REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
01-10-1963	Administrative Report; Open File Report	1966-1968

4. TITLE AND SUBTITLE

Development Grant Program Evaluation, US AID 1963. Appendix 8.
Surface water investigations in Afghanistan: a summary of activities from 1952 to 1969.
United States Operations Mission to Afghanistan; International Cooperation Administration, Lashkar Gah, Afghanistan.

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Auburn, J.E.

5d. PROJECT NUMBER

306-M-12-AD; Formerly 306-12-021

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

US Geological Survey (USGS)
12201 Sunrise Valley Drive
Reston, VA 20192, USA

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

HVA; ICA; USGS; USAID

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

AIDTO Circular NA 17

12. DISTRIBUTION/AVAILABILITY STATEMENT

Unclassified/Unlimited

13. SUPPLEMENTARY NOTES

Appendix 8.

14. ABSTRACT

The purpose of this report is to summarize briefly the history of the Surface Water Research project since its inception in 1952, the work accomplished, and the problems encountered. In general, each topic is discussed under two periods of time: 1952-1963, when projects were confined to the Helmand River Valley and was entitled "Helmand Surface Water Investigations (306-12-021, 306-M-12-AD and 306-AC-12-AD5)," and 1963-1969 when activities were expanded to cover most of Afghanistan and title was changed to "Surface Water Research (306-11-190-002)".

Prepared by the United States Geological Survey in cooperation with the Water and Soil Survey Department, Ministry of Agriculture and Irrigation, Royal Government of Afghanistan under the auspices of the United States Agency for International Development. 18 appendices.

15. SUBJECT TERMS

Afghanistan. Drainage. Flood control. Helmand River Project. HVA. Helmand Valley Authority. Hydrology. Hydropower. Irrigation. Lashkar Gah. Rainfall Runoff Calculations. Stream-flow Data. Stream gaging stations. Stream measurements. Surface Water. Water supply.

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER *(Include area code)*
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AIRGRAM (200)
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DEPARTMENT OF STATE

1963
Appendix (8)

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FROM - USAID/Kabul

SUBJECT - Development Grant Program Evaluation

REFERENCE - AIDTO Circular NA 17

In accordance with instructions contained referenced circular attached is a case history report of the project, Helmand Valley Water Investigations.

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DEVELOPMENT GRANT PROGRAM EVALUATION, AFGHANISTAN
PROJECT CASE HISTORY

SUMMARY

Project No. 306-11-12-AD (Formerly 306-12-001)
Helmand Valley Water Investigations

The Helmand River and its tributaries drain a third of Afghanistan. The Helmand River Valley, in a country where only 7% of the land is presently arable, contains large areas of potentially arable but presently non-used land. In a food-deficit country which also lacks industrial skills or resources, plans for bringing this land under cultivation and of developing it into settlement areas for a presently nomadic people have long been a major government program. Lacking the technical skills and economic potential for such a major project, the Afghan government has been forced to seek outside assistance. A Japanese project was started as early as 1936. U. S. assistance in some form has been continuous since 1952. It has included a $39,500,000 loan; a $10,000,000 grant in aid commitment to continue the development work began under the loan; and a $243,000 technical assistance program for hydrological services through a USGS contract.

The hydrologic unit, created within the Afghan Helmand Valley Authority, was established to:

(1) Collect and interpret data and report it to the HVA and its contract-agency (the Morrison-Knudson, Afghanistan, company, and subsequently the U. S. Bureau of Reclamation) for their use in land and water use planning, irrigation, drainage, hydropower and flood control work, and
(2) Train, organize and develop a capable Afghan staff for the continuous operations of such a unit.

This hydrologic unit has:

(1) Had the continuous services of USGS hydrologic engineers as advisors.
(2) Established, equipped and trained Afghan personnel to operate and collect hydrologic data from a network of 36 run-off and 4 weather stations in the Helmand Valley.
(3) Obtained data for, interpreted and prepared a national summary of hydrological data for the Helmand Valley which was printed in 1957 by USGS for international use. A revision bringing this up to the end of 1960 is now being printed.
(4) Prepared monthly summaries of run-off and of reservoir content for use of HVA and U. S. technicians working in Agriculture, irrigation, drainage, land use and hydropower projects.
(5) Prepared similar annual reports by water-year (Oct. 1-Sept. 30).
(6) Provided necessary hydrological data to the HVA Operations and Maintenance Division in 1961 for planning 1962 operations of the HVA project.
(7) Provide technical training for Afghan technicians in the United States and in India.

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Project No. 306-N-12-AD (Formerly 306-12-021)
Helmand Valley Water Investigations

1. Background Situation

a. Brief Description of country situation and needs which gave rise to project.

