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DESIGN GUIDANCE FOR SHEBELLI WATER MANAGEMENT PROJECT

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WMS REPORT 49

DESIGN GUIDANCE FOR

SHEBELLI WATER MANAGEMENT PROJECT

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by

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PREFACE

This study was conducted as part of the Water Management Synthesis II Project, a program funded and assisted by the United States Agency for International Development through the Consortium for International Development. Utah State University, Colorado State University and Cornell University serve as co-lead universities for the Project.

The key objective is to provide services in irrigated regions of the world for improving water management practices in the design and operation of existing and future irrigation projects and give guidance for USAID for selecting and implementing development options and investment strategies.

For more information about the Project and any of its services, contact the Water Management Synthesis II Project.

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ACKNOWLEDGMENTS

The Design Guidance Team is particularly appreciative of the unusually fine support provided by USAID/Somalia. Staying in the USAID Guest House was very helpful and allowed the Team to function most efficiently. Both the accommodations and food service were unusually good. We also appreciated having our transportation needs so expertly cared for. Of even greater importance was the personal assistance and back-up provided by Drs. Ray Carpenter and Roger Garner. We also appreciated Mr. Bill Denton's help and Dr. Dale Pfeiffer's deep interest in the Shebelli Water Management Project.

We are also most appreciative of the excellent assitance we received from the Somalian Ministry of Agriculture. Dr. M. Abdi Noor, Vice Minister for Planning and Mr. Mohammad Ali, Director, Land and Water Resources, both gave generously of their time. Mr. Mohammad Abdib, Engineer, MOA/DLWA, who accompanied us during all of our field visits was not only an excellent guide and interpreter, but also had a keen grasp of the engineering details and socio-economic implications of the various project approaches.

FOREWORD

This document presents the findings and recommendations of a three person Design Guidance Team which was present in Mogadishu, Somalia from August 18 through September 3, 1986. The Team was organized and supported through USAID's Water Management Synthesis II Project. Team members were:

Dr. Jack Keller - Agricultural Engineer - Utah State University

Dr. Thomas F. Weaver - Agricultural Economist - University of Rhode Island

John S. Mayo, P.E. - Civil Engineer - CH2M Hill, Yakima, Washington

The purpose of the Team's visit was to assist USAID in more clearly identifying and scoping the Shebelli Water Management (SWM) Project, which will be a long-term ($50 million over 10 years) commitment to assist the Somalian Government to enhance irrigated agriculture in the lower Shebelli River Basin. The Team looked at basin-wide management issues as well as site specific irrigation projects, both operating and under construction. The Team's findings and recommendations for the SWM Project and composition of a Project Paper Team to create the Project plan in detail are included in this report.

Jack Keller and Tom Weaver were the principal authors of the main body of the report and the Response to AID/Washington Issues Questions (Appendix A). John Mayo authored the Sample Descriptions of Potential Rehabilitation and Betterment Project Activities (Appendix B).

EXECUTIVE SUMMARY

The Team's major findings include:

1. There are presently in place village-level water user organizations that effectively clean and maintain tertiary canals (and possibly some secondary canals) and rotate water for both day and night irrigation) in both the Shalambood and Faraxaane areas. In addition, there appear to be mechanisms for cooperation between villages and large farmers along secondary canals for water rotations and some maintenance. The Somalian Government is involved in this system. These existing institutions need to be included in any rehabilitation scheme and in development of a national water law.

2. The existing irrigation systems in the proposed Project area are presently functional and in use. Rehabilitation, or at least major repair, of the barrages (river control structures) and some of the gate structures on the primary and secondary canals is needed to maintain structural integrity and to assure continued operation.

3. There is need for a basin-wide Shebelli River management system with technical and administrative staff and adequate gauging stations to model the river flow and offtake demands. This is required in order to regulate and control the water withdrawals for irrigation, especially during low flow periods when demand exceeds supply.

4. The "rehabilitation" presently under way sponsored by other donors is in effect new design and system construction superimposed on existing irrigated areas and on newly developed areas.

5. There are many donors presently pursuing projects in the Shebelli Basin. These include United Nations, FAO, World Bank, USAID, West Germany, Libya and others. Closer coordination of their efforts should increase outputs and benefits to Somalia.

6. For a USAID-sponsored rehabilitation and betterment project, the Team suggests a "pragmatic" rehabilitation in the Shalambood area. Pragmatic in this instance is defined as practical refurbishment of the existing facilities with redesign and new construction performed only where the existing system is inadequate as identified primarily by the current users of the systems. Part of this rehabilitation may include local off-stream storage which would be complementary to the large Jowhar Off-Stream Reservoir on the Shebelli River, as well as drainage facilities and roads/bridges to improve farm access.

7. Continuation of the current USAID-sponsored extension and training programs is desirable to assure improved levels of

crop husbandry so that the full benefits of irrigation may be realized.

8. Additional canal maintenance machinery and equipment will probably be required to properly maintain the larger canals. Also, training of equipment operators, mechanics and system maintenance personnel, as well as engineering and agricultural technicians, will probably be necessary.

Proposed Project Scope:

9. The Team recommends that the Somalia Water Management Project have the following four main components:

   a. Address the management of the entire Shebelli River system within Somalia.

   b. Carry out pragmatic rehabilitation of the Shalambood area, which will involve upgrading the capability of the MAO/DLWR with added new hardware and training (see [6] and [8] above).

   c. Management of the canals, drains and road maintenance and operation of pumping and the distribution of flows to the tertiary canals within the area selected for rehabilitation.

   d. Research, assistance and extension in on-farm water management (distribution, application and scheduling) and general crop husbandry, especially for foodgrains and vegetables.

Proposed PP Design Team:

10. The PP Team should be in the country from six to eight weeks, with the Team and co-Team leaders arriving a week early and remaining two weeks longer than the full Team. The PP Team should be made up of the following 10 specialists:

- Agricultural Engineer
- Water Resources Management Engineer (River/Canal Management)
- Civil/Construction Engineer (Irrigation Works and Building)
- Irrigation Agronomist
- Irrigation Agricultural Research and Training Specialist
- Agricultural Economist (On-Farm)
- Agricultural Economist (Policy and Analysis)
- Extension Specialist
- Rural Sociologist or Economic Anthropologist (With Experience in Irrigation Communities)
- Legal/Institutional/Political Scientist

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BACKGROUND AND METHODOLOGY

The purpose of this design guidance effort is to provide additional insights and guidance for the Shebelli Water Management (SWM) Project as a follow-up effort to the PID[1] and in response to the Executive Committee's Project Review (ECPR) Issues Paper[2] on the PID. In addition, this project design guidance includes a general scope for the Project Paper (PP) design effort, including Team composition, level of effort and scopes of work for each PP Team member.

To aid in understanding the physical relationship of the areas and facilities being discussed, Figures 1, 2 and 3 showing maps taken from existing reports covering the project area have been included. The Design Guidance Team (hereinafter referred to as the Team) spent considerable time locating and acquiring copies of the major reports and documents relative to the study area. (Copies of all important materials have been made and consolidated in a single file at the Mission in Mogadishu for the PP Team's use.) We reviewed the available written materials (1,000+ pages); had interviews with appropriate Government of the Somalia Democratic Republic (GDSR) officials and Donor and Technical Assistance Personnel; and spent 14 man-days on field visits to the project and surrounding areas.

The main studies relevant to the overall Shebelli River Management and Lower Shebelli Irrigation Rehabilitation which the Team reviewed are:

- Janaale-Bulo Marerta Project: Master Plan Main Report, by Sir. M. McDonald and Partners, Ltd., July 1978 (hereinafter referred to as the MMP Report).
- Janaale-Irrigation Rehabilitation Project: Feasibility Study (interim report) by TAMS, January 1986.
- Shebelli Water Strategy Study: Appendices A through H, by Lahmyer International (LI), March-May 1986.
- Somalia Agricultural Sector Survey (principally the Summary, Agriculture and Economics Subreports) by the GSDR/Ministry of National Planning and the World Bank, September 1985.
- Afgoi-Mordinle Irrigation Project II Appraisal Report by African Development Fund (ADF), July 1981.

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[1]Shebelli Water Management (649-0129) Project Identification Document (30 pages + annexes).

[2]ECPR Issues Paper on Shebelli Water Management PID based on May 19, 1986 meeting (7 pp.).

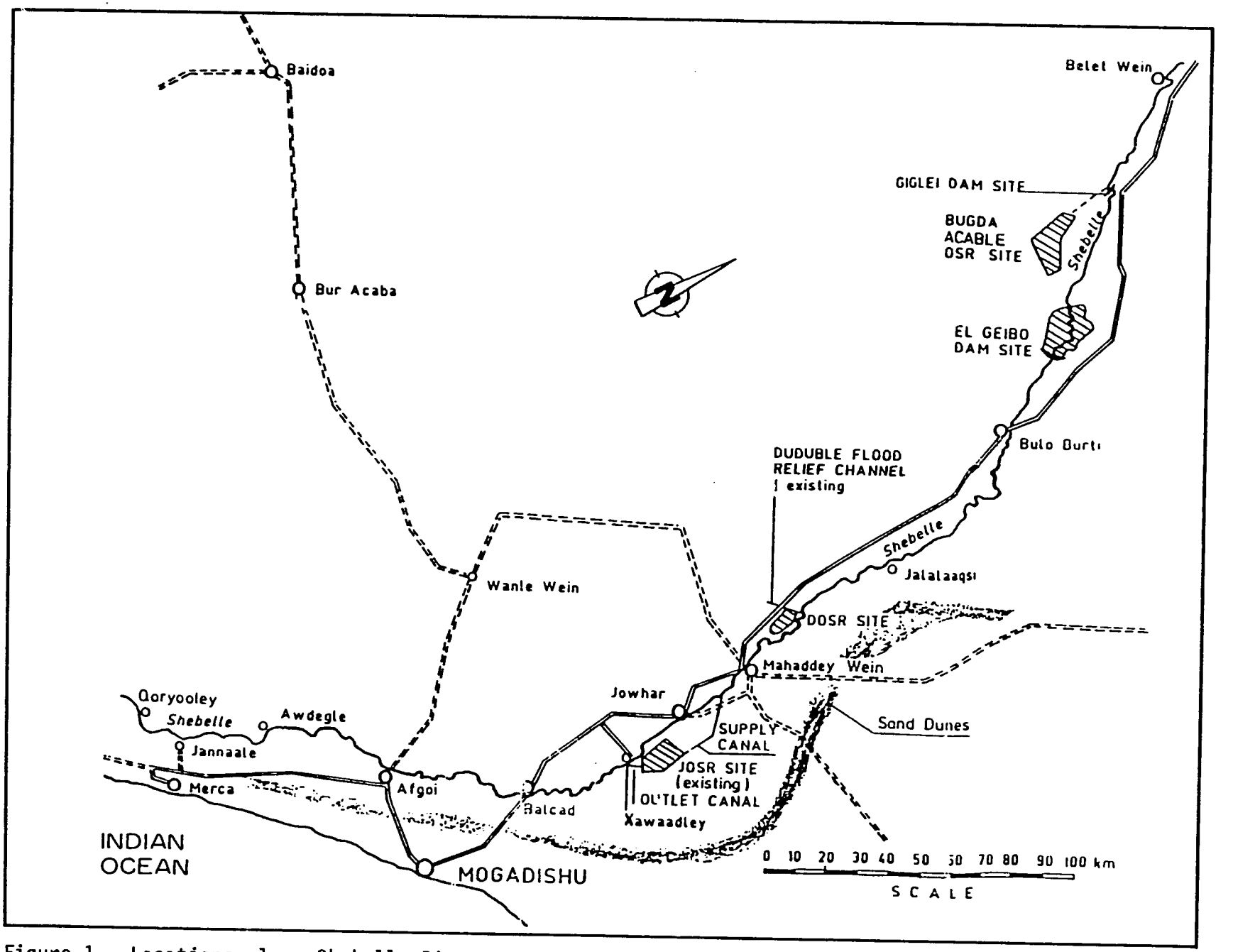

Figure 1. Locations along Shebelle River.

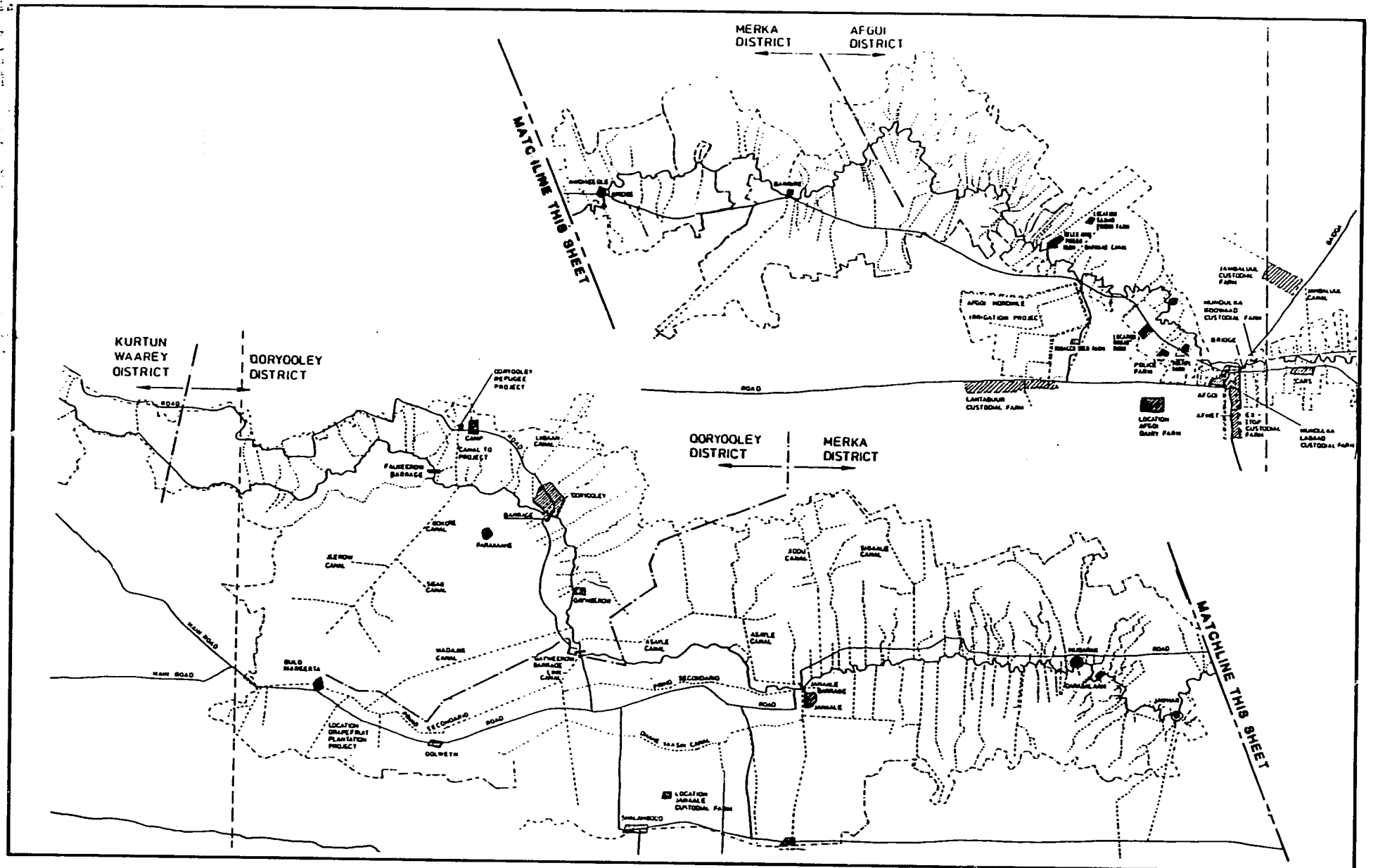

Figure 2. Gravity and pumped off-takes serving canal (see dotted lines) along the (lower and part of the middle) Shebelle River.

