

682-0203
FD-424-01-B1
2

UNCLASSIFIED

MAURITANIA, RURAL LAND RECLAMATION PROJECT (682-0203)

PROJECT PAPER

INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

Authorized LOP -- \$8,900,000

Approved June 2, 1981

JUN 1 1981

ACTION MEMORANDUM FOR THE ACTING ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AAA/AFR/DR, John W. Koehring *JK*
SUBJECT: Mauritania Rural Land Reclamation Project, 682-0203

Problem: Your approval is required to execute a grant of \$8,900,000 from the Sahel Development Program appropriation (SH) to Mauritania for the Rural Land Reclamation Project, 682-0203. It is planned that \$2,122,000 will be obligated in FY 1981. Your approval is also required for a waiver to allow the procurement of ten four-wheel drive vehicles for the project from Code 935 countries.

Discussion:

A. Description of the Project:

The project is directed to strengthening the ability of the Government of the Islamic Republic of Mauritania (GIRM) to design and construct durable dams which will increase cultivable land for agricultural production in the Brakna and Gorgol regions. Small earthen dams in the dryland interior have been used traditionally to facilitate recessional agricultural production which is based on cultivating the saturated soils resulting from retaining rainwater-runoff behind dams located across intermittent dry stream-beds. This system allows otherwise marginal land to become productive. The current system of recessional agriculture suffers from poorly constructed dams which wash out and have to be rebuilt each year. The GIRM is embarking on a national program to make the dams more durable. This project will provide technical assistance to the GIRM Rural Works Department to establish procedures, standards, and criteria for dam site selection and design, to establish a capability for contract and construction administration and to create a quality control unit. The project will also finance the construction, by local contracts over three years, of ten small dams in the Brakna and Gorgol regions which will open up 800 hectares of additional recessional agricultural land, directly benefitting 8,400 people in rural communities and increasing agricultural production by 680 tons a year. In addition, the project will introduce measures for the surveillance, treatment, and control of major water-borne diseases related to recessional agriculture, particularly schistosomiasis.

The project is consistent with A.I.D.'s development strategy in Mauritania, i.e., toward developing the interior of the country to increase food production and to encourage the rural population to remain in rural areas. While the project focusses on increasing the GIRM's ability to manage a national small dam program, the long range impact will most likely be more substantial. Improving recessional agriculture will make agricultural production possible on marginal land that otherwise would be abandoned by rural people moving to urban areas. The rapid rate of urbanization is straining the GIRM's ability to manage its affairs. Encouraging people to remain productive in the interior is thus a priority in Mauritania.

B. Financial Summary:

A.I.D. funding for the project is broken down as follows:

	<u>First Year</u>	<u>LOP</u>
Technical Assistance	\$ 847,000	\$1,690,000
Commodities	773,000	977,000
Participant Training	98,000	98,000
Dam Construction Costs	-	4,381,000
Other (engineering design, evaluation)	404,000	481,000
Total:	\$2,122,000	7,627,000
Local Cost financing		\$1,273,000
Grand Total:		\$8,900,000

The contribution of the GIRM to this project is \$494,000 and represents GIRM personnel and dam maintenance-related costs.

This project is one of several donor-supported activities to assist the GIRM Rural Works Department implement a national program for the construction, repair, and maintenance of recessional agricultural dams. The FED is currently financing the construction of eleven dams in the Hodh regions; UNSO is financing several dams in the Assaba region; and the West German Government will fund the construction of up to fourteen dams in the Tagant region.

C. Socio-economic, technical and environmental description:

Recessional agriculture resulting from rainwater-runoff retention dams in the interior of the country is based on traditional practices. Improvements in the construction and maintenance of such small dams is the most commonly suggested development action by all groups in Mauritania. Recessional agriculture reduces production risks in a delicate environment and enables otherwise marginal land to become productive. This project has been analyzed and judged technically sound.

This project IEE establishes a negative determination; no future environmental analyses are necessary as steps being taken in the project will mitigate any possible adverse effects. Water-borne diseases associated with dam-based recessional agriculture will be addressed through assistance to the GIRM National Hygiene Center in the establishment of a surveillance, treatment, and control program for schistosomiasis and the provision of drug treatments and molluscicides. Dracunculiasis (guinea worm) will also be controlled. Training in malaria surveillance will be provided in order to establish a data base for future malaria control programs the GIRM may undertake.

Among the criteria for dam site selection will be environmental standards, including effects on downstream communities.

D. Conditions and Covenants; Waivers, and Implementation:

1. A Condition Precedent in the Grant Agreement will be a commitment by the GIRM to negotiate and sign a contract with each community where dam construction is proposed in this project. The contracts will require the communities to maintain the dams and to distribute the increased agricultural land in such a manner so that all member families will benefit.

Additionally, the GIRM will be responsible for establishing a mechanism to monitor compliance with the community contract. Such contracts, spelling out rights and obligations of each party prior to assistance, are a current practice in Mauritania and are part of other A.I.D.-assisted projects, e.g., Oasis Development (682-0207).

Two covenants will be included in the Grant Agreement. The GIRM will covenant to provide counterparts required for the technical assistance contract team. The GIRM will also covenant to plan for the active involvement of the National Agricultural Training and Extension School (Kaedi) in the extension of improved agronomic practices to farmers engaged in recessional agriculture in the project area.

2. A waiver is requested to allow for procurement of four-wheel drive vehicles from non-U.S. sources. The waiver is found in Annex C of the Project Paper. A waiver will also be requested for the procurement of Ambilhar for the treatment of schistosomiasis and for Bayluscide (a molluscicide which kills snails that are an intermediate host for the schistosomiasis vector), but is not requested at this time.
3. The Implementation Plan contained in the PP has undergone further consideration, as outlined in the addendum to this memorandum. It is now believed to be realistic and establishes a more reasonable time frame for carrying out the project.
4. The project will be implemented through the GIRM Rural Works Department (Genie Rural), a division of the Ministry of Rural Development. The GIRM National Hygiene Center, a division of the Ministry of Health, Labor, and Social Affairs, will manage the modest health-related interventions. While the Project Paper discusses two U.S. contracts, one with an Architectural/Engineering firm for the final design and specifications for dam construction and another with an institution for the provision of technical assistance, the two requirements might possibly be met through a single architect/engineering contract. The

ten dams to be built in the project will be constructed through contracts with construction firms located in Mauritania.

E. Committee action and Congressional apprisement:

1. At the ECPR chaired by you on 19 May 1981, the project was reviewed with no issues outstanding from the Project Review of 11 May 1981. Supplementary information as requested at the ECPR is provided in the addendum to this memorandum.
2. Congressional Notification went forward on 19 May 1981; it will expire on 2 June 1981.

F. Requirements of 611(a) of the FAA have been satisfactorily met.

G. The cost benefit analysis in Annex H-3 indicates that construction of the individual water-related structures is acceptable; the requirements of Section 611(b) of the FAA, therefore, have been satisfactorily met.

H. The project manager responsible for the project in USAID/Nouakchott is James Wedburg; the Project Officer in AFR/DR/SWAP is G. William Anderson.

III. Recommendation: That you sign the attached Project Authorization, and thereby approve life-of-project funding of \$8,900,000, and the Code 935 source/origin waiver for the procurement of project vehicles.

Clearances

AG. DAA/AFR:RStacy
 AFR/DR:NCohen
 AFR/DR/SWAP:JRMcCabe
 AFR/DR/SWAP:GWAnderson
 AFR/DR/ARD:DSchaer
 AFR/DR/ARD:GSteele
 AFR/DR/ENG:MGould
 AFR/DR/SDP:JHester
 AFR/DR/RI:JStockard
 AFR/SWA:ICoker
 AFR/SWA:HGray
 AFR/DP:JAnderson
 GC/AFR:TBork

[Handwritten signatures and initials over the clearance list]
 (draft) *[initials]*
 (draft)
 DHB-
 (draft)
 JSH 5/26/81
 G.W. 5/26/81
 J. 5/27/81
 J. 5/27/81
 J. 5/27/81
 J. 5/27/81
 J. 5/27/81

Drafted by: USAID/Nouakchott:AReed:cd:5/26/81:ext:28242

ADDENDUM TO PROJECT AUTHORIZATION ACTION MEMORANDUM

MAURITANIA RURAL LAND RECLAMATION PROJECT (682-0203)

The following additional information and/or reflection of minor modifications in the subject Project Paper result from concerns surfaced during the ECPR of 19 May 1981:

1) Economic value of dam construction - Small dam-based recessional agriculture is a major economic activity in the interior of Mauritania. However, its total economic value cannot be assessed through traditional economic analyses, which stress the value of production alone. Recessional agriculture is basically a risk-reduction activity as opposed to a purely production effort. The importance of risk-reduction strategies in African agriculture is well-known; its role in Mauritania is recognized in the FY 1983 CDSS (page 22). Risk-reduction in the context of dam-based recessional agriculture means engaging in reliable, drought-resistant cropping patterns until farmers are assured of meeting basic needs. If the objective is to encourage agriculturalists to attempt more productive innovations, one must initially meet their perceived needs through assistance in developing a strong core of low-risk dependable activities. The economic value of such an approach cannot be fully assessed by the market value of production as there is the significant but unquantifiable additional value of insurance.

Without the assurance of a reliable agricultural yield that recessional agriculture provides, farmers in the interior would be forced to abandon cultivation because of the unreliability of rainfall at specific locations. The nature of small dam-based recessional agriculture is such that even limited rainfall in a much larger area allows successful crop cultivation on land that would otherwise remain unproductive.

Without the alternative of durable dam-based recessional agriculture, farmers have abandoned farming in the interior and have migrated to urban areas where they have been unable to engage in productive activities and have become an economic and social burden to the GIRM.

2) Implementation timetable - The implementation timetable has been changed to reflect a later likely signing of the technical assistance contract than was originally envisaged. Because of the effects this may have on fielding a technical assistance team to design the dams to be rebuilt during 1982, and on the construction activities to be undertaken during that period, the construction schedule for 1982 and 1983 has been changed. During the first year of construction, only the three dams with minor repairs or modifications (Lemaoudou, Timbara, and Toueidima) will be scheduled. The other two dams which will involve larger construction components, Lefkarine and Boudjungal, will be scheduled for construction in 1983.

3) Covenant - A second covenant has been added to the Grant Agreement in which the GIRM will covenant to program the involvement of the National Agricultural and Extension Training School (Kaedi) in extending improved agronomic practices to the recessional farmers in the project area. (The PID for this AID project (682-0224) is expected in AID/W by July 1, 1981).

4) Training through local construction contracts - Construction of the ten dams financed by the project will be implemented through local construction contracts which will be managed by Genie Rural (the Rural Works Department). In order to enhance Genie Rural construction capability at the end of this project, construction contracts will be structured to include some training of Genie Rural personnel in small dam construction to supplement the training provided by the project technical assistance team. The skills to be stressed in such training will complement construction skills developed in Genie Rural by donors of similar projects in other regions of the interior as they support the creation of Mobile Brigades which implement dam construction through a force account modality.

PROJECT AUTHORIZATION

Name of Country: Mauritania

Name of Project: Rural Land
Reclamation

Number of Project: 682-0203

1. Pursuant to Section 121 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Rural Land Reclamation Project for Mauritania involving planned obligations of not to exceed \$8,900,000 in grant funds over a four year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project consists of assisting the Cooperating Country to strengthen its ability to design and construct durable dams which will increase cultivable land for agricultural production in the Brakna and Gorgol regions by financing the costs of (1) technical assistance to be provided to the Rural Works Department; (2) construction of ten small dams in the Brakna and Gorgol regions; and (3) development of measures for the surveillance, treatment and control of water-borne diseases related to project activities.

3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country or in the United States, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Condition Precedent

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement for the construction of any dams, the Cooperating Country shall submit to A.I.D., in form and substance satisfactory to A.I.D., (1) a written agreement with the community that will be using the agriculture land contiguous to such dam, which requires the community to maintain the dam and to distribute the agriculture land amongst all member families; and (2) evidence that a mechanism to monitor compliance with the community contract has been established.

c. Covenants

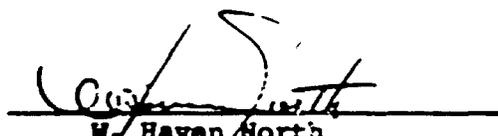
The Cooperating Country shall covenant to program the involvement of the National Agricultural and Extension Training School (Kaedi) in extending improved agronomic practices to the recessional farmers in the project area. The Cooperating Country shall also covenant to provide the counterparts to be trained by the technical assistance contract team.

d. Waivers

Notwithstanding paragraph a. above, the following waiver is hereby approved:

The requirement set forth in Handbook 1, Supplement B, Chapter 5, that commodities procured with grant funds have their source and origin in the U.S. and the requirement under Section 636(i), of the FAA of 1961, as amended, that vehicles financed by A.I.D. be manufactured in the U.S. are waived based upon the justification set forth in Annex C to the Project Paper, to permit procurement of ten four-wheel drive vehicles and spare parts, at an approximate cost of \$230,000 which have as their source and origin, countries included in A.I.D. Geographic Code 935. It is hereby determined that exclusion of procurement of project vehicles from Free World countries other than the Cooperating Country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program; and that special circumstances exist which justify a waiver of the requirements of Section 636(i) of the FAA of 1961, as amended.

Date: 6/1/81


W. Haven North
SA/APR, Acting

Clearances: As shown on Action
Memorandum

Drafted by: GC/APR: :cd:5/26/81

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT DATA SHEET	1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete <input checked="" type="checkbox"/> A	Amendment Number _____	DOCUMENT CODE 3
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2. COUNTRY/ENTITY MAURITANIA	3. PROJECT NUMBER 682-0203
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4. BUREAU/OFFICE AFRICA 06	5. PROJECT TITLE (maximum 40 characters) Rural Land Reclamation
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6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 07 31 86	7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4) A. Initial FY <u>81</u> B. Quarter <input type="checkbox"/> C. Final FY <u>84</u>
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8. COSTS (\$000 OR EQUIVALENT \$) =						
A. FUNDING SOURCE	FIRST FY <u>81</u>			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AD Appropriated Total (Grant) (1,835) (287) (2,122) (7,627) (1,273) (8,900) (Loan) () () () () () ()						
Other U.S. 1. _____ 2. _____						
Host Country Other Donor(s)	40	40	40		494	494
TOTALS	795	79	2,162	7,627	1,767	9,394

9. SCHEDULE OF AID FUNDING (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) SH	213	063				834		8,900	
(2)									
(3)									
(4)									
TOTALS						834		8,900	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each) 073 091 600 721 247 252	11. SECONDARY PURPOSE CODE 600
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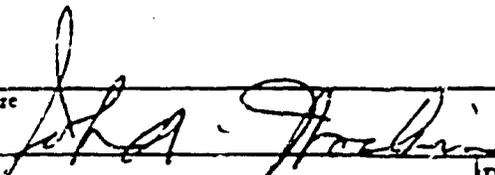
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each) A. Code BS ENV TNG B. Amount 8,900
--

13. PROJECT PURPOSE (maximum 480 characters)

To strengthen the GIRM's ability to design and construct durable dams which will increase cultivable land for recessional agricultural production in the Brakna and Gorgol Regions.

14. SCHEDULED EVALUATIONS Internal MM, YY MM, YY Final MM, YY 1 2 8 4	15. SOURCE/ORIGIN OF GOODS AND SERVICES <input checked="" type="checkbox"/> 000 <input checked="" type="checkbox"/> 941 <input checked="" type="checkbox"/> Local <input checked="" type="checkbox"/> Other (Specify) <u>935</u>
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16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY	Signature  Title Mission Director	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY 01 31 81
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AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT IDENTIFICATION DOCUMENT
FACESHEET (PID)

1. TRANSACTION CODE
A = Add
C = Change
D = Delete
Revision No.

DOCUMENT
CODE
1

2. COUNTRY/ENTITY
MAURITANIA

3. PROJECT NUMBER
682-0203

4. BUREAU/OFFICE
AFRICA
A. Symbol B. Code
06

5. PROJECT TITLE (maximum 40 characters)
Rural Land Reclamation

6. ESTIMATED FY OF AUTHORIZATION/OBLIGATION/COMPLETION
A. Initial FY 81
B. Final FY 84
C. PACD 85

7. ESTIMATED COSTS (\$000 OR EQUIVALENT, \$1 =)
FUNDING SOURCE LIFE OF PROJECT
A. AID 8,900
B. Other U.S. 1. 2.
C. Host Country 494
D. Other Donor(s)
TOTAL 9,394

8. PROPOSED BUDGET AID FUNDS (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH CODE		D. 1ST FY 81		E. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) SH	213	063		2,122		8,900	
(2)							
(3)							
(4)							
TOTALS				2,122		8,900	

9. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)
073 091 600 721 247 252

10. SECONDARY PURPOSE CODE
600

11. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)
A. Code BS ENV TNG
B. Amount 8,900

12. PROJECT PURPOSE (maximum 480 characters)
To strengthen the GIRM's ability to design and construct durable dams which will increase cultivable land for recessional agricultural production in the Brakna and Gorgol Regions.

13. RESOURCES REQUIRED FOR PROJECT DEVELOPMENT
Staff:

Funds

14. ORIGINATING OFFICE CLEARANCE
Signature
Title
Date Signed MM DD YY

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

16. PROJECT DOCUMENT ACTION TAKEN
S = Suspended CA = Conditionally Approved
A = Approved DD = Decision Deferred
D = Disapproved

17. COMMENTS

18. ACTION APPROVED BY
Signature
Title Mission Director

19. ACTION REFERENCE
20. ACTION DATE
MM DD YY
01 31 81

Outline for Project Paper

Mauritania Rural Land Reclamation Project

682-0203

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II. Project Paper Design Team

The following people were involved in the design of the Project Paper for Rural Land Reclamation from October 1980-February 1981:

Design Officer	:	Allan Dean	(Contract)
Civil Engineer	:	Lyle Weiss	(REDSO/WA)
Environmentalist	:	Vernita Fort	(REDSO/WA)
Agricultural Economist:		John Dorman	(REDSO/WA)
Agronomists		Roy Bronson	(REDSO/WA)
		James Hughes	(USAID)
Economist	:	David Carr	(USAID)
Sociologists	:	John Grayzel	(USAID)
		Melinda Smale	(PASA)
		Andy Manzardo	(Contract)
Procurement Advisor	:	Tony Bilecky	(REDSO/WA)
Health Advisors	:	Linda Neuhauser	(USAID)
		Dr. Emil Malek	(Wash-Contract)
		David Goff	(Wash-Contract)

Primary GIRM design counterparts: Hosseinou Fall, Director, Genie Rural
(Rural Works, Ministry of Rural Development)

Dr. Moustapha Siddat, Director, National
Hygiene Center (Ministry of Health, Labor,
and Social Affairs)

III. PROJECT DESCRIPTION

A. Background and Project Relevance:

Mauritania's overall development situation is critical, caused by a number of economic, social and environmental trends which have converged. Its overall food situation is particularly serious, highlighted by a decade of drought and increased desertification, the effects of which are threatening the agricultural productive base of the majority of the country's population. Annual per capita food production is declining and during the past 20 years there has been no significant shift from vulnerable forms of predominantly subsistence agriculture. Minimum overall annual cereal needs are estimated at 130,000 tons (120 kg per capita annually with a total population of 1.5 million) against an average output in recent years of 45-50,000 tons-leaving a chronic food grain deficit of approximately 130,000 tons annually. Unable to finance the food imports, Mauritania therefore has to rely on the international community which has provided substantial amounts of food. These problems are further aggravated by a massive rural exodus and the limited availability of necessary physical, human and institutional infrastructure.

Notwithstanding this situation, Mauritania has the potential for increasing agricultural production from rainfed land which would narrow the food gap and encourage the population to remain in the rural areas. Assuming desertification can be brought under control, Mauritania has natural resources that could be expanded in its semi-arid zones that are suitable for agricultural production. One of these resources is the intermittent water flow of its dryland streambeds. Significant production increases could be achieved through recessional agriculture practiced in streambed areas. While rainfall is irregular throughout Mauritania, when it does rain, rainwater runoff flows intensely through the natural relief of drainage basins and floods the dryland streambeds (oueds) providing enough moisture for the soil, if the runoff is retained to saturate the soil, for post-flood cultivation. This phenomenon has led to the construction of a large number of small dams across the streambeds to improve the retention, spreading, and infiltration of rainwater runoff floodwaters.

The practice of building these dams has been in existence over many decades, but with little attention to improving the construction methods. The traditional methods of construction include no engineering other than sight guesses, and no consideration for the actual volume of water which might be dammed as a function of the dimensions of the impoundment. Also, these dams are merely dry earthen mounds with no moisture compaction. Such dams usually fail after one season, and have to be rebuilt. This imposes an annual labor burden of sizeable proportions on the cultivating farmers, and in many cases, the sites have simply been abandoned after a major break.

The Government of the Islamic Republic of Mauritania (GIRM) proposes to build a number of larger modern dams, to a standard and of a nature that will last for decades, with minimum annual maintenance required by the farming community. This will open up a substantially greater recessional agriculture cultivation area for farmers, reduce their harvest uncertainties and labor burdens, and encourage them to remain food crop producers in their rural communities.

The USAID-supported Rural Land Reclamation Project will assist the GIRM to achieve the capability to administer its program for small designed dam construction. The project conforms both to national priorities of the GIRM, and to U.S. development strategy for Mauritania which is to concentrate on increased food production and improvement in living conditions in the traditional interior of the country. AID's focus is on innovative technical assistance projects which seek development of dryland agriculture.

B. Project Summary

Genie Rural (GR), the Rural Works Service within the Ministry of Rural Development, has been charged by the GIRM to administer the national program for construction of recessional agriculture dams. GR does not have sufficient numbers of trained and experienced technical and administrative personnel, and needs technical assistance in order to administer the program. The Rural Land Reclamation Project will help Genie Rural to develop the capacity to administer this program. GR will achieve competency in evaluating and selecting locations for dams, developing and applying appropriate standards of design and construction, supervision of contractor performance, and administering systems for maintenance of the dams. Included in this project will be the construction of a number of dams both as a training vehicle in building institutional competence in GR and to provide

greater areas of recessional agriculture.

AID will provide technical assistance and support to this four year project, including financing the construction of up to ten dams, for a total cost of \$8,900,000. The GIRM will provide counterparts and the contributed labor of participating farmers in the barrage communities for an estimated total of nearly 200 person years. The value of Mauritania's contribution will be approximately \$494,000.

C. Purpose

Through this project, AID will help Genie Rural to become fully capable of designing and constructing durable dams which will increase cultivable land for recessional agriculture. The training which this project will provide is essential for GR to undertake management of the national program for dam construction. A number of donor projects to finance Mauritanian dam construction are planned, including German assistance for 14 dams in Tagant Region, and a UNSO project for several dams in Assaba and other locations. One project currently under way with FED assistance is the construction of 11 dams in the Hodh Regions, temporarily managed by SONADER (see IV B and Annex H-1). The Ministry of Rural Development intends to transfer responsibility for this project to GR. The Hodh project currently is suffering from inadequate design and construction standards, and two of the first three dams already constructed have failed.

During design of this project, the alternate option of helping the GIRM to achieve its purpose through a force account construction capability was considered. This option was rejected in favor of the contracting method for the reason that such an organization would be costly for the GIRM to operate after the end of project, would be administratively more difficult to organize and train, would require a longer time frame to gear up with necessary construction equipment and maintenance shop facilities, and would result in delay in achieving actual construction of desired dams, with higher inflation impact on material costs.

D. Inputs and Outputs:

Technical assistance and practical training in site evaluations, engineering and construction standards and specifications, contracting and contract supervision and inspection, and maintenance systems and standards will be provided to GR through this project. These inputs will result in selection of a number of dams in the Brakna and Gorgol Regions for construction under contract, preparation of construction plans and specifications for the selected dams, construction contracting, construction inspections, and maintenance systems and contracts with the participating communities. Twelve GR personnel will receive training and experience. Up to 1300 farming families will participate in the maintenance of the dams and will receive instructions and support through the project (See IV and Annex H-1). Other outputs will include the dams themselves which are to be constructed under the project, and a small equipment pool for maintaining dams. In the course of the development of this project, USAID contracted with SONADER (the National Rural Development Corporation, a parastatal organization with connections to the

Ministry of Rural Development) to prepare detailed technical studies at fifteen possible dam sites in the Brakna and Gorgol Regions. The studies included topographical, hydrological, geotechnical, and pedologic studies. As a result, ten of the fifteen sites appear to be promising sites for dam construction or repair. The ten sites are Bou Soueiffa , Lefkarine, Zneilat , Ameira , Moundi Founti, Timbara , Toueize Grett Tagat, Toueidina, Boudjougol, and Lemaoudou.

E. Beneficiaries: (see more detailed discussion in VI D and Annex H-4)

The ten dams scheduled in this project would open up some 800 new hectares of recessional agriculture land for cultivation. On the basis of field observations, community interviews, and judgments of RAMS (Rural Assessment and Manpower Survey, USAID Project 682-0211), and other technicians, it is estimated that one and a half families will cultivate each hectare of new cultivation area. This represents an average population of 10.5 persons per hectare. The value of average production per ha. is estimated at between \$375 and \$425 annually, primarily in sorghum (50%), cowpeas (25%). Primary beneficiaries would include worker/owner families for the most part, some of whom would also sharecrop plots for absentee owners, to supplement their incomes. These families are estimated to contain around 8,400 individuals.

The farmers are of the ranks of the low income population in the rural areas. The yields from these new plots will help meet their family cereal needs thereby reducing their requirements for food purchases or food aid. The project will thus improve the production of these rural farming families and their ability to sustain themselves in the rural communities.

F. Critical Assumptions

- 1) That the new areas made available for cultivation are sufficient inducement for farming families to exploit them.

Farmers in these regions are accustomed to practicing recessional agriculture. Even when it imposes additional labor requirements on them to construct and repair dams, the greater assurance of harvest under recessional cultivation is usually all the motivation they need. Since these new basins will

require little annual maintenance, the cultivation plots will be in demand. It should be noted that a proposed new USAID project (Agricultural and Human Resources Development (Kaedi), Project 682-0224) will assist the GIRM to upgrade and broaden the curriculum at the National Agricultural Training and Extension School at Kaedi. This will include programs aimed at improving techniques of cultivation in recessional basins. The new project will further encourage and assist farming families who cultivate the recessional basins to increase their production and productivity. Since the implementation of the project at the Kaedi school will involve active extension efforts by the agriculture and engineering students to reach the recessional farming communities in this project zone in order to introduce new agronomic techniques and the proper utilization and maintenance of rainwater runoff retention dams, USAID has deleted any direct agronomic interventions as part of the implementation of the Rural Land Reclamation Project.