Most of Afghanistan is arid or semi-arid, and only an estimated 7-1/2% of the total land area is arable. Approximately two-thirds of this available arable land must be irrigated to produce crops. There is usually an abundance of irrigation water during spring and early summer in the mountain valleys which form the principal producing areas but only in the few locations where storage dams have been constructed is there water for summer or fall crops. This naturally limits the crops which can be grown economically, and further necessitates growing only single crops on land capable of double cropping if sufficient water were available. Because the precipitation which does fall usually occurs in a few extremely heavy downpours, flash floods are common, and each year cause extreme damage to the ancient canal systems or excessive run-off into undeveloped desert areas or rivers flowing out of Afghanistan.

Estimated crop acreage in Afghanistan is 12,000,000 acres; of which over [illegible],000,000 require irrigation. Approximately 145,000,000 acres are not arable due to low soil fertility, mountainous terrain, inaccessability of irrigation water. Primitive farming methods, poor seed, inadequate maintenance of soil fertility, prevalence of insect pests and plant diseases, poorly planned or maintained irrigation, or lack of credit greatly reduce yields on the arable lands and annually cause about half the arable land to stand idle.

National production in a typical year, according to Ministry of Agriculture statistics will show:

Crop	Acreage	Production (metric tons)
Wheat	5,500,000	2,279,000
Corn	1,250,000	700,000
Barley	875,000	350,000
Rice	525,000	320,000
Sugar Beets	10,000	45,000
Sugar Cane	4,500	15,000
Fruits (excluding grapes)	2,500,000	600,000
Grapes	250,000	75,000
Vegetables	250,000	400,000
Oil Seeds	375,000	50,000
Cotton	65,000	54,000

Non-arable land provides a thin pasturage for livestock, but an estimated 115,000,000 acres is used for this purpose, and results in nomadic movements from grass to grass by nearly a third of the country's population. Ministry of Commerce estimates of the livestock population are:

Sheep (other than Karakul)	15,190,000
Karakul sheep	4,653,000
Goats	1,409,000
Cattle (including work stock)	2,683,000
Camels	337,000
Horses	276,000
Donkeys	1,253,000

Afghanistan is considered self-sufficient in wheat, rice and fruits; is very deficient in sugar, oil crops and fiber crops. The Afghan's diet is primarily of nan (unleavened) wheat bread, with corn or barley substituted for the wheat when wheat is in short supply), rice and tea. The tea is all imported. Vegetables would probably be eaten more if more were available. They eat more meat than most Asians; but their amount consumed is considered very low by American standards. Milk and milk products are almost completely missing from the Afghan market.

Exports consist of fruits, carpet-wool, karakul skins, and hides — all of which are agricultural products — and a few mineral products. Forestry products are almost non-existent and most construction lumber is imported. So most food items such as tea, edible oils and dairy products. The country's small industrial activities depend largely upon imports of both raw materials and industrial equipment. Fiber processing and sugar factories built to exploit locally-grown raw materials work only occasionally due to low production of cotton and sugar beets. Carpet-wool is processed in small factories or as home industries in most parts of the country, for both export and local consumption; and some of the wool is processed into cloth for local use. Despite its own needs for cotton as cloth, most of the country's small crop is exported to earn foreign exchange because of the unfavorable credit balance.

In a typical year (1958), Afghanistan imported $12,250,000 in food products, most of which could have been grown in the country under more ideal conditions.

b. Why and how was this particular project chosen, and what was its relationship to national development and sector activities.

Afghanistan has long realized the potential available in the little-used third of their country located in the Helmand River Valley. Nationally supported work to develop this area began as early as 1935. Located in the southeastern part of the country the potentially irrigable land in the Helmand Valley consists of perhaps a half-million rich, flat acres of land through which flows the Helmand River and its tributaries on their way from the southern reaches of the Hindu-Kush mountains to Iran. Most of this land is very flat with slopes ranging from 0.5% to 1.0%. The bench soils are alluvial, derived from outwash materials of limestone, granite, feldspar, schists and basalt. The soil is underlain with gravel or gravelly calcareous materials two to five feet below the surface. Beneath this is an impermeable silica and lime-cemented conglomerate. River bottom lands have a fine sandy loam over gravelly substratum. In older river plains, there exists moderately deep silt loams, with the impermeable conglomerate at depths usually of 6-9 fee

The soils which do exist in this valley are often cloddy and crusty, and heavily

infested with unpalatable wire grass and camelthorn. They are difficult to use with existing farm instruments; but react exceedingly well to more modern equipment and power farming. Approximately 35% of the land area is affected in varying degree with alkalinity or salinity; and due to the flatness of land leaching is difficult and drainage is poor. Both of these represent problems difficult of solution by usual Afghan farming methods but readily solvable with power equipment and large-scale farming activities.