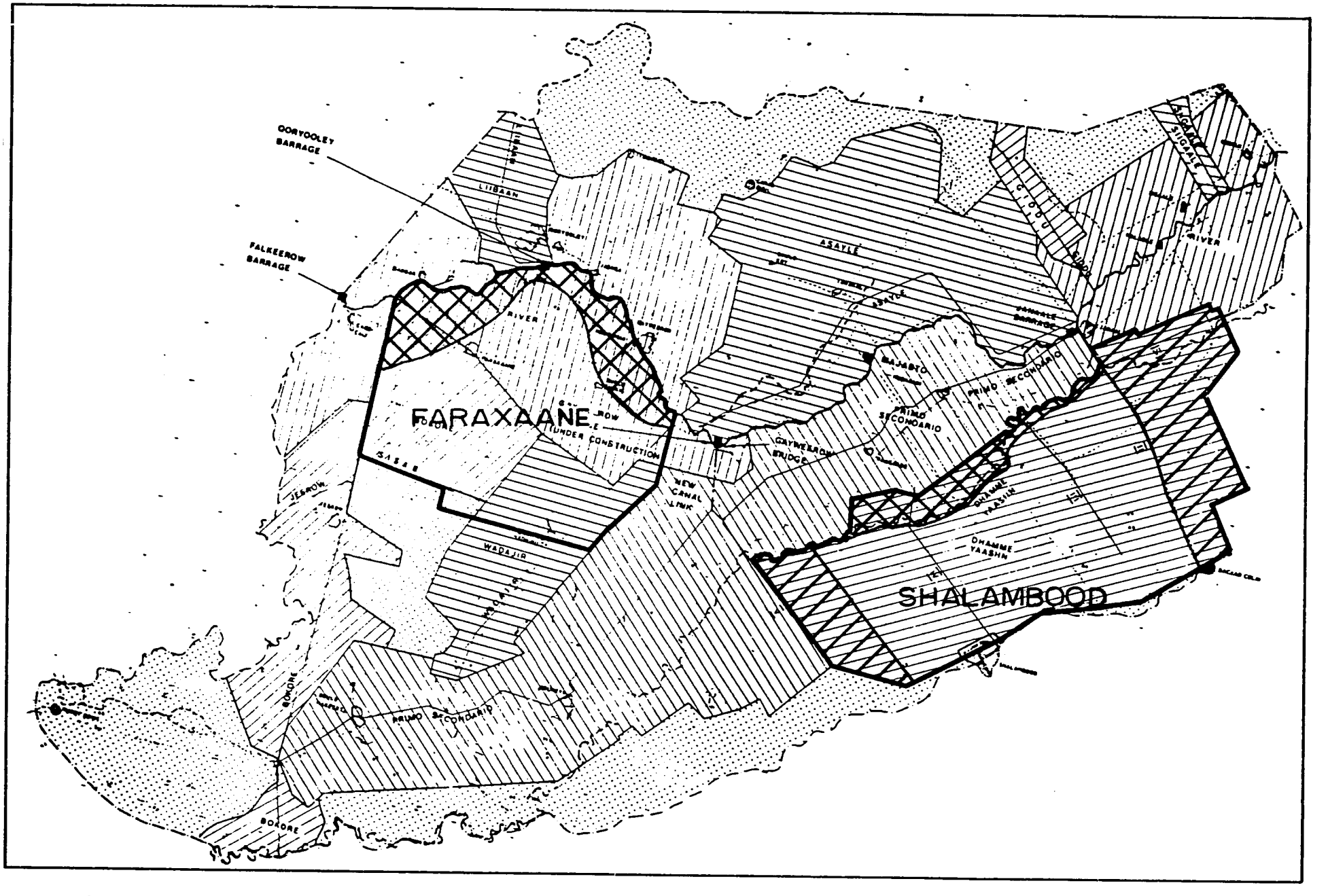

Figure 3. Location map showing the proposed Faraxaane and Shalambood Project areas.

- Somalia's Agricultural Research Program: Volume One, by International Services for National Agricultural Research (ISNAR), October 1984.

- Report on Proposed National Water Resources Law, by FAO, 1984.

- Irrigation Water Lifting in the Shebelli Water Management Project, by Associates in Rural Development (ARD), September 1986, hereinafter referred to as the ARD Report. (Report in progress at present.)[3]

The principal field trip activities included:

- Visits with the Faculty of Agriculture of the University of Somalia.

- Visit to the Central Agricultural Research Station (CARS) at Afgoi.

- Visits to various private pump lift irrigation schemes in Afgoi area.

- Touring the Afgoi-Mordinle Irrigation Project (3,000 ha lift irrigation) and review of Phase II activities.

- Tour of the Janaale-Bulo Mareta Project area with particular emphasis on: the Shalambood, Faraxaane and Qoryooley subproject areas; the four Lower Shebelli River barrages; and the 15 ha Extension Training Center (ETC) near Janaale Barrage.

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[3]A two-person team from Associates in Rural Development (ARD) arrived in Mogadishu in mid-August 1986 as part of the third phase of an effort to identify water pumping issues and options for village water supply, stock watering and irrigation water lifting in Somalia. The Shebelli Water Management Project will likely require an in-depth analysis of water lifting options, dependent on the as-yet undetermined physical structures incorporated in the rehabilitation effort. Therefore, USAID/Somalia, with input from S&T/EY and REDSO, redefined the scope of ARD's task in order to focus specifically on irrigation water lifting opportunities and constraints in the proposed project areas.

The two ARD consultants (an engineer and an agricultural economist) have been engaged in a reconnaissance of the project area, identifying pumping options and critical agricultural production constraints. Two additional consultants (a water quality speciaist and a sociologist) joined the ARD effort on September 1. The ARD team shared with our Team information gathered during field visits as well as copies of all documentation assembled. The ARD team will identify water lifting options and activities to be undertaken during the design phase of the SWMP. The ARD team's activities and findings are viewed as complementary to our Team's effort, and should be a very useful resource for the Project Paper Team.

Individuals in Mogadishu who we interviewed or held conferences with include:

Dr. Mohamed Abdi Noor	-	Vice Minister for Planning Somalia MOA
Mr. Mohammad Ali	-	Director, Land and Water Resources Department, MOA
Mr. Mohammad Abdib	-	Engineer, MOA/DLWR
Mr. Andre Saava	-	FOA, Mogadishu
Prof. Chima	-	University of Somalia, Agriculture Faculty
Prof. Der	-	University of Somalia, Agriculture Faculty
Prof. Osmund Balley	-	University of Somalia, Agriculture Faculty
Dr. Dale Pfeiffer	-	Mission Deputy Director, USAID
Dr. Ray Carpenter	-	Agricultural Development Officer, USAID
Dr. Roger Garner	-	Project Manager, USAID
Mr. Bill Denton	-	Project Manager, USAID

Subproject Areas

The MMP Report gives the most complete review of the relevant economic and agricultural background and physical resources in the rehabilitation area. It also provides the basis for delineating the subproject areas (such as Shalambood), and the existing as well as envisioned future irrigation infrastructural implementation and management needs. The interim TAMS Report contains much of the same information plus some information concerning river flows and the physical state of the irrigation infrastructure. Furthermore, we understand that the final TAMS Report will contain considerably more information specific to the Shalambood and Faraxaane area.

The MMP and TAMS reports treat the smallholder (who make up the vast majority of farmers and farm holdings in the study area) only in demographic terms. For example, the MMP Report notes that there were 18,940 families, each with an average of 5.93 members and 3.14 livestock units, fairly evenly spread over the entire study area. Quoting from a discussion of labor shortages encountered by the banana farmers (on page 7.1) in the MMP Report:

> The problem of unemployment and labor shortages are both seasonal since the demand for labor varies. This is closely demonstrated by fluctuations of wages for casual labor--(by a factor of 1:5)--. It is shown that part of the labor shortage in the peak seasons on banana farms is due to the distribution of population. Nevertheless, this is not a full explanation. Another reason may be a preference of smallholders to work in their own fields even when there is considerable demand for labor on the banana farms. For planning purposes, it has been assumed that each household has two full-time men equivalents available per family, and that the co-operatives proposed (in most cases) would be based on 2 ha per family (i.e., 1 ha per working man).

No mention is made of the very well organized smallholder irrigation user organizations which we found in the canal communities we visited and interviewed; two in the Shalambood and one in the Faraxaane subproject areas (these are discussed later in the report).

A detailed feasibility study was carried out by the MMP for the Qoryooley subproject area (which is also referred to as the Baulo-Mareerta Project) as part of their overall master planning effort. Rehabilitation of the 2,500 ha in the Phase I area is now well under way with Weidleplan (West Germany) the consultant and Juba Enterprises (Italy/Somalia) the contractor. In essence, this so-called rehabilitation effort is actually a complete redesign which effectively realigns and replaces/rebuilds most all existing canals, channels, structures and field boundaries. It appears that little, if any, attention was given to fitting the hydraulic networks with indigenous community boundaries/memberships or including their insights and organizational skills in the design efforts.

From the physical standpoint, the Qoryooley Project appears to be well planned, and Phase I is being expertly executed. However, it goes well beyond what is normally called rehabilitation. It is actually a new project built within and on top of an existing irrigated area.

It is being executed by international consultants and major contractors. It does little to develop indigenous capabilities for future operation and maintenance (O&M) during the design/construction phase. Furthermore, the designated mode of O&M is based mostly on a top-down approach. We suspect considerable indigenous user organization and management capability existed prior to the current rehabilitation effort. It appears this indigenous capability has been ignored rather than consulted. It would not be surprising if smallholders have been alienated, or at best have become indifferent.

The MMP report suggests that apart from the relative sizes of the villages, there are no substantial social or agricultural differences between Qoryooley, Faraxaane, Golweyn and Shalambood areas, and that a similar management structure (and presumably design and cropping systems) is recommended. Later we will discuss our disagreement with replicating a Qoryooley type rehabilitation. The MMP Report recognizes the need to assess the Qoryooley Project, on page 9.4, in the following paragraph:

> The need to assess progress on the Qoryooley Project before commencing work on further feasibility studies is paramount. The amount of work involved justifies the establishment of a special unit consisting of an agronomist and an economist. (Our Team feels an engineer and a sociologist should also be included.) This monitoring and evaluation unit will be concerned with the study of progress on the field trials on the Qoryooley Project and the success of the implementation.

None of the reports contain evidence of diagnostic studies conducted on operating subproject areas. The given state of the canals and

facilities is based on structural analysis and assumed performance rather than on field measurements of flows and documented constraints to improved water management. No mention is made of user perceptions of the restraints they face due to either structural or management inadequacies and any solutions they might propose. Siltation of channels is stated as being a major problem, but neither the rate of siltation nor the extent of the problem is quantified. However, mention is made in the MMP Report that the Primo Secondario Canal is in regime, and therefore little silt removal is needed (see page 4.3 of that report). Perhaps the final TAMS Report will provide more enlightenment on the siltation problems based on diagnosis of the operating systems.

We understand the Federal Republic of Germany Foreign Aid Agency (GTZ) is in the process of negotiating a Support for Smallholders in Irrigated and Rainfed Agriculture (SSIRA) Project. Apparently this is a kind of rural development project which will provide a package of services including credit; agricultural inputs of seed, fertilizer, etc.; and extension and assistance to canal communities with hardware inputs such as pumps, widening canals, bridges, roads, drainage, etc. Unfortunately, we were only able to obtain sketchy information on the SSIRA Project. The gross service area is reported to be approximately 6,000 ha in the Awdkeegle Mubarak Reach (upstream from Janaale) and 4,000 ha downstream in the Gorgal-Afgooge Reach (in the vicinity of the Falkeerow Barrage). Documents for this project should be obtained and studied by the PP Team.

Other GTZ projects/reports which may be of interest are the "Project Preparation Study for a Pilot Phase of the Middle Shebelli Integrated Agricutural Development Project" dated April 1986, and "Irrigation Potential in Northern Somalia: Promotion of Irrigated Gardening in the Togheer Region," dated August 1984.

Shebelli River Management

The MMP and TAMS reports recognize and address the need for managing the entire Shebelli River. The LI Report also focuses on the overall Shebelli River Management issue and likens the river to the main canal of an overall river basin project in which the river is potentially controlled. This is made possible by the Jowhar Off-Stream Reservoir, the Dudubale Flood Relief Channel, five barrages to raise river levels for gravity diversion, and numerous gravity and pumped offtakes serving roughly 500 canals which irrigate areas of various sizes. In total, these canals serve approximately 132,000 ha of net irrigated area.

The LI Report provides updated background and resource inventory information for establishing an overall Shebelli River management program. Their Appendix G, "Institutional Aspects," includes useful insights into the three basic types of water users, especially the "canal communities" based on field interviews. Our Team's observations and the ARD Report confirms and extends these insights to include existing water

user organizations in the lower Shebelli. We found evidence of surprisingly well organized channel maintenance and water allocations procedures among smallholders at the village level. We also uncovered cooperative efforts between the concerned farmers and water user associations of the villages along secondaries in the Shalambood Project area which was confirmed by the MOA Regional Agricultural Coordinator.

The Shebelli River water resources, climate and hydrological data is becoming better known, and more supplementary quantified information is available from the Ministry of Mineral and Water Resources. This information is documented, analyzed, and to an extent, verified and expanded in the ARD Report.

We concur with the need for an overall water management strategy for the Shebelli River which is called for in the MMP, TAMS and LI reports and has been requested by the MOA. However, we are not comfortable with the rather cumbersome and rigid structure for administrating flows suggested in the LI Report. Furthermore, we feel the suggested National Water Law being developed by FAO has intolerable shortcomings; especially in the areas of designating priorities, transferring rights, having overlooked canal communities as rightholders and potential administrators of water rights to smallholders.

We have found strong evidence that there is a rather high degree of cooperation and coordination of water allocations within each canal offtake service area. This seems to be the result of both the efforts of the individual commercial farmers and communities of smallholders as well as that of the Ministry of Agriculture/Department of Land and Water Resources (MOA/DLWR). However, attention to overall Shebelli River water management is lacking, and in view of what appears to be a rather vigorous rate of irrigation development now in progress, we feel there is an urgent need for it.

While the LI Report addresses the need for and provides reconnaissance level studies for more storage reservoirs like Jowhar, possibilities for storage within the Lower Shebelli study area are overlooked. Our Team feels some cost effective high flow period storage (haga and der season) can be provided along the major and secondary canals for use during the low flow periods (jilal and early gu seasons). The storage facilities can have average depths of 2 to 3 m and be filled and utilized by various combinations of pumped and gravity inflow and outflow. This localized storage would provide higher quality and more reliable dry season water for adjacent users. In addition, filling could be concentrated during the night whenever possible, thus reducing nighttime water flows which cause waterlogging and drainage problems when there is excess water. The MOA was less enthusiastic than our Team for more localized off-stream storage, and felt the TAMS Report will be addressing this issue.

We have good evidence that farmers do rotate water and irrigate at night (expecially when canal water is in short supply). Thus, if interseasonal reservoirs are provided to absorb excess flows during the high

water seasons, no additional special or overnight storage would be necessary, and drainage problems may be reduced. With year round access to water, smallholders could produce some crops for family consumption, as well as vegetables for sale during jilal and early gu. Off channel storage reservoirs would serve as silt traps, which could be managed to provide a means for reducing canal siltation.

