as planned it is clear that RDD will not be able to provide the required support. The key constraint in RDD expansion, identified in the Rural Works Project evaluation, is the lack of trained, experienced manpower. RDD can expect to obtain only 2 to 3 new engineers each year. While technical assistance will be available to help RDD improve its capacity there are severe limits to how fast RDD

can grow. The design of this project takes into consideration this RDD limitation and will minimize demands on the RDD central structure as well as minimize demands for personnel (especially engineers) that are clearly in short supply. Discussions have already begun with President Sediq and representatives of the involved donor agencies (in combined sessions) to examine the overall donor input and work out a collaborative process whereby the donor agencies will not be competing for scarce RDD resources.

INTRODUCTION TO PART III

This section has been written to integrate, as much as possible, the logical pattern of exposition of a complex development project with the requirements of AID's project papers. The three interrelated components of the project -- Structural, Technological and Organizational -- can be entered into the PP outline as Administrative Analysis, Technical Analysis and Social Analysis, respectively. The financial requirements to support the project complete Part II. The estimation of economic returns to an experimental project designed to produce a process which introduces rural development into Afghanistan is left to other soothsayers.

The three project components form a single development package. One cannot be omitted, based upon our analysis, without eliminating the ability of the project in its experimental or its continuation phase, to impact on the target population. In addition, there is some duplication among the three components, as we have attempted to present complete arguments, and thus innovation patterns, farmer attitudes, and some of the fundamentals of the agricultural system are mentioned, from different perspectives, in both the technological and organizational sectors.

Many more details have been included in this report than would be necessary for AID/Washington to render a considered judgement on the attractiveness and viability of the project. Since implementation is a key (the implementation arrangements constitute one-third of the experiment), much detail has been provided which would assist USAID to write a detailed

implementation plan for approval of the government of Afghanistan, and to allow project implementors a running start in the spring of 1977, when the next growing cycle begins.

TECHNICAL ANALYSIS

INTRODUCTION

This section presents the technical analysis of the project's objectives to develop a process which leads to significant improvements in agricultural production, productivity and income among the target population. It begins with a review of water constraints, and continues into the agricultural system dictated by patterns of water availability. The conclusion presents a set of experiments which should be given priority as the project gets underway--experiments to expand the knowledge of useful technology which is appropriate for this area of Afghanistan.

WATER AVAILABILITY IN THE LOGAR VALLEY

Water is the lifeblood of the agricultural system. The 6-month growing season averages only 1.5 inches of rain making agriculture in the Logar Valley, with the exception of some dry-land farming, dependent upon irrigation.

Water and water problems dominate the lives of rural villagers in Mohammed Agha District. In responding to questions on the problems which lower production and the

primary problems, past or present, in their villages, water was the inevitable answer.[1]

Besides dominating villagers' concerns, water problems consume great community effort in man-days of labor and cash payments to specialized workers. The supply of water, the beginning of the system, is relatively straightforward. However, water management and use present complexities which have not yet been fully understood or appreciated except by participants in a particular irrigation system. Century-old patterns of water rights are controlled by local associations or communities with minimal government interference. An understanding of the rural society in the Logar Valley begins with some grasp of the role of irrigation water supply, management and distribution.

WATER SUPPLY

Precipitation averages, by month, as well as temperature averages and extremes portray the Logar Valley as an area

1. See Annex One for the details of the surveys conducted in Mohammed Agha District.

dependent upon surface or ground water. During the hot summer months only minimal rainfall occurs, on the average, although in some years out-of-the-ordinary rainfall will allow a wheat crop to be harvested on the non-irrigated lands between the lower valley and the mountains.

In Mohammed Agha District, there are three main water sources: the Logar River, the Surkhab Dam (on a small tributary), and the local karez systems. These are explained in some detail in the following sections.

The Logar River

Not enough water in the hot summer months is off-set by too much water in the Logar River in the late spring. The seasonal percentage run-off of the Logar River is:[1]

Spring March-June	Summer July-August	Autumn/Winter October-February
52.3%	6.3%	41.4%

The spring run-off causes annual losses to farmland

1. Survey of Land and Water Resources, Afghanistan, Volume I, General Report, UN/FAO, 1965, pp. 114.

Table 1

Precipitation and Temperature Variation in Mohammed Agha District, Logar Province

Average Rainfall	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Inches	1.56	1.87	1.41	1.70	0.50	0.07	0.04	0.13	0.08	0.02	0.31	0.60	8.34
M.M.	39.7	47.6	35.9	43.4	12.8	1.9	1.1	3.4	2.2	0.5	7.9	15.3	211.7

Selected Summer Rainfall (inches)

1971	000	000	000	.4	000
1972	.4	000	000	.02	.1
1973	000	.2	.03	000	000
1974		.04	000	000	000
1975	000	000	.7	.05	000

(summer rainfall generally occurs in one day within the month.)

Average Temperature												
Fahrenheit	23.0	20.8	42.3	56.8	65.5	74.5	78.1	76.6	68.0	56.3	45.5	32.7
Centigrade	-5.0	-6.2	5.7	13.8	18.6	23.6	25.6	24.8	20.0	13.5	7.5	0.4
	(1971-75) Mean Maximum Temperature											
Average Fahrenheit	35.9	31.1	51.9	69.1	78.0	84.0	91.0	89.6	82.4	71.0	60.6	45.3
	(1971-75) Mean Minimum Temperature											
Average Fahrenheit	16.3	13.3	32.2	44.9	51.0	57.6	63.0	61.5	52.0	39.2	29.0	25.0
	(1973-75) Absolute Maximum Temperature											
Average Fahrenheit	43.8	54.8	71.9	80.6	85.6	94.5	96.6	96.2	89.4	73.4	69.3	52.4
	(1973-75) Absolute Minimum Temperature											
Average Fahrenheit	-2.74	-8.26	13.5	35.8	42.8	50.9	58.3	54.5	44.2	28.0	21.4	11.5

Source: Records of the Civil Aviation and Tourism Authority GOA. (Obtained for proposed new international airport site in Logar Province).

on the Logar River and smaller tributaries. Not only is the life-giving water stored in the form of snow in the mountains lost during the spring run-off, but the flooding causes obvious soil erosion as well as considerable damage to canal and intake systems on the Logar River.

There are no functioning storage reservoirs along the Logar River in Mohammed Agha District. Irrigation is solely dependent on stream and karez flows during the time period the water is to be used. According to one report, 30-50% of potential water supplies are lost in flash floods or excessive seasonal flows in rivers.[1]

Expert concensus seems to be that control of water from the seasonal tributary run-offs in upland areas would provide a more uniform flow in the Logar River and reduce damage due to flash flooding. Any impoundment, however, could affect wells, karezes or springs in the area of a reservoir. The aquifer should be studied before initiating any new reservoir proposals. High siltation can also be a major water storage problem.

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1. Project Proposal:AFG-2 UN/FAO, undated.

There are 17 major intakes supplying water to the juis or canals in Logar Province, four in Mohammed Agha District. Such intakes usually consist of retaining structures made of sticks, wood, rocks and mud which raise the water level of the river. The water enters the intake from above the retaining structures into the canal system.

These intakes are not permanent structures and are easily washed out by rising water levels of the river. One permanent intake is being constructed at the village of Moghul Khel by RDD. The construction materials are rock and concrete. The RDD Director stated that all of the other 16 major Logar River intakes need permanent structures in order to supply uninterrupted irrigation water to farmland. Repairing or replacing intake wash-outs demand a major source of farmers' labor during the spring.

The Distric's four major and numerous minor intakes irrigate an estimated 6,000 hectares in the district.[1] Not all of the farmers along the canals suffer from a shortage of water, 39 percent reported they had sufficient water for their own land holdings--farmers whose holdings are undoubtedly along the beginnings of the canal systems before water availability has been reduced. Perhaps as serious a problem as the lack of adequate water through the year is the absence of water in the spring, between times when flooding washes out the villager-made intakes before the water recedes sufficiently for local labor to make the necessary repairs. One of the seven villages surveyed along the Logar River estimated it required 16,800 man-days last year to repair the intake and the main canal, at 50 Afs per day, a cost of $18,700. These figures underscore villages' interest in obtaining RDD assistance to build permanent intakes along the Logar River. This

1. Rough calculations from the soil map of the Logar Valley prepared by the FAO, "Afghanistan and United Nations Special Fund Land and Water Resources Survey" 1962, suggest there were approximately 10,000 irrigated or partially irrigated hectares in Mohammed Agha District. Assuming that the Surkhab Dam irrigates approximately 1,000 hectares, and that the karez systems have the potential to irrigate approximately 3,000 hectares, the Logar intakes may provide water for the remaining 6,000. There are no better estimates available at this time.

would increase the availability of water in the spring. Whether such permanent structures would increase the total water availability during the summer months remains to be determined.