Such an area represented an opportunity to increase the productive agricultural lands by better than 5% of the national total, yet would be difficult or impossible to do by individual or small groups or farmers. The potential could only be developed by a large-scale government program, and with assistance from outside the country for technical or financial aspects of the proposed program. While there were other areas of Afghanistan which might be similarly developed, the Helmand River was the largest in the country (the Oxus is larger, but much of the potential land which could be developed would be in USSR rather than Afghanistan); and the valley at that contained the largest amount of relatively flat and fertile, drainable land in the country.

The Helmand Valley development project was chosen for development in light of the need for additional land for expected future population growth and to increase the standard of living of the Helmand Valley and to allow this valley to contribute more fully toward the total development of Afghanistan. In consideration of the physical problems outlined above it was apparent that basic run-off and water supply data would be needed. Also, since the Helmand River is an international river, it was considered necessary to have reliable source and use figures on water for an eventual settlement of division of water.

It was also apparent that total valley development would require more exact water supply figures than were available at the time. For those reasons, this particular project was chosen.

c. What other agencies were involved, if any (host country, international, other nation, foundation and the like) and what was their role?

No exact date can be fixed at the time when the Afghan government first began planning the development of the Helmand Valley. By 1935, however, it was found necessary to call in outside assistance to supplement and supervise the national effort, and an agreement was made with Japan to help develop the area. Actual work under Japanese financing and technical assistance began in that year with the digging of the Boghra Canal which would divert waters from the Helmand River above Girishk into the flatlands lying westward of the river. Japanese involvement in World War II ended this activity, however, with little progress made other than the beginning of the construction of the canal itself. The Japanese had, however, pointed out the need for more accurate information on the potential water resources available; and in the period after Japanese assistance ended, the Afghan government established an Afghan Meteorological Service with headquarters in Kabul which began collecting weather, run-off and other data in various parts of the country, including the Helmand River Valley. The information, due to lack of training of employees, inadequate instruments, irregularity of reports, low salaries and inaccessibility of many of the stations for supervisory purposes, was often sketchy or inaccurate; but for the first time some hydrological data was becoming available to make the further development of the project more effective. The most accurate information available for the Helmand Valley,

however, was that which had been collected at a small weather station in Kandahar established by the British consulate in 1939 and maintained later by Indian and then Pakistan consular workers.

In 1946, the Afghan government signed an agreement with the Morrison-Knudsen/AFGHANISTAN company (MKA) to continue the project started by the Japanese eleven years earlier. The early MKA contract was financed by the Royal Government of Afghanistan (RGA) from foreign exchange which had accumulated during World War II. After 1949, however, this source of funds was exhausted, and it was necessary to search elsewhere for further financing. On the basis of work completed to date and the projected work plan for the Valley, it was possible to justify an international loan of $39,500,000 which continued the operations through 1959. Since that time, work has been financed through U. S. grants to the Helmand Valley Authority.

The Helmand Valley Authority (HVA) was created in 1952 to administer the entire project; and to carry on aspects of the National Development program in the Helmand River Valley which had earlier been considered as administrative functions of the Ministries of Agriculture, Public Works, Finance, etc. It was created as an autonomous governmental organization using the facilities of other Ministries but not directly dependent on any Ministry. The President of the organization is the Minister of Finance; and there are seven vice-presidents each in charge of a sector activity. These are: Administration, Construction, Technical, Education, Agriculture, Irrigation and Health. To provide necessary hydrological information to backstop such a program, HVA created an independent Helmand Valley Hydrology Unit, and asked the United States to provide technical advisors to organize, train and develop functional activities of the new Service. This has been accomplished by a contract with the United States Geological Survey, and has had the continuous services of a USGS technician (three since 1952). It is considered one of the most successful Afghan aid projects; and much credit for its success is given to the continuance of advisory assistance over the past ten years.

Earliest organized hydrological work in the Helmand River Valley was done by the Afghan Meteorological Service; but such records as have been available from this source have proven too sketchy or inaccurate to backstop a program on the scale of HVA. HVA found it necessary to develop additional hydrological stations and/or to train personnel to operate existing stations in order to carry out their activities effectively. When U.S. grant funds became a part of the program, these were made contingent, at least in part, on accurate information on the water resources of the area and a U. S. technical assistance program was made a part of the hydrological activities.

II. Objectives

a. What was attempted?
   a. Short range objectives
   b. Long range objectives. (Significant changes of attitude, horizons, values, behavior habits, improved and effectual utilization of human and material resources.)

The Helmand Valley Water Investigations Project, in cooperation with the HVA, was established to gather hydrological data necessary for sound planning and operation of

irrigation, hydroelectric and other developmental programs within the Helmand Valley area, to develop and operate a hydrological network of stations within HVA, and to train necessary personnel. It also will provide data necessary for successful drainage of project lands, so that they can be made sufficiently productive for sound agriculture and the settlement into permanent communities of the presently nomadic population.