On-Farm Water Management

Reference is made to on-farm water management in the various consultants' reports. The MMP Report suggests an overall irrigation efficiency of 20 percent based on very little field diagnosis. The estimates were based on gross input versus potential evapotranspiration and assumed no nighttime irrigation. The LI Report assumes the same overall efficiency. The LI Report includes a field study of a single irrigation application of basin irrigation for bananas (see their Appendix D, Annexes 16 and 17) in which they estimate a 60 to 80 percent basin application efficiency, 90 to 95 percent canal efficiency and 55 to 80 percent field channel efficiency, giving an overall irrigation efficiency of 30 to 60 percent. This gives an average efficiency of 45 percent, which is then divided by two, assuming all nighttime flows are wasted.

We suspect one would find that efficiencies vary depending on supply levels. Based on interviews with smallholders, at least during periods of water shortage, farmers do (by torch light) irrigate at night. We also observed quite different irrigation practices, depending on crops, soils and topography. Some new banana farms are utilizing furrows (with siphons) in place of basin irrigation. The fields are precision leveled and a single furrow is placed bettween each 2.5 to 3 m wide by 100+ m long banana row. This should give quite a high application efficiency. We also observed small 2- to 3- by 3- to 4-meter basins being used for onions, lettuce, pepper and other vegetable crop irrigation. Many of the basins were quite well leveled, so it is reasonable to expect good irrigation efficiencies within them.

We observed smallholders collectively desilting and realigning their field and supply ditches.[4] We also observed some banana farms with piped distribution systems, so we expect that the on-farm distribution systems in many areas are functioning very well. A major problem faced by all

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[4]We observed five different cases/examples where village water users collectively cleaned their tertiary channels. The most stunning example was the large left hand tertiary canal near the end of IV secondary in the Shalambood Project area. This canal has 2-meter high banks, a bottom width of 1-meter, and 150 people had just spent 20 days cleaning its 2-kilometer length by removing weeds and over 20 cm of silt. We were told that this is done twice each year. More details on farmer participation follow.

farmers as well as MOA/DLWR is dealing with a combination of siltation and weeds clogging their supply and distribution ditches.

Low irrigation application efficiencies (which probably normally occur during periods of excess water) claim considerable land and cause crop losses because of waterlogging. Neither the Shalambood or the Faraxaane subproject areas have relief drains. Since the Shebelli River water has an average salinity of approximately 500 micromhos/cm, periodic leaching and drainage is necessary regardless of irrigation efficiencies. Loss of cropland because of high water tables and salinity resulting from poor drainage and excess water is quite evident, especially in the Shalambood area, which has been extensively irrigated for many years.

Silt Removal

The high sediment concentration in the Shebelli River creates both benefits and difficulties for the Project. The average concentration is in the neighborhood of 3 kg/m^3, which is about 20 m^3 for each ha-m (10,000 m^3) of water diverted. Ideally, it would be desirable to transport all of this sediment uniformly over the irrigated fields. Unfortunately, it is deposited throughout the canal channel network, and only part of it reaches the fields. This is because suspended particles are of various sizes, and the land slopes, and consequently canal slopes are not steep enough to produce sufficient flow velocities to keep all of the silt particles in suspension.

The good of the sediment is that it adds fertility to the fields it reaches. Furthermore, since canal sediment may be rather uniformly deposited throughout the canal network, it becomes a problem in both head as well as tail reaches. Thus, the entire irrigation community has a stake in keeping the canals clean. This, we believe, is at least one important reason for the level of cooperation we observed within the canal communities and between these communities and larger farmers.[5]

The sediment reduces seepage and the removed sediment also strengthens the canal banks. This is an important reason why the canals are sturdy and the system is still operating after years of limited formal maintenance. However, sediment removal is costly and this, plus weed control, will continue to be the major maintenance expenses. Fortunately, these are expenses that must be shared by all users.

One note of caution is that efforts to eliminate silt in the main canals (other than by exclusion at the headworks or stilling basins) only

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[5]This is in contrast to channels in which the problem is leakage from animal and insect holes, percolation and poorly closed outlets. In such cases the head reaches may receive the water they need, and helping to clean and repair the canal is of little value to them. Therefore, they have little incentive to cooperate in canal maintenance.

to have more sediment deposit in the secondary or tertiary canals is not progress. It is merely transferring the burden of sediment removal to others. To transport more sediment to the fields would require higher canal velocities through the system. With the given land slopes, this is probably impossible without pumping and/or rebuilding the irrigation canals, including lining them.

Ethiopian Dam Building

One important activity that will affect any project along the Shebelli River Valley is the hydroelectric dam which is being built with the assistance of the Soviet Union along the headreaches of the Shebelli River in Ethiopia. It is our understanding from conversations with the GSDR officials that the dam site is about 1,000 kilometers upriver from the Somalian/Ethiopian border and the capacity of the reservoir behind the dam will be about one-third the average annual flow of the river. We have no information on any plans to develop irrigated agriculture in Ethiopia after the completion of the hydro project.

Certainly, however, the dam will affect river flow in a number of ways:

1. There will be a period of reduced flow during initial filling of the reservoir.

2. Storage and water release practices for electric generation will likely decrease river flow during rainy periods and increase flow during dry periods. These changes will clearly benefit irrigation if rainy season water supply (which appears to be the case) is in excess of water demand. However, changes in river flow patterns would affect off-stream storage strategies and needs.

3. There might be changes in the river silt load which could reduce the cost of silt removal in Somalia.

4. Substantial development of irrigation in Ethiopia along the Shebelli River could impact quite negatively on Somalia.

In the opinion of the Team, the potential impact of this hydro project argues even more strongly for the pragmatic rehabilitation, institution building and river management approaches suggested for this project. The institutional capacity can support rainfed as well as irrigated agriculture (Experiment Station and Extension activities) and irrigation from groundwater sources. Pragmatic rehabilitation will tend to minimize expenditures on canals and structures, and provide other facilities which will be useful to any type of agricultural system (such as roads and bridges). Total river management will become even more critical since the river flow will be changed in significant ways.

In summary, the Team does not feel that the impact of activities in Ethiopia are likely to be sufficient cause for delay or, or major change, in Project directions. It would be wise, however, to become as knowledgeable as possible on the scope of the Ethiopian hydroelectric project so that any effects could be incorporated early on.

Central Agricultural Research Station (CARS)[6]

General Observations

The CARS consists of ± 200 ha (one-half its original size), of which approximately 40 ha are now being utilized in a research capacity. This area also contains the station buildings. The station was built under a USAID-funded project which the University of Wyoming implemented starting in 1964. Land was leveled, drains installed, main canals and laterals established and equipment for sprinkler, drip/trickle irrigation purchased. The pressurized systems were never installed and have been of little use. However, flood irrigation is and has been used.

The station is presently in a seriously "run down" and deteriorated condition. The drains no longer function. Some "low" areas have developed and canals and ditches are partially filled with silt. The buildings remain structurally sound, but need to be replastered inside and completely refurbished inside and out.

Electric power is furnished by a generator. Plans call for providing commercial power to the station within the next few weeks. The road from the highway to the station is neither paved nor graveled and is in critical need of repair in several locations. The basic tillage equipment on site should be evaluated and supplemented as necessary.

Departments

There are 15 departments or major areas of research and service, which include:

Soil and Water

1. Soils - The soils laboratory is functioning better than any other laboratory or sector. It has been supported by an FAO project in order to analyze samples for another project involved with soil management and classification. Working equipment include: pH meters, a conductivity meter, flame photometer, spectrophotometer, ovens, a muffle furnace, shakers, stirrers,

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[6]This preliminary report of research and facilities at CARS was developed by Dr. Jim Thomas, who was accompanied by Mr. A. Xarbi, the Director, on September 1, 1986.

a centrifuge, a hydraulic conductivity apparatus and electronic balances. Tests for Ca, Mg, Na, K, CO_3 and HCO_3 and Cl ions are routinely performed.

2. Irrigation water efficiency, distribution and application trials are being carried out. There are no instruments to measure water, but they do have tensiometers.

Agronomy

3. Maize

4. Sorghum

5. Oilseed

6. Cropping systems

There is a general absence of agronomy related equipment and instruments. Storage facilities per se are non-existent.

Breeding

7. Maize and sorghum

8. Grain legumes

Equipment, supplies and facilities are almost non-existent. There is no seed storage facility (genetic material is planted each season "to preserve it"). A seed laboratory exists, but there is no equipment except an ancient moisture tester and one small germination cabinet.

Other

9. Entomology - The entomology laboratory is functioning, but lacks sufficient cabinets, binocular scopes, growing chambers, etc. All the equipment is very old.

10. Pathology - Same as (9).

11. Vegetables - Same as (9).

12. Fruit - A general laboratory with refrigerators, a deep freeze, and washing equipment is needed. However, the outside nursery facilities are good.

13. Seed production - There are some very old field threshers not now in use. A full line of small-scale harvesting, processing and lab equipment is needed.

14. Economics and farming systems - The station has no computers and should have at least one computer.

15. Ag. Mechanics (AM) - This is a general service department responsible for repairing all the old equipment for the field. They have one Caterpillar crawler tractor and one old Massey Ferguson tractor. Besides each department's specialized equipment, the AM Department should have two or three small plot-sized tractors, a precision planter for plots, hand powered and tractor powered seeders, plus weeding and chemical application equipment.

Additional Constraints

A weather station has been installed, but it is quite old, and for most instruments manual recording is required. Other observed constraints are:

- Budget - There are insufficient funds so that many experiments are abandoned due to lack of labor, chemicals, etc., timeliness of operations.
- Fuel - There is a shortage of fuel at critical times.
- Housing - Because the station is remote and housing is inadequate, most staff commute to and from the station. Station houses are needed for 40 professionals (one-third of which are married).
- Transportation - Vehicles are old with the exception of one Blazer (which is in need of some parts).

The Extension Training Center

The Team visited the Extension Training Center (ETC) near Janaale which has 15 ha of irrigated land suitable for crop test plots and demonstrations. At present both field extension workers and farmers are being trained at the ETC. The facilities are minimal, but serving the purpose. Trainees stay in a large dormatory and eat "under the trees." The latrines (including bathing facilities) are in need of rehabilitation and the classrooms in need of furniture.

Once rehabilitated, the ETC can provide a useful and well positioned location for all types of hands-on field training related to managing and maintaining canal flows and on-farm irrigation. This can be done in addition to providing field demonstrations and training for irrigated crop production.

SCOPE OF PROJECT

The Team recommends that the SWM Project address the management issues and necessary training related to:

1. Management of the entire Shebelli River flow (resevoir management, offtakes and salinity levels).

2. Management of canal maintenance, internal storage, pumping and the distribution of flows within the subproject area(s) selected for rehabilitation.

3. Research and assistance in on-farm water management (distribution, application and scheduling) and general crop husbandry, especially for foodgrains and vegetables.

4. Management of drainage maintenance (and possibly pumping) for removing excess water and salinity control and possibly incorporating offstream storage capacity in the project area.

In addition to addressing these software issues, we recommend that the Project provide necessary hardware related to this, which includes:

1. For river management, needed hardware items include: water gauging; communication and transportation equipment and supplies; data processing and control equipment and supplies; plus offices and housing.

2. For rehabilitating, maintaining and operating the main irrigation distribution and drainage systems in the selected subproject area, the needed hardware includes: supplies for fabricating irrigation structures; earth moving and construction machines with related spare parts; field equipment for layout and design; mechanical pumping equipment and parts; transportation and communication equipment; data processing and controls; and fully equipped workshops, offices and housing.

3. Revamping the 200 ha CARS Experimental Farm near Afgoi into an Irrigation Management Research and Training Center (IMRTC). Revamping the Extension Training Center (ETC) at Janaale for use as an irrigation research substation and management/maintenance training center. However, crop field trials, including fertilizer trials, should continue to be carried out at this station.

We recommend this broad scope for the SWM Project because it seems futile to rehabilitate subprojects without addressing both the water supply and on-farm related issues, including crop husbandry.

We noted much new activity and development which is based on the Shebelli River water and believe that computer assisted basin-wide

management based on a national water law is urgently needed. (Even with a well managed system, there will be severe problems whenever river flows are below average, which is approximately half the time.) While we believe farmers can and do use water rather efficiently during periods when flows are barely adequate, they undoubtedly do need technical assistance to manage their irrigated agricultural production, soil and crop health for adequate profitability to justify the rehabilitation efforts.

Either the river system management or the on-farm water management, including off-stream storage with supplemental pumping, etc., and related crop husbandry research and extension efforts could stand on their own. However, we view the rehabilitation and subproject management efforts as the flagship of the SWM Project. Diagnosis of the operating system at all levels should be made in order to first understand the constraints to irrigation performance (see the ISNAR Report, Section 4.10). In view of this, we recommend that the SWM Project also include establishment of a diagnostic, evaluation and action research team(s). This will require TA, training equipment, transportation and office facilities. As well as working with/on the SWM Project rehabilitation sites, the team(s) should also carry out studies to gain experience from other relevant projects such as the Qoryooley and Afgoi-Mordinle projects which are now under construction.

We are not favorably impressed by the concept of rehabilitation (which is really a new design and expensive construction project) and the top-down management approach which is characterized by the Qoryooley subproject now being implemented. We recommend the pragmatic approach to rehabilitation. In addition to enhancing the impressive indigenous water management, maintenance and operational skills which already exist in the subproject area, the pragmatic approach is more cost-effective and socially appropriate.

SELECTION OF SUBPROJECT AREA

After considerable deliberation, the Team chose the Shalambood subproject area as being the most appropriate for AID's proposed irrigation rehabilitation efforts. Figure 3 shows a sketch of this subproject area which is served by the Dhamme Yaasiin Main Canal (hereinafter referred to as the Yaasiin Canal) and secondary canals II, III, IV, V and VI. The original design area delineated in the MMP Report only included the area shown without heavy cross-hatching. We understand the TAMS Report will cover rehabilitation of this same area plus the heavy double cross-hatched area on the right bank looking down the main canal. We believe this additional area was included by TAMS at the insistence of the MOA. In reviewing this subject area with the MOA, we understand that they also wished that the areas with the heavy single cross-hatching had been included in the TAMS analysis. This is because these areas are served by secondary canals II, V and VI, which are supplied from the Yaasiin Canal.

We are not certain about the extent of the available water for this much area if one assumes that all lands must be irrigated within the rehabilitation zone. However, we do believe it is important to include these areas since some land is certainly irrigated within them and receives its water from the Yaasiin Canal.

Since this entire area has a definite irrigation infrastructure already in existence, it lends itself nicely to a pragmatic rehabilitation effort. Furthermore, the entire area is served by the Yaasiin Canal with the offtake just upstream from the Janaale Barrage.

By pragmatic rehabilitation, we do not mean abolishing the existing system and putting in an all new canal alignment and structures; but rather, working with what is already there and bringing the area into full service by upgrading the existing system with a minimum of realignment and new construction.

By pragmatic rehabilitation we also mean working closely with the present irrigators (whether they be large farmers or communities of small farmers) in solving their water management problems. This requires communicating with them and learning from their knowledge concerning waterlogging and such problems, as well as using topographic and soil survey data in designing the rehabilitation activities. Pragmatic rehabilitation may also include village road and small bridge construction, which may bring benefits from both increasing the availability of inputs including maintenance and decreasing marketing costs. The recent village level survey carried out by the ongoing Extension project suggests declining farm level prices with increased distance from roads and market centers.

There is little drainage control in the area at present, and few roads to take care of transportation needs. We anticipate that drainage

will involve considerable new construction. We also liked the Shalambood area because it is favorably situated in terms of its water supply from the Shebelli River. During extreme water shortages the Janaale Barrage is closed and little or no water passes; thus, projects downstream will be more susceptible to water shortages.