- controlled. 2) That social constraints which may impede full utilization of the new areas by traditional farmers will be satisfactorily controlled. A condition precedent to U.S. financing specific dam construction under the project will be an acceptable system of criteria and procedures which the GIRM will develop for insuring fair assignments of rights, benefits and responsibilities to members within the communities. These criteria and procedures will be formalized in contracts between the GIRM and the individual communities. The Ministry of Rural Development will monitor compliance by the communities through the Cooperative Service of the Agriculture Directorate or through other mechanisms acceptable to USAID. The mid-project evaluation will also address compliance with and adequacy of the standards and contracts. (See IV C1, V and VI D1).
- 3) That health and environmental impacts of the dams are positive, or any negative impacts can be satisfactorily relieved. Assurances as to these are found in VI C and VI F below.
- 4) That the time frame of the project is sufficient to develop the capacity of GR to continue administering these activities. The four years established for life of project will permit GR to gain experience in selection, design, contracting and construction inspection for up to ten dams of various sizes, configurations and components. This number and time period are deemed to be sufficient to accomplish the

capability level needed in GR. This will one of the considerations to be judged during project evaluations (See V). While the project can give no assurance that the GIRM will have continuing resources to finance new dam construction, there is substantial donor agency interest in such programs as evidenced by the programs for the Hodh Regions (FED), Tagant (German assistance) and Assaba (UNSO) referred to earlier. It can be expected that the model program which this project will provide and the improved competence in the GIRM to administer such programs will be added encouragement to potential future donor assistance.

In addition, in Mauritania there are communities which have mobilized their own resources and are prepared to invest in recessional agriculture dams. A proven capability in the GIRM to manage more effective dam construction will be added incentive for such community investment.

- 5) That dams can be constructed to the intended quality standards. This would be a more significant issue were the facilities to be built through a force account unit under training. The U.S. advisory component in this project working with GR should be adequate to verify that the construction contractors are qualified and that they perform to specifications. It should be noted, however, that the UNSO project proposal does contemplate a force account approach of modest proportions, which, if implemented, could give GR an option to follow more than one mode for construction in its management of the national small dam program.
- 6) That there is a national commitment for appropriate standards of design and construction for permanent dams. This will be a major responsibility of the advisory team, to sensitize GR and the GIRM to the importance of adequate standards, adequately applied. (See VIA).
- 7) That there is an effective commitment and participation on the part of communities to cooperate in maintenance of their dams. This will be a provision and condition in the contracts between the community and the Government (see critical assumption 2 above). Recessional agriculture farmers are accustomed to repair and maintenance of their self-constructed traditional dams, and could be expected to meet their obligations under such contracts.

- 8) That sufficient number of the sites prove to be feasible for selection and construction, so that there will be a sufficient representative number for the training and standards objectives. This appears not to be a problem inasmuch as eight of the ten sites require little additional verification to meet desired engineering criteria.
- 9) That qualified construction contractors will bid for the contracts. There are four indigenous firms possessing technical capability necessary to construct the structures envisioned in this project. This will provide for competitive bidding to be successful since the amount of work is relatively substantial for Mauritania.
- 10) That Genie Rural has sufficient qualified personnel to receive on-the-job training and experience. Key personnel who would be counterparts for the technical advisors are already in position or have been nominated. Candidates who will train as equipment repair mechanics and parts clerk will be transferred from other sections of government where they currently are under-utilized.
- 11) That the trained personnel remain with Genie Rural upon completion of the project. This is a persistent issue with training programs. The demand for experienced technicians in West Africa is so great that opportunities for advancement elsewhere are tempting to the better qualified. It would not be prudent nor feasible to attempt to constrain such mobility. The hope is that a well-trained, efficient and respected cadre will develop a professional esprit which will motivate the best people to remain.

IV Implementation Planning

A. Summary of Elements and Responsibilities

Important implementation elements for the Rural Land Reclamation Project and the responsible organizations are these:

1. Contracting for preparation of construction plans and specifications for construction: USAID prepares PIC/T and forwards to AID/W which solicits bids and negotiates contracts.
2. Contracting for the technical assistance advisory team: USAID prepares PIC/T; AID/W issues

RFP and negotiates contract. GIRM provides counterparts in Genie Rural upon arrival of advisors in country.

3. Procurement of equipment and commodities relating to technical assistance advisory and training function: USAID prepares PIO/C for action by a procurement services agent (AAPC or other PSA to be selected).
4. Development of standards for design and construction of dams, and systems for inspection of construction implementation by contractor: Genie Rural and advisors.
5. Development of criteria and methodology for evaluating and proposing communities where dams could be constructed.
6. Contracting with communities where dams will be constructed under this project. (See VI D and III f-2). GIRM responsibility with USAID review and concurrence in methodology and proposed contracts.
7. Development of standards and systems for maintenance of dams by communities: GR with advisors.
8. Contracting for construction of dams: GR with advisors.
9. Procurement of commodities for construction: Included in construction contract; contractor procures.
10. Monitoring contractor performance:
 - a) for technical assistance, USAID monitors
 - b) for construction contracts, GR and advisors monitor
11. Studies of feasible interventions to combat water-borne diseases in dam areas: Ministry of Health with USAID.

12. Trial interventions resulting from studies: Ministry of Health.
13. Support to these health interventions: USAID.
14. Studies of sedimentation in impoundment basins as it affects water management, cultivation and crop yields: GR initiative with advisors; Agriculture Directorate participation. (Using SONADER agro-pedologic reports - See VI C2).
15. Procurement of maintenance equipment and hand tools, etc. for dams, spillways and outlet works; USAID prepares PIO/C for action by a procurement services agent (MAPC or other to be selected).
16. Training of mechanics and one inventory control/store-keeper for spare parts, at an institution such as CERFER in Lome, Togo: Genie Rural and USAID.
17. Contract for construction of warehouse at Aleg for storage of project commodities: Engineering by REDSC, Genie Rural responsible for contracting (with assistance of technical advisor).
18. Project evaluations: GIRM/USAID with participation of other AID representatives from REDSO and/or AID/W.

IV B. Implementation Schedule

In designing this project it has been assumed that the project authorization will take place in the third quarter of FY 1981 and that implementation will commence immediately upon signing of the ProAg. This will be essential for the construction schedule as programmed and budgeted to be adhered to, since construction as designed can take place only during and within six months of the end of seasonal rains because of the need for water for construction and soil compaction. (See Annex H-1, Section III A and B).

Requests for proposals (RFP) for the technical assistance advisory team and for engineering services (preparation of construction drawings and specifications) should therefore be expedited through the early issuance of PIO/T's by USAID.

The schedule of implementation action is as follows:

Organizations Listed in Calendar

T S C Team:	Contractor which provides technical advisors; Technical Advisory Team.
USAID:	Usually means Project Manager primary responsibility, unless for health activities, in which case it is the USAID Health Advisor. Where financial matters are involved, it means the Controller organization; where commodities are involved, the Program Support Division.
GIRM:	The symbol is used for functions which are broader than one ministry (negotiating contracts with the commodities, for example).
GR:	Genie Rural, Ministry of Rural Development, -- the primary action agency of the Government for this project.
REDSO:	Regional Development Services Office-- provides engineering, legal, commodity systems and contracting advisory services.
AAPC:	African American Purchasing Center.
CNH:	Centre National de Hygiene (Ministry of Health) (National Hygiene Center).

<u>DATE</u>	<u>ITEM</u>	<u>ORG (S) RESPONSIBLE</u>
<u>1981</u>		
<u>June</u>	Project Authorization	AID/W; USAID
	Project Agreement	AID/W; USAID; GIRM
	PIO/Ts for Engineering Plans and TSC	USAID, GR
<u>July</u>	RFP for Technical Services Contract (TSC) Team	AID/W; USAID
	RFP for Engineering drawings/specifications	
	PIO/Cs for project vehicles and office and residential furnishings	USAID
<u>August</u>	Procurement of these	AAPC or other PSA
	Analysis of soils re: siltation	SONADER/GR
<u>September</u>	Participant training (4 mos.) for health specialists	USAID and CNH
	Health Consultant (1 month) for planning the training, surveillance, and control program.	USAID and CNH
	Options for participant training for maintenance mechanics investigated	USAID
<u>October</u>	REDSO engineering for mobile test labs	REDSO, USAID
<u>November</u>	PIO/C for mobile test labs, procurement	USAID; AAPC
<u>Jan.-Feb., 1982</u>	Contract for TSC team signed	AID/W
	Contract for engineering drawings/specifications signed	AID/W
	Alternative health interventions analyzed; prog. agreed.	USAID and CNH

<u>DATE</u>	<u>ITEM</u>	<u>ORG (S) RESPONSIBLE</u>
<u>Jan.-Feb., 1982</u>	GIRM study of community selection criteria and system	GIRM
	TSC team administrative specialist arrives (3-month assignment)	USAID; GR
<u>March</u>	Health participants return; surveillance and contract program begins	USAID/CNH
	Housing and Office arrangements for TSC contract team	TSC; USAID
	Financing system for TSC contract team	TSC; USAID
	Employment of local staff	TSC; USAID
<u>April</u>	Counterpart arrangements finalized	USAID;TSC;GR
	Commodities for TSC contract team arrive	TSC; USAID
<u>May</u>	TSC contract team members arrive	TSC; USAID
	Engineering drawings/specs received for 1st five prop. dams	TSC; GR
	GIRM proposes draft community contracts for construction sites	GIRM
	USAID agrees with GIRM community contract proposals	USAID
	First phase dams advertised to contractors	GR; TSC

<u>DATE</u>	<u>ITEM</u>	<u>ORG (S) RESPONSIBLE</u>
<u>May- June</u>	Community contracts signed	GIRM
	Maintenance equipment ordered	TSC; GR
<u>June</u>	Warehouse site(Aleg) provided; engineering drawings/spec.	REDSO; GR; TSC
	Maintenance equipment partici- pants depart for 2 year training	USAID; GR
	Aleg warehouse-advertise for construction award contract	GR; TSC; USAID
	Bids for construction first dam received and evaluated; con- tract awarded	GR; TSC; USAID
<u>June-July</u>	GR drafts standards: design and construction of dams, quality control of construction and community maintenance	GR; TSC
	Mobile labs arrive, are delivered to Aleg yard	USAID; GR; TSC
	Construction drawings/specs re- ceived for phase 2 dams	GR; TSC
	GIRM begins analysis phase 2 communities	GIRM
<u>August</u>	Construction starts on phase 1 dams	Contr. GR; TSC
	GIRM drafts community contracts for phase 2	GIRM
	USAID reviews phase 2 proposed construction; concurs	USAID; GIRM
<u>September</u>	Second phase dams advertised	GR; TSC
	Community contracts signed	GIRM
	Aleg warehouse complete	GR; TSC; USAID

<u>DATE</u>	<u>ITEM</u>	<u>ORG (S) RESPONSIBLE</u>
<u>December</u>	Construction drawings/specs received for remaining dams	GR; TSC
<u>January-March</u> <u>1983</u>	Maintenance equipment arrives	USAID; GR;TSC
	Bids for phase 2 construction received and evaluated; contract awarded	GR; TSC; USAID
<u>April-June</u>	Standards for construction, quality control and maintenance refined	GR; TSC
	Construction phase 1 dams complete	
<u>August</u>	Construction starts of phase 2 dams	Contr.; GR; TSC
<u>October-December</u>		
	First project evaluation	USAID;GIRM
<p>For continuation of the project, calendar for site selections and approvals, and advertising and contracting follows as for phase 1 dams. Other implementation actions include these:</p>		
<u>January 1984</u>	TSC team completes assignment and departs	USAID
<u>March 1984</u>	Maintenance mechanics complete training; are assigned in GR	GR; USAID
<u>October-</u> <u>December 1984</u>	Final Project Evaluation	USAID/GIRM

IV C. Organizational Capacities and Responsibilities

The organizations and agencies having implementation responsibilities for this project should have little problem assuming their functions within current staffing levels and charters. The most significant work-load impact will fall on Genie Rural, within its recently-assigned responsibilities.

1. An important role for the GIRM is to develop a methodology for evaluating and selecting sites for dams, and for contracting with the communities to insure proper operation and maintenance of their facilities (See III F2 and VI D). Methodology and draft contracts which are satisfactory to USAID will be a pre-condition to construction contracts under the project. There may be several options available to the GIRM to accomplish the selection system and the contracts. An illustrative method might be through an ad hoc task group coordinated by the Ministry of Rural Development, with such services as Agriculture, Cooperative Service, Genie Rural and local government represented. There will be a continuing function for monitoring compliance with contracts by the communities. The GIRM may wish to assign this function to the Cooperative Service, which has a representative in the area.

None of the foregoing activities, following the illustrative mode, would impose difficult problems for GIRM, except the time involved for the participants. In most cases, these might be among their normal functions (i.e., role of Governor, Prefect, Cooperative Services personnel). Depending on the approach taken by the GIRM, it might be necessary for someone to be temporarily detailed from other current assignments (such as a rural sociologist, perhaps). In any case, it will be incumbent on the GIRM to accomplish the methodology and the contracts.

The community contract monitoring function will be of special interest to USAID, although it will be conducted by the GIRM. In view of the GIRM's limited resources, it is advisable for a vehicle to be provided for use in the dams area for this function, either by the Cooperatives Service agent or other organization having this function. The GIRM will be expected to finance the operating and maintenance costs of the vehicle which will be provided through project funds.

2. The Ministry of Health will have the principal responsibility for implementing the schistosomiasis-control component of this project, through the National Hygiene Center (CNH) which is a directorate within the Ministry. CNH carries out health research and surveillance activities. The center is staffed with both Mauritians and expatriates and has a modest laboratory. Schistosomiasis surveillance and control activities can be easily integrated into the CNH.

Current staff members will be trained and these functions added to the Center's work plan. CNH's managerial and laboratory capacities are adequate to support these activities. In a larger context, the Ministry of Health is very interested in undertaking these schistosomiasis control activities and so other directorates, such as Preventive Medicine, will collaborate with CNH.

3. Genie Rural will have the paramount implementing role in this project, since it is responsible for rainwater runoff retention dam construction and for maintenance of such dams. A staffing of technicians has been programmed for GR and a number of personnel are on board. They have varying degrees of experience, most of which relates to construction/maintenance of incompletely designed or non-engineered dams. GR will need substantial technical assistance, as is provided in the project, to develop and administer a national program for designed dams.

Current technical staffing in Genie Rural is thin. The Director is a well-trained and experienced agricultural Engineer (Ingenieur Agronome), a graduate of the University of Louvain in Belgium who has been assigned to Mauritanian rural works activities for eight years. One other Mauritanian assigned to GR has engineer-level training. He is a recent graduate of E.I.E.R. in Ouagadougou with a degree as Rural Equipment Engineer. Other technical personnel now assigned include two draftsmen, a topographer's assistant, two rural works crew superintendants, a mechanic and two welders. A second mechanic has been budgeted for this year.

Genie Rural depends heavily on technical assistance for professional requirements and three French advisors currently are assigned, two of them agricultural engineers, and one topographer/engineer.

Genie Rural has long-range plans to expand its staffing and equipment resources particularly with a view to organizing three separate rural works brigades which would be posted in key regional locations. The desire is to develop a capability to undertake rural works activities through force account. To achieve this, GR will require very substantial donor assistance for equipment, facilities and training, and a relatively long time frame for gearing up before construction projects could begin. It also will be a costly organization to payroll and keep supplied continually with replacement equipment, parts and construction materials. The USAID project aims at much quicker dam construction at assured standards of design and construction. These objectives are best met through the contracting approach, which encourages private enterprise and does not pose recurring cost concerns of major significance to the Government after the end of the project. Genie Rural has accepted these conditions for this project; the assistance will provide GR with experience in the contract mode which can be important in future programs as well.

Technical assistance and training using the contract approach will require some augmentation of staffing in GR, although much less than would be required through the force account mode. Genie Rural will require skills in project planning and feasibility analysis. This project will provide an engineering advisor for this function, with a Mauritanian counterpart in the Service-Etudes et Travaux (Studies and Works Service) which is one of the two sections of GR. The key functions of contracting for engineering and construction services will be addressed by a technical advisor for contract and construction administration, whose counterpart would be a Mauritanian in the same Service.

A third critical function will be supervision and inspection of construction to insure that the contractors perform the work to necessary quality standards as designed. A construction quality control advisor is provided for this purpose; the counterpart would be a Mauritanian assistant engineer, probably assigned to the Division Materiel et Approvisionnement (Equipment and Supply Division) so as to be organizationally separate from the functions of planning and design (See Annex H-1). These three U.S. engineering advisors will be provided for two years each.

Since the GR has only two engineer-level technicians currently on the rolls, new personnel will be added to provide for counterpart needs and to assume the necessary functions. These positions will be filled by transfer of people from other organizations where they currently are under-utilized, as soon as advisors arrive.

Genie Rural has requested assistance to develop its capability for machinery repair of dams in situations which are beyond the capability of labor-intensive maintenance by the communities. This project is providing a small quantity of special maintenance equipment (see VI C-1), for this purpose, to add to the limited inventory which GR currently possesses. As indicated earlier, GR has insufficient trained personnel for repairing maintenance equipment, and this project will finance two-year training for five Mauritanians at the Regional Heavy Equipment Training Center (CERFER) at Lome, Togo. Four of these will receive specialized mechanics training in heavy equipment, and the fifth will be trained in repair parts management. Candidates for the training will be assigned to GR upon completion of the courses.

Upon completion of this project, the institutional capability and experience of Genie Rural will be sufficient for it to continue to implement its charter, using available indigenous enterprise to construct modern dams to quality standards. GR will also have the capability to direct and facilitate a system

of proper maintenance of designed dams.

4. Other organizations having responsibilities in implementation of this project are these:

(a) Regional Government: The Governors and Prefects for the areas of dam construction will be routinely involved in the negotiations and contracts between the Government and the barrage communities (see IV C-1 above). This is within the normal functions and capacities of regional government.

(b) USAID: Its functions vis-a-vis this project are the ones normally performed by a USAID. It will monitor the performance of the three technical assistance advisors, approve the GIRM system and contracts related to site selection, participate in project implementation documents (PIO/Ts and PIO/Cs), and participate in project evaluations. A USAID Project Manager has been named to coordinate the USAID functions. No exceptional burden on USAID is expected in implementation of this project.

5. Training is a major element in this project. Summarizing the categories, which are elaborated elsewhere:

(a) Advisors will provide direct on-the-job training and guidance to counterparts in Genie Rural in these categories (See VI C I and Annex H-1):

- developing and applying engineering criteria for locating and selecting sites for recession agriculture dams.
- preparing scopes-of-work and securing engineering services needed for design of dams.
- contracting for construction of dams.
- monitoring/inspecting/accepting construction work.
- developing and applying systems for maintenance of dams.

(b) Participant training will be provided for four equipment mechanics and for a parts specialist, at the Regional Heavy Equipment Training Center in Lome, Togo. The training will be of two years duration, following which the graduates will be assigned to Genie Rural.

(c) The local construction contracts will include a provision by which Genie Rural personnel will be trained in construction activities to supplement training from the technical assistance team or from other donor-supported GR projects, as needed.

(d) Short-term training in a third country (probably Egypt or Sudan) will be provided to two people of the Ministry of Health. This will be of four to six months duration, and will be in schistosomiasis control (See VI C 2) as well as surveillance techniques for Malaria.

(e) Communities will receive training in appropriate annual maintenance of dams, including specific points of concern, methods of correcting defects, and appreciation of when to call for assistance from GR and the nature of assistance which can be available (technical, commodity and equipment). (See VI C I and Annex H-1).

V. Evaluation

Mechanisms to gather additional data are included in the project, to permit refinement and tailoring of interventions. They will affect final choices of dams for construction; design of structures; techniques to minimize water-borne disease and to protect soil quality for cultivation.

Examples of subjects for data gathering and monitoring are these

1. Sedimentation in the cultivation basins and its effect on moisture absorption of the soils, soil fertility, and labor input requirements for cultivation (See VI C 2);
2. Effects of the dams with regard to water-borne diseases; effectiveness of interventions of the project to correct such problems (See VI C 3 and Annex H2).

Two general evaluations-in-depth will measure the progress and achievement of the project toward meeting its purpose. The first general evaluation will take place midway in the project time frame, now forecast for October-December, 1983. A final evaluation will take place at the end of the project. Indicators and assumptions to be reviewed during the general evaluations are listed in the Logical Framework, Annex B, and are discussed in Part III.

Particular attention will be paid to the following activities:

1. The system developed and implemented by the GIRM for analysis and selection of sites for construction, and for contracting with the communities for proper maintenance and fair distribution of the cultivation plots.
2. Compliance by the communities with their obligations under the contracts.
3. The advisor-counterpart relationship
 - a) Validity as to differentiation of functions
 - b) Appropriateness of organizational arrangements
 - c) Progress in training and technical up-grading
4. Adequacy of the contracting mechanisms and implementation
 - a) contracting processes for engineering and construction services;
 - b) Competence of construction contractors; adequacy of contractor performance.
5. Administrative factors
 - a) Adequacy of technical assistance contract self-support;
 - b) Mission monitoring and advising;
 - c) Sufficiency of project funding

The two formal evaluations shall be a joint responsibility of the GIRM and USAID. Representation on the evaluation teams should include appropriate officials of the Ministry of Rural Development and USAID. Funding for these evaluations is included in the financial plan.

VI Project Feasibility

A. General

There are two important aspects to feasibility for this project:

- (a) those issues relating to the training and institution building "package" and
- (b) those issues relating to selection of sites and appropriate standards for construction of dams. The summaries in the following sections address both categories.

Much money, energy and other resources, Mauritanian and donor, has been poorly invested in past dam construction ventures in Mauritania. Most such ventures have had serious problems because decisions as to sites, design or methods of construction were made with little or no concern for hydro-geological, economic, or social realities. Many dams have experienced structural failures which leave them abandoned. Others have been the cause of community dissensions because of detrimental effects to people downstream.

One of the main elements in the purpose of this project is to develop a mechanism for rational analysis and selection of sites for construction; and to help the GIRM apply appropriate standards for design and construction. This will not be easy. Priority sites typically have been chosen in the past largely on the basis of political considerations, and these influences will always be felt. Some misguided efforts at reducing construction costs have resulted in poor design and construction, and early structural failures. An important objective will be to instill in the GIRM a sense of the importance to build at minimum feasible cost, but consistent with minimum risk of failure.

The following sections address elements of project feasibility, supplemented, as appropriate, in Annex H.

B. Economic Feasibility

The economic feasibility of this project relates to the two areas of project focus--Institution Building and Agricultural Production. The analytical methods discussed in greater detail in Annex H-3 should not be sole determinants in making final investment decisions. A number of secondary and indirect benefits discussed in the Economic and Social Annexes such as restoring the economic and social viability of the rural interior and reducing the tendency to migrate to the cities are important non-quantitative factors which must be considered.

Institution Building

This project primarily is of an institutional development nature whereby the actual construction/engineering is a vehicle for training and building experience for Genie Rural. While these benefits cannot be measured in monetary terms, they are obviously substantial. There is a need to sensitize Genie Rural to think in terms of using economic as well as social, technical and agronomic criteria as tools for selecting and comparing dam sites or other construction projects. By strengthening this capability within the administration, judgment can be sharpened and likelihood of error narrowed. Such criteria have been utilized for sites this project will develop.

Alternative approaches of developing sites have been scrutinized at all levels of the design decision making process. A lesser cost alternative of this project approach might have been to assist farmers with earth-moving equipment to construct a larger number of smaller dams, with a lower standard of engineering and construction with subsequent lower costs relative to the cultivation basin area. This has been analyzed in detail from field observations and discussions with government officials and found not to be cost effective or socially accepted since these constructions would have a short expected life. Most early efforts by the GIRM to build dams to an intermediate standard of engineering have been failures. Indeed several of the sites proposed for USAID project assistance are where such dams were constructed, and now must be reconstructed because of inadequate standards initially applied. (See VI A).

Agriculture Production

The other main purpose of the project is to construct a number of dams in the Brakna and Gorgol regions which promise a significant increase in food production. The economic impact from increased cultivable hectareage is of prime importance to the regions' economic and social welfare.

According to the technical reports submitted by SONADER, the basic area served by the ten dam sites is 788 hectares. There is some production presently at these ten sites, when rains are abundant, but for most years, the production appears to be negligible and therefore we have assumed the total basin area as the dependable net cultivated area attributable to the project activity. Present production at Timbara and Toueidima appears substantial and the estimated supplemental hectareage attributable to the scheduled improvements is 20 and 50 hectares respectively. For this net cultivable hectareage, a return of \$377 per hectare is calculated as is explained in Annex H-3, Economic Analysis. This return assumes a sorghum yield of 430 kilograms per hectare and additional quantities of cowpeas, melon and fodder. The total annual benefits for the 10 dams is approximately \$300,000.

If it were to be calculated how many years it would take to break even on the investment, TABLE VI B-1 would illustrate this method using costs and primary benefits based on 1980 prices of equipment and agricultural commodities. Inflation and discounting costs and benefits is not included in this simple analysis.

This decision-making tool is used merely for selection criteria for sites, and as a proposed technique for GR to apply in the future, in locating new dams. For more information on production yields and prices, see Annex H-3 Economic Analysis.

TABLE VI B-1

DAM SELECTION BY SIMPLE REPAYMENT

DAM SITE	AREA Cultivable ha	CONSTRUCTION COSTS (1980 \$)	COST PER HECTARE	YEARS** TO REPAY
Bou Souilefe	52	185,000	3570	9.4
Lefkarine	54	275,000	5100	13.5
Zmeilat	55	327,000	5940	15.7
Ameira	75	631,000	8420	22.3
Moudi Founti	81	353,000	4360	11.5
Toueize Grett Tagatt	91	343,000	3810	10
Timbara	20	122,000	6100	16.1
Toueidima	50	84,000	1680	5.5
Boudjoungal	140	332,000	2370	6.3
Lemaoudou	170	136,000	802	2.1
TOTAL	788	2,788,000	u=4215	u=11.3

* SONADER estimate plus 25% contingency

** Does not include inflation factor which could effect costs and benefits; excluding discounting. For more illustrative purposes see Annex H-3 for calculations of EIRR.

VI C 1 Engineering

a) General

Traditional dams are hand built, for the most part, with no engineering or proper compaction of structures. Most of these dams do not survive more than the first year, after which they must be re-built or abandoned. This project will assist the GIRM to help provide the communities with more substantial structures which can last for many years and which will require little machine-intensive maintenance. Structures which can meet these and economic criteria can be designed.

Through this project, Genie Rural will receive guidance, training and support assistance to become capable and experienced:

- in developing and applying appropriate criteria for selecting barrage sites in terms of hydro-geology and other technical factors, economic feasibility and social and other environmental considerations;
- in designing structures which are cost-effective and which impose low continuing maintenance requirements;
- in contracting for engineering and construction services and in monitoring and inspecting construction to insure adequacy; and
- in developing systems of appropriate maintenance, largely depending on community administration, and providing the communities with technical and occasional equipment assistance as required.