Specific activity targets or and results desired, include:

a. To collect basic hydrological data needed to effectively develop irrigation, drainage, land use, flood control andhydro-power projects in the Helmand Valley.

b. To develop within HVA by mid-1965 a competent organization for the collection and analysis of such hydrological data and the preparation of related reports. Through these reports it is believed maximum efficiency can be obtained in the use of available water, resulting in maximum agricultural production, The reports will also provide necessary data for planning drainage, hydro-power development; flood control measures, and further irrigation development.

c. In the process of developing this hydrological organization, to train Afghans (both in field and office procedures) to adequately operate and supervise a network of 16 discharge and/or stage stations and 4 evaporation and weather stations so that further U.S. technical or supervisory assistance is no longer needed; and to give training in the compilation of hydrological and weather data including stream flow, rainfall run-off correlations, canal and evaporation losses, and watershed snowfall data so that accurate fore-casts and intelligent management can be made of water supplies. While the project is presently limited to the Helmand Valley project, Afghan technicians so trained will be capable of planning, developing and carrying out similar activities in other areas of the country.

While these are specific objectives of the hydrological project, this project cannot be easily divorced from that of the overall parent project with its objective of ultimately adding large areas to the productive lands of Afghanistan. As such, then, the hydrological project plays an important part in increasing the probability of success of the HVA itself.

Success of the HVA project will eventually bring under cultivation several hundred thousand additional acres of presently useless desert land. On this land it will be possible to grow much of the food, feed and fiber now imported into Afghanistan at considerable cost of foreign exchange badly needed for other purposes. It can provide raw materials needed for budding Afghan industrial projects such as its fabric plants. It can introduce, as a substitude for existing hand farming and small tool culture farming methods, a more economic method of machine cultivation. Land which is potentially capable of growing two crops a year can be used at more nearly peak potential instead of lying fallow. Now crops and products can be raised, including the development of a dairy industry. The income of the farmers can be greatly increased, and with it GNP of the country.

The biggest change, of course, will come to the people themselves. At present, most of the Helmand Valley is used only by nomadic hersmen who move across it from Pakistan

to the Iranian borders annually as they search for pasturage for their crops. Lamb losses among these nomadic herdsmen run as high as 50% annually, a loss which can be greatly reduced where feed and improved technical knowledge is available. The people can be tied down to definite localities, instead of being wanderers, and at that time educational and health opportunities will be vastly improved; while the country will benefit by a more stable citizenry. Where today smuggling is common and results in large losses of revenue to the country as the nomads move back and forth across international borders, with a settled population not only will such losses of revenue be reduced but also increased sources of tax revenues will become available to the government with which to finance its operations.

III. Resources Committed

a. What resources (U.S., host country and others) were utilized? How? When? (Technicians, counterparts, participants, on-job training, commodities)

No accurate listing of resources committed is available for the early years of this project. Earliest operations of both the Helmand Valley activities and its hydrological aspects were a joint responsibility of Afghan and Japanese governments, and any records of this would be single-copy, hand-written reports in non-English buried in some Afghan government office. Similarly, during the war years when the first hydrological stations were established, all resources came from Afghan appropriations budgeted and lost in the detail of larger projects, and this is equally true of the period when MVA was operating from war-generated funds released to the Afghan government at war's end. When these funds were exhausted in 1955, an international loan for $39,500,000 was obtained; and this financed operations for 1956 through 1959. In this period, activities of the hydrological phase are blanketed into the larger MVA activities, and no separation is possible.

With the creation within MVA of the Hydrologic Unit and the coming to Afghanistan of the first American technician supplied by USGS in 1952, it becomes possible, however, to disassociate some of the resources created for the overall MVA project into their respective parts, and to form a somewhat clearer picture of the resources specifically committed to the hydrological project. Again, however, the definition is not entirely clear because the project continued to use materials or equipment obtained by grant or loan from MVA, MVA or TCA sources as well as those definitely allocated by the U. S. (through USGS or through USAID and its predecessor agencies) for specific project use. For example, the inaccessibility of many of the stations makes transportation equipment in comparatively large numbers a prime necessity, yet the project itself has purchased only a limited number of vehicles from project funds. Rather, it has used project funds to buy repair parts or maintenance supplies for vehicles originally purchased with MVA, MVA, or TCA funds and transferred to this project as part of the host country contribution.

Dollarwise, for host government contribution the best available figures indicate an expenditure of $85,000 per year in local currencies for the hydrological project, dating back to as early as 1952 through the present -- an estimated total of perhaps $700,000. The figure itself is quite questionable, however, since it is based primarily upon a dollar value assigned to Afghan contributions which has been primarily in the form of wages to personnel, estimated costs for supplying offices and utilities, furnishings for offices and stations of a non-technical or locally made type, transportation (from MVA or otherwis

provided vehicle), logistical support, maintenance and repairs locally done.