Both the area served by the Primo-Secondario Canal and the Yaasiin Canal currently share the same river offtake structure. As mentioned earier, we have read and been told that the Primo-Secondario Canal is in regime and requires little silt removal, while in the Yaasiin Canal there is a great deal of trouble with siltation. It may just be possible that part of Primo-Secondario's favored situation is because the river offtake structure serves to some extent as a silt exclusion device for it at the expense of injecting more silt into the Yaasiin Main Canal. This is because the Primo-Secondario Canal takes off at right angles to the direct flow from the river into the Yaasiin Canal and the side gate arrangements serving the Secondario may force the heavier bed load silt into the Yaasiin.

We have been informed the flow velocity in the Yaasiin Canal is now 0.1 meters per second and that the TAMS feasibility study is directing attention to designing for higher flow velocities in the neighborhood of 1 meter per second to minimize siltation in the canal. We commend this effort if this can be done cost-effectively. However, we caution against merely eliminating siltation in the main canal at the expense of injecting greater silt loads into the secondaries, and more importantly, into the tertiary system.

Unless the flow velocities are increased in all canal reaches--primary, secondary, tertiary and even quadrary--it will be impossible to eject the silt out into the fields where it can be advantageously used. If only the primary canal velocities are increased (which will eject more silt into the subsystem), the farmers will merely have more silt to contend with in their biannual tertiary canal cleaning activities. And as mentioned earlier, the smallholders are already going to almost inordinate levels of effort to keep their tertiary channels in operation. In other words, they are already paying a fairly heavy water charge in terms of labor inputs in maintenance of the tertiary channels.

The reason we favored the Shalambood over the Faraxaane subproject area is not because we liked the soils, ownership patterns or farm community's layout better in Shalambood, but rather because of the expected rehabilitation program. It seems to us the proposed Faraxaane rehabilitation program is actually an entire new canal network which will overlay an area much of which is already being irrigated. There are already some thirteen small channels with direct diversions from the Shebelli River serving the area, plus parts of the areas are served by the Bokore and Wadajir Main Canals.

The Faraxaane subproject area is also shown in Figure 2. The various cross-hatchings show areas served by respective canals. The MMP Report left the area with the heavy double cross-hatching adjacent to the

river out of the subproject area. The idea was to have a main canal with the inlet just above the recently constructed Gayweerow Barrage. This was to serve the area from its left bank but leave the area between its right bank and the river unirrigated. The MOA insisted that the area adjacent to the river (which is now being irrigated by the small channels) be included by TAMS in the study area. The MOA would also have liked to see the remaining area served by the Bokore and Wadajir canals included in the feasibility study area, but this was not negotiated.

There are at least three significant reasons why we do not prefer the Faraxaane subproject area. These are:

1. This is, in reality, a new project design which can hardly be considered as rehabilitation (although by taking a different approach, a rehabilitation project as we conceptualize such projects could probably be developed).

2. We find it difficult to rationalize not including the entire area served by the Bokore and Wadajir canals as well as that served by the smaller channels which are supplied directly from the river.

3. The water supply in this area is less assured than for the Shalambood area, as the upstream Janaale Barrage is allegedly completely shut down during very low flow eras.

In addition to the above, we also doubt that the current canal community groups who are now maintaining and operating the existing small channels in the Faraxaane area have either been consulted or included in the decision processes leading to the feasibility design study. On the positive side, we believe the farming potential in this area is more exciting and the soils are better than in the Shalambood area. Irrigation has been less extensively practiced, drainage and salinity problems are less evident and the smallholder farmer operations appear better. Furthermore, it appears more of the Faraxaane area is in the hands of smallholders.

We are quite confident in our recommendation for Shalambood as opposed to Faraxaane based on the rehabilitation versus new project argument. However, it might be well to review the TAMS Report which should contain considerable detail for the recommended activities in both of these areas before making a final selection. A more pragmatic rehabilitation approach could be taken for Faraxaane. But this would mean eliminating much of the new construction which is being planned for that area and including all the lands now served by the Bokore and Wadajir canals as well as the thirteen smallholder canals.

In connection with the Shalambood area, if the World Bank or some other donor does not take up the rehabilitation of the Janaale Barrage, this would be a worthwhile effort for the AID project. As will be discussed elsewhere, we also recommend providing some basic rehabilitation (or heavy maintenance) for all of the barrages to the extent that this is politically feasible.

SELECTED APPLIED RESEARCH AND TRAINING

As part of the USAID project we recommend considering rehabilitating the Central Agricultural Research Station (CARS) into an Irrigation Management Research Station (IMRS). The purpose of this newly named and refurbished station will be to carry out applied and adapted water management and related crop husbandry as well as irrigated agricultural production system evaluation packaging and demonstrations. Refurbishing the station would include: setting it up with a new river pumping plant; providing some farm plot areas with the necessary facilities to perform soil, plant, water and fertility experiments; and installing new innovative or simply improved irrigation practices for testing under Somalian conditions.

We recommend including some line-source sprinkler irrigated experimental plots which would provide a very cost-effective and convenient means for conducting the soil, water, plant and fertility interaction experiments. The line-source plots would also be useful for testing pre-selected sets of adapted crop varieties under Somalian conditions.

We believe 80 or perhaps even 90 percent of the necessary information for irrigated crop production can be transferred from elsewhere. However, there is always an element of site specificity which makes on-site testing imperative in order to eliminate surprises from the nontransferable 10 to 20 percent of the information. Perhaps the main reason for the lack of complete transferability is not scientific knowledge of the crop husbandry needs, but lack of sufficient knowledge about the site conditions.

Illustrative types or kinds of soil and water management research which we envision for the IMRS might include using various types of furrow as well as pressurized irrigation techniques. Since the primary tillage is already being done by tractors, there is considerable scope for improving the tillage implements and operation style to leave a more uniform seed bed for better uniformity of irrigation. Furthermore, it may also be practical to provide the farmers with furrows rather than flat tilled beds. Currently, if they wish to go to furrow irrigation, they must construct the furrows by hand, which is a very laborious operation. Under certain site conditions we have found that surge flow (which is merely turning the water on and off into the furrows every half hour) may increase application efficiencies to above 80 percent, which is as high as can be obtained from sprinkler irrigation.

Other types of adaptive water management research might include salinity control and surface and subsurface drainage activities, as well as analyzing the various sizes of basins and slopes for improved irrigation. We would also recommend some investigation into appropriate selection of micro irrigation, especially for bananas and citrus, which may prove advantageous for reducing the salinity hazard when dealing with high saline groundwaters during the dry season.

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We recommend refurbishing the Extension Training Center (ETC) to not only provide direct training to canal operators, extension workers and farmers in water management activities, but also as a center for carrying out action research on the operating irrigation systems. In addition, the ETC fields can also be used for part of the hands-on training operation as well as for demonstrating water management techniques and irrigated crop production packages.

The ETC would also make an excellent base for the diagnostic analysis team(s) which were discussed earlier. The analysis team(s) would also be involved in the action research activities which could be set up to provide data for the subproject areas being rehabilitated.

Water management in the lower Shebelli area not only involves the management of flows for proper scheduling of irrigation, but also salinity and sedimentation management. The action research team would be expected to study the system flow regimes and the silt load deposition as well as salinity control. Furthermore, they would also be involved in socio-economic research dealing with such issues as household economics, farm production, the transport of produce from the fields, community organization, smallholder and large farmer water regulation, etc.

The training activities envisioned would be directed toward the applied and adaptive spectrum. While some standard economic training is envisioned, for the most part the training would focus on upgrading the skills of graduates from the agricultural and engineering faculties of the University of Somalia with specific short courses and hands-on exercises.

Part of the training would involve the training of trainers and transfer of special training packages and adaptation of them to Somalian conditions. We believe a large number of people who receive professional degree training in the USA do not return to their posts even though in many cases they do return to Somalia. Therefore, this Project should not concentrate on providing general professional training. But it should provide training to give existing professionals and technicians as well as farmers sufficient capability to improve irrigated agriculture in Somalia.

INSTITUTIONAL DIMENSIONS OF IRRIGATION DEVELOPMENT

As part of their reply to one of the more recent drafts of the Proposed National Water Resources Law, the GSDR noted that "our perception is that a relevant water code must be framed on the basis of existing cultural, religious, legal and political factors of the Somalia Democratic Republic."[1] This Team strongly recommends that the indigenous systems of water rights and control be considered in the development of a national water law. Furthermore, the indigenous system must be taken into account in the design of both new and rehabilitated irrigation development.

Water User Groups

There are scattered references in a number of reports on the existence of indigenous systems for canal maintenance (Lahmeyer Report, Institutional Annex World Agriculture Sector Review, USAID Somalia Research Project Feasibility Study). However, nowhere are the operational features of these institutions described, either for canal maintenance or for water control at and above the farm level, nor are the water institutions cast in the broader context of village and communal life.

Recently, two USAID-sponsored anthropologists, James and Nancy Merryman, collected data on indigenous systems of water use and responsibilities in the Bay and Juba regions of the country. In both cases they identified functioning local institutions for system upkeep and for establishing and enforcing water rights. In what might be called a counterpart of canal communities, they found desert communities which depended on small dams for stored water. They maintained these dams, fenced them, desilted them as a community function, then shared the water and proceeds from allowing nomads to let their animals drink from them. It would have been surprising if similar systems had not developed in the Shebelli Valley, including the proposed Project area.

Indeed, during field trips through the Project area, the Team interviewed two village-level watermasters, one in Shalambood and the other in Faraxaane. In the Shalambood case, the water "instructor" had held his position for 35 years. He was responsible for organizing farm labor for maintenance (mainly weeding and silt removal) of the tertiary canal which served his village. This required approximately 50 workers for 30 days for each of two campaigns per year. He also coordinated rotations with a branch of the tertiary canal, controlled by another watermaster, and which also served his village. In addition, the watermaster established farm-level rotations off his branch. He reported

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[1]FAO, 1984, "Report on the Proposed National Water Resources Law," TCP/SOM/2314 (Ma), by Mitsud, Faud Wilkinson G.K. (see Annex, p. 2).

that irrigation was carried out at night, dependent upon whose turn it was in the rotation. He noted that irrigation at night was especially unpleasant during the der season when mosquitoes and snakes were most numerous. Members of the Team inspected about a kilometer of this tertiary canal which had recently been cleaned and shaped by the village level institution and found it in excellent condition. We also observed that a section of the same secondary (which served their tertiary) canal had been weeded for a long stretch, presumably by villagers.

In the Faraxaane area the village system diverted water directly from the Shebelli River into a small canal which had two branches. The watermaster was appointed by the village council and has held his position for the past six years. He, too, is responsible for organizing farmer work crews twice a year for canal maintenance (weed and silt removal) and for coordinating rotations along his branch canal with the other watermaster from his village. He reported 20 men worked on each canal for 30 days twice a year, and the maintenance crews join together to clean the common inlet canal. The labor contribution of individual households was dependent upon the size of their holding.

The Faraxaane watermaster had a written record of farm holdings and participation in the maintenance tasks. He is responsible for enforcing water rights and rotations along the distributary. They, too, irrigated at night. When asked about the problems with irrigation, he replied that if their branch canal could be widened by government, that they the villagers would assume the responsibility of maintaining it. It was not determined whether any portion of this small gravity flow canal supplied directly off the river had been constructed by the Government or by the villagers themselves.

During our field trips, we noted a number of other instances where village laborers were at work cleaning the canals. Had the area been visited during some other season (or perhaps just shortly before the Team's arrival), the preponderance of evidence, rather than suggesting vigorous indigenous institutions for maintenance of the tertiaries and some secondaries, would have suggested little canal maintenance and very serious problems; however, this is apparently not the case. Likewise, a failure to inquire about and observe the functions of the indigenous water organizations during other studies has apparently obscured the recognition of rotation practices, including a system of nighttime irrigations.

Failure to recognize the indigenous organizations may generate irrigation rehabilitation practices and institutional development plans which are in direct conflict with indigenous systems; thus, imposing unnecessary organizational costs on the participants and creating costly government bureaucracies for carrying out tasks which are already being performed by indigenous systems at a reasonable level of efficiency. It seems quite counterproductive to develop such bureaucracies and then adopt a policy of water charges that attempts to cover the ongoing costs of canal operation and maintenance.

This would seem, if future investigations substantiated the vigor of the indigenous water user organizations, an unnecessary income transfer from the farmers, especially smallholders, to Government. In other words, if a policy of charging for water at a rate which will cover operation and maintenance charges is desired, then it would seem wise to minimize these costs to the extent that the indigenous water user associations can be utilized to their full potential in the operation and maintenance of the systems.

There is one other area of special interest regarding indigenous water delivery institutions. In reports and discussions we found some evidence that intra-village cooperation (between villages and other water users, i.e., state farmer, commercial farmers and so forth) is sufficient to permit rotation off the secondary canals and to jointly contract for canal maintenance. The Team did not investigate this issue during the field visits.

The overall opinion of the Team in regard to existing water user associations and their importance is:

1. There appear to be indigenous institutions in both the Shalambood and Faraxaane subproject areas that are effective in arranging for and carrying out canal maintenance. These institutions exist at the village level for tertiary canals and sometimes secondary canals. There is evidence of cooperation between village and commercial farms for the purchase of canal maintenance from the Government and possible private contractors (see the ARD Report).

2. There is evidence that these same institutional forms are effective in managing the rotations of irrigation water, both in the day and at night. This is being done at the farm outlets, between branches in the tertiary canals, and off the secondary canals.

3. There is evidence that in times of severe water shortage, there may be some rotations of water off the primary canals. (For more information on this, see the ARD Report.)

4. The existing water user organizations should be further investigated for a number of reasons.

   a. Making the distribution of water and canal maintenance in the tertiary canals the responsibility of the users transfers a portion of the cost from the Government to them; i.e., the cost to society for operating the irrigation systems. These are costs which will not have to be recovered through water charges.

   b. More than likely there are existing and effective organizations through which new water management technologies can be introduced.

c. The existing water user associations have created a system of water rights for the water which they are able to control. It would seem wise and consistent with the previously mentioned objective of the GSDR to fully understand the existing institutions so that they may be considered in the framing of the national water law.

National Water Law

The need for a national water law has been stated in most all of the more recent irrigation studies. The situation along the canals and distributaries has been described by some as anarchy. The field evidence gathered by both this and the ARD team does not support this gross characterization. There are systems at some levels for the strict control and allocation of water. When water is scarce in the drier months of the year (when it is required for perennial crops, primarily banana and grapefruit), competition for that water is great. The MMP Report concludes that future irrigation in the gu season should not be developed because of the water shortage. (This conclusion ignores possible contribution to the water budget from off-stream storage and groundwater in selected areas.) However, new irrigation development from the river itself is proceeding on an ad hoc basis. Development could exceed and may already have exceeded the available supply in the dry months. This will result in lower than anticipated returns from the new irrigation developments, or if the new developments get the water, some others must lose out with the same overall economic consequences.

While a national water law will certainly be necessary and desirable to stabilize development along the Shebelli River Valley, the Shebelli Water Management Project, rather than create further competition for water during periods of scarcity, should improve the situation. This can be done by provision of off-stream storage, possibly greater use of groundwater, more effective water control from rehabilitated structures, reuse of drainage waters and improved on-farm water management.

By appraising and utilizing the indigenous capacity for canal maintenance and water control, the Project will provide useful information for framing a national water law consistent with Somalian institutions and traditions. The current proposed water laws contain a number of provisions that are worthy of debate. First, it specifies a hierarchy of users which may not be either efficient or equitable even at current market prices. There appears to be no provision under the law to transfer water rights between users in response to market prices.