The Effects of Water Scarcity

The canal users along the Logar River vary in water availability, associated cropping patterns, cultural practices, use of improved seeds, fertilizer, insecticide and thus yields and income. Group interviews among eight villages suggested that wheat yield ranged, among the villages, from a low average of 60 seers per jerib to a high of 110 seers per jerib. The interviewees were the more established land owners (including the malik) and their yield estimations were high compared to the larger sample of 73 households in the same area with a mean wheat yield of 55 seers per jerib.[1] The interviewers believed that there was a range of approximately 100 percent between the high and low yield estimates, with the major conditioning factor being the timing and amount of irrigation water.

Among the canal irrigators who were owners, 15 percent of the irrigated land was held idle as a result of a

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1. One seer equals 7 kilos, or 15.4 pounds. 1 jerib equals .2 of one hectare, 2 jeribs equal one acre. Wheat yields are treated in more detail in following sections. Differences between the "Group" and "Household" interview results are discussed in Annex One.

shortage of water. When the 39 percent who reported sufficient water are subtracted from the canal users population, 40 percent of the land which could be irrigated was withheld from production by the remaining owners. The cropping patterns in this area do not call for an idle fallow period--water shortage was the explanation for the idle land. This suggests wide variation in water availability, benefits, and agricultural production, productivity and income which depend critically on irrigated water.

Surkhab Dam

This dam lies above the village of Surkhab, about 15 kilometers east of the district capital of Mohammed Agha. It was constructed some 40 years ago, and has (so far as we could determine) been ineffectual since its inception. The dam has not provided the designed water storage because of seepage and leakage, and its present holding capacity is 25 per cent of the original plan.

The masonry structure is 20 meters high and 130 meters in length, made of small rock mortared with cement and sand. Three ring-type gates, 1.2 meters in diameter control the flow through the dam.

At present, water flowing into and from the dam irrigates an estimated 1000 hectares.[1] Because of the potential for expanding agricultural production on land which is presently unused, the renovation of the dam has held the continuing attention of the Government of Afghanistan. No less than four survey teams have visited the site, including a comprehensive report prepared by a Russian team (which could not be located by following UN/FAO experts).[2] The other reports suggest that a feasibility study to determine if the dam can be "waterproofed" at reasonable cost call for standard techniques which are well within the capabilities of Afghan engineers. The recommendations are to measure the inflow and out-

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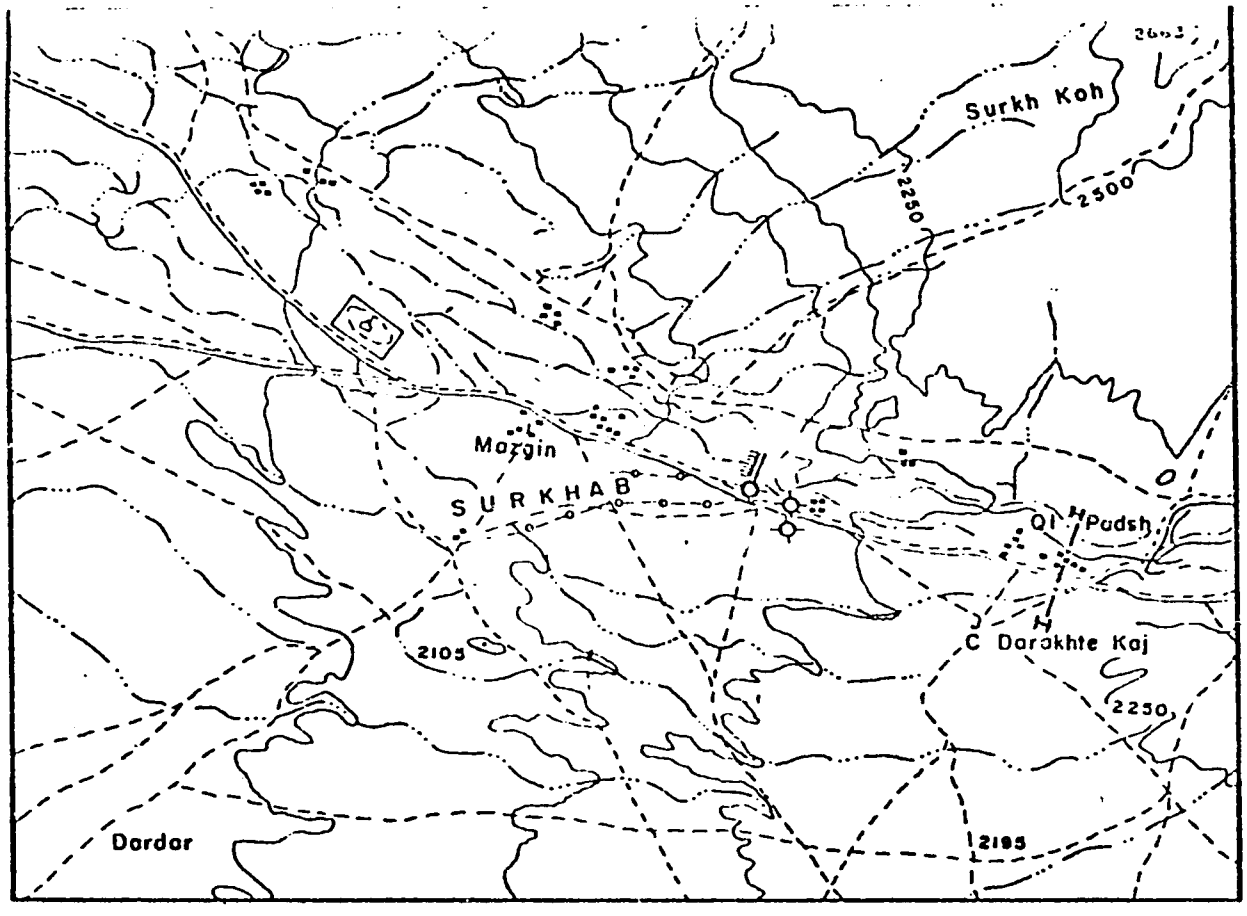
[1] Information from the report "Surkhab Dam Reservoir Leakage and Loss of Storage" by Michael Spero UN/FAO, Nov., 1974.

[2] "Surkhab Dam and Reservoir Leakage and Loss of Storage", M.V. Rao, UN/AFG/68518 (undated) and "Report on the Reconnaissance of the Surkhab Dam", Z. Dadak, UN/AFG/518, Oct. 20, 1974.

flow over a year's cycle, drill holes to determine the composition of the foundation (to understand the magnitude of the leakage problems) and grouting exploration. Specifically, they recommended a hydrogeological drill hole investigation on the left abutment and an investigation of the karez system in the vicinity of the dam.

As fundamental is a better understanding of the irrigation potential of the dam, estimated to be able to contain 1.7 million M^3. Assuming that the regular flows in and out of the dam are presently fully utilized, the storage capacity as estimated would only serve 400 additional hectares, based upon the prevailing wisdom that a jerib of wheat requires 5,000 M^3 over the growing season. However, the capacity may be significantly underestimated.

The potential for a major expansion of the agricultural base is intriguing (perhaps as much as 25-30 per cent increase in intensively irrigated land), based upon the original estimates of 4,000-hectare irrigation potential. Since the feasibility studies to determine the costs of repair are relatively inexpensive, this water source has been included in the project.



LEGEND

Surkhab dam

proposed observation borehole

proposed runoff gauging station

Logar river basin

Surkhab dam layout

Scale 1: 50000

The Karez Systems

There are no pumps or pumping stations in Mohammed Agha District, all irrigation is by gravity feed. Away from the river where elevations increase, gravity canal irrigation is not possible and the water source must be a spring or well. From centuries of experience the rural farmers have learned to dig and maintain an enclosed well system which utilizes underground outlets, tapping the aquifer at higher elevations to bring water out at ground level for utilization on croplands. A diagramatic sketch of a karez system is contained on the following page.