For its contribution, the United States has allocated $243,000 for the hydrological project. This has been used to supply:

1. The continuous services of an American hydrological engineer (through USGS) to advise, train, and develop the program.

2. Provide out-of-country training to 2 participants.

3. To provide technical equipment and other commodities not locally available for use in the training program or to establish the hydrological service for HVA.

4. To prepare, and to print and distribute, information gained through the various hydrological studies made or derived from data collected.

a. Technicians supplied. To date, three Americans have served as technical advisors for this project, in continuous and overlapping service. They include:

1. Leonard J. Snell (1952-1957)
2. I. A. Hockmiller (1956-1959)
3. R. H. Brigham (1959-present)

b. Participants trained outside Afghanistan (US or TCA grants as noted; USAID indicates present or predecessor agency)

1 man trained by TCA two years in Afghanistan, sent to U.S. for 4 years by USAID
2 men trained 1 year each in Turkey by TCA
1 man trained 1 year by TCA in Turkey and 1 year at American University at Beirut under USAID-AUB Regional contract
1 man sent U.S. for 4 years by USAID (University of Wyoming, University of Nebraska, USGS Regional Office in Lincoln)
1 man sent to American University at Beirut for 1 year under USAID-AUB contract

The present project agreement, prepared in 1961, calls for sending 1 man each year through 1965 to U. S. or other outside-Afghanistan. Under this agreement, one man is now enroute to the United States for practical training with the USGS regional offices and a 4-year course in Civil Engineering; one studying Civil Engineering in India.

c. Commodities purchased

In addition to materials transferred by loan or grant to this project from HVA, HEA, or TCA sources, a total of 50 PIO/C's have been prepared to date to cover purchases of technical equipment or other commodities for specific use of the hydrology project. In many cases these have been for replacement parts to rehabilitate machinery, transportation or other equipment turned over to the project from the indicated sources. In other cases they have been to supply office equipment necessary to establish an efficiently operating unit or station and not available by local purchase within Afghanistan from local currency

funds. They have also included supplies and materials, charts or forms used in the preparation of reports listed in (1), below, or for use in USAID or other agency purchased recorders or other technical equipment, and considered as expendable supplies. Major items of equipment purchased with USAID funds are listed below, and are in addition to those grouped together in this paragraph.

1. Vehicles: (Each complete with 2 years supply of parts)
   - 1 Willys Panel Truck
   - 1 Jeep Sedan Delivery
   - 1 Willys Station Wagon
   - 1 International Truck

2. Communications Systems
   - 1 Single Sideband HF Mobile Unit
   - 1 Motorola 2-way radio phone and receiver (transistorized)

3. Office Equipment (with repair and spare parts)
   - 1 Standard Process fluid duplicator
   - 1 Drafting table
   - 1 Tracing table
   - 2 Monroe Calculators
   - 1 Typewriter

4. Scientific equipment for field use (with spare and repair parts)
   - 8 Recorders
   - 36 Thermometers
   - 1 Psychrometer
   - 4 Anemometers
   - Headphones
   - Collecting Bags
   - Float Tape
   - 4 Gaging Cars
   - Cable Clips, Hooks, Cutters
   - Cable
   - 2 Electric Gages
   - 2 Rain Gages
   - Sounding Weights
   - Hand-line reels
   - 4 Measuring Flumes
   - Aluminum boat boom
   - Clamping cross bow
   - Boat tags, tie backs, tag-line reels
   - 4 gaging car pullers
   - Power-line pullers
   - Thimbles
   - Gaskets and glues
   - Depth sounders
   - Map measurer
   - Tow-chain
   - Reflector tape
   - Well augers and parts
   - Recorder clocks and sprocket chains for carriage drives
   - Depth indicators
   - Sounding crane

5. Aerial Survey Photographs of areas studied.

6. Carbon Steel Bars and Steel Reinforcing

7. Well Casings

8. Gaders and vulcanizing kits

d. Duplicated reports prepared and distributed.