PROJECT PAPER TEAM

The Project Paper (PP) Team should be in the country from six to eight weeks, with the Team and co-Team leaders arriving a week early and remaining two weeks longer than the full Team. Prior to coming to Somalia, as many Team members as possible should meet in Washington, D.C. with our Team and the Africa Bureau. All PP Team members should be provided with the final TAMS Report, as well as this report. The PP Team should be made up of the following ten specialists:

- Agricultural Engineer
- Water Resources Management Engineer (River/Canal Management)
- Civil/Construction Engineer (Irrigation Works and Building)
- Irrigation Agronomist
- Irrigated Agricultural Research and Training Specialist
- Agricultural Economist (On-Farm)
- Agricultural Economist (Policy Analysis)
- Extension Specialist
- Rural Sociologist (or Economic Anthropologist) (with experience in irrigation communities)
- Legal/Institutional/Political Scientist

The Agricultural Engineer and on-farm Agricultural Economist should be the Team and co-Team leaders, as best suited. The Project area will contain some rainfed as well as supplemental and fully irrigated agriculture plus considerable livestock (an average of 3.14 animal units per family -- see MMP Report). Therefore, the PP effort should deal with the economic issues on a household production basis.

Each of the technical specialists must also be capable of providing the economists with necessary cost data both for developing the Project Paper as well as arriving at a cost benefit analysis for the Project itself. For example, the Research Specialist, in addition to designing the research station facilities, must also be capable of estimating the cost thereof. The Agricultural Engineer should be capable of estimating labor, capital and energy costs associated with the various water distribution and irrigation application techniques. He/she should also be familiar with the efficiencies of the various systems in order to assist in developing crop productivity functions in terms of yields per unit of water diverted. The Construction and Water Resources Engineers must be capable of arriving at cost estimates for any new or refurbished facilities, equipment and/or software activities which they propose. The Legal/Institutional/Political Scientist should be capable of arriving at cost estimates for any research activities proposed. Finally, all of these specialists should be able to provide estimates of the training required for carrying out their recommendations, what type of people should be trained, what type of training courses should be attended or developed, and the associated costs.

The scopes of work for the various Team members are as follows.

Agricultural Engineer

The Agricultural Engineer will work closely with the Irrigation Agricultural Research Specialist and assist him/her in developing the irrigation facilities for the Proposed Irrigation Management Research Station. His/her principal concern, however, will be working in conjunction with the Civil and Water Resources Engineers in determining potential irrigated areas, water use requirements, necessary canal flows, irrigation potentials, drainage needs, salinity control and water distribution and application from the tertiary to the field level.

He/she will be expected to have a broad understanding of both basin and furrow irrigation techniques as well as being familiar with the possibilities of using adapted micro irrigation techniques for salinity control for perennial crops. He/she will be expected to analyze basic weather data to determine evapotranspiration requirements and to approximate crop losses due to shortages in river flows for irrigation and/or rainfall for both annual and perennial crops.

Water Resources Management Engineer (River/Canal Management)

The Engineer filling this position should have a strong background in surface water hydrology and watershed management. One of his/her responsibilities will be to evaluate the existing Shebelli River flow data base and to ascertain what additional gauging is required for a river basin management program.

In addition, he/she should be able to appraise the existing Somalian organizations which relate to river management and develop an organizational structure for managing the river flows, diversions and reservoir operations to optimize the use of available water. He/she will also be responsible for writing the job descriptions for the expatriate supervision and training staff, as well as recommend the hardware and software needed to create and operate the Shebelli River basin management unit.

Civil/Construction Engineer (Irrigation Works and Buildings)

This Engineer should have a broad base of experience in heavy earthwork and concrete construction. Working with the Agricultural Engineer, he/she will determine the scope of structural refurbishment required in the system. He/she will also evaluate the engineering design, structural repairs and excavation required to place the primary and secondary canals in good operating condition. Furthermore, he/she

will be responsible for determining the most effective method for having the engineering, repairs and excavation performed. He/she must be familiar with appropriate construction machinery and construction practices in developing country settings in order to specify types and classes of equipment needed to perform the necessary rehabilitation work.

Working with representatives of the MOA, he/she will review and inventory the existing mechanical workshop capabilities (buildings, equipment, tools, personnel) presently existing in the Project area and in the vicinity of Afgoi. Working with AID/Mogadishu he/she will determine the best location for the headquarters and housing of the various training teams and then determine whether to modify existing facilities for the proposed new uses or to build new facilities.

He/she will write the job descriptions for the expatriate staff to perform the supervision and training functions related to canal system and barrage rehabilitation if the Project includes these features.

Irrigation Agronomist

The Irrigation Agronomist will be responsible for working with the on-farm Agricultural Economist in arriving at production potentials based on local experience for the farms in the irrigated area. He/she should be familiar with the principal crops of the region--particularly, maize, sesame, vegetables and bananas. The Agronomist should make an assessment of the severity of the salinity problem in the region using all available data sources.

The Agronomist will also work closely with the Agricultural Engineer and the Research Specialist in delineating promising on-farm water management practices for demonstration and/or further study. He/she will be responsible for delineating the irrigation agronomic skills needed by the extension workers and the associated training needs and programs.

Irrigation Agricultural Research and Training Specialist

The Irrigated Agricultural Research and Training Specialist will be responsible for determining: (1) the needed infrastructure, instrumentation and personnel for revamping the CARS and operating it as an Irrigation Management Research Center (IMRS); and (2) the needs and personnel for upgrading the Extension Training Center (ETC). He/she will work closely with the Irrigation Agronomist, Agricultural Economist and Agricultural Engineer in determining what crop husbandry programs and water management practices should be studied. He/she will also be responsible for determining the staff training needs and programs for the CARS; and working with the Extension Specialist in determining the staff training needs and programs for the ETC.

Agricultural Economist (On-Farm)

The PP Team should include an Agricultural Economist to set up an evaluation unit which would carry out a baseline study to establish the present farming system in the Project area. This study should take a household production viewpoint, thus identifying the complete set of economic activities that compete for household resources. The study must include an analysis of the relationship between both crop and animal production enterprises.[1] Information should be collected for both small and large farms on: resource use and availability; and farmer perceptions of constraints to increased production.

He/she will be responsible for conducting an economic analysis of the operating and maintenance costs of the system with an eye to establishing user fees which cover these costs. The economic analysis of the irrigated farming systems should provide the basis for establishing the farmers' capacity to bear these costs based on farm incomes.[2] He/she will also be responsible for developing the benefit/cost analysis for the Project. This will present some difficulties because of the scanty data base available and the basic nature of the Project.[3]

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[1] It was the strong impression of the Team that in the irrigated areas, agricultural production is limited on fields that are receiving water by lack of other inputs such as crop husbandry practices, fertilizer availability, tractor service, field labor and so on. The baseline studies should help to clarify this situation.

[2] An extremely important point brought out in the ARD Report is that farmers seem to clearly differentiate between paying for water and paying for maintenance. The former meets with great resistance, the latter seems to be an expected and normal cost associated with irrigated agriculture.

[3] Ultimately, benefits will be generated through production increases of a variety of crops, especially maize, sesame and vegetables. This will come about from increasing output per acre, expanding acreage and providing more ready market access. Since the development of any additional water supply capacity or improved market access will depend upon the rehabilitation effort including off-stream storage, village level roads, etc., it will be difficult to estimate total benefits. Estimates of per acre yield increases from improved husbandry, fertilizer applications, water management and seeds are possible now on the basis of applied research and farmer experience. There is a small data base on this which is reported in the LI Report, the World Bank Agricultural Sector Survey and the Utah State Extension Project Reports. Additional data from the field survey which the recent TAMS draft report says has been allegedly carried out might prove useful. The Utah State data suggests substantial price differences for maize in villages located close to main roads compared to those more distant, suggesting benefits to be gained from the development of feeder roads.

Agricultural Economist (Policy Analysis)

The PP Team should include a second Economist to explore policies that would be beneficial in removing constraints to increased production both for smallholders and the commercial sector concerned with the production of perennial crops, including marketing and credit.[4] The availability and need for agricultural credit should be included in a baseline study. This Team member should contact the Fulbright scholar, who is presently on the Faculty of Economics, University of Somalia, in Mogadishu. She has been studying agricultural local credit systems. Drawing on available material, the PP Team may wish to include a credit program in the Project without waiting for the results from the baseline studies.

This Economist should also identify the cooperating institutions for carrying out studies in the Project area including the Agricultural Economics Departments at the University of Somalia and CARS.[5]

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[4]One of the benefits of a suitably functioning water management and delivery system is flexibility in the choice of cropping patterns in response to market prices. The agricultural policy analysis should be based around an income maximization strategy for both smallholders and commercial farmers alike. This, given the realities of water availability within and between seasons, will necessarily result in a production system which includes mainly traditional crops (maize, sesame, cowpeas, etc.) and also high valued cash crops, such as tobacco, vegetables and perennial crops. Given a system of off-stream storage and groundwater where available, and a functioning system of water rights, it is possible that smallholders can then increase participation in higher valued enterprises such as der season vegetables. This would also be of benefit to urban consumers. Entry of smallholders into the perennial crop economy is a possibility. It is worth noting that in the last two years, favorable rainfall and the removal of price controls on foodgrains has resulted in rapid increase in production of maize and sesame. Some observers speculate that, refugees aside, the country was at self-sufficiency this past year. Even a casual inspection of rainfall records will show that the probability of such rainfall patterns continuing is not great. However, the occurrence of good crops argues for giving farmers flexibility to adjust to market forces, and perhaps a GSDR stockpile policy as well.

[5]Another possibility, especially given the 10-year time period of the Project, would be to recommend establishing an expatriate Agricultural Economist position at the College of Agriculture through sponsorship arrangements with the Winrock Foundation. This associate could contribute to the Project needs and supervise Somalian graduate students working in the Project area. This would serve the long-term goal of assisting in developing an agricultural policy analysis capacity in the country. Such a placement would be consistent with the current policy of the Winrock Foundation of developing capacity in rural social science in Africa.

Extension Specialist

The Extension Specialist will be responsible for developing an outline for a farmstead extension dimension for the Project which is based upon firsthand experience in the village communities. He/should work closely with the Rural Sociologist (or Economic Anthropologist). Training in the techniques of Extension should be secondary to an immersion in the existing agricultural system and acquiring experience with local crops and husbandry techniques. An Extension program should be outlined which is based upon a bottom-up structure and demands an awareness of the local institutions.

Rural Sociologist (or Economic Anthropologist) (With Experience in Irrigation Communities)

The Rural Sociologist (or Economic Anthropologist) should be familiar with irrigation communities to outline a set of first year studies which: (1) identify the existing functions and viability of all levels of water user associations within the Project area, i.e., village level, between villages and commercial farmers; (2) identify the existing system of irrigation water rotations and water rights, including the transfer of those rights; (3) capture the response of the water user association to periods of water stress, including procedures for settling disputes both at the village and secondary levels; (4) identify the current mechanism for interacting with and for securing water and secondary canal maintenance from the MOA by villages, commercial farmers, state farmers, etc.; and (5) identify and investigate the experiences of other village organizations, such as their functions and membership, especially related to other aspects of production, including input supply and marketing of agricultural products.

This information should establish what mechanisms exist for enabling farmers to communicate their needs to the MOA, including unnecessary constraints on private sector development. This should be useful in both policy analysis and in identifying mechanisms for allowing the MOA to be responsive to the needs of the rural/agriculture sector. These studies should also assist the MOA in establishing at what points along the irrigation system water control and canal maintenance should be controlled by the indigenous water user associations. It is quite possible that the points of responsibility for canal maintenance and for water control (rotation) by the indigenous water user association would not be the same. Another study output would be to provide information on water use rights for recognition and consideration in the proposed National Water Law. There is no evidence that such information has been available for discussion in framing the present national water law proposal.

The Rural Sociologist (or Economic Anthropologist) should work closely with the Extension Specialist in outlining an Extension program for the Project which capitalizes on and ties into the existing indigenous water user groups who are now maintaining and operating tertiary, and other portions of the irrigation system.

Legal/Institutional/Political Scientist

The Legal/Institutional/Political Scientist should be familiar with water institutions in Moslem countries. He/she will be responsible for providing assistance in outlining a framework for or further development of the National Water Law. There appears to be recognition both inside and outside the GSDR that the proposed law fails to address such issues as the status of current water users, the transfer of water use rights, water distribution within use categories, inconsistencies in the value of water between perennial and annual crops, etc.

If the currently proposed law has not been adopted, the Project can assist in shaping the provision of the law to be more in tune with the situation in Somalia. If the law has been adopted, then the same objective will be valuable in amending the law. There appears to be sentiment in Government that any law is better than no law, but this view may not prevail. In any event, the PP should identify the appropriate Somalian Government agencies and donors (especially including FAO, who has been very active in helping to form a national water law) with whom to coordinate activities.[6]

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[6] In addition, the Team feels that the Project should include the service of a Senior Water Rights Specialist over a two-year period who has had experience in water law in similar societies. This Senior Specialist would be committed to short-term assignments during which he/she would: (1) develop special studies to collect relevant information from the other Moslem countries; (2) establish dialogue with appropriate Government and donor agencies; (3) plan and conduct workshops on the principles of water law; and (4) as appropriate and where welcomed, assist GSDR officials in framing or sharpening the National Water Law. Given the rapidly changing economic circumstances facing the nation, it would seem wise to put forth every effort to develop a water law which facilitates the orderly assignment of water rights in tune with national objectives. This view is in agreement with the objectives of both GSDR and USAID for meeting both equity considerations and development of the private sector.

APPENDIX A

RESPONSE TO AID/WASHINGTON ISSUES QUESTIONS

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APPENDIX A

RESPONSE TO AID/WASHINGTON ISSUES QUESTIONS

The following comments are addressed to the questions raised at the Issues Meeting held on May 19, 1986 in Washington, D.C. The Issues were considered by our Team to be extremely helpful in directing them to relevant areas of inquiry in the process of developing an agenda for development of the Project Paper. (The topic numbers listed correspond to the numbers on the unclassified telex--STATE 180126, Annex 1, attached.)

3. Phasing and Timing: To the extent that the Project involves stabilizing structures and canal grades, the rehabilitation program envisioned by our Team can begin as soon as design and procurement have been arranged.

The existence of strong local water user institutions at and beyond the village level changes the emphasis of the Project from one of developing water user organizations to that of understanding the strengths and traditions of existing institutions and working with them on rehabilitating the system. This is a less time consuming activity. Nevertheless, it will be necessary to phase in the pragmatic rehabilitation projects which will be identified by working closely with the institutions identified in the baseline studies. Thus, a phased approach to the Project will be required.

Master-Plan Development: Our Team does not envision the development of a master-plan which would commit the valley to a water allocation schedule between the general water users (human, livestock, perennial crops, annual crops and industrial commercial), but rather a water rights and use system which is consistent with both water availability and the value of water in its alternative uses. We expect that planning will always place the highest priority on water availability for human consumption and for livestock and that those needs should be met first. The water management model which is considered most likely to be utilized for understanding water allocations along the river can be both supply and demand driven. Those factors which are exogenous to the river itself can be allowed to guide water resource allocations. Consistent with current concepts in planning, the water management modeling effort would place heavy emphasis on establishing a data base system. This is not the approach taken in the recent LI Report, which basically takes a target approach to water allocation in the Shebelli River Valley.