There are 44 karez systems in Mohammed Agha district, irrigating 11,420 jeribs. In addition, 1,500 jeribs receive partial water from karezes which have lost much of their flow. Seven are dry, with a loss of 1,400 previously irrigated jeribs. A listing of the karez systems in the district is attached.

In contrast to the canal irrigators, only 7 per cent of the land owners operating on karez systems reported they had enough water, causing 24 percent of the total irrigated land (land which could be irrigated) to be held out of production.

DIAGRAM OF A KAREZ

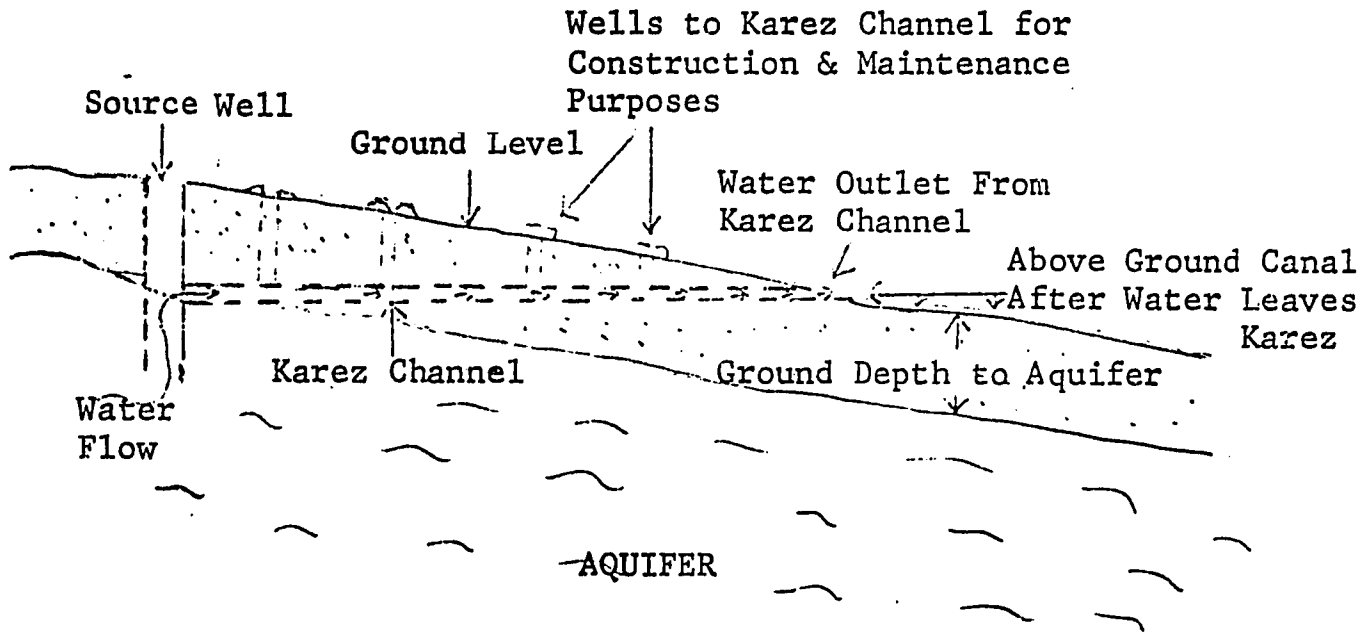


TABLE 2 Number & Location of Karezes
in
M. A. District.

No.	Name	Location	Areas Irrigated in Jeribs
1	Toudabi	Moghul Khil	20
2	Hindu	Moghul Khil	100
3	Fateh	Moghul Khil	400
4	Chashma Akhtar Mohd.	Siah Koh	50
5	Siah Koh	Siah Koh	30
6	Shiqar Qala	Moghul Khil	1,000
7	Molah Bahadur	Nerkh Abad	300
8	Fiaz Mohd. Khan	Nerkh Abad	100
9	Nowdag	Zarghoonshah	200(dried)
10	Ziarat	Zarghoonshah	500
11	Chamtagia	Zarghoonshah	200
12	Bakhshi	Zarghoonshah	200
13	Ali Khil	Zarghoonshah	400
14	Rayees	Zarghoonshah	100
15	Babag	Zarghoonshah	200
16	Saadat	Zarghoonshah	200
17	Banki	Zarghoonshah	200
18	Malik	Deh Now	400
19	Nazir	Deh Now	500
20	Doulat Khan	Deh Now	1,000(dried)
21	Khanan	Mirza Khil	500
22	Mirza Khil	Mirza Khil	400(little water)
23	Surkh	Mirza Khil	500
24	Shirin	Mirza Khil	300
25	Jabar	Mirza Khil	400
26	Landi	Mirza Khil	200
27	Dillawar	Mirza Khil	200(dried)
28	Ghaldara	Mirza Khil	500(little water)
29	Quili	Mirza Khil	500
30	Ghulam Jan	Mirza Khil	400
31	Abdul Ghani	Nerkh	200(little water)
32	Sarigoat	Abbazak	400(little water)
33	Sang Sarakh	Abbazak	200
34	Qala Khumia	Abbazak	150
35	Siah Bini	Abbazak	500
36	Qala Dag	Abbazak	400
37	Kutagai	Abbazak	150
38	Qala Mirah	Abbazak	400
39	Qala Kutchi	Abbazak	80
40	Furman	Abbazak	40
41	Akhundzada Khil	Abbazak	400
42	Qala Sar	Abbazak	600
43	Qala Nazir	Abbazak	600
44	Hadji Mirza Jan	Abbazak	200

Source: Sub-Governor office of Mohamrad Agha District

Karez systems are particularly difficult to maintain, since men must enter the covered openings and remove the silt accumulated in the tunnels by the spring deluge. The tunnels often collapse, necessitating major repairs. In addition, the water table (aquifer) has apparently shifted, leaving dry some karez systems which formerly provided water for irrigation.

Depending upon the type of soil, the damage from flooding during the spring runoff, and the distance from the source wells to the croplands, karez maintenance can be trivial or a great burden. In the nine villages operating on this irrigation method, one estimated it required only 12 man-days to prepare its karez for the 1976 summer crop. Another estimated it required 4,560 man-days, nearly $5,000 to put the system back into operation. Among the eight villages surveyed, the estimated average cost of renovations was more than $ 1,500.

The Effects of Water Scarcity

There is no method of measuring the flow of water onto farmlands in Mohammed Agha District--water is regulated by days or hours of use. Whatever remains in the irrigation ditch when it is the individual farmer's turn becomes what is distributed to his fields. In general, water used per unit of land is significantly less on the karez systems than along the canals, and uncertainty of supply is

greater. On the karez systems there are, therefore, fewer vegetables grown and significantly less use of improved seed and fertilizer than along the river. Farmers reported that in the past they used more improved seeds and fertilizer, but as the karez systems provided less water (or as the water was distributed among more owners) they maximized their income by reducing input purchases, relying on more traditional agricultural methods. The group survey of 17 villages estimated the wheat yields among the karez users at approximately 60 percent of the yield among canal users, while the individual surveys reflected a wheat yield that was 65 percent of the canal users harvest per jerib.

ONGOING PROJECTS TO INCREASE WATER AVAILABILITY

Besides the permanent construction of a water intake at Moghul Khel, RDD will undoubtedly be considering permanent intake structures on the remaining three major canal intakes in the coming years. In addition, there are four active requests into the Logar Provincial Office of RDD for water availability assistance in Mohammed Agha as follows:

1. The Shah Canal, with the repair of a canal which washes out during the spring runoff;

2. Toudabi Karez, repair of 500 meters blocked by an apparent cave-in;

3. A Karez at Zargunshahr, where 1,528 meters have caved in, with an additional request for assistance in digging 4 source wells, which would (according to villager estimates) irrigate 250 jeribs.

4. The Sia-Bini Abzak Karez, a request for cleaning assistance plus construction of 30 additional source wells.

At present, these villager requests are handled in the routine manner used to investigate, approve and support rural works construction within the Rural Development Department.