Three technical advisors will be provided through this project to assist and advise in the above endeavors: an engineering advisor, concerned with project planning and feasibility; a contract and construction administration advisor; and an advisor for construction quality control (See Annex H-1 for discussion of advisor functions and counterparts).

b) Site Selection

For developing the capability and experience of Genie Rural, eleven potential dams to be constructed through this project have been identified and analyzed. In the design process, feasibility studies have been conducted. These are not considered final for supporting inclusion of all eleven dams in the construction program, although seven of the twelve sites are reasonably assured as meeting required tests.

Some sites have economic justification which will require closer analysis, or have potential soils questions deserving of further study. Studies so far performed and those yet to be done will be the basis from which the GIRM will develop its criteria standards and site selection procedures for its future programs.

c) Design and Engineering

As opposed to traditional dams, modern "designed" dams include spillways to pass flood water without rupturing the embankments, and outlets works for draining the basins after the soil is adequately saturated. Designed dams also are constructed within quality specifications as to strength of concrete, density of compacted soil at optimum moisture and other construction quality features, to insure that the structures will perform adequately over many years. Traditional dams lack spillways, outlet works and moisture compaction, and typically over-top and wash out during the annual flash rains in this area.

Design criteria and standards for structures shall generally conform to those developed by the Bureau of Reclamation, U.S. Department of the Interior ("Design of Small Dams"). The technical advisor will assist his counterpart to establish standard criteria for design, including structural, hydraulic, hydrological and geological features.

d) Construction

(1) This project emphasizes construction by contract method. Therefore, technical assistance will include the functions of advertising for bids, contractor evaluation and selection, contractor construction performance, and project completion, inspection and acceptance. Four indigenous construction firms in Mauritania are capable of undertaking the work contemplated for this project. All have the necessary technical skills and the equipment necessary for concrete work. Some of them have heavy equipment for dam embankment construction. The firms are EGB, ECT, COMACOTP, and PEREVET.

Genie Rural will provide a counterpart for the contract and construction administration advisor.

The technical advisor and his counterpart will establish schedules and prepare documents and approvals necessary for meeting those schedules. The advisor will assist his counterpart in establishing a contract administration and records management system. The USAID grant will include specialized office furnishings and equipment for this purpose (files and racks for maps and blueprints, etc.).

The validity of the construction-by-contract approach will be judged at the time of the project evaluation scheduled for the middle of the project (December of the third year in the Implementation Schedule).

(2) Quality control of construction is of paramount importance, especially in dam construction.

Genie Rural currently lacks a component that is responsible for quality control of construction and therefore such a unit will be established (See Annex H-1). To be effective it should be separate from either construction units or design units and the chief of this unit should report directly to the Director of Genie Rural. The cadre of this unit will consist of the following:

Chief - (Engineering Assistant)

Inspector (Concrete)

Inspector (Earthwork)

The technical advisor will give on-the-job training to the chief and the inspectors. In addition, two mobile laboratories and field testing equipment will be provided, as well as vehicles for transportation.

(3) The implementation of dam construction is dependent upon the rainy season because water required for construction will be flood waters diverted from the streams into reservoirs to be constructed prior to the actual dam construction. Therefore construction contracts should be awarded not later than June of any year.

The construction related activities are non-critical, that is to say there is a given amount of flexibility in scheduling the design, bidding award and construction phases for the second series of dams which presently are scheduled for 1983.

e) Maintenance

Traditional dams are usually constructed manually by those communities which wish to cultivate the soils of the basins. Since traditional dams suffer wash-outs, they require frequent repair and reconstruction. The communities know and expect that there will be annual labor requirements for this purpose, and they have incentives to perform the necessary work because they perceive direct benefits from these efforts. As regards "designed" dams, the appropriate approach for the GIRM is to look to, and to require, the benefitting communities to contribute their labor for the major part of maintenance on their dams. This keeps to a minimum the recurring burden on national government resources. This is the approach which the RLR Project is taking with regard to dams which will be financed through the project.

This approach requires that the construction design be such that required annual maintenance will be relatively minimal, and will be within the capability of the communities to perform with hand tools. Community agreements or contracts with GIRM are a condition for approval of the construction. These agreements will commit the communities to provide this annual/periodic maintenance. The Project will assist in initial outfitting with tools and wheelbarrows. Genie Rural will establish standards and schedules for maintenance, and will provide technical support to the communities for this activity.

The USAID grant assistance will also provide a small maintenance equipment inventory for use by GIRM for the occasional repairs which may require such equipment. It will include a tractor-loader with backhoe attachment, two ten-ton dump trucks, a trailer-mounted concrete mixer, and a portable pump (5 cm discharge).

Additionally, this project will assist GR to maintain heavy equipment which other donors make available to it (notably UNSO which is equipping a GR force account brigade to work on dams in other regions of Mauritania). For this purpose, two years of training at the Regional Heavy Equipment Training Center (CERFER) in Lome, Togo will be financed for four maintenance mechanics and one equipment parts supervisor. Also provided through this project will be a set of hand tools for engines and hydraulic, electric and fuel systems, and a set of tire repair equipment, tools and jacks.

A warehouse building for stocking parts, tires, cement, rebar and tools will be built in Aleg in the Brakna Region, to facilitate GR activities in maintenance and in construction of rural dams through this and other donor assistance projects. GIRM will provide the site and REDSO engineering services will approve the design and contract construction specifications. \$150,000 provided in the budget for this building will be sufficient for type and size required (500 m² @ \$300/m².)

(f) Costs Estimates for Construction

Costs were estimated based on quantities specified in SONADER designs, modified to include requirements for additional free board and revised upstream rip-rap protection and sand bedding. A contingency factor of 25% was added to the base figures, plus inflation at the current local rate (construction costs in Mauritania) of 20% compounded annually (See Annex H-1 for more detailed discussion of cost estimating for this project).

VI C 2. Soils

Recessional agriculture has been practiced for almost 4000 years in many parts of the Middle East, North Africa and southern Arabia. In limited rainfall areas of 100-200 mm rainfall per year, impounding water behind dams can store sufficient water for crop use, depending on soil conditions, topography and types of crops.

There are certain conditions necessary for successful recession agriculture. These include:

1. Sufficient run-off from a catchment basin to spread water over a sufficient area for crop production.
2. Soils behind the recession dam with sufficient moisture holding capacity for a crop to mature.
3. Soils which are not of a problem nature, such as saline or alkaline.
4. A soil profile with sufficient friable depth for plant root development.
5. Sedimentation rates that do not interfere with water penetration behind a dam site over a reasonable length of time.

The areas of Brakna and Gorgol Regions where construction of these dams is contemplated fulfill all the requirements cited, except for some possible future problems of sedimentation. Sediment rates will depend on topography, occurrence of flash floods, types of soil colloidal systems involved, including soil particle size and structure. Sedimentation will tend to build up just at the base of the dam due to settling out of the finer silt particles, particularly colloidal clays in suspension. If these colloidal clays build up over a period of time, water penetration begins to decrease, with subsequent cracking of the soil.

After a period of years, some soil improvement by removal or disking the deposited sedimentation may be necessary in some situations. Most of the dams might not require this type of soil improvement for 10-20 years after construction, although this is difficult to assure in absence of information on sedimentation rates. As of the time of drafting this PP, insufficient data had been available to anticipate what sedimentation build-up might occur behind project dams. Additional soil sampling in the project basin sites is being conducted by SONADER, analysis of which will give some indication. (Several of the samples are from basins where failed traditional or designed dams were in use over some years). Based on observations in the barrage regions, it appears that any sedimentation problem will be long term, and correctable.

Soils interpretations have been carried out on ten samples from the Brakna and Gorgol Regions which were analyzed by the SONADER soils laboratory.

These possible barrage sites include:

- | | |
|-------------------------|------------------|
| 1. Toueize Grett Tagatt | 6. Ameira |
| | 7. Lemaodou |
| 2. Moudi Founti | 8. Boudjoungal |
| 3. Zmeilat | 9. Lefkarine |
| 4. Timbara | 10. Bou Souilefe |
| 5. Toueidima | |

Soils in the areas of Brakna dams are generally classified as sandy loams, silty loams or loamy sands. These soils are alluvial in origin with moderate to low water holding capacity.

The cation ion exchange capacity ranges from low to moderate which gives an indication of the inherent fertility of these soils. Fortunately, the sodium capacity is low in all soil samples analyzed, which is somewhat unusual in most desert soils. PH values range from 6.6-7.8 with one exception being the barrage soils in the area of Bou Souilefe. In that area pH values average 8.8 which is definitely alkaline in nature. The samples indicate the highest calcium values of any soil samples tested, which is understandable with the high pH cited.

The interpolation of pH values would indicate water absorption is sufficient in all barrage sites. Since the disturbed soil samples were tested under laboratory conditions in Nouakchott, which did not utilize on-site water as a source for the water columns determinations, on site water-holding capacity and infiltration studies will be carried-out in the field by GR.

Phosphorus levels are low in all soil samples analyzed. This low phosphorus condition is not too common in desert soils, particularly in soils with alkaline or slightly alkaline pH values. The indication of high calcium ion association with high pH values would suggest, in most instances, a problem with phosphorus fixation. Stunted growth early in the growing cycle of cereal crops such as sorghum appears to be common in the Sahel due to phosphorus deficiencies. Purple discoloration of the sorghum leaves is often observed later in the plant life cycle, which is symptomatic of phosphorus deficiency.

Based on the soils analyses, the only potential soil problems would appear to be at the Bou Souilefe site where pH values average 8.8, phosphorus levels are not measurable or low with the calcium ion concentration at a moderate to high levels. These soil factors would not preclude the production of sorghum or millet, but low yields could be likely.

Water extracts indicate that sodium could be a future problem for the soils in Bou Souilefe. Since saline soils usually receive salts from other locations and water is the carrier, water quality should be determined for the impounded water to better determine the suitability for recession agriculture purposes. Saline problems are not considered to be a problem in the tested areas at this time.

In conclusion, none of the proposed sites would appear to have problem soils except possibly for Bou Souilefe.

VI C 3 Health

Health interventions in this project will address community health problems relating to malnutrition and water borne diseases. In addition to alleviating malnutrition, the project will undertake surveillance and control measures aimed at reducing water-borne diseases in the project area, especially schistosomiasis and dracunculiasis.

The interventions designed for this project are based on an analysis of health problems in the project area which resulted from an epidemiological survey conducted in November 1980 by the National Hygiene Center (Centre National d'Hygiene, CNH) of the Ministry of Health. This analysis was followed by a visit and evaluation by an AID contracted (WASH) (Water and Sanitation for Health Project) consultant in January, 1981. Annex H 2 reports the findings of the CNH evaluations.

The main health impact of this project will be the reduction of malnutrition resulting from the increased crop production at the dam sites. The severity of malnutrition (see nutrition survey in Annex H-2) correlates with the relative lack of food at the dam sites. The increased food security is expected to significantly improve the nutrition status of the population of the project area.

The specific health activities incorporated in this project are outlined in the following sections discussing schistosomiasis and dracunculiasis surveillance and control, and malaria.

Schistosomiasis

Few interventions have been undertaken to date in schistosomiasis control in West Africa. This project seeks to develop a Mauritanian capacity to undertake schistosomiasis surveillance and control. The surveys and evaluations referred to above have determined that schistosomiasis is prevalent in the project area. Urinary schistosomiasis, due to the parasite schistosoma haematobium, is the extant form of the disease in the project area. To date, intestinal schistosomiasis has not been discovered in Mauritania. The prevalence of schistosomiasis in Mauritania and specific dam sites varies widely. Likewise, there are a variety of bulinid snail which are recognized as intermediate hosts for schistosoma haematobium. Annex H-2 discusses the epidemiology of schistosomiasis in Mauritania and the project area. See also WASH report of March, 1981, "Public Health Assessment of Proposed Dams, Water Related Diseases and Community Water Supplies", by E. Malek and D. Goff.

From the past studies and the recent CNH survey and consultation of the WASH expert, as detailed in Annex E-2, the following conclusions can be drawn on which the intervention activities are based:

At present schistosomiasis exists in discrete pockets in the project area. Snail breeding is essentially limited to a two-month period during which the dams hold water. The dam sites are the only bodies of surface water in the project area. This profile of a relatively "self-contained" schistosomiasis problem indicates a high probability for successful schistosomiasis control and eventual eradication.

The patchwork prevalence of schistosomiasis suggests on the one hand that studying the factors currently preventing schistosomiasis at specific dam sites will yield answers to control at infected dam sites. On the other hand, it is also likely that improvement of the dams will make them all suitable snail habitats.

Therefore, it can be concluded that without control measures, this project could spread schistosomiasis; with control measures, the project will significantly decrease schistosomiasis.

Project Interventions: The objective of the proposed interventions is to produce a long-term Mauritanian capacity to control schistosomiasis in addition to specific control of this disease in the project areas. This objective will be met through the following steps:

1. Study the epidemiology of schistosomiasis in greater depth in the project area.
2. Train several Mauritians in schistosomiasis surveillance and control.
3. Experiment with Schistosomiasis control measures at selected dam sites.
4. Set up a longitudinal schistosomiasis surveillance control system.
5. Propose models for national schistosomiasis control.

The accomplishment of these applied research steps should have ramifications on schistosomiasis control efforts in West Africa where few interventions have been undertaken to date.

Implementation of Project Activities to Meet the Objectives

This project seeks to develop a Mauritanian capacity to undertake schistosomiasis control and surveillance. This will include the following activities:

1. Training: Two Mauritanians, currently government employees of the Centre National d'Hygiene and preferably nurses or laboratory technicians, will be trained in schistosomiasis surveillance and control methods prior to construction of the dams. It is estimated that four months will be an adequate period for such training. The final choice of training center(s) should be left up to the GIRM. Among the possible training sites are the Sudan (Gezira) and Egypt, both of which have ongoing schistosomiasis control efforts. In the Sudan, in addition to the Gezira irrigation system, there is also a WHO control project on the Blue Nile at Barakat. Dr. W. Jobin, the director of the latter project, is familiar with Mauritanian conditions and other projects along the Senegal River. Sudan has cases of *S. haematobium* as well as malaria. The trainees will also be instructed in techniques for malaria surveillance.

Once trained, this team will be assisted by a laboratory technician and a number of laborers. While the team will have other functions at the CNH, they will make seasonal visits to the project area to carry out studies and control efforts. They will establish in the project area a small laboratory for urine examination, for detection of infection among snails and for preliminary laboratory testing of molluscicides.

Liaison: The team will operate under the direction of the Director of the CNH who, in turn, reports to the Director of Health in the Ministry of Health, Labor and Social Affairs.

2. Functions of the Team:

a) To conduct a survey of snail fauna at all project dam sites and to continue these surveys for several years.

b) To collect base-line malacological data at the dam sites (to determine prevalence of snails and their parasite infection rates at the dam sites and various environmental factors, etc.).

c) To determine prevalence of urinary schistosomiasis in the villages through a population-based survey (number of cases as well as the intensity of infection).

d) To conduct human-water contact studies at dam sites.

e) To carry out control operations and post-control evaluation of these operations (detailed below).

f) To carry out chemotherapeutic treatments of patients with the assistance of medical personnel.

g) To reinforce the above activities through a local health education program.

3. Selection of Dam Sites:

The team will carry out the above functions at selected dam sites serving as a pilot area. At least one schistosomiasis-endemic dam site will be initially chosen for surveillance/control as well as one schistosomiasis-free dam site for surveillance. Based on the experience of these pilot dam sites, surveillance/control measures will be extended to other dam sites.

4. Engineering Snail Control Measures:

The following modifications will be considered by the engineers before the construction of the individual dams:

a) If acceptable to the engineers operating each dam, and if it does not interfere with agricultural practices, the water level in the reservoir should be lowered and fluctuated starting about three weeks after the reservoir is full. Rates of lowering the surface will vary according to the slope of the banks at the water's edge. (The snails and mosquito larvae are mostly found in the littoral zone, the shallow, photosynthetic, optimum area for adequate vegetation and other life along the edge.) The operators should ideally draw down the level at least beyond this area, thus stranding and destroying the snails and larvae on the bank.

b) If acceptable to the engineers, the dam margins should be straightened and deepened, aquatic vegetation should also be cleared.

5. Chemical Control:

The use of particular molluscicides, as well as other control measures, will be selected by the CNH after the training of the team and completion of the first surveillance studies at the pilot dams.

a) An effective molluscicide which kills the snails and their eggs is Bayluscide. Bayluscide (Niclosamide), produced by the Bayer Company of West Germany, is available in several forms and can be easily applied in the barrage area. If used

correctly, water is safe for consumption two days after application; ~~this~~ molluscicide is not toxic to humans or animals.

There are also molluscicides of plant origin which might be used (after local laboratory experimentation by the CNH). Balanites Aegyptica is a common plant in the dam site region with molluscicidal properties (active ingredient is a saponin). If proven effective, the plant could provide a cheap source of locally produced molluscicide.

6. Chemotherapy

Several chemotherapeutic drugs effective against schistosomiasis, notably Ambilhar, generic name niridazole, and Metrifonate. All of these drugs, (including Ambilhar, commonly used in Mauritania) have some side effects and require supervision. The drug of choice would probably be praziquantel (trade name: "Biltricide" produced by Bayer Company of West Germany). Praziquantel has few reported side effects and likely will not require close medical supervision.

7. Health Education

Health education will be indispensable for the effective participation of the population in schistosomiasis surveillance and control. Health education will concentrate on several discrete objectives:

- informing the local population about schistosomiasis and its control;
- enlisting the participation of the population in discovery of schistosomiasis cases for surveillance and treatment;
- enlisting the participation of the population to assist with control procedures (clearing aquatic vegetation and helping with mollusciding where necessary).

(Note: After studying the experience of other schistosomiasis control projects and the customs of Mauritians, it has been concluded that oft-suggested intervention of attempting to prevent human-water contact would be ineffective. This measure has either failed in most control projects or been relatively unimportant in relation to chemical and drug treatment. Considering the extreme heat in Mauritania and lack of alternate water sources, this option has little chance for success.)

Health education activities will be directed by the CNH technicians who will work with the authorities at each dam site to organize the participation of the population in specific activities above. The CNH technicians will also work with local medical personnel to carry out surveillance and drug treatment activities.

9. Evaluation

Evaluation of the program will be built into the ongoing surveillance/experimentation system which operates on a seasonal basis. Quantitative measurements of snail parasite infestation (including its density) and schistosomiasis cases will serve as the evaluative indicators.

Dracunculiasis

Dracunculiasis, or guinea worm, infection has been discovered at dam sites in the Gorgol (see Annex H-2). This project will control guinea worms by the application of molluscicides to infested waters. Molluscicides which kill snails will also kill the copepod hosts.

Malaria

Malaria is a major endemic disease in the project area. Malaria is hyper-endemic in the project area during the rainy season (See Annex H-2).

In the development of this project, the GIRM and USAID considered the problem of malaria and its control in the project area. The criteria of long-term impact, administrative and technical feasibility, cost and negative effects, and past experience with malaria control in Mauritania, were used to examine various possible malaria control measures (including spraying, chemotherapy, and chemoprophylaxis, etc.). The resulting analysis concluded that all options contained serious drawbacks that would prevent any significant positive impact at this time. The major problem is the lack of health infrastructure for the distribution and monitoring of drug treatment in the project area (the most effective control option). Therefore, the effectiveness of an uncontrolled program of chemotherapy and/or chemoprophylaxis would most likely be very low in addition to the risk of producing drug resistance.

The GIRM has decided that malaria control measures should be a later undertaking in the project area. The GIRM is currently experimenting with a model primary health care

program in southwestern Mauritania through the USAID-supported Rural Medical Assistance Project, 682-0202. If successful, the GIRM plans to extend this program to other areas, including the project area. This would provide the necessary decentralized infrastructure to begin malaria control. Meanwhile, the GIRM has chosen to concentrate on schistosomiasis and dracunculiasis control which have a good chance of success. When schistosomiasis and dracunculiasis control are firmly established, the project will consider the development of malaria control measures at selected dam sites where the population is judged capable of effectively participating.

There are some steps which can be taken through this project, however, which can help the Mauritanian Ministry of Health to prepare for when it is ultimately able to effect a malaria control program. Since the health trainees may be sent to Sudan for schistosomiasis-related training and since there is a high incidence of malaria in that country as well, it is proposed that the Mauritanian trainees also receive instruction in establishing localized surveillance of malaria and its incidence. This will enable the same teams that carry out the schistosomiasis interventions in the project to also establish reliable baseline data on the incidence of malaria that is found in small dam-based communities, which can be valuable information for later action programs.

VI. D. Social Feasibility

1. Project Compatibility with Social Environment

a) Background and social environment:

Sahelian areas of Mauritania have traditionally been under the domination of pastoral groups (See Annex 3-4). Agriculture was practiced by tributary Haratine farmers who gave a portion of their harvest to the pastoral group to which they were attached. The coming of the French in the last century, and new markets for grain, resulted in increased agricultural activities. Recessional agriculture techniques, behind dikes and dams, had their significant beginnings in Mauritania some sixty years ago (although they had been practiced for centuries in river basins). These traditional dams were not designed or engineered.

During the final years of French rule and the early years of independence, the first attempts to improve recessional agriculture dams by modern design of larger structures took place. A few of these remain successful, but most have partially or totally collapsed due to inadequate engineering and construction.

The years of drought from 1968 have shaken many traditional social relations and practices. Former tributary agriculturalists continue to cultivate, and have, where possible, settled around better agricultural areas. The relationship between the cultivators and the pastoral groups to which they had paid tribute is in a state of flux and some uncertainty. In some cases, the pastoral group leader, a Bidan, continues to have dominant control; in others, the agriculturalists effectively control the area, but recognize the traditional tributary leader, providing a share of their harvest or a percentage of their land. Disputes do arise that involve the distribution of rights within the groups. Most Haratine cultivators wish more egalitarian integration into the Bidan dominated tribal group. However, neither element wishes to dissolve the relationship entirely since it offers political power and economic advantages in hard times.

b) Social relevance of project; perceived needs:

The communities in the areas of recessional agriculture seek the means to reduce risks in the cultivation of grains and other essential food crops. That the primary risk is inadequate rain and moisture for growing crops is all too apparent to them. Their only traditional solution to reduce this risk has been construction of dams to retain the water from seasonal rains long enough to saturate the cultivation plots. Assistance in building larger, more durable dams is the constant and primary desire that they voice, even above concerns for other economic and social needs. This is because food production is imperative to their survival. They perceive dams as directly enhancing their farming efforts by providing more assured water resources and demanding only their labor to achieve better production.

c) Project implementation within social structure:

The communities at the dam sites are key to the success or failure of the GIRM recessional dam agriculture program as they will be responsible for food crop production and the annual dam maintenance. There is ample evidence that these conditions can occur in properly motivated communities, since recessional agriculture has existed in Sahelian regions over so long a period of time. However, there are sufficient examples of dams which have failed and been abandoned that the GIRM

recognizes the importance of careful planning and site selection to insure that the selected communities will have motivation and appreciation for the need for community management and participation.

From the standpoint of this project, a successful community will be one in which cultivable basin land is fairly distributed to farming families, the families reap the benefits from their labor, and the families are properly motivated and organized to perform essential routine maintenance on their facilities. Their social environment is of major importance in the success or failure of the communities. The dryland interior communities of Mauritania where recessionary farming is practiced reflect a wide range of social organizations (See Annex H-4). This project seeks to concentrate in locations where the society is sufficiently open that, given proper safeguards, all members of a community who wish to could benefit from the increased hectareage made available.

To these ends, GIRM will require compacts or contracts which will commit the communities to operate, exploit and maintain the facilities and cultivation basins properly, for the benefit of the working farmer families. The GIRM will develop a methodology, acceptable to USAID, for the approval of sites. This will be a condition precedent for funding construction contracts under this project. The system will include criteria and standards for selection of sites, identification of present users of proposed dam areas, identification of their agreed-upon representative, and draft contracts between the GIRM and the candidate communities. The contracts will detail what contributions will be provided by the GIRM (through the project), what obligations the communities will have as to maintenance of the facilities, and how both benefits and obligations will be distributed among community members.

The GIRM will monitor compliance by the communities through a mechanism acceptable to USAID. The Cooperatives Service of the Agriculture Directorate is one possible arrangement, although other mechanisms could be acceptable. USAID and the GIRM will, at the time of mid-project evaluation, address the adequacy of compliance with the contract provisions (See V).

d) Skills factors

The project will require few technological innovations, and the farming communities will be able to operate and maintain their dams and farm their fields largely with techniques they now possess. Health interventions to reduce risk of water-borne diseases may call for some variation from current practices of releasing water from the saturated basins. However, this will not be complicated, and the modern design of the dams with outlet works will facilitate a controlled release of water. The dams are designed to require a minimum of routine maintenance, which will be largely within the technical and physical capacities of the communities. Annual maintenance of outlet works, valves, trash racks and spillways will be required, but will not be complicated. Genie Rural will provide for instructing and advising the communities in this and in the maintenance of embankments, with which they are already accustomed.

Social Impact of Project

As intended, the project first seeks to re-establish and increase the resource base on which the communities depend. Second, it seeks to use the opportunity of an economic resource base to effect a fair distribution of benefits within the communities that would increase the number of worker/owners and establish their rights

and obligations by contract.

The project does not seek, nor will it make, fundamental changes in existing social structure. This structure is undergoing change in response to much greater influence (climatic changes, modernization, education) than will be caused by this project. The project does seek to effect a more egalitarian distribution of power and benefits within communities that have maintained their coherence and evidenced the desire to exist as a unity, but seem sufficiently flexible to adapt as necessary. Communities where potential for this does not clearly exist have been excluded as potential dam sites for this project.

Direct beneficiaries of the project will be farming families who are the majority in the communities and who currently earn the lowest incomes. Within this income group, there is little differentiation of labor between men and women, and there is basically equal distribution of resources, labor and benefits. The communities contain numbers of widows and other women supporting children whose husbands are elsewhere for much of the year. These women will particularly feel the impact of the project which will increase cultivable areas and their ability to support their families.

The project does not deprive any members of the communities of any resources which they currently utilize and value. The dams are on small tributaries of major seasonal streams, and are in a population density area. Downstream impacts of the dams will usually be minimal.

VI E. Financial Analysis

1. Summary of Costs

Financed project costs and financial plan are summarized and detailed in Tables in the following pages. The project is designed for a four-year implementation. U.S. contribution (grant) will total \$3,900,000 for that period. The GIRM contribution will be \$494,000 for a project total of \$9,394,000.