5. Allocation of Resources: As already noted, the proposed pragmatic rehabilitation approach, coupled with the existence of strong indigenous institutions and known opportunities to improve agricultural output

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(improved seeds, fertilizer and insecticides) argues for packaging some of each in all phases of the Project. The physical rehabilitation of the main structures on the primary canals and/or establishing new grades on these same canals can get under way within the first year. The irrigation communities studies, both social and economic, and the development of research support capacity, should begin within the first year. The irrigation community studies should be considered prerequisite to the design of the phased programmatic rehabilitation activities. The PP Team might explore this more fully in discussions with the GSDR and may gain some insights from the village level studies found in the ARD Report.

Regarding Somalian counterparts, it is most important that Government personnel from the Ministry of Agriculture (MOA) be closely involved with the identification of the pragmatic rehabilitation projects.

6. Public/Private Split in Responsibilities for Irrigation System Operation and Maintenance: Our Team has addressed the control and operation questions. Briefly, it seems that at least some existing irrigation water user organizations are already assuming responsibility for water control and canal maintenance at the tertiary level. We feel that maintenance of the secondary and main canals should be carried out by Government--mostly because the task is too great for hand labor. It may be possible, however, that the GSDR could contract this service from the private sector. The decision on this should likely be arrived at after an assessment of the capacity of both the private and public sector to carry out this task has been determined. A policy of gradual involvement of the private sector may be the best option. It is clear that Government, and not the private sector, should control water along the river, the mains, and probably the secondary canals, while taking into account the existing committees that establish water rotations. This is the argument for developing a water master-plan for the river which recognized indigenous systems of water rights and control.

Discussion on Existing Methods and Socio-Economic Organization: We totally endorse the concept of utilizing existing water allocation methods and socio-economic organizations. The irrigation system as it is now operated recognizes the right of tail-enders who are reportedly served first, and of village smallholders, while at the same time supplying commercial and state farmers. In fact, it appears that AID's equity goals are being met, based on preliminary information, in a very satisfactory manner. The proposed irrigation community studies will clarify this view.

Recommendation on the Roles of Large Landholders versus Smallholders in Project Participations: Both of the suggested feasible project areas have both smallholders and large landholders within their borders. It is our impression that smallholders predominate in terms of acreage operated. Since the Team's proposed Project would cover the total

agricultural area of the Shalambood region, both groups would be served. The water management studies would potentially benefit both small and large landholders alike, as would improvements to the main and secondary canals, roads and drainage.

7. Recurrent Costs and Economic Analysis: Recurrent costs on the irrigation system may be relatively low on a per hectare basis given the current stability of the canals, in spite of large silt loads. This is because of the apparent extensive system of water user associations and traditions of canal maintenance which seem to be in place. Since the system of barrages and main canals which control and divert water to the Project area serves an area that is greater than the Project, a study of operating costs would have to proportion these costs accordingly. The Project is expected to include a determination of ongoing maintenance costs for establishing water charges based on operating and maintenance costs. Ultimately, this will be a matter for national policy and this Project may serve as the catalyst for that debate.

Multi-Level versus Narrower Focus: We feel the Project should be "concurrently developing both tiers of activity in the system." We recommend that this be the case at the start--i.e., master water planning, village level studies, canal works, the research component, and extension, are all efforts that should be mounted early in the life of the Project.

Resource Allocations Among the Components: It is our Team view that: (1) the Dudubie off-stream storage facility will very likely be funded by other donors; (2) as the Project is now envisioned, both software and hardware components will be balanced by Project needs; however, given the pragmatic rehabilitation approach, hardware is an unknown claimant on Project funds; (3) the research agenda has been further refined by our efforts, and it should be sharpened a good bit more in the PP; and (4) where possible, the rehabilitation of older buildings at the CARS and ETC is preferred over new structures.

The Team strongly recommends that the PP Team establish a close liaison with the German (GTZ) efforts in the Shebelli to coordinate not only research, but extension and institutional building efforts such as credit programs. There have been numerous references to water user infrastructure development. It is our understanding that this can be financed out of the local currency budget allocation which will be substantial.

8. Conditionality: We have not considered this in great depth. Studies on the implication to the farmers of paying for recurrent costs have been called for. Our intuition is that costs will be sufficiently low to make such user charges economically and politically feasible. The other likely area for consideration may be fertilizer and seed availability. Also, a strong call for donor coordination of irrigation development activities beyond that which is currently being done could result in substantial gains to all parties involved.

9. Implementation Issues: These are addressed according to the I, II and III found in Item 9 of the attached telex:

I. There is no obvious reason to suggest that private water user associations require PVO involvement.

II. Procurement will need to be phased to be in tune with the multi-dimension nature of the Project.

III. Title XII institutions may well be involved in some of the baseline institutional and household production research components. The existing Water Management Synthesis II (WMS II) Project could lend considerable support to the PP design effort by conducting a Joint Field Study/Workshop prior to or in conjunction with the PP design effort. Furthermore, the follow-on to WMS II would be a likely candidate for providing special assistance to the ongoing Project in the form of training programs and action research studies.

Annex 1

ACTION: AID INFO: CDA ECON

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CHRG: AID
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E.O. 12356: N/A
TAGS:
SUBJECT: SOMALIA- SHEBELLI WATER MANAGEMENT PID (649-0129)- ECPR DECISION AND GUIDANCE

1. THE ECPR HELD 5/28 DURING PROGRAM WEEK WAS CHAIRED BY DAA LARRY SAIERS, AND WAS PARTICULARLY WELL ATTENDED WITH PARTICIPATION BY AFR/EA, DP, PD, AFR/PRE, TR/ARD, PPC, BIFAD, AND USAID DIRECTOR LOU COHEN, PROGRAM OFFICER AKIM MARTINEZ, MISSION ECONOMIST MEREDITH SCOVILLE, AND FUTURE DEPUTY DIRECTOR DALE PFEIFFER.

2. ECPR DECISION: THE PID WAS APPROVED WITH THE FOLLOWING PP DESIGN GUIDANCE:

THE PP INTRODUCTION WILL ESTABLISH THE CONTEXT FOR A LONG TERM AID COMMITMENT TO SHEBELLI WATER MANAGEMENT (APPROXIMATELY DOLS 50 MILLION OVER APPROXIMATELY 10 YEARS) AND AN ORDER OF MAGNITUDE FOR THE TOTAL COST OF BASIN DEVELOPMENT, BUT DETAILED PP DESIGN WILL FOCUS ON PHASE I ACTIVITIES (APPROXIMATELY DOLS 12-15 MILLION FOR FIVE YEARS, ESTIMATE TO BE FURTHER DEVELOPED DURING PP DESIGN). THE PURPOSE OF PHASE I IS TO LEARN HOW TO GO ABOUT IMPROVING WATER MANAGEMENT IN THE SHEBELLI BASIN. INPUTS FUNDED UNDER PHASE I WILL INCLUDE INTERVENTIONS WHICH ARE NECESSARY FOR THIS LEARNING PROCESS ACROSS ALL LEVELS IN THE SHEBELLI IRRIGATION SYSTEM (BOTH SOFTWARE AND HARDWARE), AND SUPPORTIVE IRRIGATED AGRICULTURAL RESEARCH. PHASE II WILL BE AUTHORIZED WHEN THE NECESSARY HANDS-ON EXPERIENCE IN SYSTEM MANAGEMENT HAS BEEN OBTAINED, THE FRAMEWORK FOR LARGER SCALE REHAB HAS BEEN ESTABLISHED, AND DESIGN STUDIES HAVE BEEN COMPLETED. THUS, PHASE II MAY OVERLAP WITH PHASE I DURING IMPLEMENTATION. AUTHORIZATION OF PHASE I IS EXPECTED DURING FY 87, AND WILL TAKE PLACE IN AID/W. ADDITIONAL ECPR GUIDANCE FOLLOWS.

3. PHASING AND TIMING: THE ECPR REAFFIRMED THE BUREAU'S 1/86 DECISION THAT THE SHEBELLI WATER MANAGEMENT PROJECT WILL BE AID'S MAJOR INITIATIVE IN THE AGRICULTURAL SECTOR DURING THE COMING DECADE. AS DESCRIBED IN THE PID, THE PROJECT HAS THREE COMPONENTS: (1) IMPROVEMENT OF PUBLIC/PRIVATE MANAGEMENT OF SHEBELLI BASIN IRRIGATION, (2) SUPPORTIVE ADAPTIVE IRRIGATED AGRICULTURAL RESEARCH, AND (3) SHEBELLI IRRIGATION SYSTEM REHAB. BASED ON AID EVALUATION OF RIVER BASIN PROGRAMS ELSEWHERE, THE ECPR DECIDED THAT PHASE I SHOULD INITIATE ALL THREE COMPONENTS ON A MODEST SCALE AS A LEARNING PROCESS THAT WILL ALLOW US TO FINALIZE DESIGN OF LARGER SCALE INTERVENTIONS WHICH WILL BEGIN TO BE IMPLEMENTED DURING PHASE II. THE LENGTH OF TIME NEEDED FOR PHASE I AND ITS FUNDING REQUIREMENTS WILL BE DEFINED DURING PP DESIGN, BUT THE ECPR ESTIMATED THAT APPROXIMATELY DOLS 12-15 MILLION FOR FIVE YEARS WOULD BE REQUIRED FOR AID TO GAIN THE HANDS-ON EXPERIENCE IN WORKING AT ALL LEVELS IN THE SYTEM WHICH WILL BE REQUIRED TO IDENTIFY CONSTRAINTS AND PROMISING SOLUTIONS THAT COULD BE EXPANDED IN PHASE II. PHASE I SHOULD INCLUDE FUNDING FOR ALL INITIAL REHAB ACTIVITIES THAT WILL ADDRESS THE MOST PRESSING WATER CONTROL NEEDS, WHILE WE CONCURRENTLY LEARN ABOUT MANAGEMENT CAPACITY AND USER REQUIREMENTS.

4. MULTI-LEVEL FOCUS FOR PROJECT ACTIVITIES: THE ECPR AGREED WITH THE PID THAT WE SHOULD WORK SIMULTANEOUSLY ON ALL CRITICAL LEVELS IN THE SHEBELLI SYTEM (FROM CENTRALIZED SYSTEM-WIDE MANAGEMENT FUNCTIONS DOWN TO ON-FARM GROUPS). SINCE THIS WILL NEED TO BE STRUCTURED IN A MANAGEABLE WAY, THE PP SHOULD DEVELOP GUIDELINES FOR THE LEVEL OF EFFORT TO BE SUPPORTED AT EACH TIER OF THE SYSTEM, IN COORDINATION WITH OTHER DONORS' CONTRIBUTIONS.

5. ALLOCATION OF RESOURCES AMONG THE THREE PROJECT COMPONENTS: RESOURCE ALLOCATION AMONG THE THREE COMPONENTS SHOULD BE PROPORTIONAL TO THE PROJECT PURPOSE: TO LEARN HOW TO GO ABOUT IMPROVING WATER MANAGEMENT AND INCREASING IRRIGATED AGRICULTURAL PRODUCTION. THE RESEARCH COMPONENT SHOULD BE PRODUCTION-ORIENTED AND PROBLEM-SOLVING. AS INSTITUTION-BUILDING IS NOT THE PURPOSE OF THIS COMPONENT, FUNDING FOR RESEARCH SHOULD BE SCALED APPROXIMATELY, AND PP DESIGN SHOULD SEEK WAYS TO KEEP COSTS FOR AGRICULTURAL RESEARCH AT A MINIMUM LEVEL NECESSARY TO ACHIEVE PHASE I OBJECTIVES, E.G. BY USING EXISTING STAFF AND FACILITIES AS MUCH AS POSSIBLE. AS LOP FUNDING NEEDED FOR INFRASTRUCTURE REHAB WILL BE DEFINED DURING DESIGN OF PHASE II, IN COORDINATION WITH OTHER DONORS, THE PHASE I PP WILL NOT NEED TO SPECIFY HOW MANY HECTARES OF SMALLHOLDER IRRIGATION WILL BE REHABILITATED BY AID, OR THE EXTENT TO WHICH THE PRIMARY IRRIGATION SYSTEM WILL REQUIRE AID FUNDING.

6. PUBLIC/PRIVATE SPLIT IN RESPONSIBILITIES FOR IRRIGATION SYSTEM OPERATION AND MAINTENANCE: THE ECPR DECIDED THAT THE DEFINITION OF PUBLIC VERSUS PRIVATE SECTOR ROLES REQUIRES ADDITIONAL INVESTIGATION DURING PP DESIGN AND PHASE I PROJECT IMPLEMENTATION. ISSUES RELATED TO THIS SHOULD BE FULLY ADDRESSED IN THE DESIGN OF FOLLOW-UP PHASE(S).

7. RECURRENT COSTS AND ECONOMIC ANALYSIS: THE ECPR DECIDED THAT THESE ISSUES SHOULD BE INVESTIGATED AND ADDRESSED DURING PP DESIGN AND PHASE I IMPLEMENTATION, AND FULLY ADDRESSED IN THE DESIGN OF FOLLOW-UP PHASE(S).

(FYI, SPECIFIC CONCERNS ARE: HOW CAN WE ENSURE THAT USER FEES ARE REINVESTED IN THE SYSTEM, AND WILL USER FEES BE SUFFICIENT TO COVER THE PUBLIC SECTOR SHARE OF THE SHEBELLI IRRIGATION SYSTEM'S RECURRENT COSTS? HOW BROAD WILL IMPACTS FROM OUR INVESTMENT IN THIS PROJECT BE, AND WHAT LEVEL OF PRODUCTIVITY IS ALREADY BEING ACHIEVED IN THE SHEBELLI IN CONTRAST TO INCREASES THAT WE CAN EXPECT TO ACHIEVE THROUGH MULTI-DONOR INVESTMENT IN THE SYSTEM?

THE SOW'S FOR THE MISSION'S PLANNED RECURRENT COST STUDIES SHOULD INCLUDE REVIEW OF SHEBELLI SYSTEM COSTS AND DEVELOPMENT OF BUDGETARY RECOMMENDATIONS WHICH WILL ADDRESS THE RECURRENT COST ISSUE. END FYI.)

8. CONDITIONALITY: PHASE I CONDITIONALITY SHOULD BE CONFINED TO COVENANTS SO FAR AS POSSIBLE, PARTICULARLY FOCUSSED ON A GENERAL COMMITMENT BY THE GSDR TO UNDERTAKE NEEDED REFORMS IN NATIONAL WATER LAWS, AND FISCAL CADASTRAL, AND LAND TENURE POLICIES IN THE SHEBELLI BASIN WHICH WOULD BE DEFINED DURING PHASE I IMPLEMENTATION. IF APPROPRIATE, THESE REFORMS COULD BECOME CONDITIONS PRECEDENT FOR THE PROJECT'S PHASE II.

(FYI, AT THIS TIME, IT IS EXPECTED THAT THE PROJECT'S TECHNICAL ASSISTANCE WILL BE TARGETED TOWARDS IMPROVING THE ABILITY TO MANAGE SHEBELLI IRRIGATION OF THE MINISTRY OF AGRICULTURE AND THE PRIVATE SECTOR, THUS THE C.P. PROPOSED IN THE PID RELATED TO ESTABLISHMENT OF A SHEBELLI WATER MANAGEMENT ENTITY WAS NOT FELT TO BE APPROPRIATE. ADDITIONAL POLICY REFORMS MAY NEED TO BE EMPHASIZED IN OUR FY 87 PROGRAM (AND BEYOND) TO SUPPORT INVESTMENT IN THIS PROJECT (E.G. RELATED TO FOOD, AID, CIVIL SERVICE REFORM, AGRICULTURAL INPUTS, AND FUEL IMPORT AND ALLOCATION POLICIES), AND THIS SHOULD BE TAKEN INTO ACCOUNT DURING AID/WASHINGTON DIALOGUE WITH OTHER DONORS ON LONG TERM POLICY REFORM. END FYI.)