Various hydrological data collected at established stations by the American technician, the Afghan technicians he has trained, or from records developed by predecessor groups within the Afghan, TVA, or UVA organizations is periodically summarized, analyzed, and interpreted by the American scientist or under his supervision and inspection by the Afghan staff, and this is duplicated on a monthly or annual (rainfall-year of Oct. 1 to Sept. 30) basis, and distributed to various UVA, USA, USA, or USAID personnel for their information and use. A compilation of all available data and its interpretation has been assembled by the American technician and printed by USGS in the United States for world-wide use; and a second edition of this report is now awaiting printing. The duplicated reports prepared to date are:

1. "Stream Flow Records, Helmand River Valley, Afghanistan, 1947-54" published by USGS
2. Monthly Hydrologic Summary
3. Reservoir Operations Record, monthly, of Arghandab and Kajakai Reservoirs
4. Final Annual Records of Stream-Flow and Reservoir Content on Water Year Basis (Oct. 1 - Sept. 30). Printed annually

IV. Factors accelerating or inhibiting progress

a. On host country side consider administrative arrangements, high level interest, understanding of technical factors, legislation, financial support, natural disasters, internal complications, etc. Discuss in terms of 1. Major difficulties encountered; and (2) factors accelerating progress.

b. On U. S. side, consider U. S. performance in terms of planning, financing, implementation, time schedules, staffing, contractor selection. Discuss (1) devices and tactics facilitating progress, and (2) how right performance be improved.

While again it is impossible to completely divorce the overall UVA activities from those specifically performed by the Hydrological project within UVA, such a divorce is not entirely necessary and the successes or problems of each materially affect the other.

Unquestionably, the Afghan government has evidenced a large degree of high level interest in the development of the Helmand River Valley, as shown by their initial inauguration of the project, their calling upon various non-Afghan sources for both technical and financial assistance, their formation of the UVA with leadership vested in cabinet-level personnel, their assignment of large segments of their national resources

to the activity. Their decision to combine administrative functions into a single autonomous organization rather than carry on with split administrative responsibilities in many ministries has been wise for HVA development and for all its component parts including the hydrological work. Within their economic limitations, the financial support to HVA and its component parts has been as much as could be expected. Legislation which created HVA has probably been one of the most important factors in making this project workable. Natural disasters, primarily flash floods which have washed away stations or changed water courses have required some re-establishment of stations or duplication of efforts; but has not proven a serious obstacle.

Perhaps the largest single factor handicapping the program has been the complete lack of trained personnel capable of adequately measuring, interpreting, and reporting hydrological data; and the almost complete lack of Afghans with backgrounds suitable for training in this field. While the Afghan government maintained a meteorological service prior to the initiation of this project in 1952, its personnel were unskilled, their results undependable, their equipment almost non-existent. Further, such personnel as were available in this service were not transferred to the HVA; but continued to provide meteorological services for other parts of Afghanistan while HVA had to recruit, train and put into operation its own service with new workers.

Leonard J. Snell, the first U. S. technician, listed in his terminal report the following nine basic problems which he believed were most important in their effect on the hydrological project. While later technicians reported solutions to some of these, all were in agreement that the list was specific and represented their own analysis of the problem: -

1. Lack of experienced personnel, or persons capable of being trained on basis of prior education and experience.

2. Lack of pride in work and willingness to assume responsibility.

3. Procurement problems.

4. Transportation problems to stream-gaging locations.

5. Lack of necessary equipment to do accurate job.

6. Absenteeism of Afghan personnel.

7. Salaries paid employees (Afghan system bases salary on education, not ability to do specific job).

8. Pilferage of equipment, supplies.

9. International water-use problems of Helmand River which flows from Afghanistan into Iran and in some parts serves as boundary.

To this list, since Snell's report was written, has been added the problem created by closing of the Afghan-Pakistan border which has seriously slowed-up the inflow of needed

materials not locally available, and has added considerably to the cost of and damage to items which have been procured since they had to be flown in by air-freight, or freighted in through Iran with several hundred additional travel miles, all over inferior roads.

On the American side, it is impossible to put enough stress on the value resulted from the fact that this project, during its ten years of development under U. S. aid, has always had the services of one or more experienced U. S. technicians, without any break in advisory services and supervision. The fact, too, that it has been continuously under a single contract entity (UNL) has been extremely helpful.

Planning of this project has been uniformly good, although the implementation of plans has sometimes fallen down due to local or U. S. problems of supply, maintenance, Afghan personnel, or myriad intricate Afghan administration. Personnel problems have been multiplied by the USAID training program which will eventually provide more and better trained Afghan technicians but which currently removes for long periods from necessary project activities the only Afghan personnel available and even partially capable of performing necessary tasks. Time schedules have often been interrupted, and at times completely abandoned, because a lack of trained Afghan personnel and counterparts made it necessary for the American technician to spend his time on housekeeping, administration or office routine tasks instead of carrying out planned training or program activities. Locations of gaging stations were adequate on the basis of data potentially available from them; but often they were too inaccessible to service or supervise adequately, or to bring to them the type of gaging equipment which would provide the maximum of useful information.