The large and growing demands upon RDD for irrigation

construction should be clear. As a proven performer in rural works, particularly minor irrigation systems, the Department has been given a set of targets to reach which severely constrain the availability of personnel (specifically engineers) who could work in Mohammed Agha District. Projects supported by the World Bank, the UN, as well as Community Irrigation Systems and Rural Works supported by AID, have overextended the capacity of RDD's qualified engineers to design and supervise water projects. With new engineers joining RDD at three per year (with one being abroad for foreign study in 1976), RDD will be unable to provide more than occasional engineering assistance to the Logar IRD project. For this reason, technical personnel have been added to the advisory staff of the project to augment the scarce and vital human resource base within RDD.

Recommendations to Increase Water Availability in Mohammed Agha District

Permanent intakes on the Logar River are necessary improvements, if not in water availability during the entire year, then at least during the spring. The RDD department should add one intake each year, to allow the project to investigate the changes which take place as the permanent structures replace temporary ones.

Increasing water availability from the Surkhab Dam calls for a hydrogeologist, drilling equipment and a feasibility study of the potential costs of improving the carrying capacity of the dam. If the tests are positive, such a new water source would provide an excellent opportunity to experiment with different forms of local organization for the use of water on land which is not now irrigated.

Other water storage or holding areas should be investigated as part of the project. This includes not only minor dams across ravines, but ponds to capture the seasonal runoffs. That there are no ponds in Mohammed Agha District suggests the technique is subject to local

constraints--most likely an absence of clay soil and extremely high evaporation rates. However, this should be the subject of investigation and tests during the first phase of the project.

The traditional karez systems may offer the best possibility of increasing the availability of water in the areas away from the river or the Surkhab Dam through the use of appropriate new technology.

The first recommendation must be for a detailed study of the aquifer or underground water storage in the Logar Basin, especially as it may relate to water shortages in karez areas. This would entail the boring of a number of wells in the Basin. The wells, if a minimum diameter of 6 inches, could be used for irrigation purposes after data collection was finished.[1]

Test pumping the wells would be included in the collection of data to determine the specific volume of water each

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1. See the Water Use section for a discussion of the economics of tube wells.

is capable of providing. In the absence of such a study, the deepening of source wells or the completion of new karez systems may work to the detriment of all villagers who depend upon ground water for irrigation. However, without increasing water sources, there are a number of water availability improvements which could be tested in Mohammed Agha District, improvements which have been considered and,in some areas, tested, by the senior UNDP advisor to RDD:

- The karez systems run (in all cases we could investigate) continually. A simple system providing a shut off when the water is not in use might help store water for the hot summer months, or prevent flooding in the spring.

- The spring floods often cause cave-ins as a sudden influx of water flows into the karez. This may be mitigated by the placement of concrete rings above the ground around each well opening--or other procedures to close the karez at the source wells during this period of time.

> It appears that in antiquity the karez tunnels were lined with stone--a practice which has disappeared. A re-introduction of a stone lining, or ferro-cement slabs as reinforcement in those areas which experience frequent blockages would be a worthwhile innovation.

Field investigation of particular karez irrigation systems will undoubtedly reveal other potential improvements in this system, which could be tested in coordination with RDD's engineering department.

Water Management

There has been some controversy on whether there is a water shortage or simply a water management problem in Afghanistan. One report on Afghan irrigation projects concludes:

> "The critical constraint to agricultural surplus generation has not been the physical insufficiency of traditional irrigation systems, but an institutional constraint: on-farm water distribution operates according to feudal tradition and is both inefficient and inequitable."[1]

There is little relevant data on the efficiency of water systems in Logar Province. Water is distributed on a rotating cycle, so far as we could determine, without regard to crops or cropping cycles. The farmers surveyed reported (both canal and karez users) an average of a 14-day interval between water turns, with a range of 8 to 20 days. It is also clear that water rights

1. "The Water Supply Constraint: An Evaluation of Irrigation Projects and Their Rôle in the Development of Afghanistan." Lloyd I. Z. Barron, March 15, 1976.

are regularly shared among villages, that is, the water pattern does not end with one "community", but extends across a number of communities. In addition, water rights are bought and sold within limits set by local tradition. However, the complexity of the arrangements, the potential for several different water sources for different parcels of land, owned or sharecropped by the same farmer, and the variation among different systems in the same area negated attempts to extract more detailed and consistent data through a household survey. This area must remain one of the first priorities of any in-depth investigation into water availability management and use in Mohammed Agha District.

There are few other sources on water management in rural Afghanistan. The UNDP sponsored a water management study by I.O. Turkoz, that included a model code leading to water rights legislation. His reports include the details of short investigations into various irrigation systems--usually 7-10 day field trips. His 12 conclusions on water management are instructive and presented as follows:

Institutional Aspect

(1) Every local irrigation system in Afghanistan has and long and well established original water rights system though mostly corrupted and misused.

(2) These different water right systems are based on Hanefi Jurisprudence of Islam and reflect the different conditions in different parts of the country.

However many misconceptions have been injected to the system or its principles have been interpreted in a narrowest content without comparing and checking the results of this interpretation with more general and basic principles of Islam. Then the applications of specific provisions of Islam have been conflicting with the more general and basic principles of the same.

(3) The water running through irrigation canals is used for many purposes, i.e. drinking, animal watering, irrigation, mill operation etc. There is an order of preference among different uses in different seasons/regions which are primitive and not well defined.

(4) Nothing is fixed regarding the amount of water withdrawn from the stream in different season. If the water doesnot reach to down stream canals the beneficiaries thereof may request the upstream beneficiaries to reduce the amount of water they divert so that they may also receive some. However this request may or may not be accepted. In many cases administrators may serve as arbitrators between/among the parties concerned. None of the solutions recommended is permanent, so disputes arise in every irrigation season.

(5) In none of the systems irrigation area is fixed. It increases from year to year. As the new lands, mostly owned by the Government are opened to cultivation, the canals ditches are extended to cover these new lands and original irrigators suffer from this practice.

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1 I. O. Turkoz, "Formulation of Long Term National Policy for Water Resources Development and Water Rights", UNDP, Kabul, October 10, 1974, pp. 24, 25.

(6) After diverting the water into any of the canals it is distributed in proportion to the size of the holdings. Type of soil, crop and topographical conditions are not taken into consideration. Irrigators are expected to adjust cropping pattern in accordance with the properties of their land and the water rights attached thereto. However, the rule of proportional distribution is not practised. Irrigators located up the canals may receive many times more water than those located down the canals.

(7) Water rights are attached to the land in principle, but water turns may be exchanged among irrigators or rented within the command area of the same canal (tertiary.).

(8) Water is allocated to the land for all crop growing season. After harvesting the first crop, second one may be grown and irrigated even in water shortage areas. Granting the same amount of water to one irrigator for the first crop and to another irrigator for the second is not practised.

(9) Water is distributed in accordance to the time turn system and measured through rather elaborated devices on the time basis.

(10) Water distribution and other operation and maintenance works are carried out by mirabs, water masters elected by beneficiaries from among themselves. Mirabs may serve as arbitrators in solving water disputes.

(11) Maintenance works are undertaken jointly by the beneficiaries. Work is divided among them in proportion to the size of the holdings and distance between the holdings and the in-takes and or other diversion points.

(12) Government involvement in these local irrigation project is nominal.1/

1/ See also Expert's Reports "Report on the Existing Water Rights system in Afghanistan, I - Local irrigation systems using surface water, 1- Report to the field trip to Northern Provinces, 2- Report about Water problems of four villages, 3- Report on Kush-i-Jan Canal; II - Local Irrigation system using ground water, 1 - Report about Pirzade Karez, Maywand Kandahar.

Recommendations for Water Management Studies

Comprehensive water management studies in Pakistan have identified similar constraints to the efficient use of available water. In the summary and conclusions to a study on the organizational alternatives to improve on-farm water management in Pakistan, the authors write:[1]

> "1. Pakistan has no formalized pattern of local association or organization concentrating upon water use and conservation.
>
> 2. The laws and regulations for water use as well as the design and operation of the water delivery systems do not encourage creation of cooperative efforts among water users at the farm level."

We suspect, but cannot yet document, that significant differences exist in rural Afghanistan. Although the data which has been amassed by studies in Pakistan could

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1. Organizational Alternatives to Improve On-Farm Water Management in Pakistan. George E. Radosevich and Craig Kirkwood, Consortium for International Development, June 1975. This report is one of a continuing series which reached 45 studies/reports as of December 1975.

be useful, and certainly should not be duplicated, the first priority is to learn in detail how water management systems work in Mohammed Agha District. This can only be accomplished by a detailed tracing of water through one irrigation system, from source to final user, over a crop cycle. Such a study, combined with a knowledge of agricultural practices which follow from water availability and management, would add greatly to the ability of any development assistance program to intelligently intervene in the complex natural, agricultural, and social environment which exists in the Logar Valley.