2. The Contribution of the GIRM

The GIRM is suffering a continuing and growing budgetary problem (see CDSS). The GIRM is hard pressed to meet its routine operational costs, and is unable to bear any substantial financial burdens relating to developmental ventures financed by donor organizations. It poses a severe dilemma for the GIRM which must depend heavily on such developmental assistance to improve, over the long term, its economic health and budgetary solvency.

In design of this project, the paucity of Mauritanian financial, administrative and technical resources has been taken into account. Interventions have been programmed in a manner which will impose minimal requirements on limited GIRM resources and services, but which will assist the GIRM to become more efficient and effective in its impact on the economy. Personnel who are currently under-utilized because of lack of transportation, operating equipment, or funded programs are to participate in large part. To minimize the impact on future recurring costs, the approach for this project has been to develop GR capability to contract for construction of dams, rather than developing a sizable permanent force account entity which would be a substantial continuing cost burden after the end of this project. Design of the dams emphasizes low continuing maintenance requirements, maintenance which will largely be within the capability of the communities themselves.

Some continuing maintenance will require GIRM inputs and the project will train and outfit a GR capacity of modest proportions for this purpose. The recurring costs of this function will not impose major burdens on the GIRM, since the primary maintenance work will be performed as a contribution of the participating communities. However, the expected recurrent costs burden to the GIRM involving GR mechanics and the operation and maintenance of the equipment for dam maintenance is expected to run around \$30,000 per year. The total GIRM contribution to the project implementation costs over the four year time frame will be fairly substantial in person year, but will actually be small in terms of Mauritanian salaries

and wages. Nearly 200 person years of GIRM officials, technicians, extension personnel and community residents will be devoted to this project. In most cases this will represent only a small part of the time of numerous participating individuals, ranging from community workers to GIRM officials (two weeks/year of an eventual 3250 cultivating families, and varying amounts of the time of 44 other officials and specialists). The personnel contributions of Mauritians to the project will amount to about \$494,000 over the four years (includes a projected inflation factor of 10% per year).

3. Cost Effectiveness of Project Compared to Alternatives

Alternatives analyzed and discussed during the design process were examined (see also Economic Analysis), and the specific approach used is the most cost effective as compared to the following alternatives.

a) To reduce costs of the project, the technical assistance and institutional building components could have been deleted. This approach could not have given a beneficial long-term impact upon Genie Rural to accomplish significant, responsible construction for future projects. Assistance to oversee construction is needed to assure adequate standards during this project and to assure continued cost effective engineering construction methods for future works.

b) Standards of construction and design specifications of the engineering could have been reduced, but, as discussed in Economic Analysis section, inadequate dam construction standards in the past have led to dam breaks and down-the-road high yearly maintenance costs.

c) The number of dams constructed might have been reduced, but that could have also reduced the benefit stream and the engineering variation necessary to give Genie Rural sufficient experience in all types of construction.

4. Administrative and Financial Arrangements

This project is designed to be as administratively self-contained as possible, and not to depend heavily on administrative and logistical support from USAID or GIRM. Support services of those organizations are over-taxed, and it would be unrealistic to expect that such

services could easily or efficiently be made available as required for this project. Therefore, the technical services contractor (TSC) organization which provides the technical advisory services will be responsible for supporting its advisors. This can be accomplished by the contractor setting up a local currency fund financed in the contract that will include paying for the following functions:

a) necessary direct support costs for the TSC team. These include housing and housing recurrent costs (utilities, guard services, maintenance);

b) necessary operational support for TSC team, which includes

- office space and related recurrent costs (utilities, guard services, maintenance);

- office supplies and materials;

- local employees required by the TSC team (stenographer, clerk, three chauffeurs, etc.) and related travel, salaries, benefits;

- vehicle maintenance and operation (not including those for use by GIRM personnel).

USAID logistical and administrative support will consist of monitoring and providing advice to the TSC team. Direct USAID involvement will be necessary only for major commodity procurement (vehicles, office/residential furniture and equipment, major project-specific commodities) to insure compliance with AID regulations.

Administrative support for the TSC team will be a responsibility assigned to the Contract and Construction Advisor upon his assignment to post. However, most of the groundwork for these responsibilities will have been done prior to his arrival. Immediately upon signing of the contract with the Technical Services Contractor, the TSC will dispatch an administrative officer to Nouakchott for three to four months, to lease houses and office space, employ essential local personnel, establish the local bank account, and perform other preparatory functions prior to arrival of the three advisors. (At the option of the contractor, this individual might be the eventual Contract and Construction Administration Advisor himself, sent in advance of his family and of the other advisors.) The administrative

officer will work closely with and be advised by the USAID Project Manager, Financial Management, and the Program Support Division in making initial arrangements and developing systems.

5. Host country payrolling and support to counterparts will be handled through the normal GIRM administrative processes.

6. Budget Tables summarizing U.S. and Mauritanian contributions to the project are as follows:

- Table VI E 1 Summary Cost Estimate and Financial Plan
- Table VI E 2 Projection of Expenditures by Fiscal Year
- Table VI E.3 Costing of Project Outputs/Inputs.

TABLE VI E-1

RURAL LAND RECLAMATION PROJECT 682-0203

SUMMARY COST ESTIMATE AND FINANCIAL PLAN

\$ 000

<u>Use</u>	<u>AID GRANT</u>		<u>FX</u>	<u>GIRM</u>		<u>TOTAL</u>
	<u>FX</u>	<u>LC</u>		<u>LC</u>	<u>LC</u>	
Advisors and Consultants	1536					1536
Training (third country)	89					89
Engineering design/specs.	350					350
Commodities	888	390				1278
Construction dams	3558					3558
Construction warehouse		182				182
Local employees		129				129
Local rents, util. services		281				281
Local travel		175				175
Evaluation Exerc.	88					88
Community workers				180		180
GIRM Adm. and Participation				314		314
Sub-Total	<u>6509</u>	<u>1157</u>		<u>494</u>		<u>8160</u>
Contingencies	1118	116				1234
GRAND TOTAL	<u>7627</u>	<u>1273</u>		<u>494</u>		<u>9394</u>
TOTAL AID	8,900					

TABLE VI E2
PROJECTION OF EXPENDITURES BY FISCAL YEAR

PROJECT 682- 0203

\$ 000

<u>Fiscal Year</u>	<u>AID (Grant)</u>	<u>GIRM</u>	<u>TOTAL</u>
1981	750	50	800
1982	1800	70	1,870
1983	2800	150	2,950
1984	2400	175	2,575
1985	1150	45	1,195
TOTALS	<u>8,900</u>	<u>494</u>	<u>9,394</u>

A.I.D. Obligation Schedule: (U.S. \$000's)

<u>FY 1981</u>	<u>FY 1982</u>	<u>FY 1983</u>	<u>FY 1984</u>	<u>TOTAL</u>
2,122	1,814	2,712	2,252	8,900

TABLE VI E 3

RURAL LAND RECLAMATION PROJECT 682-0203

COSTING OF PROJECT OUTPUTS/INPUTS

\$ 000

	1.	2.	3.	TOTAL
AID Appropriated	3586	4766	548	8,900
GIRM	279	—	215	494
	<hr/>	<hr/>	<hr/>	<hr/>
TOTAL	3865	4766	763	9,394
	<hr/>	<hr/>	<hr/>	<hr/>

Column 1: Technical Assistance and Training
Column 2: Engineering and Construction of dams
Column 3: Maintenance of dams

VI. F. Environmental Impact

An initial Environmental Evaluation (IEE) is attached as Annex G to the Project Paper. As this indicates, the general impact on the environment is expected to be beneficial as the project has been designed. Remedies are provided through this and complementary projects for impact elements which might be problems.

Specific beneficial impacts include these important effects:

- Currently unproductive terrain in the watercourses will be cultivable for recessional agriculture production through moisture collection and absorption into the soils which this project provides. This will help the populations in these regions to become more self-sufficient in meeting their food consumption requirements, and will additionally enhance their incomes and levels of living.
- The Project will enhance community sensitivity to health problems and appropriate and feasible solutions to those problems.
- The Project will cause local, regional and central governments to become sensitive to a spectrum of environmental considerations in evaluating the feasibility of site selection for rural public works. This will be through the development and application of criteria and standards.
- Specific environmentally beneficial initiatives, complementing this project, will be undertaken in these regions through the aegis of other USAID projects, notably the Amended Renewable Resources Management Project (682-0205).

Potential negative impacts which might result from this project have been addressed as follows:

- Those of a social or physical nature which might injure individuals in the community or area will be identified in the process of selecting and locating sites for dams, following standard criteria and guidelines which the GIRM will administer.
- Sedimentation carried by the watercourses will accumulate over time in the cultivation basins behind the dams. Experience indicates that the magnitude of this will not significantly reduce the volume of water temporarily impounded, nor the quality of the soil for cultivation. Over several years, it is expected that colloid materials in suspension and small

clay particles would gradually form a layer which would reduce moisture absorption by the soils. The time period for this to occur will vary from site to site.

- Water-borne diseases have received careful attention in design of this project and measures incorporated to control the incidence and spread, particularly of schistosomiasis and dracunculiasis (see Part VI C 3 and Annex H-2). The Project incorporates appropriate surveillance and control initiatives for this purpose, as well as surveillance measures for malaria.

These and other less critical potential impacts are covered in the IEE, Annex G.

Environmental criteria for the selection of future dam sites for construction will also be among the criteria which the project technicians will help GR develop. The GIRM Protection of Nature Service, a Directorate also within the Ministry of Rural Development, has played a role in evaluating the environmental feasibility of some proposed dam sites. Project technicians will encourage closer coordination between GR and the Protection of Nature Service to assure that environmental considerations are consistently addressed. If short-term technical assistance is required to help develop these or other criteria, it can be funded from the contingency factor in the project budget.

VII. Conditions, Covenants, and Negotiating Status:

The Grant Agreement for the project is expected to be negotiated and signed in the Third Quarter of FY 1981. A condition precedent will be included which commits the GIRM to negotiating and signing a contract with each community where dam construction is proposed in this project before USAID will release any funds for the construction contract for any particular dam. The contracts will require the communities to maintain the dams and to distribute the increased agriculture land in such a manner so that all member families can benefit. The GIRM will also be responsible for establishing a mechanism to monitor compliance with the community contract.

A covenant will be included in the Grant Agreement assuring that the GIRM will provide the counterparts required for the technical assistance contract team. A second covenant will be included in the Grant Agreement assuring that the GIRM will program the involvement of the National Agricultural and Extension Training School (Kaedi) in extending improved agronomic practices to recessional farmers in the project area.

Financial Tables

Annex A

Table 1

Budget Summary

\$000's

<u>Cost Component</u>	81	82	83	84	All Years
<u>Dollar Costs *</u>					
Technical Advisors (6 pers. yrs.)		465	512		977
Contractor overhead/		210	230		440
Short term consultants (6 p. mos.)	74	21	24		119
Third Country Trng. - G. Rural (5 x 2 yrs.)		66			66
Third Country Trng. - Health (2 x 4 mos.)	23				23
Engineering design	350				350
Commodities	276	524	88		888
Evaluation			38	50	88
Subtotal	723	1286	892	50	- 2951
Contingencies (10%)	72	129	89	5	- 295
Total	795	1415	981	55	- 3246

* Based on 1980 prices plus 15% inflation rate, compounded yearly, with exception of salaries and overhead which are based on contract personnel cost estimates made by mission controller.

Construction of Dams

Construction *	-	780	940	1570	3290
Contingencies (25%)	-	195	235	393	823
Erosion Control	-	117	114	37	268
Total	-	1092	1289	2000	4381

* Based on 1980 cost estimates plus 20% inflation rate, compounded yearly.

Local Costs

Commodities (POL)*	18	132	152	88	390
Rents, utilities, guard serv. for advisors		100	110		210
Local travel	17	54	60	44	175
Local employees		39	43	47	129
Office: lease, utils., guard serv.		34	37		71
Construction: Aleg warehouse		182			182
Subtotal	35	541	402	179	1157
Contingencies (10%)	4	54	40	18	116
Total	39	595	442	197	1273

* Based on 1980 cost estimates plus 15% inflation rate, compounded yearly; 10% compounded annual inflation rate on all other local cost components.

Continue

Table 1 (cont.)

<u>Summary Totals</u>	<u>81</u>	<u>82</u>	<u>83</u>	<u>84</u>	<u>All Years</u>
Dollar Costs	795	1415	981	55	3246
Dams	-	1092	1289	2000	4381
Local Costs	39	595	442	197	1273
GRAND TOTAL	834	3102	2712	2252	8,900

Table 2

Commodities*

Item	FY Obligations					All Years
	81	82	83	84		
<u>Dollar Cost Procurement</u>						
Mobile Construction Inspec. Labs		125				125
Office Furn. and Equipment	16	7				23
Vehicles (7- '81; 3-'83)	145		82			227
Maintenance Equip./tools		380				380
Camp gear (10 sets)	1					1
Residence furn./appliances	110					110
Health program Commodities	4	4	6			14
Total	276	516	88	-	-	880
<u>Local Cost Procurement</u>						
POL (for both engineering and health components)	18	132	152	88		390

* Includes 15% yearly compounded inflation rate; 1980 base cost estimates.
For further details, see Annex C, Procurement Plan.

Table 3

Budget-Dams

Dams	Cost (1980) million ouguiya	\$'000 FY Obligations				All Year
		1981	1982	1983	1984	
Lefkarine	8.940			287		287
Boudjougol	9.670			310		310
Lemaoudou	2.820		91			91
Timbara	1.275		40			40
Touidima	1.625		52			52
Moudi Founti	9.510			365		365
Zmeilat	9.410			361		361
Bou Soueilife	5.590			214		214
Ameira	20.850				960	960
Touize Tagatt	13.210				610	610
Oudei Chrak	27.370					
Subtotal	110.270	-	183	1537	1570	3290
Contingencies (25%)			46	384	393	823
Subtotal			229	1921	1963	4113
Erosion Control			70	161	37	268
GRAND TOTAL			299	2082	2000	4381

*Figures include 20% annual compounded rate of inflation; base is 1980 cost estimates in Ouguiyas.

+ Pro-rated according to relative size of drainage basins involved in construction for each fiscal year.

Table (4)

Summary of Mauritanian Contribution

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>Total</u>
Community Workers (maintenance)	\$	\$	\$ 54.0	\$ 76.0	\$130
Community & Reg. Officials	26.0	31.5	37.5	43.0	138
Central Gov't	10.0	16.5	21.5	49.0	97
Subtotal	36.0	48.0	113.0	168.0	365
Infl. 10% comp.	3.6	10.0	37.4	78.0	129
GRAND TOTAL	\$39.6	\$58.0	\$150.4	\$246.0	\$ 494

ANNEX B

LOGICAL FRAMEWORK

Mauritania -- Rural Land Reclamation

Project 682-0203

GOAL

- Increased food production in dryland interior areas of Brakna and Gorgol regions of Mauritania.

- Reduce abandonment of farming and influx to urban areas from Brakna and Gorgol regions.

- Indicators Relative to Goal:

- Percent of new barrage basins put into cultivation.

- Level of population of farming families at barrage locations.

- Level of commerce at market centers in barrage regions.

- Verifications:

- Project evaluations

- Government Statistical reports

- Critical Assumptions:

- That the new areas made available for cultivation are sufficient inducement for farming families to exploit them.

- That social constraints which may impede full utilization of the new areas by the traditional farmers can be satisfactorily controlled.

- That health and environmental impacts of dams are positive, or that negative impacts can be satisfactorily relieved.

PURPOSE

- To strengthen GIRM's ability to design and construct durable dams which will increase cultivable land for recessional agriculture production in Brakna and Gorgol Regions.

End of Project Status

- Improved capacity in Genie Rural (the Rural Works Directorate of GIRM) to administer the government program for rural dams.

- Standards and criteria for site evaluations and selection developed.

- Standards for design engineering and construction of dams, and for maintenance of dams developed.

- Up to ten dams constructed within developed standards to give training and experience to Genie Rural.

- Maintenance support capability in Genie Rural developed for assisting communities in maintaining their dams.

- Verification Relative to Purpose:

- Published standards and criteria for site evaluation and selection.

- Published standards for design, engineering, construction and maintenance of dams.

- Dams constructed under the project.

- Communities properly maintaining their dams.

- Critical Assumptions:

- That the time frame of the project is sufficient to develop the capacity of Genie Rural to continue administering these activities.

- That dams being constructed can be built within quality standards contemplated for this project.

- That there is a national commitment for high standards of design and construction for permanent dams.

- That there is an effective commitment and participation on the part of barrage communities to cooperate in maintenance of their dams.

OUTPUTS

- Proposed dam sites evaluated and engineered in process of developing national standards.
- A selected number of these dams constructed by contract.
- Maintenance systems installed at these locations, including contracts with participating communities.
- Genie Rural administrators, technicians and other cadre receive on-the-job experience and training.
- Maintenance support equipment pool provided to Genie Rural.
- Indicators Relative to Outputs
- Site evaluation and selection reports.
- Design plans, construction specifications.
- Engineering and construction contracts.
- Construction inspections.
- Maintenance contracts with communities.
- Maintenance equipment.
- Genie Rural personnel trained.
- Verification:
- Copies of reports, plans, specifications, contracts.
- Technical advisor reports of training provided and received.
- Critical Assumptions:
- That a sufficient number of the ten sites prove to be feasible for selection and construction so that there is a good representative number for the training and standards objectives.
- That qualified construction contractors will bid for the contracts.
- That Genie Rural has sufficient qualifying cadre and technicians to receive the on-the-job training and experience.
- That the trained personnel remain with Genie Rural upon completion of the project.

INPUTS

- Technical Assistance and Training
 - in site evaluations
 - in engineering and construction standards and specifications
 - in contracting and contract inspections
 - in maintenance systems and standards.
- Support Assistance
 - construction of a number of dams by contract
 - maintenance equipment for dams
 - other commodities and contract services
- Magnitude of Inputs: See Financial Tables (Annex A) and Procurement Plan (Annex C).

Procurement Plan: Annex C

RURAL LAND RECLAMATION

PROJECT 682-0203

I. Responsibilities

The Ministry of Rural Development through the Directorate Genie Rural will be the implementing agency for this project. It is anticipated that the services of a Procurement Services Agent (PSA) will be used to procure all commodities so identified in the PP. Procurement will be in accordance with AID procurement regulations. Local procurement will be in accordance with good commercial practices, i.e., solicitation of offers from more than one supplier (if more than one supplier exists) etc.

II. Commodity List

Prices shown in parentheses are 1980 base prices. Final figures are shown to reflect a 15% annual compounded rate of inflation on the basis of the budget detail presented in Annex A.

(a) Misc. Quality Control Equip. (\$95,000)			\$125,000
(b) <u>Qty.</u> Office Equipment			
8 Desks @ 300	(\$ 2,400)	\$2,750	
8 Chairs @ 100	800)	900	
8 Side Chairs @ 75	450)	500	
2 Tables 3x5 @ 200	400)	450	
1 Large Work Table	400)	450	
3 File Cabinets @ 250	750)	850	
3 Typewriters 2 manuals, 1 electric	2,400)	2,750	
Mis. Office Equipment	6,400)	7,350	
Subtotal	(\$14,000)		16,000
(c) Engineering Planning Feasibility			
Office Furniture, Books	(5,000)		7,000
(d) Vehicles - 10 ea. Jeeps 4WD or equivalent	(180,000)		227,000
(e) <u>Qty.</u> Maintenance (Dsm) Equip. and Tools			
1 Tractor Loader w/Backhoe	(70,000)	92,250	
2 Dump Trucks 10 Ton	(120,000)	158,250	
@ 60,000		158,250	
1 Concrete Mixer (tractor mounted)			
1 Sand/Aggregate Bins (skid mounted)	(27,000)	35,500	
1 Batcher, concrete			
1 Portable Pump	(1,000)	1,500	
1 Lot of Hand Tools (shovels, various types picks, pickaxes, pails, wheel barrows)	(10,000)	13,000	
1 Lot Maintenance Equipment, spare parts and supplies for tractor, trucks, concrete mixer, pump	(40,000)	53,000	
1 Lot Mechanic's Tools (inch and metric) for repair of above equip- ment (tire repair, tire mounting, machine and hand tools)	(20,000)	26,500	
Subtotal	(\$288,000)		380,000

(f) 10 Sets Camping Gear (sleeping bags, air mattresses, etc.) @ 100 a set	(1,000)		1,000
(g) 3 Sets Furniture and Appliances for technicians @ 32,000	(96,000)		110,000
(h) Health Intervention Supplies			
Medicines	(11,000)	12,000	
Mollescucides	(4,000)	6,000	
Adm. and lab supplies	(3,000)	4,000	
Subtotal	(18,000)		22,000
(i) POL for Project	(306,000)		390,000
For Health Intervention	(6,000)		
For Advisors/Counterparts	(300,000)		
Total	(\$1,003,000)		(\$1,288,000)

Note: Commodities for construction will be procured by the contractor involved. In case contractor has no capability to procure, USAID will assist in the procurement on behalf of the GIRM.

III. Commodity Eligibility

All commodities listed are eligible for AID financing, and will be procured from the U.S. Code 000, except for items designated for local procurement.

IV. Source/Origin

Except as indicated in the equipment list, all commodities are from AID Geographic Code 000 Source/Origin.

V. Shelf-Item Procurement - Local Cost Financing

The Rural Land Reclamation Project will utilize approximately \$1 million for local cost procurement of such items as spare parts, POL, construction material, etc. Procurement under the shelf-item rule will be in accordance as described below:

Local procurement of commodities can provide the following items:

- Indigenous commodities - those mined, grown or produced in the cooperating country. Non-free world componentry is disallowed.
- Shelf items - those items imported and stocked to meet a general public demand in the cooperating country. They are not goods imported solely to support an AID-financed project.

Both indigenous goods and shelf items must meet eligibility criteria - they are subject to the statutory and policy restrictions found in Handbook 1, Supplement B, Chapter 4.

Financing Support

- Indigenous goods can be financed by AID project funds without limitation, other than the total currency limit of the project.

- Imported shelf items from Code 000 (U.S.) sources can be financed in unlimited quantities. Commodities from Code 941 sources (U.S. and Less Developed Countries) can also be financed in unlimited quantities; the eligible source(s) must be identified in the project agreement. Shelf items coming from Code 899 (Free World) sources but not from Code 941 (Selected Free World) sources, i.e., Code 935 sources, can be procured if the price per unit does not exceed \$2,500; the total amount of these project purchases cannot exceed \$10,000 or 10% of the total project local cost financing, whichever is higher.

Prices to be paid for locally procured commodities will be no more than the lowest available competitive prices, and purchases will be in accordance with good commercial practices. Commodities on the local market that are imported from non-Free World countries are not eligible for AID financing. Vehicles are not eligible items under the "shelf item rule" but cement, sand, gravel, POL, and construction materials are obtainable with local cost financing.

Some locally-procured items may be ineligible as a result of being shipped aboard non-Free World vessels; high visibility commodities (tractors, farm equipment, fertilizers, etc.) may fall under this heading.

Invoices for payment should state the source and origin of locally purchased materials, if such a requirement is practical.

VI. Vehicle Waiver: A source/origin waiver from Code 000 (U.S.) to Code 935 (Special Free World) is hereby requested to authorize the procurement of ten four-wheel drive vehicles and spare parts for the approximate amount of \$230,000. Origin: Japan, Spain, U.K.

Justification:

Mauritania faces a situation in which imports emanate almost entirely from France and other European Community countries. This past trade pattern, which has developed over many years, has resulted in the training of Mauritians in the use and maintenance of European-made goods and in the establishment of a spare parts source in Mauritania. American manufacturers and American distribution and service firms are not represented in this local market. As a result, the capability to obtain spare parts for U.S.-made equipment does not now exist in Mauritania, and Mauritians are not trained in the basics of U.S. vehicle maintenance. In the past, audits and inspections of A.I.D. projects have been critical of the difficulties that host countries have in maintaining U.S. vehicles after the project phases out. Coupled with the severe sand and wind conditions in Mauritania, vehicles are subjected to harsh conditions not normally faced and require constant repair and access to spare parts and maintenance. Project vehicles will be used for travel on rough rural roads and trails.

These motor vehicles are an essential part of the successful implementation

of this project and are not available from eligible sources. The concept of availability means in-place facilities to repair and maintain the vehicles once delivered. They must be the type that the host country can use effectively over a normal useful life when taking into consideration spare parts and maintenance. It would be unwise for the U.S. Government to use vehicles which cannot be maintained effectively over the life of this project and which, when turned over to the GIRM, would be outside their competence to maintain under the best of circumstances.

Recommendation:

Based on the above justification, a determination and certification is made that: (a) exclusion from procurement from countries in Code 935 would seriously impede attainment of U.S. foreign policy objectives and objectives of the Foreign Assistance Program, and (b) special circumstances exist to waive the requirements of Section 636 (1) of the FA Act.

ANNEX D

5C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

- No
1. FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?
- Yes
2. FAA Sec. 113. Has particular attention been given those programs, projects, and activities which tend to integrate women into the national economies of developing countries, thus improving their status and assisting the total development effort?
- No
3. FAA Sec. 481. Has it been determined that the government of the recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?
- Yes
4. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not dominated or controlled by the international Communist movement?
- No
5. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government?
- No
6. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

7. FAA Sec. 620(a), 620(f), 620D; FY 80 App. Act. Secs. 511, 512 and 513; ISCA of 1980 Secs. 717 and 721. Is recipient country a Communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos or Vietnam? (Food and humanitarian assistance distributed directly to the people of Cambodia are excepted). Will assistance be provided to Afghanistan or Mozambique without a waiver? Are funds for El Salvador to be used for planning for compensation, or for the purpose of compensation, for the confiscation nationalization, acquisition or expropriation of any agricultural or banking enterprise, or property or stock thereof?
8. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression?
9. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?
10. FAA Sec. 620(k). Does the program exceed the \$100,000,000 limit?
11. FAA Sec. 620(i). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason?
12. FAA Sec. 620(m). Is the country an economically developed nation capable of sustaining its own defense burden and economic growth and, if so, does it meet any of the exceptions to FAA Section 620(m)?
13. FAA Sec. 620(o): Fishermen's Protective Act of 1967, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters,
- a. has any deduction required by the Fishermen's Protective Act been made?
- b. has complete denial of assistance been considered by AID Administrator?

No

No

No

No

N/A

No

N/A

No 14. FAA Sec. 620(g); FY 80 App. Act Sec. 518. (a) Is the government of the recipient country in default for more than six months on interest or principal of any AID loan to the country? (b) Is the country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds?

N/A 15. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

Yes * 16. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

Mauritania regularly meets its UN obligations. 17. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget?

No 18. FAA Sec. 620A, FY 80 App. Act, Sec. 521. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? Has the country granted sanctuary from prosecution to any individual or group which has committed a war crime?