Staffing on the basis of U. S. technicians supplied, has been adequate or perhaps outstanding. The same cannot be said of the Afghan staff which has been made available to the technicians by IWA. One counterpart has served continuously with all three U. S. technicians; but he has not proven to be entirely acceptable. One technician in his terminal report commented that this man lacked a desire to learn more of the technical aspects of the program, while another indicated that he spent more time in Kabul than in the Helmand Valley. At the time of the project's start he had two years experience with IWA and was probably the best man available to lead the project. Because of their greater interest or more recent training, other project Afghan technicians may seem more capable of leading this project; but no changes in the Afghan leadership have been made by IWA.

The project currently has enough Afghan technicians with some degree of training that it should be capable of better performance than is currently being produced. The slowdown has been caused in part by the sending of a few key persons from among this limited core of trained men to training opportunities outside Afghanistan; by the frequent absences of key personnel from job assignments; by the comparatively low IWA pay scale which has created turnover beyond expectation; and by other outside-Afghanistan training opportunities which have become available in other branches of the Afghan government, causing project technicians to transfer in the belief that they had more opportunity for such training at the other government posts.

It is the belief of the present U. S. technician that a minimum of three additional Afghan personnel, of at least college-education level so they are capable of being trained, is necessary if the project is to be completed as planned by 1966. He is also of the belief that it will be necessary to continue U. S. advisory training and capability

assistance on the present scale through that year if the unit is to be capable of carrying out the long-time goal of establishing within Afghanistan a unit capable of collecting, interpreting and reporting hydrological data sufficiently adequate and detailed to become the basis for HVA and RGA development work in irrigation, power generation, and water use.

V. Accomplishments

1. Sixteen gaging stations have been established in the Helmand Valley run-off area, and at these, automatic recorders have been established at fourteen, staff-gaging continues at two.

2. Records have been accurately computed at these stations since 1958, while records have been compiled for each station since its installation, using the best-available information for periods prior to the installation of automatic equipment.

3. Records so compiled pertinent to the Reservoirs are distributed monthly to HVA, MMA, RGA and USAID personnel for their information and use in planning or programming activities in agriculture, land use, water use, hydroelectrical development and flood control.

4. Annual reports are prepared each year on stream flow and reservoir content for the Helmand and Arghandab Rivers and many of the smaller tributaries of the Helmand. Some canal data is now also being collected and included in these statistical annual reports. They have proven of great value to both USAID and RGA officials in planning programs and forecasting probable effectiveness of proposed programs.

5. Through USGS, a comprehensive report of all available flow and reservoir data for the area was prepared in 1955, and is currently being revised and brought up-to-date. This has been used internationally, particularly in analyzing applications for international credit.

6. Rating of canal control structures has awaited the arrival of boat measuring equipment, held up by the border closing, but a beginning has been made at the Boghra and Naserjuft canals.

7. Weather stations have been established at Lashkar Gah and at Kala Kang and records maintained since 1957. Records available include rainfall, temperature, evaporation, humidity, wind velocity. A station was completed at Darweshan in 1960 which is now collecting information on rainfall, temperature and evaporation. Rainfall and temperature records were started at Panjoa in 1960. Snow surveys have been made each February near Ghazni since 1954 and in the Shiniz River Basin since 1961.

8. In 1960, runoff records at the reservoirs were analyzed for a period of 13 previous years, and a schedule of reservoir operation was supplied to the Operation and Maintenance Unit of HVA, which used them for 1961 schedules of water releases. This was the first practical application of project results. However, storage and runoff records are now at a stage where relatively safe predictions can be made as to water availability during the crop year. This is especially valuable for short water years in crop planning and water rationing schemes.

9. Reservoir sedimentation studies have begun on 21 cross-sections of the Arghandab Reservoir. Data so obtained is not yet considered useable because of lack of adequate staff with sufficient training to do an accurate job; but the information which was collected and the methods used have become the basis for a more effective program now to be carried out. Sedimentation figures for Afghanistan are almost completely lacking or inaccurate. Such figures, if available, would prove a valuable addition to hydrological data suitable for planning large reservoir programs needed throughout the country.

10. A participant returned from the University of Wyoming in 1960 at first proved slow in adapting his new training to local conditions. He now has adjusted to the current situation, and is proving an excellent technician and is considered by the U. S. technician as capable of becoming director of the Afghan hydrological activities in HVA.

11. During the earlier years of the project, the HVA contribution to the hydrological project budget was relatively small, and entirely insufficient to cover operations. Now, apparently convinced of the value of the project, they have materially increased the budget as well as other types of contributions.