WATER USE

Optimal water use has been investigated for both Kabul and the Logar Valley. A summary of water requirements is set forth below.

Table 3

Kabul and Logar -- Summary of Rates of Water Requirements*

Main Crops	Pre-sowing** Watering (M^3)	Growing** Period (M^3)	Number of Waterings
Wheat & Barley	800	2,200	3
Cotton	1,000	7,000	9
Alfalfa	1,000	7,200	9
Potatoes, Melons & Vegetables	800	6,600	11
Vineyards, Orchards & Farmsteads	1,000	5,200	6
Maize for Grain	1,000	3,300	4
Pulses	800	3,800	5
Second Crops			
Maize for Silage	1,300	2,500	3
Vegetables	800	3,000	5

*Requirements are given per hectare.
**An additional 40% should be allowed for transmission losses.

Information from Survey of Land and Water Resources-Afghanistan Vol. VI. UN/FAO, 1965.

With water as the constraint, the preference for wheat as the least demanding crop is clear. The number of waterings recommended is not as

reflected by the farmers themselves, but then there is no way to determine whether the 700 M^3 recommended per irrigation are actually applied. A more complex algorithm has been developed by irrigation engineer Z.G. Tyson, which allows the entry of specific variables,(crop, soil type, hours of daylight, etc.) into a formula to determine irrigation requirements by location.[1] This system will be useful in conducting actual tests of irrigation water availability and use in the project.

Within the project area, water use dictates the agricultural pattern. Wheat is grown on 80 per cent of the available land, offering a ready explanation of the farmers' solution to optimizing water use. A more detailed examination of actual production practices is contained in the following sections.

Recommendations for Research on Water Use

A series of simply-constructed water measuring devices should be installed on a representative sample of water systems--both canal and karez irrigation. This would not only measure the losses within the system, but the amount of water actually reaching the crops. This data is critical for the development of appropriate agricultural technology which reflects the farm conditions in the Logar Valley.

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[1] Z.G. Tyson, "Irrigation Water Requirements in Afghanistan" USAID/Kabul, July 1976.

Further, there is a need to combine research on water availability, management and use with the potential for high-yielding and high-income crops. Other studies have documented the inability of a wheat crop to support the expenses of tubewells, even if the aquifer would allow such an irrigation system.[1] While this is likely true for wheat (or corn and clover for that matter) the question is whether the farm system, taking all activities together, would allow economic use of pumped water. This is a subject to be studied in detail during the first phase of the project.

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[1]Dean F. Peterson, NFSA Irrigation Practices Seminars 1956-1970, An Evaluation, U.S. Agency for International Development, March 1973, pp. 23.

WHEAT PRODUCTION IN MOHAMMED AGHA DISTRICT

Wheat is the staple grown and consumed by the residents of the Logar Valley. Wheat production accounts for 80 percent of the total land area under cultivation and is the preferred crop for three years in a four year rotation cycle. Almost universally, group interviews nominated wheat as the crop which earned the highest return--it is used to pay for farm labor, traded locally for other household necessities and generally serves as a medium of exchange.

If the household sample represents general tendencies in the Logar Valley, the area is not self-sufficient in wheat. Total production (45,117 seers) was nearly equal to total consumption (45,480) among the 136 respondents --a per family consumption of 335 seers. However, 20 families had no access to land, and were forced to purchase (or receive payment in-kind) for their needs. Forty nine farmers paid an average of 25 seers per jerib to land owners for sharecrop rights, 56 percent of the estimated yield of 45 seers per jerib.[1]

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1. Wheat yield figures depend critically on whether dry land farming is included, as they are in this estimate, taken from the sharecroppers' yield estimates.

In addition, there were wheat losses from rodents and next season's seed requirements. Taken over all respondents, the average family purchased 160 seers of wheat in the last 12 month period.

Self-sufficiency in wheat is the number one concern of near subsistence farm families, and there is little likelihood that land will be planted to higher-yielding cash crops (at least among the small land holders) until their subsistence needs are met. It requires more than 8 jeribs to produce the necessary subsistence requirements (at 45 seers per jerib). Average wheat planting by the household sample was 8.6 jeribs. With a severe constraint on irrigated land, the problem of self-sufficiency can only be solved by increasing yields. In our estimation, this is a first priority of the project.

Wheat yields vary tremendously depending in part upon water availability. They may also vary in accordance with a number of other cultural practices, as has been found in other areas where rationalized farm management could bring about yield increases of 25 percent. However, in the Logar Valley, water availability differences mask any

attempt to determine the "best" local technology presently being used in wheat production. This should be a starting point for adaptive research--monitor the water and the cultural practices, use of inputs, labor, etc. and determine the most appropriate wheat technology presently being used in Mohammed Agha District.

Table 4 Average Yields on Irrigated Land[1]
(Estimated by Group Interviews)

Crop	Average Yields* (seers per jerib)		Range of Yields in Seers	
	River	Karez	River	Karez
Wheat	80	46	60-110	5-75
Corn	79	60	55-120	8-160

*Given in seers per jerib.
1 seer = 7 kilos or 15 lb.
1 jerib = .2 hectare.

In the major grain crops of wheat and corn, river irrigation systems produced the highest estimated yields by farmers. This might be expected because of a more constant availability of water.

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1. Yields of wheat in this table compare closely with yields expected on fertilizer trials - The AFC Amended Paper, USAID/Afghanistan, 1976. The group interviews were arranged by, and inevitably included, the Malik, suggesting that the relatively wealthy villagers, with better access to water, provided high yield estimates.

Table 5 gives cropping information based on both dry and irrigated land as estimated by individual farmers.

Table 5 Planting and Harvest Figures on Irrigated and Drylands

Crop	Average Jeribs Planted		Total Amount Harvested-seers		Average Yields/ Jerib(seers)	
	River	Karez	River	Karez	River	Karez
Wheat	6.7	11.7	366.2	416.0	54.66	35.55
Corn	2.4	2.6	143.8	126.8	59.91	48.76

CROPPING SYSTEMS IN THE LOGAR VALLEY

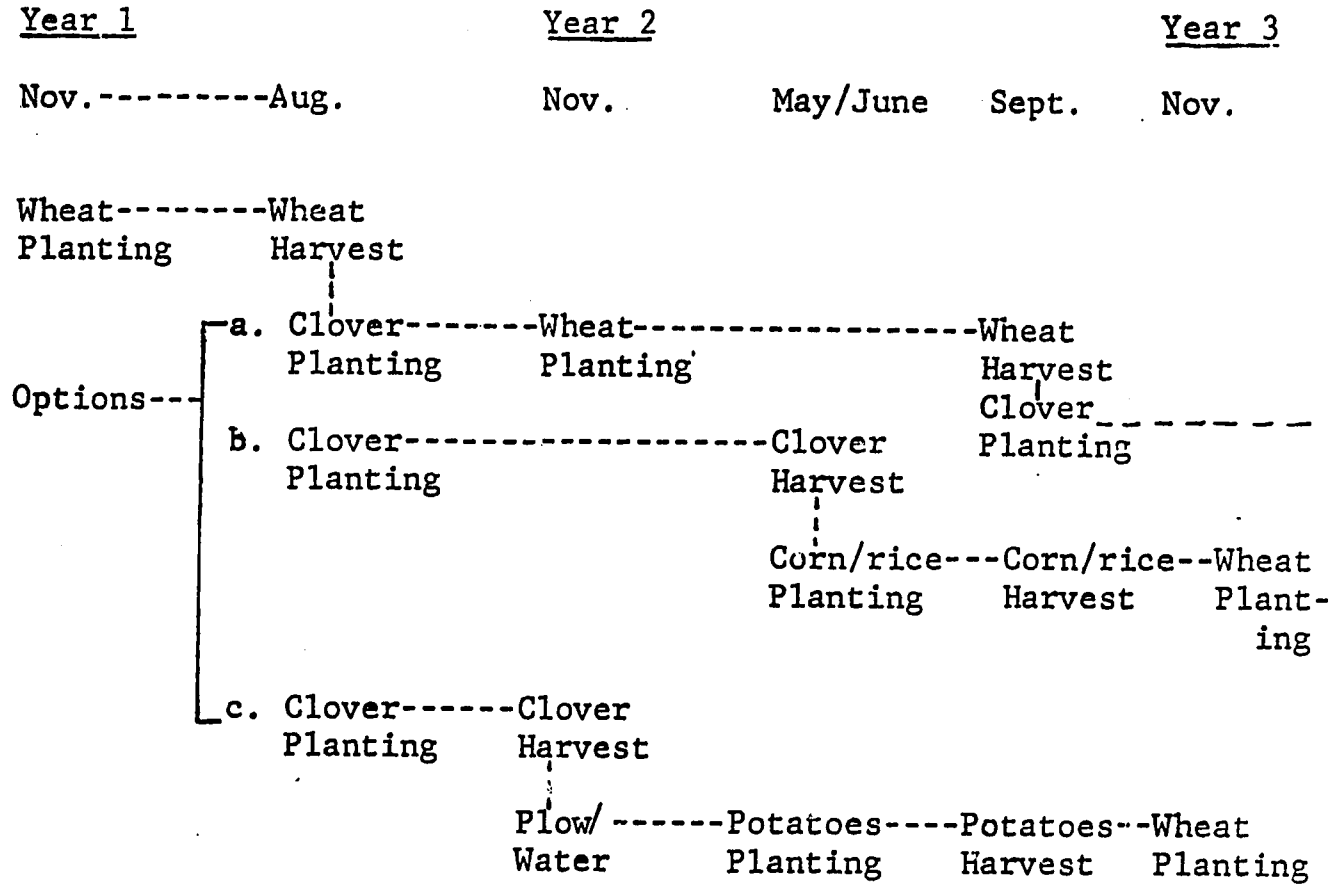
While wheat is the preferred crop, centuries have established that a continual rotation of wheat is not optimum, both because of the reduction in fertility as well as the growth of particular weeds which reduce wheat yields. The other crops in the cycle are clover and corn/potatoes/birdseed/rice alternatives, with corn predominating as the major second crop.