No 19. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA?

* Diplomatic relations have been resumed and a bilateral assistance agreement currently is being negotiated.

No 20. FAA Sec. 669. 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty?

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria.

Yes a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of the country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment and (6) increased literacy.

Yes, Agricultural production will be expanded through this project and nutritional condition thereby improved.

b. FAA Sec. 104(d)(1); IDC Act of 1979. If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, assistance to urban poor and through community-based development programs which give recognition to people motivated to limit the size of their families?

2. Economic Support Fund Country Criteria.

No a. FAA Sec. 502B. Has the country (a) engaged in a consistent pattern of gross violations of internationally recognized human rights or (b) made such significant improvements in its human rights record that furnishing such assistance is in the national interest?

No b. FAA Sec. 532(f). Will ESF assistance be provided to Syria? If so, has President waived prohibition against the assistance by determining that such assistance will further U.S. foreign policy interests?

N/A c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

No d. FY 80 App. Act Sec. 510. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

No e. FAA Sec. 620E. Will ESF be furnished to Argentina?

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 80 App. Act Unnumbered; FAA Sec. 634A; Sec. 653(b);.

Advice of program change will be submitted. (b) Yes.

(a) Describe how authorizing and appropriations Committees of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure)?

* 2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

N/A

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

*(a) construction of facilities will follow plans and specifications which will have been approved by REDSO/WA Engineering. (b) Yes.

- Yes, individual constructions subject to this requirement will be subjected to the appropriate analysis prior to implementation.
- * 4. FAA Sec. 611(b); FY 80 App. Act Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973?
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?
- No 6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.
- Project will expand the production of food crops through the construction of 11 rainwater-runoff retention dams affiliated with recessional agriculture. 7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
- Project will finance technical assistance services and project commodities from private firms in the U.S. 8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
- Mauritania's contribution represents the maximum that it can manage, given that it is one of the poorest countries in Africa. 9. FAA Sec. 612(b); Sec. 636(h); FY 80 App. Act Sec. 508. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.
- No 10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

* The project is a combined technical and capital assistance project. It has been designed to require minimal recurring costs since the operation and maintenance of the dams to be constructed will be a responsibility largely within the capabilities of the communities. As a condition of construction, these communities will commit themselves to this responsibility. Occasionally, supplementary assistance with equipment will be provided by Rural Works as needed. The frequency and type of such assistance will be within the resources of Rural Works upon completion of AID assistance.

- Yes 11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?
- N/A 12. FY 80 App. Act Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. procedures of the same, similar or competing commodity?

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

The project will increase the availability of productive agricultural land through the construction of small dams. The communities will be involved in the labor-intensive maintenance of these dams as well as in the increased agricultural production. Formal agreements between the GIRM and dam communities, assuring mutual rights and responsibilities, will be based on cooperative or pre-cooperative organizations.

N/A (Sahel funds are being used)

a. FAA Sec. 101(b); 111; 113; 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(1) [103] for agriculture, rural development or nutrition; if so (a) extent to which activity is specifically designed to increase productivity and income of rural poor; 103A if for agricultural research, full account shall be taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made; (b) extent to which

assistance is used in coordination with programs carried out under Sec. 104 to help improve nutrition of the people of developing countries through encouragement of increased production of crops with greater nutritional value, improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot or demonstration of programs explicitly addressing the problem of malnutrition of poor and vulnerable people; and (c) extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging domestic production, building national food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution.

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, (i) extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(4) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development; and (ii) extent to which assistance provides advanced education and training of people in developing countries in such disciplines as are required for planning and implementation of public and private development activities.

(5) [106; ISCA of 1980, Sec. 304] for energy, private voluntary organizations, and selected development activities; if so, extent to which activity is: (i) (a) concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new

methods of energy production; (b) facilitative of geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas, and coal reserves; and (c) a cooperative program in energy production and conservation through research and development and use of small scale, decentralized, renewable energy sources for rural areas;

(ii) technical cooperation and development, especially with U.S. private and voluntary or regional and international development, organizations;

(iii) research into, and evaluation of, economic development process and techniques;

(iv) reconstruction after natural or manmade disaster;

(v) for special development problems, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

Yes

c. [107] is appropriate effort placed on use of appropriate technology? (relatively smaller, cost-saving, labor using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor.)

Strict adherence to the 25 percent rule is not required of SDF-funded projects.

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least developed" country)?

N/A

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

* (f) FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

Yes

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

2. Development Assistance Project Criteria (Loans Only)

N/A

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.

N/A

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Economic Support Fund

N/A

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

*Pecessional agricultural dams are widely requested in Mauritania. This project improves on a traditional agricultural practice. The project will provide Rural Works with the means of managing a national dam construction and maintenance program.

A. Procurement

- Yes 1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?
- Yes 2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?
- N/A 3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will commodities be insured in the United States against marine risk with a company or companies authorized to do a marine insurance business in the U.S.
- N/A 4. FAA Sec. 604(e); ISCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)
- Yes 5. FAA Sec. 608(a). Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.
- Yes 7. FAA Sec. 621. If technical assistance is financed, to the fullest extent practicable will such assistance, goods and professional and other services from private enterprise, be furnished on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?
- Yes 8. International Air Transport, Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?

Yes 9. FY 80 App. Act Sec. 505. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States?

B. Construction

Yes 1. FAA Sec. 601(d). If capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interests?

Yes 2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

Yes 3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million?

C. Other Restrictions

N/A 1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

N/A 2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

Yes 3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries?

4. Will arrangements preclude use of financing:

Yes a. FAA Sec. 104(f). To pay for performance of abortions as a method of family planning or to, motivate or coerce persons to practice abortions; to pay for performance of involuntary sterilization as a method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization?

- Yes b. FAA Sec. 620(d). To compensate owners for expropriated nationalized property?
- Yes c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?
- Yes d. FAA Sec. 662. For CIA activities?
- Yes e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of motor vehicles manufactured outside U.S., unless a waiver is obtained.
- Yes f. FY 80 App. Act Sec. 504. To pay pensions, annuities retirement pay, or adjusted service compensation for military personnel?
- Yes g. FY 80 App. Act. Sec. 506. To pay U.N. assessments, arrearages or dues.
- Yes h. FY 80 App. Act Sec. 507. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multi-lateral organizations for lending.)
- Yes i. FY 80 App. Act Sec. 509. To finance the export of nuclear equipment fuel, or technology or to train foreign nationals in nuclear fields?
- Yes j. FY 80 App. Act Sec. 516. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?

جمهورية الإسلامية الموريتانية
République Islamique de Mauritanie

شرف - الاخلاص - العمل
Honneur - Fraternité - Justice

ANNEX E - GRANTEE

CHRON
DRF Incoming
from Ministries

AGR 9-3

وزارة التنمية الريفية

MINISTÈRE
du DÉVELOPPEMENT RURAL

REQUEST FOR ASSISTANCE

Feb 1 1979

059

N. / MDR

Nouakchott, le 11/2/79 نواكشوط في

Réf:

La Ministre الوزير

Objet: Réfection des barrages
Traditionnels de dégrue.

à Monsieur le Directeur de l'I.D.
M. S. A. I. D.

MICROFILMED FROM BEST
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-1/OUAKROTT-

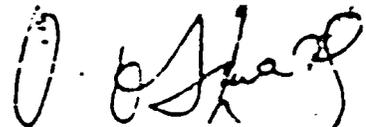
Lors de la mission d'évaluation agro-pastorale effectuée en novembre 1978 et à laquelle les représentants de l'USAID ont participé, il a été constaté une fois de plus l'importance des barrages à vocation agro-pastorale dans le développement économique de la Mauritanie.

Cependant, compte tenu de leur état actuel, certains de ces barrages nécessitent des travaux de réfection, ils ne peuvent être exploités d'une manière satisfaisante.

Malgré cela, nos collectivités rurales ont fait preuve de beaucoup d'initiative dans le domaine de la réfection de ces barrages. À la lumière des informations relatives à l'importance des barrages à vocation agro-pastorale en Mauritanie, j'ai l'honneur de vous solliciter afin d'être favorable à l'octroi d'un prêt de réfection de ces barrages.

.....

Veuillez croire, Monsieur le Directeur a
l'expression de ma haute considération ./.-



Dr. OUMAR BA.



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ANNEX F

Legislative Criteria

FAA Section 611 (a) and (b):

Detailed planning and cost estimates which are reasonably firm have been developed in the PP. The engineering analysis, Annex H-1 of this project, has considered and addressed the planning, technical engineering and factors which will affect cost. The project will involve the construction of up to eleven modest rainwater runoff retention dams. Detailed technical studies at each potential site have been carried out as described in the engineering analysis. These studies form the basis for a reasonably firm estimate of cost.

INITIAL ENVIRONMENTAL EXAMINATION

OR

CATEGORICAL EXCLUSION

Project Country: MAURITANIA

Project Title and Number: RURAL LAND RECLAMATION, Project 682-0203

Funding: FY (s) 81-84 \$ 8,900,000

IEE/CE Prepared by:

Environmental Action Recommended:

Positive Determination _____
Negative Determination X _____
or
Categorical Exclusion _____

This activity meets the criteria for Categorical Exclusion in accordance with Section 216.2 (C) _____ and is excluded from further review because:

Action Requested by: [Signature]
Mission Director

Date: March 27, 1981

Concurrence:
Bureau Environmental Officer

APPROVED [Signature]

DISAPPROVED _____

DATE 31 May 1981

Clearance: G./AFR [Signature]

Date 5/14/81

I. Examination of Nature, Scope and Magnitude of Environmental Impacts

A. Description of Project

Among the goals of the Government of the Islamic Republic of Mauritania (GIRM) is the reversal of the trend on the part of the rural population to abandon formerly viable agricultural land in favor of movement toward the urban areas of the country. This trend, common in many developing countries, has been exacerbated in Mauritania by the severe impact of the Sahelian drought of the late 60's and early 70's and the continued sub-normal rainfall in the region. The present situation threatens the viability of Mauritanian agricultural development and places ever-increasing economic and social burdens on the urban sector. Among the GIRM's strategies for coping with this difficult problem is the regeneration and expansion of the traditional system of recessional agriculture practiced in certain parts of the country through the use of small dam structures.

In regions of Mauritania such as the Brakna, Gorgol, Tagant, Assaba and Hodh regions, Mauritanians have employed small-scale earthen dams or dikes to trap rain water flowing through run-off areas known as Oueda. Water is held for a period sufficient to saturate the soil so that, when the water is released, crops may be grown to maturity without further rainfall. Generally, the dam structures were constructed with no compaction of the soil and no measurement of the impact on the structure of the volume of water to be retained. As a result, many such dams have failed.

The GIRM, with the objective of increasing food production, reducing farming risks and improving rural income levels, has become involved in the reconstruction of a number of old dams and the construction of a number of new dams utilizing improved methods of engineering and construction. The government body charged with carrying out this activity is Genie Rural, the Rural Works Service of the Ministry of Rural Development.

USAID will assist the GIRM by engaging in two closely related efforts: (1) an institution building activity within Genie Rural, which will be essential to achieve, (2) the construction or rebuilding of up to eleven dams in the Brakna and Gorgol regions of the country. Assistance will be targeted toward enhancing Genie Rural's capability to do the following: utilize technical engineering criteria and other data in selecting dam sites; develop national standards for dam design, engineering and construction; administer contracts for feasibility analysis, design work and project implementation; and assist local communities in small dam maintenance. The USAID-assisted construction activities in Brakna and Gorgol will complement similar work being assisted by the FED in the Eastern and Western Hodh regions, UNSO in the Assaba region and a German effort in the Tagant.

B. Identification and Evaluation of Environmental Impacts

Excavation of basic construction materials (earth, sand and gravel) will be required in order to build the dam structures. However, the size of the dams envisioned is such that only a minimal amount of land and material moving and land levelling will be required. Once the dams are constructed, a certain amount of downstream erosion is anticipated when the dams are released. This erosion will be controlled through proper training of local responsible for managing dam water run-off, by undertaking erosion control measures using

the project's construction phase and by including analysis of potential damage from erosion as part of the design criteria package to be developed for future work by Genie Rural.

Use of the retained dam water is expected to be focussed on increased agricultural production. In almost all cases, this is a return to previous practices undertaken through the use of traditional dam structures. The new structures should reduce the risk of dam washout, thus reducing farmer uncertainty and creating a positive social benefit in the fragile ecological zone.

Flow regimes will be altered in the oueds where dams are placed. However, the pattern of flow will be regulated in such a way as to decrease the risk of flash flooding through the oueds during the rainy season or the risk of flooding due to the failure of dam structures.

The construction phase of the project will necessitate the use of a great deal of water for a limited period. It has been deemed inadvisable to overburden local wells for construction purposes. Therefore, during the season prior to construction excavations will be made at each site which will serve as ponds to collect water for construction activities. In this manner, precious ground-water resources will be left largely undisturbed, while the temporary ponds can be filled in once construction is completed.

Development of a more stable agricultural regime in the dam region may lead to upward pressure on land values and questions regarding tenure and ownership of an improved natural resource. Possible social inequities are expected to be mitigated by the project requirement of a contract, between each local dam community and the GIRM, affirming that the benefits of improved agriculture will be shared equitably by the members of the community.

Other than the below-mentioned use of a molluscicide for health purposes, this project will not procure or use any other pesticides. Should such a need arise during project implementation, the mission will prepare and submit an appropriate pesticide risk-benefit analysis or environmental assessment for AID/W approval.

The positive social and economic benefits of the project arising from increased agricultural productivity could have been at least partially offset by the expansion of disease vectors, particularly in the case of schistosomiasis. To counter this detrimental effect, health monitoring and control measures have been incorporated in the project design. Control measures include the use of a molluscicide, bayluscide (A risk/benefit analyses of the product is attached as part of this I.E.E.). It is expected that implementation of the health monitoring and control program will eliminate the adverse impact on health which might otherwise result from the proposed project interventions.

Discussion of Attached Impact Identification and Evaluation Form Ratings

The following comments explain the evaluation charted in the accompanying forms. All notations under the heading N exert no negative impacts and will require no explanation. All other columns (L - little, M - moderate, H - high, and U - unknown), where checked, will be commented on below:

Land Use

Since erosion control structures will be incorporated in dam design, the downstream effects of erosion from water released from the impoundments will be limited. As the dam structures are of small size, the required excavation and grading will also be limited in scope. In regard to changes in animal and plant habitats, all barrage sites incorporated in the project have seen the use of traditional dam structures in the past for purposes of recessional agriculture. Thus, the moderate change envisioned is in reality a return to previous agricultural practices, but with an improved technology. It is expected however, that the improved dam structures will endure for a much longer duration than the traditional dam, thus reducing the risks inherent in this form of agriculture. Thus it can be anticipated that the populations surrounding the dam sites will stabilize and, in some cases, increase as long unutilized land is made available for production. This stabilization of rural population is viewed as a positive result of the project since it contributes to the long-range goal of reducing rural to urban migration.

Water Related Impacts

The project is expected to have a high impact on related drainage and flood patterns. From an ecological viewpoint, much of the damage caused by flash flooding during the rainy season will be eliminated at project sites by utilizing proper techniques of dam design. Water which is currently dissipated through an ecologically destructive process will be controlled to be used for beneficial agricultural practices. Negative implications of changes in downstream flow regimes have been mitigated by targetting all project barrages to sites with negligible downstream populations.

Retention of water in the dam site areas is expected to possibly produce a beneficial effect on water table levels at most dam sites.

Some sedimentation behind the dam structures is inevitable. But the effects of this sedimentation are expected to be minimal. Overall, the ecological balance which has been shifting in favor of further desertification of the environment will be reversed in favor of an environment which can support productive agricultural pursuits.

Atmospheric

During the construction period at each site, an increase in pollution from dust, vehicle exhaust and noise can be expected. This is a temporary phenomenon with no long term environmental implications anticipated.

Natural Resources

Water is critically short in the Mauritanian environment. Traditional dam recessional agriculture has attempted to retain and utilize this scarce commodity by impounding rainwater. The project seeks to assist this effort through assisting in the improvement of dam construction. When the project is completed, the natural resource balance in the area will have been altered, at least on a seasonal basis, to the benefit of the inhabitants of this generally resource scarce land.

Water is necessary for the construction phase. Rather than draw it from the available wells, the project will obtain water from ponds dug before the onset of the rainy season. The impact of these ponds on well recharge rates is expected to be minimal.

Cultural

An increase in agricultural production in the region is expected to contribute to the continuing trend of the adoption of a sedentary lifestyle by formerly nomadic people. This is a trend which has been prevalent since the drought. Assistance targetted toward improving the rural sector as a settling place for many of these people is regarded as preferable to continued migration to urban centers.

Socioeconomic

Increased agricultural production in the project area should also accelerate the value of the land resulting in possible conflicts regarding tenure and ownership. Such negative consequences are expected to be avoided by requiring an agreement with the community associated with a particular dam. The agreement will state that the benefits from agricultural production associated with the dam will be shared equitably.

Improved agricultural practices should have positive effects on rural income and employment. Some slight changes in market patterns and demand for services may be expected, particularly if a marketable surplus is produced at any given project site.

Health

An increase in the disease vectors for schistosomiasis and guinea worm infection is expected as a result of the creation of bodies of still water behind project dams. Despite the fact that the water is released after having soaked the land, the implications for the spread of disease are regarded as significant. To counter these negative implications, a disease monitoring and control activity has been incorporated as part of the project design. In fact, it is expected that this activity will reduce the incidence of schistosomiasis and guinea worm infection below the current pre-project levels. Monitoring of Malaria in the project area will also take place to gather baseline data on its incidence. It is not anticipated that new food products will be introduced as a direct result of this project, although the results of AID's work in vegetable production may well penetrate the proposed project zone. In any case, the improved agricultural environment for traditional cereal crops and other products usually grown in the region will benefit the nutrition of the local population.

General

The proposed interventions in the recessional agricultural zone are designed to contribute to the improvement of productivity and well-being in this area of rural Mauritania. The success of this project will generate further interest and support for the recessional agricultural zone, thus promoting its long term environmental and agronomic viability.

Risk/Benefit Analysis for use of Bayluscide
(niclosamide)

(Prepared by Linda Neuhauser, RCD, USAID/Mauritania and Dr. Moustapha Syddat, Director National Hygiene Center, Nouakchott)

This project has selected Bayluscide for the chemical control element of the schistosomiasis/dracunculiasis control component. Bayluscide, a molluscicide has the chemical formulation niclosamide and is registered for the same or similar use without restriction by the U.S.E.P.A. Its registration numbers are 3125-1360 and 3125-215.

Bayluscide was chosen as the molluscicide for this project because of high effectiveness, ease of application and lack of toxicity. Among the available molluscicides, Bayluscide ranks in first class for the above criteria. Bayluscide is proposed as the only molluscicide to be used in this project.

Risk Benefit Analysis

Bayluscide will be applied using either backpack sprayers, high pressure sprayers or pneumatic motorized sprayers. When one of the above methods is selected, the spraying apparatus will be purchased according to the required standards. The technicians applying Bayluscide will be thoroughly trained in these methods during their 4-month training in Schistosomiasis control techniques.

Toxicity and Environmental Effects

Bayluscide is not toxic to humans or other warm-blooded animals when used according to product specifications. The oral LD50 for the rat is 5,000 mg/kg of body weight, far exceeding the usual dose of 2ppm proposed for the dam sites. Bayluscide is toxic to small biota including fish and frogs as well as snails. There has been no reported danger of toxicity experienced by those applying Bayluscide. Bayluscide is not absorbed by the soil and shows no long-term environmental effects. Between the twice yearly recommended applications, Bayluscide will gradually degrade into harmless by-products so there will be no build up of harmful chemical products.

Regarding the compatibility of Bayluscide with the target and non-target eco-systems, no negative environmental effects are foreseen. Bayluscide's toxicity to fish and small biota is not important since water at the dam sites is used for cultivation and not for these aquatic animals which are rare or absent at these sites. Bayluscide use is confined to discrete bodies of water at the dam sites; therefore, its activity will affect non-target eco-systems only in so far as successful snail control in the project dams may reduce the transmission of snails to neighboring areas. By the time the impounded water is released, the Bayluscide will have degraded into its harmless by-products, therefore it will not adversely impact the downstream environment.

Product Effectiveness

Bayluscide is ranked in first class not only for its lack of toxicity and ease of application, but also because of its superior effectiveness in killing snails (and copepods - host for guinea worm). Bayluscide kills both snails and their eggs as well as the intermediate aquatic forms of the schistosome parasite usually within several hours. Two applications of Bayluscide per year is

usually sufficient to prevent reappearance of snails.

While there are other available molluscides, none surpasses Bayluscide regarding the above criteria and also its commercial availability in the relatively small quantities necessary for this project. Non-chemical control methods are still experimental and have experienced limited success to date.

Benefits from use of Bayluscide

As note above, Bayluscide poses negligible risk through its use in this project. The benefits from Bayluscide use will be significant. It is expected that with regular application of this product accompanied with drug treatment of Schistosomiasis cases, Schistosomiasis in the project area can be reduced to a very low level. Likewise, for the improved or newly constructed dams which are currently not reservoirs of Schistosomiasis, Bayluscide use offers a method of preventing snail infestation if snails begin to appear at these sites. Thus, Bayluscide offers a method of preventing the expected spread of snails and Schistosomiasis with the increase of dams and recession agriculture. The reduction of schistosomiasis will reduce the necessity for treatment of cases and especially the very costly long term complications produced in some of these cases.

II. Recommendation for Environmental Action: Negative determination.

INITIAL ENVIRONMENTAL EXAMINATION

Impact Areas and Sub-areas - See Explanatory Notes for this form.

Impact Identification and Evaluation - Use the following symbols:

- N - No environmental impact
- L - Little environmental impact
- M - Moderate environmental impact
- H - High environmental impact
- U - Unknown environmental impact

		N	L	M	H	U
A. LAND USE						
1.	Does the project change the character of the land through:					
a.	Erosion _____		X			
b.	Excavation and/or grading _____		X			
c.	Change in animal or plant habitats _____			X		
d.	Modification of land use _____			X		
e.	Increasing concentration/population _____				X	
2.	Potential natural disasters _____			X		
3.	Unplanned roadside activity (e.g. overgrazing) _____		X			
4.	Other factors _____					
B. WATER RELATED IMPACTS						
1.	Does the project change the quality of water resources through:					
a.	Drainage pattern _____					X
b.	Modification of flood patterns _____					X
c.	Water table change _____			X		
d.	Salinity modification _____			X		
e.	Pollution of adjacent waters _____			X		
f.	Induce sedimentation of adjacent waters _____			X		
g.	Ecological balance _____					X
h.	Other factors _____					
C. ATMOSPHERIC						
1.	Does the project induce atmospheric changes through:					
a.	Pollution (during construction e.g. dust) _____			X		
b.	Pollution (vehicle generated e.g. dust, exhaust) _____			X		
c.	Air pollution (cargo generated e.g. chemical asbestos, phosphates, etc.) _____			X		
d.	Noise pollution _____			X		
e.	Other factors _____					
D. NATURAL RESOURCES						
1.	Does the project change the natural resource balance through:					
a.	Planned and unplanned exploitation _____					X
b.	Utilization of limited resources for construction _____			X		
c.	Other factors _____					

	YES	NO
E. CULTURAL		
1. Does the project affect the culture through:		
a. Changes in traditional cultural values	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Alter physical symbols	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Alter traditional modes of transportation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. Alter traditional living patterns through increased mobility changes in family structure	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e. Other factors	<input type="checkbox"/>	<input type="checkbox"/>
F. SOCIOECONOMIC		
1. Does the project affect socioeconomic conditions through:		
a. Changes in ownership/land values/tenure	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Changes in market patterns (local, national, regional)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Increase demand of services (e.g. public and private automotive, water supplies, health, etc.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. Change in transportation pattern (cost; cargo)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e. Changes in economic/employment patterns	<input checked="" type="checkbox"/>	<input type="checkbox"/>
f. Other factors	<input type="checkbox"/>	<input type="checkbox"/>
G. HEALTH		
1. Does the project affect health standards through:		
a. The creation of stagnant water which may result in increased disease vectors	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Increased carrier mobility (human and/or animal)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Dietary changes (introduction of new food products)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. Increased traffic accidents (human and animal)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
e. Other factors	<input type="checkbox"/>	<input type="checkbox"/>
H. GENERAL		
1. Does the project have:		
a. International impacts	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Controversial impacts	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Larger program impacts	<input checked="" type="checkbox"/>	<input type="checkbox"/>
d. Other factors	<input type="checkbox"/>	<input type="checkbox"/>
I. OTHER POSSIBLE IMPACTS (not listed above)		

ANNEX H-1
ENGINEERING ANALYSES.

I. Site analyses, pre-feasibility and feasibility studies of Brakna and Gorgol regions:

A. SOGETHA studies in 1950' s of existing and potential dams in these and other Regions of Mauritania. These studies included, among others, a number of the sites currently contemplated for this project. The studies were general in nature.

B. SQVADER studies of thirty specific sites in Brakna and Gorgol were conducted in 1978 under contract with USAID. These provided criteria for dam design and addressed social, environmental and health considerations at the sites. From these findings, fifteen sites were chosen for more intensive site-specific studies which were conducted by SQVADER. The results have been the basis for the inclusion of eleven sites for potential construction under this project. As indicated elsewhere in this P.P., the construction contemplated is for the purpose of training and experience for Genie Rural technicians and cadre, as well as for the resultant increased agricultural production.

II. Design.

A. General.

The review of the feasibility analyses of the 15 dam sites for recession agricultural activities raises the question as to appropriate construction technology. One: should these dams be constructed using modern equipment; or two: is it possible to design the project using traditional methods but introducing modern materials to achieve a serviceable structure? Modern methods of dam construction have been determined as the appropriate way for dams of the size and configuration being considered.

B. Construction equipment.

Design of dams for construction which would use modern construction equipment (bulldozer, scraper, compactor, concrete mixer, etc.) was carried out under an A.I.D. contract with SQVADER, as indicated previously. The plan, profiles and X-sections for these dams are sufficiently complete for evaluation as to area of land that can be cultivated under recession farming and an estimated quantity of materials needs for building these dams.

C. Hydrological.

The following tabulation of the 15 dam sites studied is arranged in ascending order by size of normal cultivable area, the size of drainage basin is also shown:

RESERVOIR NAME	AREA (ha)		AREA (km ²)	
		<u>CULTIVATABLE</u>		<u>DRAINAGE BASIN</u>
1. AZGUELEM	47		73*	
2. BOU SOUEILIFE	52		9	
3. LEFKARINE	54		14	
4. CAG EL MCHOR	55		80*	
5. ZMEILAT	55		120	
6. AMEIRA	75		13	
7. MENDI FOUNTI	81		90	
8. TOUEIZE GRETT TAGAT	90		11	
9. TIMBARA	**		106	
10. TOUEIDIMA	**		8	
11. SOUDJOUNGAL II	140		61	
12. LEMAOUDOU	**		34	
13. OUDEI CHRACK	160		106 *	
14. MINT AWAWA	235		350 *	
15. LEHNAKATT	680		389*	

* Sites excluded, because of costs of other factors.