BALANCE SHEET

COMMENTS	1962 Status	1962 Status
Basic Law Governing	None	HVA created, 1952. Included hydrology in title, with USGS technical advisor and Afghan counterpart as director.
Personnel in Unit	None	4-5 technicians, 2 outside Afghanistan for training; maintenance and operations crews working at 20 sites.
Skilled technicians available	1 man, 2 yrs. with HVA as Engineer-aide 3 men in Turkey for 1-yr training by HVA as civil-engineering aides. 2 men in Beirut for 4-yr training by HVA as civil engineers	Have trained present project workers and 4-5 now on other projects. Two U.S. participants, 1 Indi
Stations in operation	7 stations in area had been established prior to 1952 by HVA or HVA to obtain needed data. Equipment inadequate and workers not adequately trained so results not always reliable	16 run-off stations and 4 weather stations in operation All but two stations now have automatic recorders.
Advisors available	Some part-time advisory assistance from HVA engineers available	Record of continuous USGS advisory assistance 1952-1962
Hydrological data available.	Practically none. HVA collected some data for an use 1946-1952. HVA had Meteorological Service in Kabul with some weather data, not generally available and often inaccurate.	Monthly and annual reports prepared since 1952, for distribution to all U.S. and HVA personnel working in land use, flood control, agriculture, irrigation, drainage and hydropower projects.
World-wide contribution of available data	None	Report prepared by USGS of all compiled data on run-off and reservoir operations on Helmand River, 1957. Revision through 1960 now being printed.
Use of data obtained	Contractor had to establish own facilities since no information was available.	Data compiled in 1961 was used to plan 1962 operations program for entire HVA project.

BALANCE SHEET
(continued)

Finances

Prior to 1935	by RCA financing for all activities in Helmand Valley. No breakdown of any funds used for hydrological services.
1935-1941	Joint Japanese-RCA financing all activities in Helmand Valley. No breakdown of funds for hydrological services.
1941-1946	RCA financing, all activities in Helmand Valley. No breakdown of funds to show any hydrological services.
1946-1952	Helmand Valley activities begun using foreign exchange funds blocked during war, released to Afghanistan. By 1949, these were generally exhausted and an international loan for $39,500,000 obtained for continuance. Operations under contract to HVA. No breakdown to show costs of hydrological work.
1952-present	a. U. S. technical assistance of $243,000 for establishing hydrological unit within HVA, including services of technician, under USGS contract.
	b. Afghan contribution to establishment of hydrological unit estimated at average of $60,000 annually, average 1952-present. Part of contribution was for personnel, training abroad of Afghan personnel, buildings, logistical support. Part was in form of equipment transferred to project but originally purchased from (a), above, or earlier financing classifications.

Attachment "A"

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VI. Appraisal by Reporting Technical Division:

a. Actual rate of progress of this project has been steady and forward moving. The rate, like that of most projects, was slower than was hoped for but was certainly acceptable and even remarkable when considered against the background of difficulties of lack of trainable people, equipment, roads, weather conditions, etc. Certainly there now exists 10 years of reliable and acceptable data on the main stem of the Helmand River. Since development of the project is only presently at a point where less than half of the available land and water are utilized, the past and future information the project will gather will be invaluable in the planning for further development.

b. Findings revealed by this report can have significance in respect to National development. They can show the desirability of providing adequate resources in money and people to allow the program goals to be accomplished. They can further show that persistence and continuing action on a program, even though the program is not spectacular, will usually come up with valuable and useable information. The findings, when and if coupled with reliable soil and drainage surveys could be valuable in the planning and further development of the Helmand Valley.

c. The success of this project when balanced against the success of other programs in the Helmand Valley in Agriculture point up two facts that have world-wide application:

1. That continuity of high grade, dedicated technicians without break in presence over extended periods of time is essential to the success of Technical Assistance programs.

2. That there is no substitute for sound technical knowledge on programs of this kind and that the best source of recruitment for this knowledge is through experienced agencies such as TVA. The success here represented is overall the selection and coupling of competent staff with minimal but adequate backstopping in commodities and host country participation.

VII. Director's Comment

This past spring, the hydrological unit predicted a low water year and was proved accurate. This is the first time that water needed rationing in the Valley. As a result of political pressures, the rationing was higher than recommended, but still progress was made.

When a new main canal for the Tarnac area was begun in 1961, recommendations of the hydrological unit were partially ignored.

Although the Helmand Valley Authority has continued to support this activity, it has not made sure that personnel stayed with it so that the work could expand. The Dana-Hongreen report stressed that data on more streams is necessary before designing flood control or planning more expansion of irrigation systems.

The HVA has not, until recently, been conscious of the need for similar work in other river basins. Just this year, the USAID pointed out that the first step before planning multi-purpose development of the Hari Rud near Herat would be the collection of hydrologic data.

Thus, the complete "pay-off" on this project is yet to come. This is a problem for underdeveloped countries which goes beyond this project - namely, the attitude of mind which recognizes the value of scientific data and careful planning before launching new investment. Recognizing this attitude, we can feel pleased that our technical assistance has begun to show real results and exert an influence.

BREWER