Water determines the cropping cycle, although farm management can have a powerful affect when water is not scarce. The patterns identified during the survey are divided into three basic categories:

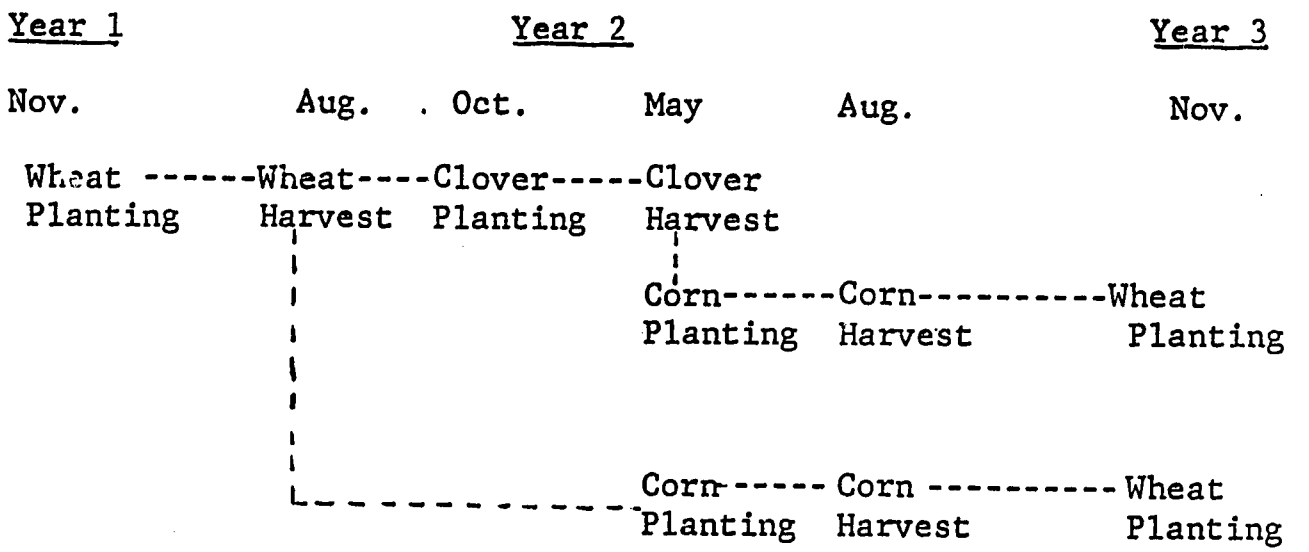
- abundance of water during the entire year (corresponding to the head of the canal);
- less than adequate water, but enough to grow corn in the summer (corresponding to the middle ranges of the canal);and
- scarce water, less than enough to grow a corn crop during the summer months (corresponding to the far reaches of the canal).

CROPPING PATTERNS BASED ON WATER AVAILABILITY

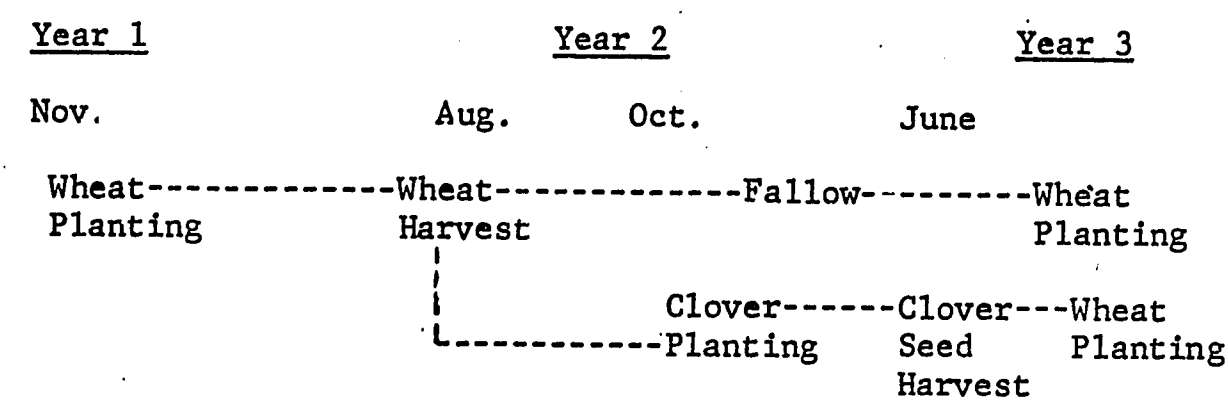
Abundant Water



Some Water



Scarce Water



The cycles show the special deviations from wheat, beginning with clover/corn or clover/rice options, and ending with a required fallow period. There are no salinity problems in this area, and more water will mean more land under crops.

There are subtleties in the system. Clover can be planted immediately after the wheat harvest if there is sufficient water, which will allow cuttings before the next wheat planting in the late fall. In the absence of irrigation water in August, the farmer can wait until October, and plant clover which will last through the winter, to be replaced by corn/rice in higher water availability levels, or be allowed to go to seed in dry areas. Clover is sold as fodder to the nomads when they travel through the area in the spring, while the seed is

traded locally for wheat or other necessities. Corn is eaten and fed to animals, but is a distinct second preference as a staple for human consumption.

In a survey of 16 villages in the district, approximately one-third had sufficient water to follow the Wheat/Clover/Corn rotation, while 25 percent were in such water-scarce areas as to require a fallow period through one growing (summer) cycle. The remaining villages, in general, practiced a wheat, corn, wheat, wheat rotation pattern over four crop years.

FRUIT PRODUCTION IN MOHAMMED AGHA DISTRICT

After field crops, and the associated cropping cycle, farmers showed a strong interest in fruit production. Attempts to obtain yields faltered on the lack of well-defined orchards. Trees and vines are grown in corners of land, along irrigation ditches and near houses. The farmers were well aware of the income potential of fruit, and expressed interest in assistance in expanding fruit production as a cash crop. Even cursory investigations suggest this is a strong possibility and one which should be included, along with field crop experimentation, in the early stages of the project.

There are no large orchards in Mohammed Agha District. With the exception of grapes in Zargunshahr, most of the fruit is grown along waterways or other small slivers of land.