** Sites involving betterments to existing structures.

The acceptance of the design for Mint Awawa on the basis of empirical equations for determination of flows, using area of drainage basin and other variables from charts and graphs, is too risky, especially because of possible adverse effects on the Makta-fahjar reservoir downstream. The design of the other eleven dams using empirical equations for determination of peak flood flow and volume of runoff to establish spillway size and crest elevation is considered acceptable.

D. Structures.

The SONADER study has envisioned the use of various types of structures for spillway and embankments:

1. Spillways.

a) On Permeable foundations - the spillways for this condition consist of a compacted earth core that is keyed into base material. The compacted core material is covered with a permeable fabric to prevent loss of core material due to wave action of water flowing over or through the core. The permeable blanket is held in place and protected by gabions. There are eight spillways of this design and these spillways should be redesigned as a permanent structure in accordance with "Design of Small Dams" published by U.S. Dept. of Interior, Bureau of Reclamation (USBR) and economic studies of length of spillway versus depth of water over crest shall be made.

b) On Rock.

The spillways for this condition, where the rock surface is below spillway crest elevation, consists of concrete weir and stilling basin. There are three spillways of this design and economic studies for length of spillway versus depth of water over crest shall be made.

The second condition is where the rock surface is above the elevation of the dam embankment; here the spillway is simply a channel excavated into the rock. There is one spillway of this design and length-depth economic study as per above should be made.

The third condition is similar to two above, but a natural saddle exists and excavation of a spillway channel is not necessary. There is one spillway of this design.

2. Embankments.

a) On Permeable Foundations. - the embankments for this condition consist of a compacted earth core that is keyed into base material. The earth core is covered with a permeable fabric to prevent loss of core material by wave action or by water that has percolated through the dam embankment. The permeable fabric is protected by and held in place by gabions and/or rip rap. At the downstream toe there is a gabion rock drain. The berm of dam is protected with a gravel blanket (suitable for light traffic). Ten dams have such embankments and the embankments shall be redesigned for using construction equipment, i.e. cut-off (key) made so equipment be used instead of hand compaction equipment. The redesign shall follow USBR "Design of small Dams" Standards.

b) On Rock Foundation - The second type of dam consists of an 18-inch thick concrete dam that is keyed into the subsoil or rock. This type of construction is used for short and low dams. Seven dams incorporate this type of construction to some extent.

3. Outlet Works.

All outlet works for the dams included in this project are of the same design and are similar to an irrigation canal valved turnout. The outlet consists of a concrete headworks with a cast iron gate valve and a pipe conduit through the embankment and fitted with concrete anti-seepage collars on through the concrete dam and an energy dissipation stilling basin at the conduit outlet.

4. Suitability.

The technical evaluation of the various designs for the above structural appurtenances, which will make up the infrastructure to be constructed at each site, indicates that the designs for some of them can be improved, based on more complete knowledge of each site and taking the proposed methods of construction into account. Therefore the engineering firm selected to prepare the construction drawings and specification shall reevaluate the SONADER design concepts and redesign more in accordance with USBI standards.

III. Construction.

A. Water:

The construction of earthwork in these regions of Mauritania is limited to the availability of water for embankment construction. Water can be made available by construction of ponds by excavation prior to the rainy season and/or by drilling wells. The utilization of wells for construction purposes in the project area is highly questionable. Output rate for water needed for embankments construction exceeds the probable yield from wells and these wells are suitable for community water supply only.* Therefore construction planning should be based on rain-fed ponds. These ponds shall be excavated prior to planned construction season for storage of water needed to obtain minimum density necessary for a sound dam embankment. The construction period will be limited to the volume of water needed and the rate of embankment construction. In the project area the maximum rate evaporation is approximately 0.5 meter per month during the dry season, thereby limiting construction to 4 to 6 months after the rainy season.

* CIEH Report/volume 2 prepared by TMS/AID contract.

B. Schedule.

1. Duration - The earthwork for the dams have been estimated to require about 300 days based on an average production rate of 370 cubic meters per day. Therefore if these conservative estimates are used (4 months of optimum construction time each year) there will be about 102 working days each year for efficient and economical placement of compacted earthfill embankments. Therefore it would require a minimum of 3 construction seasons to construct all ten dams.

2. Sequence - The construction schedule for the dams has been arranged so that those most closely meeting selection criteria, with little further study, will be constructed first. Also considered in establishing schedule was the type of dam, (the earth embankment type or concrete gravity type).

<u>First Construction Season</u>	<u>Constraint Time</u>
1. <u>Timbara</u>	
a. Embankment construction 350 m3	1 day
b. Concrete 12 m3	no constraint
c. Rock excavation 280 m3	no constraint
2. <u>Toueidima</u>	
a. Embankment construction 750 m3	2 days
b. Concrete (nil)	no constraint
c. Rock excavation 150 m3	no constraint
3. <u>Lenaoudou</u>	
a. Embankment construction 3200 m3	10 days
b. Concrete work 10 m3	no constraint
c. Rock excavation 70 m3	no constraint
<u>Second Construction Season</u>	<u>Constraint Time</u>
1. <u>Bou Soueilife</u>	
a. Embankment construction 9,000 m3	28 days
b. Concrete work 4 m3	no constraint
c. Concrete work 4 m3	no constraint
2. <u>Zreilat</u>	
a. Embankment construction 7000 m3	22 days
b. Concrete work 6 m3	no constraint
c. Rock excavation 1,700 m3	no constraint

3. Mondi Founti
- a. Embankment construction no constraint
 - b. Concrete work 730 + m3
 - c. Rock excavation 300 m3 no constraint
4. Lefkarine
- a. Embankment Construction 9,000 m3 28 days
 - b. Concrete Work 253 m3
 - c. Rock excavation 700 m3 no constraint
5. Boudjougol II
- a. Embankment construction 3,500 m3 11 days
 - b. Concrete work 500 m3
 - c. Rock excavation 500 m3 no constraint
- Third Construction Season
1. Toueize Grett Tagatt
- a. Embankment construction 25,000 m3 80 days
 - b. Concrete work 12 m3 no constraint
 - c. Rock excavation 420 m3 no constraint
2. Ameira
- a. Embankment construction 8,000 m3 23 days
 - b. Concrete work 420 m3
 - c. Rock excavation 10 m3 no constraint

The above construction schedule is based upon the assumption that the work is to be performed using modern construction methods.

C. Quality Control:

Quality control of construction will have to be insured, therefore the necessary quality control technical assistance and field testing facilities and equipment should be provided. The technical assistance advisor (TAA) will establish the soils and concrete testing procedures and standards according to U.S. Bureau of Reclamation's, or the U.S. Dept. of Agriculture Soil Conservation Service's, recommended practices. The TAA shall assist in the establishing of two mobile field laboratories and the training of inspection technicians to perform the required tests and to evaluate the results.

1. Qualifications requirements for the technical advisor (construction quality control): the advisor shall have had at least 10 years experience, and at least 5 years shall have been for earth dam embankment and concrete quality control at U.S. standards. His experience shall have included field inspection and sampling, laboratory analysis, evaluation of results and preparation of reports. The minimum French language required will be at the 3 level (FSI standards).

Because laboratory field testing equipment and the mobile laboratories will be needed by the time the quality control advisor arrives, and because of the necessary lead time involved in procuring such equipment, REDSO engineering services, in collaboration with the Director of GR, will advise USAID on the procurement specifications needed to prepare PIO/c's early in project implementation, including:

a. Preparation of list of testing and sampling equipment and supplies for:

- 1) Field testing and sampling compacted earth dam embankment
- 2) Laboratory testing and analysis of earth dam embankment samples.
- 3) Field testing and sampling of concrete
- 4) Laboratory testing and analysis of cement, coarse and fine aggregate and water for concrete

b. Preparation of specifications for mobile field laboratories.

The quality engineer will be responsible for:

- a. Preparation of testing and sampling procedures for earth work and concrete quality control.
- b. Training Genie Rural counterpart technicians in testing and sampling procedures, use of field and laboratory equipment and analysis of results for acceptance or rejection of in-place construction.

IV. Cost Estimates

A. General

The estimates of costs provided in the SONADER studies were compared to costs of doing similar work in the U.S. This practice of comparing to U.S. cost has proven to be a valid method of verification. However, a contingency factor of 25% has been added to allow for differences in administration, risk and size of project.

B. Inflation/ Competing Works

One of the factors which will affect cost is the coincidence of the optimum construction period with the planting period; the second factor will be the availability or scarcity of skilled and semi-skilled labor needed for operation and maintenance of equipment for earthwork and concreting operations. Any shortage will become more acute as other major construction projects in the area begin to mobilize their operation, such as, Diama Dam on the Senegal river and new port facility for Nouakchott. These may be under construction during the time frame of the Land Reclamation Project. The construction of Diama Dam and port work would aggravate the inflationary stress upon the cost of construction in Mauritania. The best skilled and semi-skilled labor will tend to go where they can earn the most and those who remain may include the less qualified; therefore the quality and efficiency of the construction organization being assembled might possibly deteriorate during the life of this project unless competitive wages and salaries are conferred. The same forces will impact on Genie Rural, SONADER and all indigenous construction contractors. The SONADER cost estimates have not anticipated potential inflationary factors as their estimates are projected to July 1980 only.

The inflationary trend used by SONADER to project their estimates from Dec. '79 to July 1980 was 8.5% or 1.21% per month. The equivalent annual rate is 14.5%. Genie Rural puts the rate of inflation for construction at 20% per year, largely due to costs of imported construction equipment and materials. On this basis (20%) one can expect the construction cost for the dams to be built during the first construction season (1982) under this project to increase by nearly 50%. Assuming the first construction season would be in 1983, the SONADER construction cost for 1983 season would be escalated by 1.728, the second season cost by 2.074, the third season cost by 2.488 and fourth season cost by 2.986 to provide for inflation; this is not considered overly conservative.

Within Mauritania there are several companies that could contract for the earth work and concrete work of this proposed project; therefore, if this approach were taken, these works could be contracted for and start of construction for these projects could be advanced by as much as one construction season. This approach would reduce the inflationary cost factor by more than 72 million ouguiya (almost 1.6 million dollars). It would have the added benefit of encouraging local private enterprise.

C. Contingencies

The accepted practice for valuing contingencies depends on the amount of information available upon which quantity estimates can be made. The SONADER study falls in the category of a feasibility study, therefore the contingency factor should be 25%, because little information is yet known about foundation conditions.

D. Project Estimates

See Annex A, Table 3 - Budget for dams for cost estimates by SONADER, increased by the contingency factor, escalated by an inflation factor related to the proposed construction schedule, and including downstream erosion control measures.

E. Construction Drawings and Specifications

Before proceeding to the construction phase of the project it will be necessary to contract with an engineering firm well experienced in the design in dams. (See Appendix 2 to this Annex).

The engineer will work from the SONADER feasibility study plans and layouts. The engineers's plans shall delineate all structures and for concrete work their plans shall show location and quantity of reinforcing steel. The work shall include but not be limited to the following-structures:

Outlet Works

Spillways

Retaining walls (reinforced concrete)

Gravity Dams

Earth Dams

Gabion Structures

The engineer shall provide detailed technical specification for all work required for construction of earth embankments, concrete structures, rock excavation, gabion construction and rip-rap. The engineer shall provide inspection and testing procedures for embankment construction and concrete work.

V. Maintenance of Dams

Maintenance of dam embankments and structures will be an important concern in the project. As designed, the dams will require mainly community labour routine maintenance, with only occasional GR machinery inputs. The communities will accept responsibility for this as a condition of the Governmental construction of their dams (See III F and VI D). Genie Rural will develop maintenance standards and systems (see below), and will coordinate and assist the communities' participation in annual maintenance. The engineer (works) and his advisor will administer this. The minimum preventive maintenance practices will include at least the following:

1. Outlet works - after each season and or use an inspection shall be made of the inlet and outlet rip rap and where there are signs of erosion, these areas shall be reinforced. The valve shall be inspected and all moving parts shall be greased to ensure ease of operation. The trash racks shall be inspected and shall be cleaned of all debris.

2. Spillway - inspection of upstream and downstream rip rap shall be performed and all areas where failure has occurred shall be repaired or reinforced with additional rip rap.

3. Embankment - inspection of embankment shall look for signs of settlement and/or inhabitation of embankment by burrowing rodents. The cause of settlement shall be determined and shall be eliminated by placement of additional moist compacted fill to return embankment to original crosssection. If burrowing rodents exist they shall be eliminated and any holes shall be filled.

4. Maintenance of embankments and other structures will be minimal, but maintenance will be required and equipment will be necessary to carry out required maintenance. Genie Rural has no equipment for this purpose except one dump truck. Therefore some equipment will be provided as well as a place for maintaining and storage of equipment. The proposed warehouse to be built at Aleg could be utilized for the storage and maintenance facility for equipment needed for maintenance.

Further to the dam and other structures' maintenance is servicing and repair of the maintenance equipment. USAID will provide tools and shop equipment for the repair of above maintenance equipment, as well as for other equipment being provided through the UNSO project. Personnel for maintenance of equipment is discussed under institutional capability and training is recommended for five candidates.

VI. INSTITUTIONAL CAPABILITY

A. The organization of Genie Rural is set up as follows:



In Nouakchott Genie Rural has two facilities: a garage complex for repair of vehicles (has not been used for years) and storage for parts etc. (shelving etc. needed); and a storage yard for equipment with a warehouse for cement and other supplies that need protection. Most of the equipment stored is outdated and apparently not reparable. It should be disposed of because it takes up space and makes the facility non-functional.

B. As indicated in IV C, the current administrative capability of Genie Rural is limited. Functional responsibilities for GR sub-units are still in planning, as the organization is gearing up to take on responsibility for the national program. Therefore the following advisor - counterpart arrangements may change, at least as regards organizational unit, over the life of the project. As currently planned:

1. The engineer(works) will work with the technical advisor for contracting and contract administration. In addition to these functions, they will administer the community contract responsibilities for routine maintenance of dams (see discussion above).
2. The engineer(studies), will work with the technical advisor for project planning and feasibility to establish criteria for project selection and standards for structures and methods of construction.
3. The quality control counterpart engineer will be from the Material and Supplies Division so that material inspection and quality control will not be a responsibility of the units charged with construction. A section for material inspection and quality control will be established and an Assistant Engineer will be assigned to head this section. He will work with and be trained by the technical advisor for quality control.

With the above technical assistance, Genie Rural should be capable to administer the contracts and control the quality of construction and maintenance for the works envisioned for this project.

C. The capability of Genie Rural's Material and Supplies Division is almost non-existent as a functioning unit. This unit will have to be reinforced to be able to maintain an equipment fleet necessary for maintenance of dams.

1. Training should be provided for up to five candidates for the central garage - their training should cover repair of heavy equipment, hydraulic systems, electrical systems and diesel fuel systems as well as welding and machining. This training could be obtained at Centre Regional de Formation pour Entretien Poutier (CERFER) in Lome, Togo, a training facility assisted by A.I.D. In addition to four mechanics one candidate should study inventory control of spare parts etc. at CERFER.

2. The physical facilities for repair and storage of spare parts in Ncuakchott is adequate. However, warehouse and equipment repair facilities are needed in the dam area to support the construction functions and continuing maintenance of dams. A building will be financed through this project. The site will be provided by GIRM and suitability of the site approved by a REDSO engineer (size, location, above high water, ease of access, etc.). The warehouse envisioned would be about 800 m² max. with 5 m high walls.

ANNEX H-I

APPENDIX I

TECHNICAL ADVISOR

ENGINEERING - PROJECT PLANNING AND FEASIBILITY

Scope of work

The engineering advisor shall work with Mauritanian engineer of the "Service Etudes et Travaux" of the Direction of Genie Rural. The engineering advisor shall assist and advise in the establishment of procedures, standards and criteria for:

1. Reconnaissance reports
2. Feasibility reports including

- a) Demographics
- b) Social
- c) Financial
- d) Environmental
- e) Economic analysis of alternatives

3. Design Reports

- a) Standards of design (Type of construction)
- b) Standards of construction (Specifications)
- c) Standards criteria for design
 - 1. Structural design
 - 2. Hydraulic design
 - 3. Hydrological studies
 - 4. Mapping
 - 5. Geological studies
- d) Standard Contract Documents
 - 1. General conditions
 - 2. Special conditions
 - 3. Technical specifications
 - 4. Invitation to Bidders
 - 5. Bid Form

4. Time Required: Two years.

5. Qualifications: French-speaking civil engineer with experience in rural works (particularly small dams) and environmental assessment. A minimum of eight years appropriate experience required.

NOTE: If short-term technical assistance is required to help address any of the considerations under point 2 above, it can be funded from project contingency funds.

TECHNICAL ADVISOR

CONTRACT AND CONSTRUCTION ADMINISTRATION

SCOPE OF WORK

A technical advisor to develop administrative coordinating management plan, enterprise accounting and effective liaison between participating Directions and regional/local groups.

The advisor shall train the host country counterpart in the following:

1. How to establish schedules for:
 - a. Engineering documentation for construction contracts
 - b. Advertise, Bidding and Award.
 - c. Processing monthly contract payments, etc.
 - d. Expediting schedules contract materials
2. To establish and advise in operation of:
 - a. Management system for:
 1. Records, general
 2. Drawings
 3. Specification
 4. Contracts and Amendements
 - b. Inventory control System for construction materials
(cement, reinf. steel etc.)
3. Contracting procedures (USAID and USA)
4. Assist in the establishment of dam maintenance procedures.
5. Time required : Two years.
6. Qualifications: French-speaking civil engineer with a minimum of five years experience in the administration of construction projects.

TECHNICAL ADVISOR

QUALITY CONTROL/CONSTRUCTION

SCOPE OF WORK

A. The advisor shall train host country counter-part and inspectors for concrete inspection and for earth dam embankment inspection. The training shall include the following:

1. Demonstration in proper use of testing and sampling equipment for
 - a. concrete materials (cement, sand, aggregates)
 - b. concrete before placement i.e. slump test
 - c. embankment materials (borrow pits)
 - d. embankment completed (field density and proctor)
2. Assist in establishment of standard procedures for testing and inspection i.e. the practices used by the U.S. Bureau of Reclamation or equivalent.
3. Assist in establishment of procedures for documentation and reporting of test results, record keeping.

B. The advisor shall advise in assembling testing and sampling equipment and supplies ordered for project.

1. Field testing and sampling earth dam embankment
2. Laboratory testing of embankment samples.
3. Field testing and sampling of concrete
4. Laboratory testing and analysis of cement, fine and coarse aggregates and water for concrete, and
5. The mobile field laboratories.

C. Time Required: Two years.

Qualifications: French-speaking civil engineer with training in soil mechanics and testing with a minimum of five years of appropriate experience.

ANNEX H - I

APPENDIX 2

SCOPE OF WORK

for

PREPARATION OF CONSTRUCTION DRAWINGS AND

TECHNICAL SPECIFICATIONS FOR DAMS

A. Information available

The engineer will be provided with a set of feasibility studies (one study for each dam) which will include a layout of structures, contour maps along dam axis and of reservoir area.

The engineer will be free to change length of spillway, height of dam, side slopes of dam and embankment protection (rip rap and its bedding), outlet works (location and size).

Working from these givens, the engineer shall accept the crest elevation established in the provided studies and shall use flood routing to determine total peak discharge for various maximum reservoir pool elevations. From these discharge requirements the engineer shall determine cost effectiveness of shortest spillway length versus height of dam. Once having the minimum cost the engineer shall prepare construction drawings for spillway structure and the dam (earth embankment or concrete gravity).

The design of the outlet works for each dam site shall be sized so that reservoir can be lowered by at least 20 cm every 10 days (this requirement is established so that mosquito larvae, shistosome larvae and any snails present may be stranded and die).

B. Documents to be produced

The engineer shall prepare for each dam plans and cross-sections for all structures to be built at that site, which shall include but not be limited to the following:

Spillway

Outlet Works

Dam (Gravity Concrete or earth)

Gabion Structures

Retaining Walls

The above plans shall be of sufficient detail to delineate all construction requirements and shall show location and size of reinforcing steel.

The engineers design shall utilize the minimum number of sizes of reinforcing steel rods and an estimate of quantity for each size shall be made indicated on drawings for each structure. In addition to reinforcement the engineer shall estimate quality of concrete for each structure.

The engineer shall provide detailed technical specifications for all work delineated on the construction drawings prepared as part of this contract. The technical specifications shall cover the following: concrete, earth embankments, rock excavation, gabions, sand bedding and rip rap, miscellaneous metals (Sluice gates and stems, corrugated metal pipe etc. etc.).

The engineer shall provide inspection and testing procedures for embankment construction and concrete work.

C. Additional Requirements

1. The metric system shall be used on drawings and specifications.
2. The drawings and specifications shall be in the French language and, the following number of copies are to be provided.

Drawings 10 sets (blue line)

1 set (reproducible sepia)

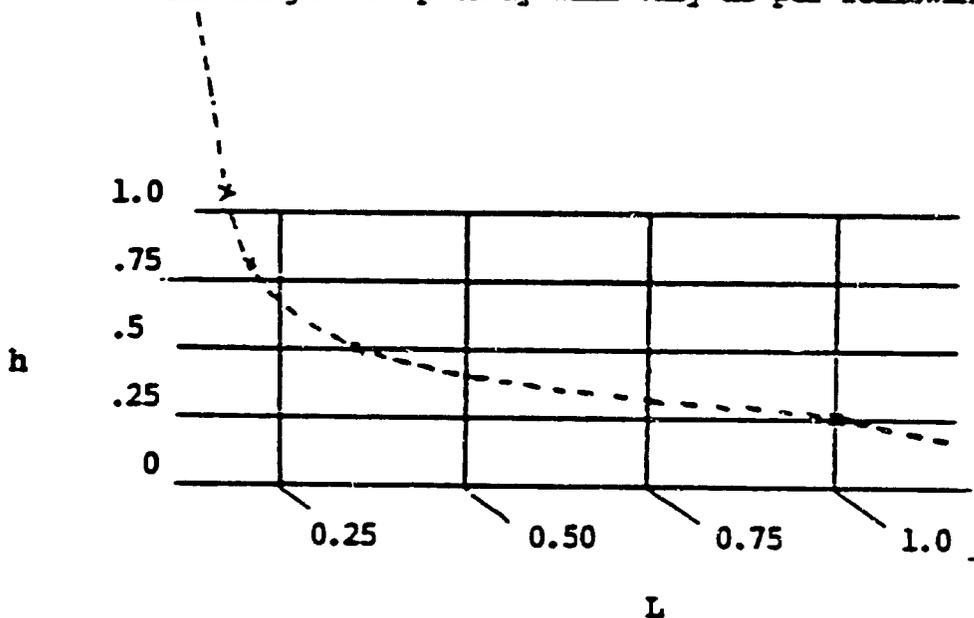
Specifications 10 sets.

3. A photocopy or copy of each standard or product referred to shall be provided.

Given: Spillway with discharge depth of 0.25 m as per Snoder Report
($Q=1.64 h^{3/2} L$) metric system.

Evaluate: Cost effectiveness of using greater depth to shorten length
of spillway- but not changing crest elevation.

The length of spillway will vary as per following graph:



Recommendations: A cursory check of cost per unit length indicates that a change in height of two (2) meters is needed before the cost of embankment equals the cost spillway per meter of length. Therefore for the range of change in head over spillway considered about 1 meter no change in over all cost of project is anticipated.

Benefits: The greater depth of discharge will greatly increase the volume of reservoir, thereby increasing the safety factor against over-topping dam, because as head increases discharges increase as per $3/2$ power of head and as reservoir volume increases peak discharge is reduced and can be determined by flood routing studies. In addition to cost and safety factor, the area of land flooded at each reservoir during passage of flood will be greatly increased and thereby increasing agricultural production in each reservoir.

ANNEX H - 2

ADDITIONAL NOTES ON EPIDEMIOLOGY

OF WATER-BORNE DISEASES IN THE

PROJECT AREA.

I. Schistosomiasis:

The prevalence of schistosomiasis varies widely in Mauritania, from 74% in the Gorgol area to 17% in Atar. A decrease in the prevalence of schistosomiasis was noted during the drought years (late 60's-early 70's) whereas more recent research points to a recrudescence of the disease due to increased rainfall and development of agricultural irrigation projects. Field surveys carried out along the Gorgol river (Jobin et.al., 1976) and OMS studies (1977-79) determined that in the project area and surrounding environs, there is an important reservoir of schistosomiasis infection. The studies showed varying rates of schistosomiasis prevalence, reflecting the geographical and seasonal specificity of the disease as well as sampling variance. The most recent survey carried out by ONI in the project area in November, 1980 shows prevalence rates at the various dam sites ranging from 0 to 43% (Annex H-2, page 3).

Although there is no agreement in the literature about the specific identity of the snail intermediate hosts of urinary schistosomiasis, a number of possible hosts have been discovered. These snails are all of the genus Bulinus. (B. truncatus, B. guernei are commonly found). These bulinid snails can also serve as intermediate hosts in the transmission of Schistosoma bovis - the parasite causing schistosomiasis in cattle, sheep and goats (with reported rare cases in humans). High infection rates of Schistosoma bovis have been found in livestock in many areas in Mauritania. Schistosoma mansoni, which produces intestinal schistosomiasis, is poorly documented in Mauritania. While there have been reports of its snail intermediate hosts, Biomphalaria pfeifferi in a few limited areas, this was probably before the drought period. There have been no recent reports of either the snail intermediate host or cases of intestinal schistosomiasis in Mauritania (even south of the Senegal River this snail intermediate host is only found in two small locations). Barring any new evidence, therefore, it can be assumed that urinary schistosomiasis due to Schistosoma haematobium is the only form of human schistosomiasis in Mauritania. Surveillance activities should continue search for intestinal Schistosomiasis cases.

Schistosomiasis is usually transmitted when the cercariae (a form of the parasite which ex_its daily from the snail intermediate host) penetrate the skin of persons wading or bathing in infected waters. Drinking water containing cercariae may (rarely) be a mode of transmission of the disease. While the urinary form of schistosomiasis does not usually cause serious consequences in its victims, a small percentage of those affected will develop important urinary, or liver problems. These problems are often untreatable in the Mauritanian health system, especially in rural areas, and accounts for many of the evacuations for these problems -not only to Nouakchott, but to other countries as well. Schistosomiasis is also considered to be important compounding factor in the aggravation of urinary, liver or renal problems caused by other endemic diseases.