9. CONCERNS: A NUMBER OF QUESTIONS WERE RAISED ABOUT THE STRUCTURE OF PROJECT IMPLEMENTATION AND CONTRACTOR PROCUREMENT WHICH WILL NEED TO BE ADDRESSED DURING PHASE I PP DESIGN, PRINCIPALLY:

(I) WILL TECHNICAL ASSISTANCE TO PRIVATE WATER USERS' ASSOCIATIONS REQUIRE PVO/NGO INVOLVEMENT?

(II) SHOULD THERE BE TWO PROCUREMENTS DURING PHASE I: ONE FOR SOFTWARE COMPONENTS, AND A LATER ONE FOR INFRASTRUCTURE REHAB? OR SHOULD THE INITIAL PROCUREMENT SELECT A CONTRACTOR (OR CONSORTIUM) WITH EXPERIENCE IN ALL THREE COMPONENTS?

(III) IS THERE A ROLE FOR TITLE XII INSTITUTIONS IN THE RESEARCH AND WATER MANAGEMENT COMPONENTS? OR SHOULD INTERESTED UNIVERSITIES JOINT VENTURE WITH PRIMES WHO HAVE EXPERIENCE IN WATER MANAGEMENT INSTITUTIONAL STRENGTHENING AND REHABILITATION?

10. THE ECPR WAS PLEASED WITH MISSION INTENTION TO INVOLVE THE WATER MANAGEMENT SYNTHESIS PROJECT PERSONNEL IN THIS EFFORT AND AID/W WILL HELP THE MISSION FURTHER THIS COLLABORATION. (FYI, MISSION DIRECTOR PLANS TO REQUEST AN INITIAL TDY BY WATER MANAGEMENT SYNTHESIS STAFF DURING SUMMER '86. END FYI). THE ECPR AGREED WITH THE PID THAT DONOR COORDINATION WOULD NEED TO BE CAREFULLY ORCHESTRATED DURING PROJECT DESIGN AND IMPLEMENTATION, SO THAT THE TOTAL DONOR PACKAGE WOULD ADDRESS ALL CRITICAL CONSTRAINTS TO SYSTEM PRODUCTIVITY, WHILE ALLOWING AID AUTONOMY IN IMPLEMENTATION. PLEASE KEEP AID/W INFORMED AS TO PROGRESS IN MISSION'S EFFORTS TO ESTABLISH A DONOR COORDINATION COMMITTEE.

11. AUTHORIZATION VENUE: THE ECPR DECIDED THAT THE PP SHOULD BE AUTHORIZED IN AID/W, TO MAXIMIZE DISSEMINATION OF LESSONS LEARNED DURING PP DESIGN AS THIS WILL CONTRIBUTE TO AID'S UNDERSTANDING OF IRRIGATION PROGRAM ISSUES.

12. IEE: THE BUREAU WILL NEED TO EXECUTE AN IEE CATEGORICAL EXCLUSION FOR THE TRAINING AND RESEARCH PORTION OF THE PROJECT. A POSITIVE THRESHOLD DETERMINATION SHOULD BE MADE WHICH WILL REQUIRE AN ENVIRONMENTAL ASSESSMENT FOR THE REHAB AND CONSTRUCTION PART OF THE PROJECT. SHULTZ
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APPENDIX B

SAMPLE DESCRIPTIONS OF POTENTIAL REHABILITATION AND BETTERMENT PROJECT ACTIVITIES (FOR COST COMPARISON PURPOSES)

APPENDIX B

SAMPLE DESCRIPTIONS OF POTENTIAL REHABILITATION AND BETTERMENT PROJECT ACTIVITIES (FOR COST COMPARISON PURPOSES)

Potential Project features might include the following:

I. Enhance the capability of the Land and Water Resources Department of the Ministry of Agriculture (MOA/LWRD) to manage flows in the Shebelli River Basin.

II. Construct additional off-stream storage reservoirs in the rehabilitation area.

III. Refurbish existing barrages and canal headworks structures.

IV. Establish a canal clearing policy and program and provide capacity for systematic mechanical removal of silt.

These potential Project features are being proposed partially as a result of the Team's review of the existing literature, but primarily due to our observations in the field and interviews with Somalian farmers and irrigation system operations personnel.

For the most part, the water delivery systems are functional. Water is being delivered to the farming areas, and a significant amount of irrigation is being accomplished. However, a considerable amount of rehabilitation and continued maintenance is required. This proposed Project responds to that need in Features III and IV. A greater, somewhat intangible need, the requirement for a better knowledge and control of the entire Shebelli River Basin System, is considered in Features I and II.

Project Feature I relates to the Team's concern that the flow regime of the river is not adequately understood nor appreciated. The literature reviews and our field observations lead us to suspect that the limiting factor in irrigation development in the river basin is the total water supply. Existing systems, when combined with new development currently under way, may overextend the total system capacity, especially in the dry years, with a subsequent serious negative economic impact on the entire area. For this reason, we propose a Hydrology Study Program outlined later in this document.

Project Feature II is concerned with a different aspect of the same suspected problem. One accepted physical solution to augmenting low flows in a system during water short periods is to release water from storage for that purpose. The system already has some off-stream storage that can be released into the river from the Jowhar Reservoir. Numerous small private storage reservoirs have been established throughout the delivery systems, especially in conjunction with banana and citrus plantings.

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In addition, we noted numerous locations within the existing developed irrigated areas where the relationship of the canals to adjacent unused land was such that in-system reservoirs could be developed with some basic diking. As discussed later, very accurate topographic mapping would be required to allow feasibility level studies of specific sites to proceed. Some of the observed in-system reservoir sites would adapt to gravity discharge. Others would need to have pumping facilities included.

Project Feature III relates to establishing a capability to rehabilitate and maintain the barrages and other river and canal control structures. Recent studies, previously listed, have emphasized the opinion that the deteriorated condition of the barrages and canals was primarily due to the lack of timely maintenance. Our observations in the field did not necessarily confirm this premise. Some of the structures are approaching 60 years of age. Obsolescence and deterioration from just time passing have to be a significant factor in the apparent deterioration. The design choice of making a vehicle bridge immediately adjacent to the slide gate control superstructure also proved to be a negative factor, as much damage has been caused by vehicle accident impact.

The original barrage designs obviously included some factor of safety or redundancy in the number of gates at each barrage. This is confirmed by the fact that the systems have been kept operable with only a portion of the gates being used. This fact should be considered as those structures are rehabilitated. This proposed Project Feature should allow the MOA/LWRD to gradually carry out the rehabilitation of the control structures, do the deferred maintenance and then provide maintenance in the future in a timely manner.

Feasibility level studies done by the Japanese team which is constructing a piped domestic water system in the Lower Shebelli River area indicated that they plan to make some of their piped river crossings by supporting the pipes on the existing barrage bridges. This should be called to the attention of the MOA so that some immediate coordination can occur to prevent that installation from impeding future barrage rehabilitation.

Project Feature IV is concerned with perhaps one of the most significant parts of the Project. This program of supplying appropriate canal construction and maintenance equipment, as well as training, operating and support staff, would provide the MOA/LWRD with an improved maintenance capability. In addition, they could perform modest amounts of new construction.

Some local surveying and canal design capability would have to be developed to accomplish these functions efficiently if the capability does not now exist. Probably the expatriate specialists could provide the necessary specialized training if some Somalian surveyors or junior grade Civil or Agricultural Engineers could be assigned to the Project.

PROJECT FEATURE I

Enhance the capability of the Land and Water Resources Department of the Ministry of Agriculture to manage flows in the Shebelli River and to allocate water quantitatively at diversions into the main canals (either gravity or pumped).

This enhancement would be accomplished by furnishing a team of experienced American trained personnel to work with and train qualified Somalian counterparts. The Team would be kept intact for the life of the Project (10 years) with personnel rotated as required.

The Training Team might have up to four members for the first five years and two for the remaining five years.

1. A Senior "Project Superintendent" (United States Bureau of Reclamation job description) with extensive experience in river system and storage reservoir coordinated management.

2. An experienced Hydrologist familiar with basin runoff studies and specific experience in allocating diversions and calculating return flows to a river system.

3. Two water measurement technicians with experience in establishing and operating stream gauging stations and recording the data from said gauging stations.

The Team would develop/design a permanent hydrological data collection system, effect the installation of the system and use the data obtained to help manage the Shebelli River Basin System.

We understand that some flow measuring stations are in existence and operating under a British program. The extent of said system and the proposed duration of the British program should be ascertained. We propose only augmenting the existing system to the degree necessary to furnish enough flow data so the USAID-sponsored program can assist in actual river system operation. This will certainly include installation of staff gauges at each river barrage and each major canal outlet structure and diversion point. The hardware cost for this program can be estimated only after the existing equipment has been inventoried and the ultimate system requirements have been designed.

One of the early tasks of this Team would be to investigate the impact of the Shebelli River flow regime of the proposed major hydropower dam which may be constructed on the Upper Shebelli River in Ethiopia. The Somalian Government should be cautioned to not promote the development of the new irrigated hectarage until the availability of water to serve the new areas has been confirmed. This will require creation of a hydrologic model by the Team as outlined above, plus an accurate inventory of the hectarage and cropping patterns now in existence. The inventory could best be accomplished using modern aerial photogrammetry techniques.

PROJECT FEATURE II

Construct additional in-system local small storage reservoirs to release water during the dry season and thus furnish water for a longer period each year. Volume and cost to be determined by a detailed study/analysis of each service area. The study would utilize aerial photography and mapping combined with field reconnaissance.

PROJECT FEATURE III

Refurbish appropriate existing barrages and canal headworks structures. This could be accomplished in one of two ways: (1) fabricate new gates in the USA to be shipped to Somalia and installed in the existing structures after the structures had received the necessary remedial repairs including downstream pool stabilization by installation of gabions and some reinforced concrete work; and (2) create a local machine crop capability to repair the existing slide gates (as necessary) and fabricate new gates as required as the systems expand/or are modernized.

We prefer the second alternate which would involve the following:

1. Import the necessary machine tools and steel shapes to accomplish the physical work.

Estimated hardware cost for shop building and equipment (shear, drill press, welder, etc.)	= $350,000
Original steel shape inventory	= $150,000
TOTAL	= $500,000

2. Furnish expatriate staff to provide the supervisory and training officer functions for a period of at least three years:

   - One shop foreman
   - One journeyman machinist
   - One journeyman welder

PROJECT FEATURE IV

Establish a canal cleaning policy and program and provide institutional capacity for systematic mechanical removal of silt from the barrages and larger canals. Elements of this program would include the following:

1. Provide specialized excavation equipment suited for the intended purpose.

2. Train equipment operators and mechanics to adequately operate and maintain the equipment provided.

3. Establish a mechanical workshop(s) and machine maintenance facility, either independently or in conjuction with ONAT. (See TAMS Report, page VI-17, concerning ONAT workshop locations.)

   The conceptual estimated cost for a permanent workshop, adequately equipped to maintain the proposed equipment fleet, is in the $350,000 to $500,000 range per workshop.

4. Utilize the same men and equipment to construct gabions and install them to stabilize the river channel immediately downstream from each barrage.

Potential List of Canal Cleaning Equipment[1] (for one R&B area)

Large Canals: (3 meters to 10 meters surface width)

2 ea Gradall; $100,000+ each, FOB USA

A self-propelled (on rubber-tired truck), hydraulic, telescoping boom, backhoe-type excavator with a special canal cleaning bucket. Capabilities include accurate ditch shaping while working from a canal bank access road.

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[1]All engines to use diesel fuel. Preferably use as few different manufacturers as possible. Log chains, blocks, pulleys, chokers (cables) to be furnished in adequate numbers.

2 ea Bulldozer; $80,000± each, FOB USA

Wide track mounted tractor (caterpillar D-6 class) with an angle blade on the front and a backhoe attachment on the back end. Used to flatten spoil berms and construct access roads as well as clean and construct medium-sized canals.

1 ea Crane/Dragline; $150,000± each, FOB USA

Mobile truck mounted (rubber tires) crane with a live boom fitted for use as a hoisting crane or a 1 to 2 cubic meter bucket sized dragline with outrigger legs for work on barrages, gates and cleaning headworks of silt and debris. (Can also be used as a winch for pulling out vehicles or equipment which are stuck in the mud.)

Small Canals and Ditches: (less than 3 meters width)

4 ea Loader; $75,000± each, FOB USA

Bucket loader/backhoe attachments mounted on a (D-4 caterpillar class) wide track crawler tractor.

6 ea Loader; $50,000± each, FOB USA

Bucket loader/backhoe attachments mounted on a large rubber-tired agricultural-type tractor.

1 ea Motor patrol grader; $80,000± each, FOB USA

Caterpillar 12 class grader for maintenance of canal bank access roads.

Trucks:

3 ea Fuel tank truck; $35,000± each, FOB USA

4,000-liter-capacity tank with pump and hoses to deliver fuel and lubrication supplies to equipment working in remote areas.

1 ea Mechanical workshop truck; $100,000± each (equipped), FOB USA

A van-type service truck to carry tools and spare parts to equipment working in remote areas. This truck would be equipped with electric arc welding capacity as well as an air compressor and the necessary equipment to do rubber tire repairs.

1 ea Lowboy or low loader; $60,000± each, FOB USA

Truck and semitrailer capable of hauling the bulldozers and tractor-mounted bucket loaders.

5 ea Dump trucks; $50,000± each, FOB USA

5 cubic meter box capacity for hauling concrete aggregate, cement, re-steel and other supplies to construction sites, and for transfer of excessive silt piles from congested areas in conjunction with canal cleaning activities.

20 ea Pickup trucks; $15,000± each, FOB USA

4-wheel drive heavy duty 3/4-ton pickup trucks to be assigned to each machine operator crew for transportation to and from the work site for each shift.

It is anticipated that the canal cleaning equipment would be left in the field at the work site with a security watchman during non-working periods (16 pickups are for operator crews and four are for general supervisory personnel).

General Cost Summary - Canal Cleaning Equipment:

Item	No. Units	Unit Cost US $	Program Cost US $
Gradall	2	$ 100,000	$ 200,000
Bulldozer	3	80,000	240,000
Crane/Dragline	1	150,000	150,000
Loader (track)	4	75,000	300,000
Loader (wheel)	6	50,000	300,000
Grader	1	80,000	80,000
Fuel tank truck	3	35,000	105,000
Mech. workshop truck	1	100,000	100,000
"Lowboy" truck	1	60,000	60,000
Dump truck	5	50,000	250,000
Pickup truck	20	15,000	300,000
		SUBTOTAL	$2,085,000
	Add 10% for spare parts		209,000
		FOB USA GRAND TOTAL	$2,294,000

Because the canals appear to need an extremely heavy silt removal effort at this time, we suggest that the equipment listed above be concentrated in the prioritized R&B area. It is anticipated that after the initial cleaning is completed, future maintenance can be accomplished in the Project area with about one-half of the suggested equipment fleet.

This may create the opportunity to move a portion of the machinery to other areas not included in the initial program, and thus gradually rehabilitate enough of the infrastructure to carry water to as much of the land area as there is water to serve in the entire valley.

Program for Training of Equipment Operators and Maintenance Mechanics

Obviously, there is at present some Somalian capability to maintain and operate heavy- and medium-class construction equipment, as some of this type of machinery is currently being used in the Project area. However, the proposed mechanized canal maintenance program will require a considerably larger number of skilled people than now are available. Therefore, we propose that the Project include the following two separate training programs.