The predominant fruit species are:

1. Grapes (grown in large quantities in the large village of Zarghunshahr).
2. Apples
3. Apricots and mulberries

Grapes

Grapes are grown in small amounts in many villages. Zargunshahr, however, is the "grape" village in Mohammed Agha.[1] Middlemen buy the grapes on the vine prior to their ripening and bring teams to the village and pick and pack the grapes in wooden boxes for export to India and Pakistan. Raisins are reported to be sold through the Zargunshahr Cooperative.[2]

The Zargunshahr area has two very large vineyard owners, with other smaller but still impressive grape orchards under private control. Net profits, as estimated by the survey teams, were very large, with the two owners receiving more agricultural income than the total of the other 90 farmers interviewed. Given the large and perhaps dominating size of these private holdings, the activities of the Zargunshahr cooperative may reflect the particular interests of a narrowly defined group. This subject

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1 "The Improvement and Development of Marketing of Table Grapes and Raisins in Afghanistan", FAO/SWE/TF-80-1972.

2 Information supplied by the Acting Director of the Department of Cooperative Development Office in Logar.

should be included in the in-depth investigations of the cooperative structure as one part of the organizational component of the project.

Apples

There are two nurseries in Mohammed Agha District selling local variety fruit trees. One nursery visited in Mohammed Agha village had several thousand apple and apricot trees (primarily apple). The nursery owner had grafted and budded local apple varieties back onto improved apple stock. He stated that improved apple varieties produced a better fruit than local varieties but did not compare with the local varieties in yields or disease resistance. Young trees sell for Afs 15-70 each.

Farmers will bud and graft improved apple varieties onto local stock themselves. Although a substantial number of "takes" were observed in fields, grafting and budding was done high on the limbs, allowing for continued annual growth of the local variety below the bud or graft.

Apple and apricot trees were pruned for wood production rather than maximum fruit production. It is economically

impossible to do both on the same tree.[1] The main support limbs on a tree might not begin for 5-6 feet up the trunk. These limbs are then allowed to grow up, instead of spreading laterally, making maximum production impossible. In some orchards, farmers had used hatchets to prune limbs, rather than a saw, leaving jagged cuts that did not heal properly.

According to the household survey, many farmers were interested in raising improved apple varieties because of the cash value after harvest. The most popular improved varieties were Red and Golden Delicious. Extension agents from Logar take orders from local farmers and then travel to Midon and purchase improved trees for the farmers from a large modern nursery. They then, according to their reports, assist the farmers to plant and care for the new trees.

Apricots and Mulberries

Apricots and mulberries are less popular in Mohammed Agha District. Apricots are pruned with the same sub-optimal method used for apples. The cold climate of Logar is not

1 Information from the report entitled, "A Detailed Outline of Procedures for Developing Fruit Production in the Helmand-Arghandab Valley Region", H. W. Pillsbury, November 1971.

as conducive to the variety of apricots presently grown as apples. There have, however, been recent developments in cold hardy apricot and peach varieties in the U.S. that might prove adaptable to the Logar area. These apricot varieties--Sungold, Moongold, and Manchu--are reported to fruit after winter temperatures of 25 degrees below zero (Fahrenheit) in the U. S. A peach variety, Reliance, has successfully fruited in the U. S. under similar low temperatures.

Mulberries are grown in very small quantities by farmers in the district and do not appear to be of high economic importance.

Problem Areas

1. Farmers in Mohammed Agha are interested in growing improved apple varieties but retail outlets for these varieties are not locally available. In the past, the Extension Service has bought improved trees for farmers after receiving money to purchase the stock.

2. Traditional pruning methods on apples and apricots are such that maximum yields are impossible.

3. Budding and grafting of fruit trees by local farmers detracts from maximum yields.

4. Fruit trees are subject to disease and insects which are not adequately controlled with existing technology and local practices.

5. Grapes are sold on the vine by farmers. Farmers' profits may be seriously reduced by this practice.

Recommendations for Improving Fruit Production

Experimentation should be conducted to determine if U. S. improved, cold hardy apricots or peach trees would be agronomically and economically viable in the Logar Valley.

Utilizing the best methods of pruning, grafting, budding and insect and disease control on existing fruit trees, approaches should be developed and tested to extend this knowledge to local farmers. This might include:

- a training course for extension workers, and broad contact with the farmers to spread this knowledge;
- a training course for farmers to explain and demonstrate better production and protection methods;

extended demonstrations on selected trees and vineyards in major population centers, on farmers' land.

Since water is a critical constraint to increased fruit or grape production, experimentation should be conducted in the "drip" method of irrigation, eliminating water loss from ditches between trees (as well as the crops which are traditionally planted in orchards during the early years before the trees mature).

CROPPING PRACTICES AND PROBLEMS

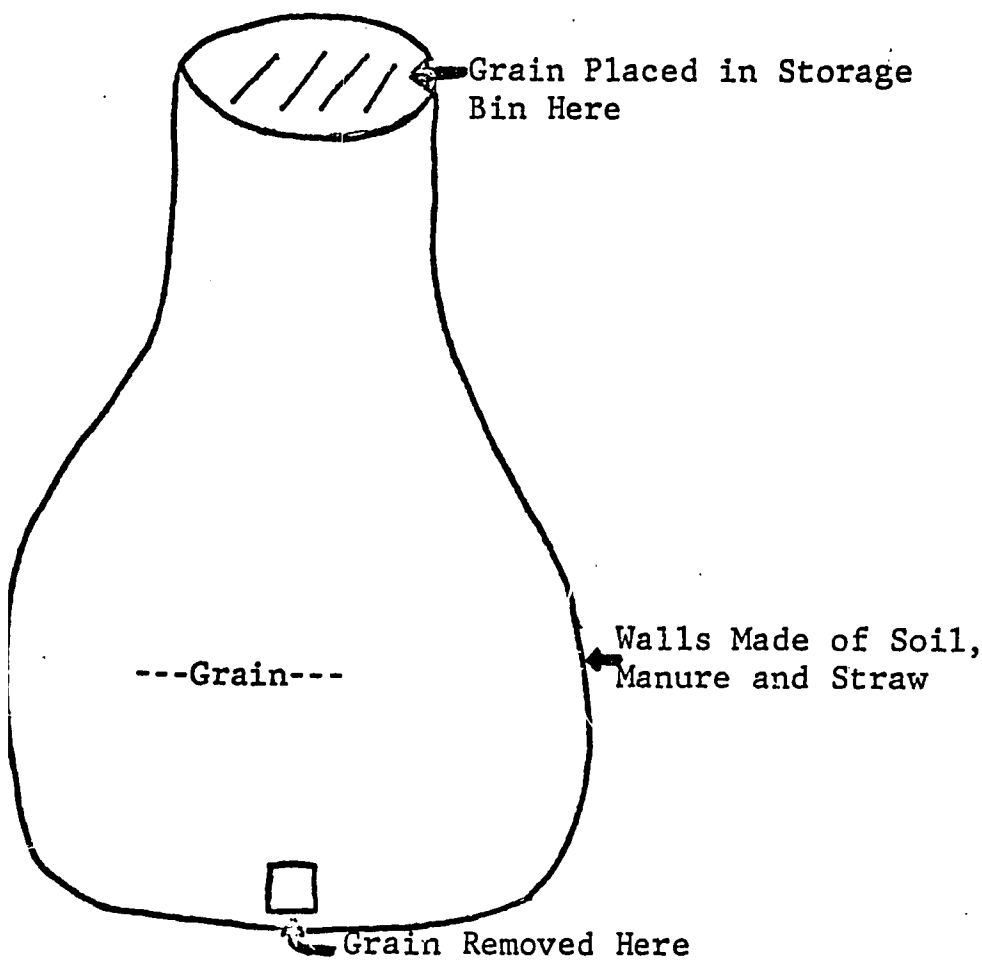
Rodent Destruction of Grain

Nearly every respondent stated that mice were a serious problem with stored grain. We expect, but cannot document, that mice also eat grain in the field. Research in other countries suggests that as much as 10 percent of the potential harvest can be lost to rodents.

Grain is generally stored in a jar-like container in farmers' homes. The container is made of a mixture of mud, straw and manure. An average size for the storage container would be 2⅔ meters in height by 1⅓ meters in diameter. There is an opening at the top for filling the container, and a smaller opening on the bottom to allow for a free flow of grain for home consumption. A sketch of the container is on the following page.