Schistosomiasis presents a complex epidemiological profile which is evident from the geographical and historical variations in the prevalence of this disease. There are many possible factors determining this profile, and careful studies will be necessary to find the answers.

Important factors to be considered include the life cycle of the particular snail host (its ability to withstand a range of PH, water temperatures, waterlevels, vegetation levels, etc.); life cycle and transmission of the parasite, degree of exposure of the local population and the surrounding hydrological system allowing transmission of snails and parasites from other areas. The dam sites vary widely as to their suitability as transmission sites for schistosomiasis. At some sites, no snails have been found (bulinid or other). This may be due to some unfavorable aspects of the habitat (pH, temperature, vegetative growth, etc.) or simply because snails have never been introduced. What is possible is that with environmental changes (such as the retention of water and growth of vegetation after dam improvement) snails and schistosomiasis can be expected to become endemic in these diseasefree areas. A second hypothesis of snail/schistosomiasis prevalence emphasizes water retention time as an important factor. It is estimated that water remains in the dam reservoir for up to two months in the majority of cases. This may or may not be time for the snails and parasites to establish their life cycles and transmit the disease, depending on the snail variety and the many associated environmental factors. Likewise the fluctuation of the water level in the reservoir is suggested as an important determining factor. It is hypothesized that manipulation of this water level may effectively destroy the snail/parasite life cycles. The above discussion points to a variety of hypotheses which need to be tested in order to find ways of controlling schistosomiasis. The variety of these hypotheses reflects the complexity of schistosomiasis epidemiology that has been noted in studies and control efforts in countries with environments similar to Mauritania's (Sudan, Egypt and Iraq for example). Therefore an applied research program is indicated to understand and control schistosomiasis.

From the known epidemiological profile of schistosomiasis in the project area, the pattern of generally self-contained geographical foci of the disease and the lack of standing bodies of water other than the dams themselves, suggests a high probability for successful schistosomiasis control. By combining chemical control of water sources and modification of various factors affecting the snail habitat with drug treatment of cases, schistosomiasis should be able to be greatly reduced and possibly eradicated at the dam sites. The epidemiological situation is quite different from that of the Nile Delta in Egypt where a constant flooding of large interconnected waterways makes control very difficult.

II. Malaria:

Malaria is a major endemic disease in Mauritania. Plasmodium falciparum is the main species responsible for malaria. (P.malaria, P.vivax and P.ovale are reportedly rare). The principal mosquito vector in Mauritania is Anopheles gambiae. (A.funestus and A.pharoensis are less common)

Malaria can be said to be hyper-endemic in the project area during the rainy season (July-Nov.) and decreases greatly during the dry season.

Malaria control has proven difficult in Mauritania except on a short-term basis. The expense of spraying and the lack of administrative and health infrastructure needed for environmental drug intervention are the main problems.

III. Dracunculiasis

Dracunculiasis; or guinea worm infection is caused by the guinea worm (dracunculus medinensis) living in human tissues. Guinea worm larvae infect an intermediate host (copepods) of which many species (cyclops, etc.) exist. Transmission occurs most frequently when copepod-infested water is consumed. Guinea worm exists in the Gorgol region and may exist at other dam sites. The application of molluscicides for schistosomiasis control also kills the copepod hosts.

BEST AVAILABLE DOCUMENT

ANNEX H-2 (MEXIC)

REPUBLIQUE ISLAMIQUE DE MAURITANIE

HONNEUR FRATERNITE JUSTICE

CENTRE NATIONAL D'HYGIENE

— ENQUETE EPIDEMIOLOGIQUE CONCERNANT LES BARRAGES —

DU GORGOL ET DU BRAKNA

Dans le cadre d'un Projet de Restauration et de Construction de Barrages dans les Régions du Gorgol et du Brakna, l'U.S.A.I.D., a chargé le Centre National d'Hygiène d'effectuer pour son compte une enquête épidémiologique dans ces régions. Cette enquête devait fournir un rapport sur :

- 1°/ - L'état de Santé des populations devant bénéficier des barrages ainsi que leurs besoins de santé.
- 2°/ - La prévalence du Paludisme et de la Bilharziose Urinaire.
- 3°/ - L'état Nutritionnel et Alimentaire des Collectivités.
- 4°/ - Les influences éventuelles des barrages sur la santé des populations concernées.

Une équipe composée :

- Du Dr. SILATT MOUSTAPHA, Directeur du Centre National d'Hygiène.
- De Mr. ABDEKRAEMANE OULD HANDE, Infirmier Chef de service de la Vaccination Internationale.
- De Mr. ABDALLAH OULD ATIGH, Aide Laborantin
- De Mr. DIALLO YBRAHIMA, Manoeuvre

s'est rendu sur les lieux du 30 Octobre au 13 Novembre 1980.
Mlle LINDA NEW Houser a rejoint l'équipe le 10/11/1980.

...2...

--- MATERIELS ET METHODES ---

En moyenne 20 à 50 enfants de chaque localité ont été examinés ainsi que 10 personnes adultes choisies au hasard. Les enfants sont pris dans les écoles quand celles-ci existent.

1°/ - LA BILHARZIOSE URINAIRE

10 à 20 cc d'urine sont prélevés, centrifugés pendant 3 minutes à 250-300 tours/miⁿute. La mission dispose d'un microscope et d'une centrifugeuse à main. Les urines sont examinées directement au microscope par le Dr. SIDATT. Les recherches de biliarzioses n'ont pas pu être correctement effectuées durant cette mission. Cependant il est correcte de se baser sur les rapports de la mission du Centre National d'Hygiène effectuée conjointement dans la région du Brakna.

2°/ - LE PALUDISME

L'indice de la spléno et de l'hépatomégalie est mesuré par une appréciation manuelle, un travers de doigt correspondant à 1,5 cm. Pour des raisons de facilités, on ne fait pas de différence entre la spléno et l'hépatomégalie. Le paludisme étant la principale cause de splénomégalie, on peut, avec une faible marge d'erreur, faire le rapport entre celle-ci et le Paludisme.

3°/ - LES EXAMENS DENTAIRES sont effectués par le Dr. SIDATT.

On tient compte du nombre de dents touchées et on néglige la profondeur de l'atteinte par la carie.

4°/ - LES EXAMENS OCULAIRES sont effectués par le Dr. SIDATT.

5°/ - La Croissance est appréciée par la mesure du poids et de la taille, à l'aide d'une balance toise ainsi que le pourtour du bras à l'aide d'un mètre ruban.

Ces mesures sont effectuées par Mr. ABERRAHMANE OULD RAMDI.

Le dépouillement des données est effectué au Centre National d'Hygiène par l'équipe qui a réalisé l'enquête.

— R E S U L T A T —

BILHARZIOSE URINAIRE

Lieux	Nbre de Personnes Examinées	Nombre de Cas Posi- tifs	Pourcentage
Oudai Leffcarine	22	0	0
Soussouillif	22	1	4,5 %
Hodi Founti	21	8	38 %
Sédinal	24	0	0
Lam'Oudou	8	0	0
Tousidima	24	0	0
Tembara	7	0	0
Ameira	30	0	0
Oudai Chrak	23	10	43,4 %
Tousizakra	12	1	8,3 %
Total.....	193	20	10,3 %

TAUX PAR AGE ET PAR SEXE

M A S C U L I N				F E M I N I N			
Age	Nbre de Per- sonnes Exa- minées	Nbre de cas Positifs	Taux	Age	Nbre de per- sonnes Exa- minées	Nbre de cas Positifs	Taux
4 ans	9	1	11%	4ans	6		
5 ans	12			5ans	9		
6 ans	5			6ans	5		
7 ans	8	1	12%	7ans	4		
8 ans	35	5	12,2%	8ans	14	1	5%
9 ans	31	1	3,2%	9ans	2		
10ans	19	6	31,5%	10ans	8	3	37,5%
11ans	4			11ans	1		
12ans	6			12ans	4	2	50%
13ans	6			13ans			
14ans	3			14ans	2		
15ans	1			15ans			
Total...	138	14	10,14%		53	6	10,9%

La Bilharziose Urinaire, a des degrés variables dans les sites de barrages.

Certaines zones ne sont pas encore atteintes. Cependant, les conditions sont réunies pour qu'une fois les barrages construits, la bilharziose subisse une recrudescence. En effet, si Oudei Leffarine et Boussouaïf sont encore indemnes, Dionaba, situé à 7 km à mi-chemin entre les deux sites est fortement infesté. Une bonne proportion des enfants que nous y avons visités urinent du sang.

Les bulins peuvent être charriés par les eaux des Oueds et amenés de distances éloignées.

HEPATOSPLENOMEGALIE

Lieu	Nbre de Personnes Examinées	Nbre de Cas Positifs	Pourcentage
Oudei Lekkerine	22	1	4,5
Boussoueilif	22	2	9,1
Modi Pounti	21	0	0
Eddingal	24	2	8,3
Len'Oudou	8	0	0
Tousidima	24	9	37,5
Tembara	7	2	24,6
Ameira	30	3	10
Oudei Chrak	23	4	17,4
Touzeikre	12	5	41,7
TOTAL.....	193	28	14,5

HEPATOSPLENOMEGALIE SELON LEUR IMPORTANCE

Nbre de Cas positifs	1 à 3 travers de doigts	4 à 5 travers de doigts	6 travers de doigts et plus
	26	2	0
Total.....	92,8	7,2	

A cette saison de l'année le paludisme regresse. Il a fait ses dégâts durant l'hivernage. Le chiffre de 14,5 n'est pas loin de celui de Bankassa, situé en pleine région de Haute endémie. Les villages les plus touchés (Tousidima, Oudei Chrak, Touzeikre) sont situés dans les Oubés où s'effectuent les cultures.

— ANÉMIE CLINIQUE —

Lieux	Nbre de personnes Examinées	Nbre de cas Positifs	Pourcentage
OUDEI LEKSRITZ	22	4	18,
BOUSSOUKILIP	22	3	13,5
MODI FOUNTI	21	5	23,8
BEDINGAL	24	3	12,5
LEM'OUDOU	8	1	12,5
TOUKEIDIMA	24	0	0
TEMBARA	7	0	0
AMEIRA	30	1	3,3
OUDEI-CHRAK	23	4	17,4
TOUZIZERE	12	0	0
TOTAL.....	193	21	10,8

- COMMENTAIRES

Le nombre de cas d'anémie est très variable suivant les localités. Ceci peut être en rapport avec la richesse de l'alimentation en lait. Les villages constitués, Oudei Leksrine, Modi Founti, Boussoukilip, Oudei Chrak sont plus touchés que les localités à orientation Pastoral (Touaidima, Ameira, Touzizere, Tembari). De toutes façons, le chiffre de 10,8 % nous semble trop élevé pour cette saison, la meilleure de l'année.

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— ATTEINTES OCULAIRES —
à l'occasion des épidémies de conjonctivites

Lieux	Nbre de personnes Examinées	Nbre de Cas Positifs	Pourcentage
OUDEI LEFKARIVE	22	1	4,5 %
BOUSSOUILLIP	22	2	9,1 %
MODI FOUNSI	21	0	0
BEDINGAL	24	4	16,7 %
LEM'OUDOU	8	0	0
TOUELDIMA	24	2	8,3 %
TEMHARA	7	1	14,3
AMEIRA	30	0	0
OUDEI CHERAK	23	2	8,7
TOUZIZENNE	12	1	8,3
TOTAL.....	193	13	6,7 %

- COMMENTAIRES

La saison des épidémies de conjonctivites n'a pas encore commencé. Parmi les atteintes oculaires rencontrées, seuls deux cas de Panus, soit 15,3 %, peuvent être attribués aux Saquelles du Trachôme.

— AFFECTIONS DENTAIRES —
—————

Lieux	Nbre de Personnes Examinées	Nbre de Cas Positifs	Pourcentage
Oudal Lekkarins	22	6	27,3 %
Boussouellif	22	5	22,7 %
Modi Pounti	21	5	23,8 %
Bédingal	24	3	12,5 %
Lam'Oudou	8	1	12,5 %
Foucidiza	24	6	25 %
Tembara	7	1	14,28 %
AMEIRA	30	8	26,7 %
Oudal Chrak	23	5	21,73 %
TOUKIZEKRE	12	3	25 %
TOTAL	193	45	22,3 %

**— IMPORTANCE DE LA CARIE DENTAIRE EN SE BASANT SUR LE
 NOMBRE DE DENTS TOUCHÉES —**

Nbre de dents touchées	1 à 2 dents	3 à 4 dents	5 à 6 dents	7 et plus
	28	13	1	
Pourcentage	65,1 %	30,2	2,3	2,3

Le Chiffre total de 22,3 % n'est pas loin de celui des autres régions : 21 % dans l'Assaba, 20 % dans le Guidimaka. Il est moins important que celui du Trarza = 69 %

**AUTRES AFFECTIONS RENCONTREES DANS LES DIFFERENTES
COLLECTIVITES**

OUDEI'LEKARINE	Rhumatisme articulaire aigu Bronchite
BOUSSOUILLIF	Marasme Début Epidémie de Rougeole (Cinq cas)
MODI FOUTI	Bronchite Pyurie Hématurie
EDINGAL	
LEM'OUDOU	
TOUNIDMA	Fièvre chez plusieurs personnes l'origine palustre est très probable
TEBHARA	Malnutrition
AMIERA	Taïgne
OUDEI'CHRAK	- Fièvre probablement d'origine palustre - Taïgne - Syphilis endémique (Trois cas) - Dracunculose - Hématurie - Malnutrition
TOURIZERE	Dracunculose Malnutrition

Ce tableau reflète les besoins en soins de Santé
de ces zones très peu couvertes sur le plan Sanitaire.

— DISTANCE ENTRE LES BARRAGES ET LES POSTES DE SANTE —

Barrages	Poste de Santé de Dépendance	Distance de ce Poste
OUDEI LEFERRINE	Maghta-Lahjar	70 km
BOUSSOUILLIF	Maghta-Lahjar	100 km
MORI FOURZI	Maghta-Lahjar	55 km
HEONGAL	Maghta-Lahjar	60 km
LEM'OUDOU	Maghta-Lahjar	70 km
TOUKIDIMA	Maghta-Lahjar	50 km
TEMBARA	Méle	20 km
AMEIRA	Maghta-Lahjar	25 km
OUDEI CHRAK	Mouguel	35 km
TOUZEZES	Mouguel	30 km

— CONCLUSION ET RECOMMANDATIONS —

- Les barrages que nous avons visités sont tous situés dans une plaine en dépression, limitée à l'Est par la chaîne de l'Assaba, au Nord-Est par la chaîne du Tagant, au Nord-Ouest et à l'Ouest par les dunes désertiques du Tratta, au Sud par le Fleuve Sénégal.

Les eaux des montagnes du Tagant et de l'Assaba parcourent des centaines de kilomètres à travers cette plaine rocailleuse pour se jeter dans le fleuve.

- Les populations de cette plaine sont essentiellement agricoles et pastorales. Elles sont très peu couvertes sur le plan Sanitaire. La malnutrition, le paludisme, la Dracunculose y constituent des problèmes de santé publique.

- Un projet de barrage aura des effets favorables

1 - Alimentaires en diminuant le déficit en grain.

2 - Sociaux : en fixant les populations, ce qui facilitera la solution des problèmes de scolarisation, de couverture sanitaire etc...

3 - Hydraulique : L'eau est extrêmement rare dans cette zone. Les retenues permettront une alimentation en eau des populations et des animaux, de même qu'elles fourniront l'eau à la nappe phréatique.

Ce Projet augmenterait sans nul doute le nombre de cas de Bilharziose, Urinaire et de Paludisme.

En conséquence, il nous semble important d'étudier pour l'avenir les possibilités :

- De lutte contre la Bilharziose dans la région par des méthodes adaptées.

2 - De prévoir le forage de puits à targes, quest urgent surtout à Touleouare et Ouadi Chant.

3 - De prévoir un petit projet Chloroquinisation des villages en période de pluies.

Le Directeur du Centre National d'Etudes

Dr. SIDATT MOUSTAFA

ANNEX H - 3

Economic analysis

Background-Agriculture Sector

Agriculture production in Mauritania consists mostly of subsistence cultivation of cereals (millet, sorghum, and rice), vegetables and dates and the harvesting of gum arabic. No reliable statistics on production and consumption of agricultural products are available except for marketed production. Estimates from the Ministry of Rural Development indicate that during the last five years the production of sorghum and millet averaged only 31,000 tons annually, a steep fall from over 80,000 tons annually during the 1960's.

The Brakna and Gorgol rain-fed regions produce approximately 10,000 tons of sorghum and millet a year, with the RLR Project promising to add cultivation potential for up to approximately 525 tons annually. While there are no official marketing statistics available for sorghum/millet in these two regions, there is uniform consensus that most if not all cereals produced are consumed locally. ✓

In the Gorgol region, the average consumption of cereals per day is 359 grams per person. Of that amount, 50 grams or 16% of the total consumption comes from their own production resources. Any additional production would be consumed locally. In the Brakna region, 287 cereal grams are consumed per person per day but of that amount 147 grams are produced locally or 51% of total consumption. If the additional production were substantial, some marketing might take place over and above auto-consumption. Mauritania is greatly dependent on food imports, as local production is not sufficient to satisfy domestic needs.

1/ Consensus based on:

- 1) Statistical data provided by SONADER
- 2) RIMS synthesis report, and
- 3) Discussions with regions' extension agents

To meet the food deficit in 1975 the GIRM created the Mauritanian Cereal Office (OMC), the responsibilities of which are to stabilize prices by purchasing cereals during the harvest season when prices are low and by selling them during the off-season when prices are high and, together with the Commissariat à l'Aide Alimentaire (created in 1979), to stock grain for emergency purposes.

Substantial quantities of imported grain are also received in the form of grants. In 78/79 about 89,000 tons of cereals were imported, of which 26,000 tons were in the form of grants while the rest was purchased by SONIMEX (53,000 tons) and the private sector (10,000 tons). Because of unusually poor harvest in 1980, grants of cereals assistance during 80/81 are averaging about 70,000 tons. Selling prices for sorghum/millet are determined by market forces, with some intervention from GIRM purchasing agencies. Depending upon surplus and demand in different seasons of the year, sorghum/millet prices on the local market range from a low of 15UM/kilo to 30UM/kilo. Farmers are permitted to sell their produce freely, receiving on the average about 14 UM for millet and 15 UM for sorghum per kilo. When Government purchases are made, they are at only 12 UM/kilo, but since these purchases are usually less than 10% of local production, they do not have much effect on the market price. The availability of substantial quantities of food assistance, about 20% of which is given to the needy free and the rest sold at Nouakchott at 10 UM/kg and in the interior at 8 UM/kg, have a greater effect on the selling prices.

For the long term agricultural development in Mauritania, the government has established the Societe Nationale pour le Developpement Rural (SONADER) in 1976, to prepare and manage irrigation projects. Mauritania's dependence on the vagaries of the weather outside the river zone and the urgent need to restore the social and economic viability of the drylands interior regions has prompted SONADER and GENIE RURAL to develop water control measures in geographical areas other than the Senegal basin.

PRIMARY BENEFITS

A. Institution Building

The Rural Land Reclamation Project is primarily of an institution development nature whereby the actual construction/engineering is a vehicle for training and experience for Genie Rural. The nature of this component is not suitable to traditional cost/benefit analysis. Thus, while sites for construction are expected to meet adequate productivity and other benefit criteria relative to costs, the construction training process has another purpose with other expected benefits which cannot be measured in monetary terms. In general, the key benefits to the training and up-grading of Genie Rural are summarized in the Economic Feasibility statement. (See Part VI B).

B. Agricultural Production

Future single-crop yields are assumed to be the same as present yields and are presented in the following table. Present yields are based on the Brakna and Gorgol regional recessional agricultural study published by RAMS, October 1980, which estimates 430 kg/ha for sorghum. Specific actual yield statistics are not available. The yield of other crops as estimated in annex H-4 Social Analysis, may be the sorghum equivalent of another 420 kg/ha. The current prices received by the farmers for sorghum are artificially depressed by current GIRM pricing and subsidy policies. Instead of such current prices the price of commercial imports which expanded sorghum production is designed to displace, have been used in this analysis. Cowpeas and melon are given the traditional prices, however, since these were found to be completely free. Sorghum fodder is also linked to the world market price of \$ 40 per T. Since cowpea fodder is intermixed with sorghum, the value could be more, but it has not been added to the cowpea value.

TABLE I
SUMMARY OF PROJECTED RETURNS

CROP	ASSUMED YIELD KG/HA	PRICES (1980 \$) /Kg	RETURNS PER HA/ PER ANNUM
Sorghum	430	.44	189
Cowpeas (Niebe)	157	.56	88
Melon	88	.50	44
Fodder	1,400	.04	56
			377 total

The economic internal rate of return has been calculated for nine of the projects/areas separately as shown in tables 2. These were based on the estimated costs (1980 \$) including a contingency factor of 25%, estimated net benefits, and a project life of 25 years from the start of the project operation. Costs separately identified for maintenance, operations, technical assistance, or other facilities have not been included in the economic analysis as these were not to be considered directly related to the derivation of agricultural benefits. Increased productivity per hectare is not expected to arise from this project but would be an anticipated benefit from another project. (Agriculture and Human Resources Development - Kauai, Project 682-0224).

TABLE 2
INDIVIDUAL ECONOMIC INTERNAL RATE OF RETURN

7 DAM SITES

Dam site	Construction Cost (1980) \$ *	Net Cultivable Hectarage	Annual Benefits (1980 \$)	EIRR Per estimate **
Bou Souilefe	156,000	52	19,604	12
Lefkarine	248,000	54	20,358	7
Zmeilat	261,000	55	20,735	6
Ameira	579,000	75	28,275	1
Moudi Founti	264,000	81	30,537	11
Toueize Tagatt	367,000	91	34,307	8
Boujoungal	266,000	140	52,780	20

* SONADER estimates plus 25% contingency

** Includes discount benefits 25 years stream; excludes discounting capital cost. Calculations are not made for Timbara, Toueidima and Lemaoudou because reconstruction works for those dams are relatively minor and inability to separate out present production in those areas would yield meaningless EIRR's.

Operation and Maintenance

The cost for operation and maintenance was estimated to be 1/4 of 1% of total costs. Economic unit price per hectare was low. Even though this cost is real, it is not reflected in the cost analysis. Strengthened community cooperation (a secondary benefit) involving approximately 1-2 weeks annual labor requirements should be sufficient per dam site.

Labor and other inputs

Price of labor in a perfectly competitive market would be determined by the marginal value of the labor. By the nature of this project-opening up new economic alternatives-where labor is taken from a community where it is producing nothing and put to work producing something, the marginal value product of that laborer is zero. In some cases, the family member may be doing something of economic utility, but for sake of ease in economic analyses, the opportunity cost of labor is considered to be zero.

The only other production cost utilized in recessional agriculture is seeds. Since 1 kg. of seed sorghum produces an average of 110 kg at harvest, seed cost too, is considered incidental to cost analysis. The seed is not usually purchased by small farmers in this area, but stored from previous harvest.

Secondary Benefits

The primary and quantifiable benefits of the RLR project will be accompanied by a wide range of secondary or indirect benefits that are difficult to quantify in economic terms but that, nevertheless, are deserving of consideration in the overall evaluation of the project. Secondary benefits are associated with the reduction of risk and regional economic stimulation, increased employment, reduction in food aid, reduction in rural/urban flow, and improvements in livestock production.

Risk Reduction and Regional Economic Stimulation

Infrastructure improvements will induce improved water management and productivity. Perhaps the most obvious benefit from the assured availability of water that dam construction will occasion is that crops, which previously failed, suffered reduced yields, or were never attempted, because of inadequate dam construction or rainfall, can be produced with assurance of success year after year. There is some production at a few of the dam sites when rains are abundant, but for most years, the production appears negligible except at Timbara and Toueidira, where only small repairs are scheduled and for which we have considered as supplemental hectareage only a small part of the total basin area.

Overall more than 1500 families (or 10.500 people) in the combined 11 project areas will have a more reliable supply of water for recession agriculture. The net cultivable hectareage from the project is 1000 hectares; RAMS studies indicate that 1.5 families on the average benefit from each hectare of cultivated land. As pointed out in the Social Analysis section, however, the definition of beneficiary is somewhat elusive, with almost all people in the area having a multiplicity of income sources, only a small part of which is crop production. This proportion should rise with implementation of the RLR project, but one should still state all beneficiaries are partial, i.e. each beneficiary receives a benefit which satisfies only a portion of his total needs.

The increases in production of crops are primary rather than secondary benefits; however project activities will undoubtedly generate ancillary activities. Wages earned by laborers in larger towns such as Aleg, Magta Lahjar, Kaedi and Monguel, and profits made by entrepreneurs in primary production and in processing and marketing will be spent for a variety of goods and services; the multiple effect will magnify the roles and the incomes of entrepreneurs ranging from small transport operators, mechanics and street vendors to market women.

Employment

The project will create employment opportunities. More intensive agricultural practices will increase labor requirements by opening up new arable land. Increased marketing, processing, and transportation will create new jobs, as will increased demand for goods and services. Construction, to meet project and secondary service needs, will also provide substantial local employment. The preliminary RAMS studies on employment and manpower emphasize the increasing severity of the unemployment problem, particularly in the urban areas. At the same time, agriculture is believed to be the most promising source of new jobs, particularly such labor-intensive agriculture projects as this one. If development in the interior does not take place and large-scale rural exodus continues, the urban employment rate, already an enormous 24%, will worsen still further. While the precise effect on employment to be generated by the project can not be quantified, the employment goal is such an important policy objective of the GIRM that the project's desirable employment effects should be ranked as a leading benefit.

Reduction in U.S. Food Aid.

Although the nation, as well as the Braikna and Gorgol regions, has had to rely on heavy grain imports in most years to meet their social food needs, there are strong indications, given employment of appropriate resources, that these regions could make significant progress toward self-sufficiency.

There has been an annual distribution of U.S. Title II sorghum of approximately 2000 metric tons, in these two regions during the past several years and this amount could well be reduced with implementation of the RLR project.

Livestock

Growth in value added in the livestock sector after dam construction will depend mostly on increased productivity from existing herds i.e. increased meat and milk production per animal rather than increased numbers. Increased amounts of residue (as sorghum and naibe fodder) left after harvest will contribute to the nutritive value of livestock feed and consequently will contribute to the nutritive by-product (meat and milk) for the surrounding population. In assessing the livestock benefits attributable to the project activity, we have calculated only the additional fodder to be made available.