First, a program to train equipment operators. This program can only begin after at least some of the proposed excavation equipment is delivered to Somalia. We are proposing the initial purchase of 17 pieces of excavation equipment. There should be at least three operators assigned to each piece to maximize the use of the machinery (sick leave, absenteeism, double-shifting, etc.). This suggests training from 50 to 60 Somalian operators. Each operator should also be trained as a truck driver, both light and heavy-duty. To accomplish this would require a training staff of six men for two years after the training program starts.

- One program superintendent; and
- Five skilled versatile machine operators

Second, a program to train maintenance mechanics. In order to cover the many skills required to properly run a mechanical workshop, including the spare parts storekeeping function, we propose a five-man training staff. This would consist of:

- One shop superintendent (and storekeeper);
- One diesel engine mechanic;

- Two general mechanics (body work, gear trains, gasoline engines, etc.); and

- One service mechanic (lubrication and tire repair).

We envision the training activity beginning at the same time as the equipment operator training would begin. When the program first starts, most of the difficult mechanical repair would have to be performed by the training team. As time passes, more and more responsible work would be assigned to the Somalian trainees. A reasonable beginning number of trainees might be 15. From five to ten more "beginners" could be added every six months or so as the original groups gain proficiency and require less supervision.

The expatriate training team would be required for a period of three to five years.

SUMMARY OF HARDWARE COSTS

General order of magnitude cost estimates for Features I, III and IV plus overall Project management are:

I	Stream gauging equipment allowance (to be estimated after system design)	$ 200,000
III	Machine shop (barrage repair)	500,000
	Housing for instructors at $150,000 each, 3 families	450,000
	Dormatory for trainees (15 bedrooms)	150,000
	SUBTOTAL	$1,100,000
IV	Mechanical workshop for tractors, etc., used for repair and canal cleaning	500,000
	Housing for instructors at $100,000 each, 11 families	1,100,000
	Dormatory for trainees (20 bedrooms)	200,000
	Canal cleaning equipment and vehicles	2,294,000
	SUBTOTAL	$4,094,000
	Expatriate Project staff and administrative office and housing in Mogadishu	
	6 families at $150,000 each	900,000
	One office	200,000
	SUBTOTAL	$1,100,000
	GRAND TOTAL	$6,494,000

SUMMARY OF SOFTWARE COSTS

General order of magnitude cost estimates for the Expatriate staff for Project Features I, III and IV and overall management are:

I	Hydrologic team	2 men for 10 years	= 20 man/years
		2 men for 5 years	= 10 man/years
		Subtotal	30 man/years
III	Machine shop	3 men for 3 years	= 9 man/years
IV	Canal cleaning	6 men for 2 years	= 12 man/years
	Mechanic workshop	5 men for 4 years	= 20 man/years
		Subtotal	32 man/years
	Team Leader	1 man for 5 years	= 5 man/years
	Asst. Team Leader	1 man for 5 years	= 5 man/years
		Subtotal	10 man/years
		GRAND TOTAL	81 man/years
		81 man/years at $150,000/year	= $ 12,150,000
		Round up to	$ 15,000,000

APPENDIX C

THOUGHTS FOR THE SHEBELLI IRRIGATION PROJECT IN SOMALIA

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APPENDIX C

THOUGHTS FOR THE SHEBELLI IRRIGATION PROJECT IN SOMALIA*

By Jack Keller

Small-scale traditional irrigation based on simple technology using self-sufficient farming systems adapted to the local environment has long been practiced in suitable locations. In Africa, survival has usually been more important than profit, and risk minimization has taken precedence over surplus production. On the other hand, the objective of recent large-scale formal irrigation in Africa has been commercial crop production using modern technology, supported by efficient management, with adequate physical and social infrastructure, regular supplies of inputs, experienced farmers and efficient marketing.

The two types of irrigated agriculture have had very little in common. With a few exceptions, the conditions required for successful commercial irrigation are absent in traditional irrigation. These conditions can be artificially created and imposed by a central authority, colonial or commercial, with a greater or lesser degree of success. But they do not grow out of the knowledge, experience and skills of traditional peasant farming systems.

Given the appropriate conditions, both types of irrigation are valid. Indeed, they can and do exist successfully side by side in peasant communities and in commercial estates. The mistake in thinking is that subsistence peasant irrigation can be rapidly transformed into competitive commercial farming by the massive injection of modern technology and capital. The transformation of subsistence into commercial irrigated farming is possible, but can only be achieved by a process of growth from below, not by the imposition of an alien system from above.

Realization of the defects of the imposed top-down approach, the spontaneous growth of peasant irrigation and awareness of the potential of accelerated growth from below, with additional support from above, is encouraging. These factors indicate that irrigation development in Africa in general, and Somalia in particular, may be at a turning point, with hopeful prospects if the opportunities can be grasped.

Such works as the Shebelli Irrigation Project are inevitably expensive, and in addition to the need for thorough planning of the

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*This paper is adapted for the Shebelli Irrigation Project, and contains extensive quotes and paraphrases from the paper, "Prospects and Trends of Irrigation in Africa, Concepts for the Involvement of Public and Private Sectors," by H.M. Horning, T.H. Mather and H.W. Underhill. Paper presented at the 1985 Conference on Water in International Development at College Station, Texas.

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rehabilitation activities, they demand the establishment of institutional arrangements to assure that the rate of development and the outputs from the scheme are comparable with these high investments.

Complex development programs of this type have a generally poor record of adhering to the planned schedules and targets. Common causes are: shortages of human, technical and financial resources; problems of scheme management, organization of farmer groups, input supplies and services; and the need to revise and adjust original planning concepts to match national objectives.

Success, therefore, depends on the removal of a number of institutional constraints which have too often been underestimated. It implies the need for: complementary programs and services for the training, mobilization and participation of peasant farmers; the creation of a skilled technical cadre; the application of an integral agricultural policy on prices, markets and credit; the necessary infrastructure, storage and processing facilities; and supportive agricultural research into crop varieties and cultural practices.

On the other hand, small-scale irrigation has long been practiced in Africa in a variety of forms where natural conditions provide easily obtainable water close to suitable land. Perennial streams are utilized through simple diversions and upland areas. In valley bottoms the use of simple structures and earth dikes gives a form of water control to extend the season of flood recession cultivation. Furthermore, in many cases shallow groundwater, accessible through small wells and pumps, offers profitable opportunities for vegetable crop production, especially on urban fringes or close to markets.

Combinind Small- and Large-Scale Thinking

A relatively new line of thinking is to combine the advantages of large- and small-scale schemes. This is done by using large-scale approaches to develop the major water supply to serve a series of "artificial perennial streams." These new perennial streams, in turn, are sources for small-scale development. This approach relieves the governmental agency of much of the expense and need for services, and encourages farmer self-help. This new approach to irrigation development is being directly utilized in diverse locations such as Ecuador and Indonesia, and indirectly in India, Pakistan and Sri Lanka, to name a few. The combined large-/small-scale irrigation development has the advantage that it reduces the heavy investments for infrastructure and water control. Foreign funding requirements for capital investment are reduced. Furthermore, the gestation period, or time needed until full benefits can be drawn from the investments, may even be shortened. Farm-level investments are also below the requirements of large-scale, formal schemes if appropriate technologies are used, allowing a major share of the work to be done under farmers self-help schemes.

Great care should be taken in selecting the sites for small-scale development and the irrigation technologies to be used. Small, informal schemes must be founded on an ability to apply self-help measures to overcome problems and constraints imposed by water availability, land characteristics and structural needs. By their very nature, these schemes are not suited to massive injections of capital and improved technology in the form of sophisticated machinery and costly materials at the farm level.

Some initial support is clearly needed at the farm level in the form of surveys, design, advice, and possibly supervision for construction. With a phased approach to provide such support services to a group of small-scale schemes, such costs should be relatively low. Similarly, a program for financial support to a series of such schemes will give a continuity and momentum to development and will avoid the need for repeated budgetary allocations or loan negotiations, which will otherwise retard progress, especially where there may be foreign loan components.

The concept of community initiative and involvement is basic to the process of small-scale, informal irrigation. There have been many examples of failure as a result of scheme planning, design and construction from outside the community, with little or no prior consultation with the intended farmers regarding their own needs, abilities and customs. The unacceptability of this approach by the farmers is evident in schemes which are underutilized and badly deteriorated in the absence of regular maintenance. Occasionally this provokes a takeover by the responsible authority, and subsequent operation under a formal administration. This, in turn, perpetuates the separation between scheme and community, suppressing farmer initiatives, and at times even competing with the population it was intended to serve.

It is essential, therefore, to avoid excessive direction and investment from outside and to acquire instead an understanding of the cohesiveness and intricacy of existing farming systems in matters such as the seasonal labor pattern and differentiation of tasks between men and women. Assistance from designated authorities will be more effective if it is unobtrusive and encourages farmer and community initiatives.

To provide the extension of small-scale irrigation, a technical and financial support service in scheme design and implementation which operates together with any local rural development programs is needed. The staffing of this service will call for professional and technical personnel of a high caliber, and capable of working together with the rural community. Their selection and training will be a matter of priority. The experience and knowledge they gain in their work will become an invaluable asset to future development programs.

Policy Issues

The concentration of effort and investment on large-scale irrigation projects such as the Shebelli, often modeled on similar schemes in other

countries, has generally failed to achieve the predicted goals of production and economic returns. A critical reappraisal of approaches is called for in order to find solutions which are better applied to African needs. Some of the policy lines which can be expected to lead toward more effective and more productive irrigation are:

1. Clear distinctions must be made between a production-orientation and serving the broader role of improving rural life and society. The objectives may not be mutually exclusive, but once the primary aim has been defined, the conceptual, physical and institutional design must be entirely suitable to fulfill that purpose.

2. Proposed production-oriented aspects must pass the test of technical and economic feasibility, and there must be a guarantee that the necessary management skills and material inputs will be provided. To initially insure these, consideration must be given to external channels of local private enterprise in addition to governmental sources. But there should be an underlying longer term national policy for scheme management within general policies for manpower development and use.

3. For the Shebelli Project, rehabilitation is rightfully a priority concern in order to derive maximum benefit from the sunken investment, and from experienced human resources. Procedures for the evaluation of performance and subsequent redesign should extend beyond structural and technical changes to include the design of management systems with appropriate decentralization and deregulation of authority and responsibility, reaching ultimately the farmers themselves.

4. Assuming the Shebelli Irrigation Project is intended to form a component of a more general program for rural development improvement, it should satisfy broader criteria than the typical economic analysis. It should offer scope for informal small scheme development through farmers groups and water user associations, as discussed previously. It should also place emphasis on self-help and self-sustainability, impose a minimum of external regulation and offer attractive financial incentives through community pricing structures.

5. The support services to irrigated agriculture have to provide technical assistance to the scheme for construction, operation, maintenance, and eventually for mechanization. This is besides the usual services for extension, marketing and credit. For the large-scale portion of the Shebelli scheme, the provision of such services will be the responsibility of the scheme management. For the small-scale portions, these services must be organized or provided by the appropriate government agency, such as the Agricultural Extension Service. They must operate at the district or local level to reach the farming communities and small farmers.

6. The human needs must be kept in view, and this calls for the inclusion of policies to reduce the poverty gap and to raise the quality of life in the communities served. This should be done through increased attention to disadvantaged groups, recognition of the particular role of women in agriculture and the incorporation of health measures to the provision of safe water supplies and protection against water associated diseases.

APPENDIX D

WATER MANAGEMENT SYNTHESIS PROJECT REPORTS

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WATER MANAGEMENT SYNTHESIS PROJECT REPORTS

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WMS 2 Nepal/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 3 Bangladesh/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 4 Pakistan/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 5 Thailand/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 6 India/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 7 General Asian Overview

WMS 8 Command Area Development Authorities for Improved Water Management

WMS 9 Senegal/USAID: Project Review for Bakel Small Irrigated Perimeters Project No. 685-0203

WMS 10 Sri Lanka/USAID: Evaluation Review of the Water Management Project No. 383-0057

WMS 11 Sri Lanka/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 12 Ecuador/USAID: Irrigation Sector Review

WMS 13 Maintenance Plan for the Lam Nam Oon Irrigation System in Northeast Thailand

WMS 14 Peru/USAID: Irrigation Development Options and Investment Strategies for the 1980's

WMS 15 Diagnostic Analysis of Five Deep Tubewell Irrigation Systems in Joydebpur, Bangladesh

WMS 16 System H of the Mahaweli Development Project, Sri Lanka: 1980 Diagnostic Analysis

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WMS 17 Diagnostic Analysis of Farm Irrigation Sysems on the Gambhiri Irrigation Project, Rajasthan, India: Volumes I-V

WMS 18 Diagnostic Analysis of Farm Irrigation in the Mahi-Kadana Irrigation Project, Gujarat, India

WMS 19 The Rajangana Irrigation Scheme, Sri Lanka: 1982 Diagnostic Analysis

WMS 20 System H of the Mahaweli Development Project, Sri Lanka: 1983 Diagnostic Analysis

WMS 21 Haiti/USAID: Evaluation of the Irrigation Component of the Integrated Agricultural Development Project No. 521-0078

WMS 22 Synthesis of Lessons Learned for Rapid Appraisal of Irrigation Strategies

WMS 23 Tanzania/USAID: Rapid Mini Appraisal of Irrigation Development Options and Investment Strategies

WMS 24 Tanzania/USAID: Assessment of Rift Valley Pilot Rice Project and Recommendations for Follow-On Activities

WMS 25 Interdisciplinary Diagnostic Analysis of a Work Plan for the Dahod Tank Irrigation Project, Madhya Pradesh, India

WMS 26 Prospects for Small-Scale Irrigation Development in the Sahel

WMS 27 Improving Policies and Programs for the Development of Small-Scale Irrigation Systems

WMS 28 Selected Alternatives for Irrigated Agricultural Development in Azua Valley, Dominican Republic

WMS 29 Evaluation of Project No. 519-0184 USAID/El Salvador, Office of Small-Scale Irrigation - Small Farm Irrigation Systems Project

WMS 30 Review of Irrigation Facilities, Operation and Maintenance for Jordan Valley Authority

WMS 31 Training Consultancy Report: Irrigation Management and Training Program

WMS 32 Small-Scale Development: Indonesia/USAID

WMS 33 Irrigation Systems Management Project Design Report: Sri Lanka

WMS 34 Community Participation and Local Organization for Small-Scale Irrigation

WMS 35 Irrigation Sector Strategy Review: USAID/India; with Appendices, Volumes I and II (3 volumes)

WMS 36 Irrigation Sector Assessment: USAID/Haiti

WMS 37 African Irrigation Overview: Summary; Main Report; An Annotated Bibliography (3 volumes)

WMS 38 Diagnostic Analysis of Sirsia Irrigation System, Nepal

WMS 39 Small-Scale Irrigation: Design Issues and Government Assisted Systems

WMS 40 Watering the Shamba: Current Public and Private Sector Activities for Small-Scale Irrigation Development

WMS 41 Strategies for Irrigation Development: Chad/USAID

WMS 42 Strategies for Irrigation Development: Egypt/USAID

WMS 43 Rapid Appraisal of Nepal Irrigation Systems

WMS 44 Direction, Inducement, and Schemes: Investment Strategies for Small-Scale Irrigation Systems

WMS 45 Post '87 Strategy for Irrigation: Pakistan/USAID

WMS 46 Irrigation Rehab: User's Manual

WMS 47 Relay Adapter Card: User's Manual

WMS 48 Small-Scale and Smallholder Irrigation in Zimbabwe: Analysis of Opportunities for Improvement

WMS 49 Design Guidance for Shebelli Water Management Project (USAID Project No. 649-0129) Somalia/USAID