Some farmers use zinc sulphate to protect against rodents, the poison (according to the Extension agents) is provided free. Further research should be conducted on the efficacy of this solution, and the potential for rodent-proofing the grain storage containers as one method of increasing the surplus available for sale.

Farmer Grain Storage Containers



Insects and Disease

After water difficulties, disease and insects present major problems to farmers in Mohammed Agha District. Farmers are aware of both the problems, and their potential cure. The problems apparently are a lack of available chemicals and sprayers, and the costs involved in eliminating the insects or disease.

Only 30 percent of the farmers use insecticides on grains or vegetables, although corn is apparently attacked regularly in this area. Slightly more farmers use insecticides on fruit trees, although only a handful (1 percent) own their own sprayers. The Extension Service is equipped to provide sprayers or spraying services at least to some farmers in the area. This is a subject which could be profitably investigated by the project with solutions tested and extended as applicable.

Fertilizer

Afghan farmers use fertilizer, more when they have water and good seeds, less when traditional seeds and water constraints are the norm. When asked about fertilizer applications, respondents along the river systems replied that they applied an average of 8 seers of commercial

fertilizer per jerib on wheat, approximately 245 kilos per hectare. This is well within the fertilizer trial limits established in test plots by the Government of Afghanistan.[1] Karez system farmers applied 4 seers.[2]

Farmers apply the fertilizer in two applications, one at planting and a second in the spring. Ratios of urea to DAP were evenly split, approximately half the farmers applied a 1:1 ratio, the others 2 urea to 1 DAP.

While nearly 50 percent of the farmers purchased some fertilizer, the remainder applied soil and manure to their fields. The more affluent river irrigators applied 86 "donkey bags" (approximately 35 kilos per bag) per jerib on their wheat crops while the better-off karez users added 68 bags. Corn, grown with more water in the river systems, was chemically fertilized at 8 seers per jerib, while the karez farmers applied only 3 seers to their crop. Onions, potatoes and other vegetables,

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1. Afghan Fertilizer Company, Project Paper, Amended, 1976. With a 1:1 ratio of urea to DAP, or a 2 urea to 1 DAP ratio, the applications fall within the recommendations.

2. These figures from group interviews are likely higher than the average application.

fruit trees and grape vines were also fertilized, often with soil or manure.

Patterns of Innovation

Afghanistan farmers respond to economic incentives. Not only do they take advantage of a new innovation, they stop its use when other constraints reduce overall benefits. Two-thirds of the farmers mentioned new inputs and techniques over the last 10 years as the use of improved seeds and fertilizer. Insecticide was also included in the list of new innovations. The demonstration plots of the Extension agents were given prime responsibility for convincing farmers of the value of the new technology, with their own leaders -- Malik and elders -- a close second.

When asked for major agricultural changes over the past five years, river system farmers stated they planted more land, used more improved seeds and more fertilizer. However, karez farmers indicated they used more local seeds, and had retreated from previously higher fertilizer applications. This is optimizing behavior given the erratic, and limited availability of water.

Marketing

Just 45 minutes from Kabul, on a main highway, the Mohammed Agha farmers would not appear to be isolated from buyers for their agricultural products. Yet more than one-third of the villages reported that they could not sell some of their produce when it was available. This was rarely the case with wheat or corn, and potatoes and onions apparently have a ready market. Apples sold better than the apricots and grapes unless arrangements were made with large buyers. The survey team listened to complaints that vegetables other than those listed above were hard to sell, and clover, normally sold to the nomads in the spring, was occasionally in oversupply.

Why there are marketing problems was not clear -- some farmer complaints may simply reflect their belief that the offering price was too low. Others may feel, particularly the more isolated villages, that the buyers did not come to the village, and there was no organized system for collecting small producers' output for the Kabul market. This is a subject which can readily be investigated, given the ease of transportation. The five cooperatives within the district, now notable only for fertilizer credit provision

and raisin sales, might be one useful way of overcoming a marketing problem, if one exists.

FARM INCOME AND ASSETS

The household survey attempted to determine gross farm income by totalling all output by crop enterprise for the past 12 months, and capturing aggregate agricultural costs of production. After subtracting two very prosperous grape growers (with a net income of more than $30,000), the average range of farm income, for 90 respondent households, was from $390 to $440.[1] While the majority indicated that their major income source was from agriculture, nearly all families contained at least one member who had off-farm employment--augmenting the family's cash income position.

1. The survey team was particularly aware of the inherent difficulties in obtaining accurate output/income figures. Net farm income is offered as a relative magnitude, one built up from innocuous bits and pieces of information concerning the operation of the farm. No precision in measurement is intended in this initial foray into the Logar Valley.

Table 6.1
Net Farm Income

	River	Karez	Total/N	$\bar{X}$[1]
Afs	878,066	909,102	1,787,168/90	17,532 - 19857
Range:	2080 - 142,840	150 - 241,996		($390 - $441)

1 The coding methodology dropped zero responses from N values. The low end of the $\bar{X}$ range is $\bar{X}$ gross income minus $\bar{X}$ agricultural costs. The high $\bar{X}$ is the actual calculation of gross income minus agricultural costs. Net agricultural income from 1971 survey near Kabul averaged Afs 11,600 which, at a 7% inflation rate, would be approximately equal to the survey figures above. Robert R. Nathan, Associates, The Afghan Farmer, Report of a Survey, Oct. 1971.

Land Ownership and Sharecropping

The following table provides some insight into the complex arrangements of land ownership and sharecropping.

Table 7
Land Ownership, Planting and Sharecropping

		Jeribs	Range	N	$\bar{X}$	$\bar{X}$ Ha.
No. of irrigated jeribs owned	River	380	1-40	50	7.6	1.5
	Karez	768	1-200	45	17.1	3.4
	Total	1148		95	12.1	2.4
No. of irrigated owned jeribs planted	River	286	0-12	45	5.2	1.0
	Karez	284	1-42	32	8.9	1.8
	Total	520			6.8	1.4
No. of irrigated jeribs planted but not owned	River	256	1-20	31	8.3	1.7
	Karez	182	2-80	11	16.5	3.5
	Total	430		42	10.4	2.1

Although there are other categories of land control (renting, garrowing--created by loan default--and idle) the picture is relatively clear. The best riverland, at the front of the line for water, is fragmented, with the average ownership being under 2 hectares. As the water availability goes down, away from the river, the irreduceable size of land holdings goes up, to an average of 3.4 hectares. Among the 50 respondents surveyed, assuming some veracity in the answers, the largest land owner had less than 6 hectares. Irrigated land in the karez area is much less valuable, since it may only be farmed once in three or four years.

There is an overlap in ownership/sharecropping categories, with complex arrangements in which owners may both rent out (sharecrop) their land and yet plant on (sharecrop) land of other owners. These patterns, and the underlying reasons are beyond the state of knowledge of this area at this time, but will be a subject of continuing investigation in early stages of the project.

Livestock

Nearly all farm families had livestock, an average of 2 oxen, a donkey, one cow and calves. In addition, some of the families in the areas are newly settled nomads, with direct relatives or family members still tending migratory herds. These individuals have herds of sheep and goats, although it was not possible to determine whether, during the winter, the animals would move with the rest of the nomads or remain in Mohammed Agha District.

Table 8
Livestock Per Farm Family

	River		Karez	
	$\bar{X}$	N	$\bar{X}$	N
Oxen	1.6	46	1.9	33
Donkeys	1.1	50	1.5	37
Cows	1.1	51	1.7	37
Calves	2.1	45	2.2	32
Sheep	2.1	29	14.8	28
Goats	1.0	3	20.0	9
Camels	1.0	1	0	0

The animals are fed the remains of the wheat and corn crops, as well as small plots of perennial alfalfa planted near canals or irrigation ditches. Clover may be fed to their own animals, but farmers prefer to trade or sell the crop to nomads as they return to the area in the spring.

Only 15 farmers reported animal sales during the last year, leaving the distribution of calves, lambs, etc., unknown.

GOVERNMENT INTERVENTION IN AGRICULTURE IN MOHAMMED AGHA DISTRICT

Four government agencies offer direct support to farmers in Mohammed Agha district. These are:

- The Agricultural Development Bank (ADB);
- The Afghan Fertilizer Company (AFC);
- The Extension Service of the Ministry of Agriculture; and
- The Department of Cooperative Development of the Ministry of Agriculture.

Their operations and activities in support of increased agricultural production are reviewed on the following pages.