Reducing Rural-Urban Flow

The project would also contribute to the rebuilding of the regions' economic and social viability and thus reduce the burdens on the GIRM of excessively rapid urbanization. The decline in the viability of the dry-lands interior during the recent past has been one of the principal factors behind the explosive rise of the urban population by more than 10% annually between 1962 and 1977. This urbanization has increased the demand for social services, particularly in Nouakchott, with no corresponding increase in food or other production, thereby aggravating demands on scarce budget resources. The RLR project in conjunction with other GIRM and Donor activities should have some effect in stemming the rural to urban migration and hopefully lead to the return of some back to region. While this benefit is even more difficult to quantify than the employment effect, the migration issue is probably the most important benefit anticipated from the project since it interacts with all the other benefits, including increased agricultural production.

ANNEX H-4

SOCIAL ANALYSIS

Basic Background

The social analysis that follows represents an attempt to succinctly provide adequate background data for the Rural Land Reclamation Project. A more general outline of Mauritanian life and social structure is available as an appendix to the USAID, Nouakchott Integrated Development of Oasis PP (Project 682-0207). A few overriding qualifications particular to Mauritania as a developing nation are necessary to insure that the information provided is understood in its proper cultural context. These are as follows:

1. There is not a single action other than small dams, neither health, nor roads, nor even wells, that is so consistently suggested by all groups of all ranks as what they wish to see as a development project.

2. The Mauritanian perspective is based on over fifty years of experience with dam recessional agriculture in general, and over twenty years of experience with larger concrete structures. Thus, in contrast to so many development efforts that look good but are never accepted by the local participants, dam recessional agriculture, despite many problems, has, based on people's experience, provided something of great, even fundamental value, and proven highly adaptive to the realities of Mauritania's harsh environment.

3. The fundamental values involved are community and livelihood. Among the Moors, the community is not synonymous with a particular geographic location, but a spectrum of activities - herding, agriculture and commerce - which are coordinated but diffused over large expanses of space, with different individuals performing different roles. With increasing sedentarization, particular socio-economic communities are trying to establish more definitive physical communities in the form of permanent settlements. However, the ultimate vitality of the group is based on its engaging in an adequate number of productive activities, independent of any one particular living area. The creation of new dam recessional areas would greatly increase the prospects of the involved populations staying together as functioning groups. With careful supervision of the distribution of benefits, it could also assist the evolution of a more egalitarian social structure.

4. Dam recessional agriculture is a major economic activity, but its total economic value cannot be assessed through cost-benefit analysis alone. This is because it is primarily a risk-reduction rather than high production activity. The recognition of the importance of risk reduction strategies in African agriculture is well-known and basically means that the poor, in order to avoid a "fatal blow", will engage in less productive but more reliable (e.g., drought resistant) cropping patterns until they are assured of meeting their basic needs. For project design and assessment purposes, this has at least two major implications. One is that if we want to encourage agriculturalists to try more productive innovations, we must first respect their desire and assist them to build a strong core of low-risk activities on which they can depend. Second, the economic value of such activities cannot be fully assessed by the market price of production because they have a significant additional value as insurance.

5. The pressure from communities for the construction of new recessional dams is so strong that many will continue to be built regardless of USAID participation, by both other donors and private parties. However, unless a new standard of quality control is effected, many will fail to perform to expectations. Therefore, any action that would contribute to establishing new standards of quality would have beneficial economic ramifications beyond the specific structures built.

Specific Situations

The original proposal for 15 dam sites encompasses two neighboring regions of Mauritania - the Brakna and the Gorgol. While very loose generalizations about life and recessional agriculture can be made that are applicable to both areas, situations in particular communities and between the two areas themselves vary significantly.

1. General Description:

A) General Life Style:

a) Nomadism vs. Sedentarization: The census taken in 1965 estimated that 2/3 of Mauritania's population was nomadic, 1/3 sedentary. The last census taken in 1976 showed a complete reversal, with the population now 2/3 sedentary and 1/3 nomadic. This dramatic shift has had both beneficial and detrimental effects. By stabilizing people, it becomes more feasible to provide governmental services such as education, health, potable water and emergency food aid. Large semi-permanent concentrations of people also generate a series of secondary employment possibilities in activities and services. Greater permanence also increases the attractiveness

of more intensive development and greater investment of capital in single-focus local activities. Unfortunately, in a fragile environment such as Mauritania, sedentarization has at least two complementary negative side effects. Marginal resource areas, such as distant pasture, become more and more difficult to exploit, thus in many cases reducing the economic viability of traditional herding and remote oasis cultivation. Concomitantly, increased pressure by both people and animals upon limited local resources results in rapid environmental degradation.

b) Transportation: Difficulty of access and high transportation costs are primary constraints to providing extensive goods and services to nomadic people. Sedentarization and transport infrastructure are inseparably mixed in Mauritania. As people settle, it becomes more feasible to provide better access routes to them. As better access is provided, such as the national road, people settle in response to it. This feedback process is clearly in operation in Mauritania and for all practical purposes irreversible.

c) Mobility: Superficially, nomadism is equivalent to mobility, while sedentarization means restricted movement. There are important qualifications to this in the Mauritanian context. In a totally nomadic society, everyone, including inactive and dependent people (children, the old, the non-working elite), move with the production unit (the herder or cultivator). Much of the sedentarization occurring in Mauritania represents the settling of these financially or physically dependent members of the family. The active members, especially males from 15 to 45-50, remain highly mobile. While certain distant marginal areas are no longer practically accessible, new transportation and urban development has opened new opportunities for seasonal employment both in and outside the country. Therefore, for many individuals of working age, sedentarization has actually increased their mobile life style.

d) General Economic Strategy: Certain realities of Mauritanian life, fostered by the overwhelming constraints of its harsh environment, remain amazingly constant in the face of the rapidly changing social and political situation. Among the overriding constraints are: 1) the unreliability of rain both in total quantity and distribution over a particular season; 2) the seasonal nature of any exploitation opportunities (i.e., grass and water only available in months x, y, z); 3) the fact that often only a single

opportunity exists in an area (e.g., area "x" is good for grazing camels but has no water drinkable by cattle or humans, area "y" has mineral resources, but not grass, area "z" has fish but no grass or potable water); 4) the low productivity of many activities in general; 5) the insufficient ability of all incountry possibilities to provide for all needs, and 6) the ever present possibility of catastrophe in case of productive system failure.

The above confirmation results in a specifically-adapted economic strategy and socio-economic structure that must be clearly understood to appreciate the role recessional agriculture does and can play. First, since it is impossible to avoid production risks, security is found by diversifying activities over time and geographic space. The herder not only moves rapidly to take advantage of immediate opportunities, but mixes animals (ovine, cattle, camels), and splits his herds, providing he has sufficient numbers and helpers. He also makes secondary investments in oasis or recessional agriculture, if possible. The agriculturalist diversifies into various types of agriculture: dryland, river recessional, and dam recessional, while trying to do small secondary animal husbandry, if possible. Even within specializations there are subdivisions between the more remunerative activities and the more secure. Within agriculture, dam recessional cultivation is traditionally the least risky because it requires only two or three rains a year, regardless of their spacing. Second, limited regional and nation-wide possibilities prevent anyone from becoming a totally subsistence producer. Everyone needs cash in addition to what they can produce. The original source of such cash is mostly outside the country or in modern sector or government service. The society is split between those who work outside the country (as merchants or laborers) or as civil servants, or in the modern sector, and remit money to their dependent families and communities, and those who come into secondary possession of this cash either by working for or selling to possessors or recipients of those earnings. Thus two basic symbiotic relationships exist between 1) those who engage in earning activities outside the community and those who stay in the community, and 2) between those who fulfill their cash needs through commercial activities requiring capital (i.e., commerce) (the general possessor-accumulators and distributors of capital to local communities) and those who fulfill their cash needs by working for the capital possessors.

2. Dam Recession Agriculture in Brakna and Gorgol

A. History

River recessional agriculture has existed for centuries and perhaps thousands of years. Earthen dam recessional agriculture seems to have first become prominent during the last century with French pacification. Large concrete recessional dams were introduced by the French in the late fifties.

B. Crops and Technology: The basic crops of dam recessional areas are sorghum intercropped with cowpeas (niebe) and melons. Two types of sorghum predominate - "Takaite", which people prefer for its taste and which reportedly has some resistance to "carbonne symptomatique" (fungus), and "Beskna", which apparently is a high tannic acid variety resistant to attack from birds, but which is disliked because of its bitter taste and lower ultimate edible yield, because it requires more extensive husking. The stalks of both are eaten by animals as fodder. Cowpeas are highly valued as both food (both beans and leaves) and fodder (stalks). Melons are eaten, but the most valuable part are the seeds which are ground for sauce and are an important source of protein for those too poor to afford meat.

The basic process of dam agriculture involves closing the dam prior to the rainy season. Only two or three rains are required to fill most areas. Reportedly, three weeks of soaking suffices to impregnate the ground. However, water is often retained up to four months because this retards the growth of competing weeds and because crops cannot be planted until after the rains are over and damage from an unexpected flood is no longer feared.

Water is released by opening a gate or breaking a hole. Thereafter, each person plants their parcel in a process that involves breaking the earth, punching a hole into the wet underground, and planting several seeds of sorghum, cowpeas and melons together. Planting time is generally in October-November. Harvest time is approximately four months later (February-March). According to people interviewed, no fertilizer is applied, nor apparently is there any noticeable decrease in fertility. Animal manure does get spread when animals eat the standing stalks after the harvest.

C. Modes of Production

1. Background: While the situation in particular sites differs, as will be explained, all stem from the same traditional system explained more fully in "Traditional Hassaniya Social Organization," (Annex to PP Integrated Development of Oases - 682-0207). Basically, the areas of the Brakna and the Gorgol potentially affected by the project are recognized to be controlled by various Moor factions. In the past, these factions (frakhad), in addition to other groups in passage, mainly used the areas as seasonal pasture. The limited agricultural opportunities were exploited by Haratin ("Black Moor") groups. These Haratin were free but dependent on the protection of controlling Bidan groups ("White Moors"). In exchange for such protection, they paid tribute from their production to Bidan leaders.

Since independence, recessional dam agriculture has become increasingly attractive to people for at least two reasons. Given the decimation of their livestock, any economic opportunity is welcomed by the poverty-stricken mass. Second, in addition to its economic benefits, a significant agricultural area presents an opportunity to generate a new community identity for previously nomadic - subservient groups. For the more powerful and rich, the economic benefits of agriculture are generally small compared to what can be earned from livestock (providing one still has animals), commerce (providing one has the capital), or the exercising of political influence. In fact, it is with the last goal in mind that many powerful traditional leaders still claim or seek to exercise control over recessional areas. In such cases, the ultimate benefit sought is not the agricultural production of the area, but the political allegiance of the people who may see their rights as dependent on the goodwill, investment of capital, or political influence of the titular Bidan head of the collectivity.

2. Ownership, Control, Distribution, Labor:

a) Ownership: At present, rural land ownership in Mauritania is a problematic situation. The law dating from independence states the two conflicting standards that land belongs to those who work it, but that traditional ownership rights are recognized. In the Brakna and Gorgol Regions,

where specific oueds have long been recognized as belonging to specific pastoral factions, and where recessional agriculture has been practiced by cultivators dependent on them, there is ongoing confusion and contestation as to whether today these areas belong to those who have long cultivated them or to the pastoral group who originally allowed the cultivators to settle.

The land tenure situation is presently under consideration. While the process has yet to work itself out, the lines of an eventual resolution seem fairly clear. Specific rights of preference (e.g., first choice) to exploit areas has to be given to members of the traditional group claiming the area. Those who have worked the land will have to be (and are beginning to be) recognized as members of the group and not just as dependent laborers. In terms of the present project, there is little AID can or should seek to do, since reform of land tenure must occur on a national basis. However, the project should seek to help establish the basis for insuring that when reform does come, the situation at the sites in question is sufficiently clear as to allow easy and just application of the law. At present, prior to assistance, communities are often required to sign agreements with the government spelling out the rights and obligations of each party. As part of this project implementation, there should be required a contract form mutually agreed upon by the GIRM and USAID. Each community should be recognized by the GIRM as a "pre-cooperative," (according to present Mauritania practices), under the supervision of the Ministry of Rural Development.

Each contract should clearly state that the area is being improved for the benefit and as the property of the pre-cooperative and its members.

b) Distribution and Control: In Mauritania, actual ownership is sometimes more figurative than real and the more important question is often who actually controls distribution of and production on the land. The opposite of what is obvious often occurs. For example, along the river in areas developed by projects such as the Gorgol scheme at Kaedi, people are given ownership of plots, but told what to plant, to whom to sell, at what price to sell, and what costs to bear. In contrast, on traditional lands, people often enter into contracts with owners that provide that in return for a stated percentage of production they are free to do as they wish. The result is that people often prefer such traditional sharecropping arrangements to more modern project systems.

At present, the situation vis-a-vis distribution and control of land at dam sites varies along a spectrum stretching from authoritarian control of a powerful individual or community to egalitarian control by the workers themselves. Basically, the land on each site is divided into a specific number of participatory shares. The size of each share varies from site to site. The largest recorded is approximately 1/2 hectare, the smallest, 1/20 of a hectare. Within any one site, the size of shares is equal.

Two fundamental systems for the original distribution of shares apparently exists. In the first situation, which is found in areas dominated by Bidan groups and where a significant investment of capital, as well as labor, was required to construct the dam, each person is asked to contribute their labor or a sum equivalent to it (e.g., the salary of a replacement). The result is that poorer laborers get one share for their labor. Rich parties often obtain numerous shares because they contribute the salaries of several workers. Under the second system, generally found in areas controlled by poorer Haratin groups, the needs of each family is assessed annually. A single person gets one share, a family head (male or female) gets two, and thereafter each family gets another share for each child over a certain age. The land is then divided into the total number of shares required and each party gets their appropriate portion.

Repairs or improvements are made in a similar fashion. If the dam needs repair, each participating person is asked to contribute either labor or a sum to hire a replacement. For other tasks, such as fence building, each participant is responsible for a portion of the job (e.g., the area of his field bordering the area).

c. Labor: Analysis of the ongoing system in functioning recessionary areas indicates that labor availability per se is not a major constraint. Nowhere were there indications of significant productive areas lying unused. The lack of economic activities and the poverty of the people is such as to make this unlikely now or in the future. Two types of constraints do, however, exist, that strongly influence the nature of the organization of labor and the final number of workers. Both of these could have important effects on project implementation.

The first constraint involves the high mobility of the population and the need to conduct diversified activities in different areas. As a result, what proves difficult is not

getting people to labor per se, but getting them to work together simultaneously on a major task. As long as the job can be split into individual tasks that can be independently performed, the problem is manageable. If, however, a hundred people are needed on a specific day, the problem becomes formidable. To the extent that the proposed dams would require such coordinated activities, it becomes valuable to encourage the formation of a nearby secondary population center to help insure labor availability.

The second labor constraint concerns the size of the plots. It appears that a minimum of 1/2 hectare is needed to make it economically feasible to work a recessional dam area. While in a few places people possess plots equalling or exceeding this, in many other areas plot sizes do not even approach this necessary minimum. Therefore, were everyone actually to work their own plots, the system could not function. The system does function precisely because there are sharecropping arrangements. An individual often will cultivate his own plot plus the plots of several absentee participatory share owners to insure that in toto (his plot plus one-half other plot yields) he receives the equivalent of the yield of about 1/2 hectare. In fact, the work itself is often split between the various members of the laborer's immediate family (wife and older children). As a result, the number of working units (nuclear families) working a recession area is estimated to be in the ratio of between 1:1 to 2:1 the number of hectares being worked (e.g., 50-100 families for 50 hectares). The number of working units is not, however, synonymous with the total number of beneficiaries, as will be explained.

d) Benefits and Beneficiary:

1) The direct benefits of recessional agriculture can be calculated in terms of production yields. Unfortunately, the size and nature of yields varies from site to site, year to year, and even by particular parcels within the same site. The following list represents a "theoretical" averaging, based on the claims of the people themselves and direct observations. Final value is given for all products, in terms of the equivalent value in sorghum production;

2) Indirect Benefits: In addition to its own production, the presence of a major recessional area can have highly beneficial secondary effects. People tend to exploit, in addition to the principal production area, any other surrounding opportunities, such as the banks of small oueds or depressions. These opportunities by themselves would offer insufficient benefits to justify several months in the area. However, once people are there for the principal areas created by the dam, these secondary areas are also put into production. In addition, the dam areas, because they represent not only opportunities for labor but also opportunities for outside investors, help maintain links between rural and urban dwellers. In some cases, wealthy urban sector individuals will invest not for profit but to create or maintain a viable rural settlement for their group of origin. In such cases, the investor's motive is not necessarily direct monetary gain, since the profit from agriculture is smaller compared to modern economic or political sector possibilities. Rather the desire is to maintain a group's claim to rural land; to be seen as the political and economic leader of a significant number of people, and the awareness that if the group members become urban squatters, it is from the wealthy or influential urban leader that they will demand charity.

3) Effects on Urban Migration: The GIRM, as well as the influential community leaders mentioned above, see the creation of additional recession dams as a tactic in the fight against urban migration. However, it would be inaccurate to view each dam as a future thriving community. The ability of a dam site to be a permanent settlement depends on several other factors, the most important of which is the year round availability of water, followed by easy access, and then by desired services (school, dispensary and shops).

It is most important to realize that dam recessional agriculture's contribution to the ultimate viability of rural life is but one part of an overall system of rural production. In cases where the dam site itself is not suitable for year-round living, the dam as an economic resource may still be a vital factor permitting the survival of a community either settled elsewhere during part of the year or still following a nomadic life style. The viability of rural life is dependent on the rural producer having available an adequate spectrum of productive activities that provide the necessary food, income and risk protection. Recessional agriculture forms one link in such a chain and its importance as a productive activity is not dependent on year-round water being available.

Product	Producer's Claims	Observations	Value in Equiv. kilos of Sorghum per hectare
Sorghum	People claim between 225-1000 kilos a hectare	Random questioning reveals most claims to vary between a low of 225 to a high of 600 k.	Estimate 400-500 kilos a hectare average production
Cowpeas	People claim cowpea product is twice as important as sorghum	Cowpea production is consumed and sold in somewhat random fashion so that people are not aware of their total production. Kilo for kilo it sells for twice the price of sorghum. Cowpea production estimated at 25% of sorghum (e.g., 25 K for 100K sorghum)	200 kilos per hectare (100 kilos production = 200 kilos of sorghum value)
Cowpea leaves and stalks	The leaves of the cowpea are used for sauce, the stalks are fed to animals for fodder	At best one can only guess at value, but it is significant and should be counted	25 kilos (estimated)
Melons	Few melons are actually sold. The seeds are the most important product as they provide a protein source during periods when no meat is available	Significant melon production is seen in many areas and 10-30 UM a melon according to size is not an unusual price when sold by producer	100 kilos sorghum equivalent value
Sorghum Stalks	In the past, animals ate these in the field. Nowadays, some people save for dry season fodder and even sell the stalks	There is no question that the stalks have a value as fodder. If a hectare's production is consumed by one steer, it would equal in value 200 kilos of sorghum	100 kilos

While the above calculation is rough, it does not exaggerate production. It is fair to estimate the annual value of total production (all products) of a hectare of recession land at the value of 850 kilos of sorghum. Sorghum usually varies in price between 15-30 UM a kilo (33 to 66 cents) depending on the season. If one takes 50 cents as the average market value, the annual value of a hectare's production of all products is \$425.

4) Beneficiaries Per Se: Because recessional dam sites are not synonymous with fixed populations; because the distribution of land can vary from year to year; and because the situation is one of a small benefit being spread among many people, it is most difficult to fix a beneficiary number. In terms of the types of beneficiaries, one can cite a) worker-owners; b) sharecroppers, and c) absentee owners. In areas where worker-owners predominate, benefits tend to be more important, but favor fewer families (estimate one family per hectare). In areas where there is much absentee ownership and sharecropping, the benefits are less and shared among the owners and workers (estimated ratio: two beneficiary families per hectare). The average Moor family comprises approximately five members, but recent food consumption studies indicate the average "eating" unit as 9+, which is indicative of the large number of people who live off the charity of others.

In gross terms, the project should provide for 1.5 beneficiary families per hectare with each family and associated dependents equal to seven people, giving a rough total of 10.5 beneficiaries per hectare of recessional agricultural land. Again, one must realize that each beneficiary receives a benefit that does not satisfy all of his/her needs, but is an important link in a long chain of survival activities.

III. Specific Sites

The following list discusses relevant particulars of each site. One division manifests itself, the division between sites where some form of dam recessional agriculture is now occurring and those where it is not. Dam recessional agriculture has traditionally been more adaptive to the arid northern Brakna, with its deep oueds, than to the Gorgol, where more rainfed agriculture is practiced and where people's agricultural activities seem more directed to the Senegal River area.

Lefkarine: This area belongs to a faction of the Kounta Tribe. While it has been exploited since the 1920's, the settlement itself has only existed since 1973. There is a school, and should the new dam increase production, the community would itself probably increase in size. The present leadership is, however, quite authoritarian and exploitation of the land appears less egalitarian than most other areas.

Bou Soueillife: The dam is broken and agriculture is practiced behind it in the bed of the Gorgol Blanc. The original dam was apparently constructed by the Haratin cultivators themselves. Of the original fifty families, only approximately twenty work the area at present. The others, plus additional families, could be expected to return, providing an adequately rewarding opportunity existed..

Moundi Founti: This is a well-established community. The settlement is clearly under the strong influence of a particular family who appears to exercise a constructive form of traditional leadership. As an already viable community, improvements to the dam could be expected to result in further settlement in the area.

Boudjounal: This is a community of apparently well-organized, dedicated, but extremely poor cultivators. The community has the social potential of becoming a well-established permanent settlement. There is a question of the area being threatened by encroaching dunes. Distribution of parcels is done by the village "djamaa" (council of respected leaders) each year, according to family size.

Le Maudou: This dam belongs to the El Mentghambrine. There is an area consisting of a small store that represents the community. The majority of members are dispersed throughout the area, cultivating small patches of rainfed agriculture, in addition to the area at the dam site. After the rainfed field harvest, the males leave for Magta Lahjar or Nouakchott to seek work as day laborers. The women and children stay behind watching the fields and animals.

Timbara: This dam belongs to the Ideidba and represents an unusual social mix. It is shared by four "grand famille" (R'Kiz) who are mixed herders (camels, cattle and ovins) and agriculturalists. Each R'Kiz is responsible for sub-dividing its section as it wishes. The land is worked by a mixture of types: dependent workers still attached to families; Haratin working for themselves; poor Bidans working for themselves;

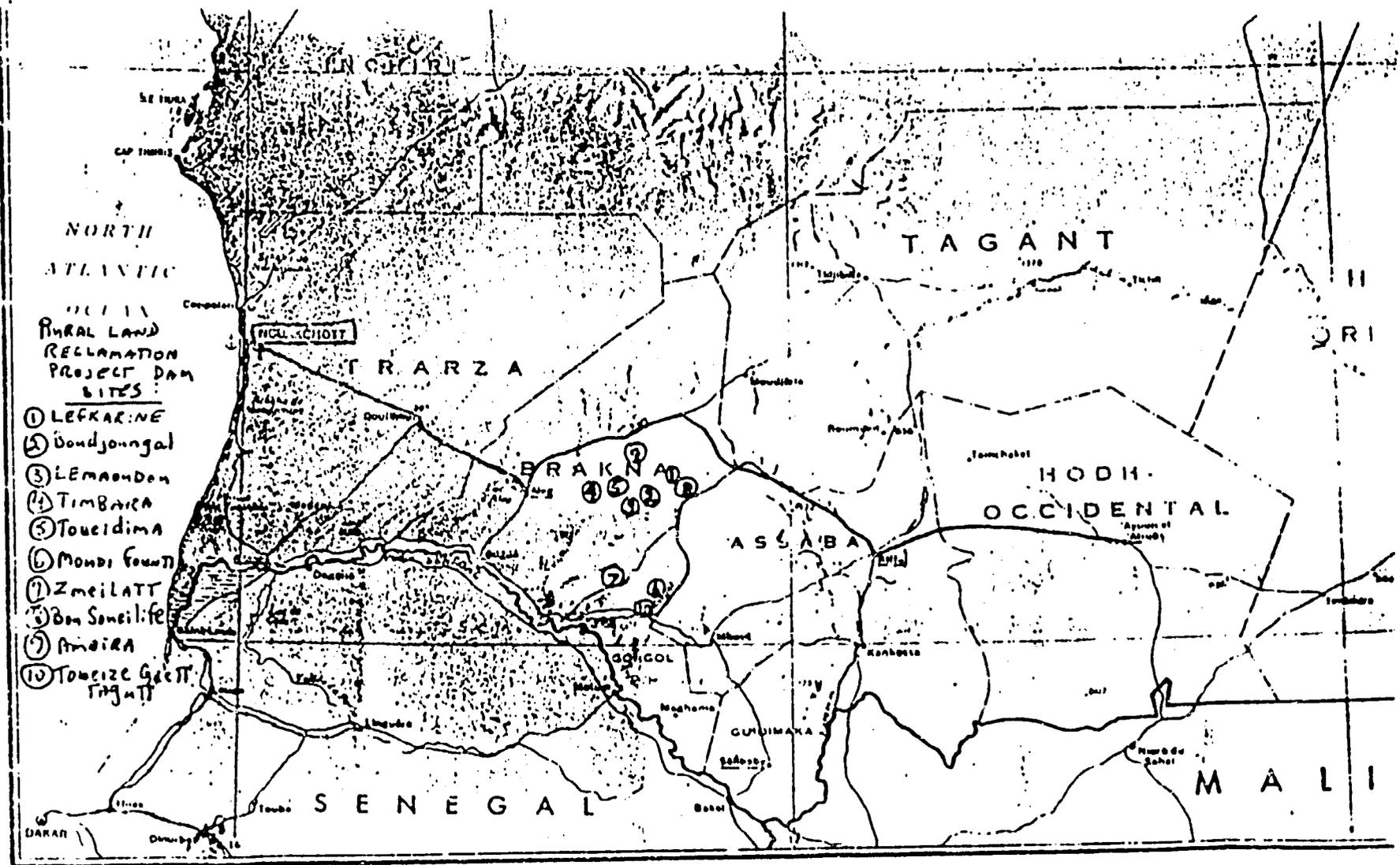
and some outsiders who have been given permission to participate. An average parcel is 2.5 meters by 110 meters. Decisions are made by the Djama which is comprised of two representatives from each of the four "R'Kiz."

Toueidima: This is a functioning dam with a social situation similar to that at Timbara. In this case, all the Haratin sharecrop and only Bidan own parcels. Given the dam's present situation, the profits to be gained are small and unless improved, the Haratin seem inclined to leave permanently and become urban migrants. This may occur anyway unless they receive some parcels of their own should the area be enlarged.

Ameira: This is a site with no current cultivation. It belongs to the community of Guimi on the paved highway.

Gorgol

Toueize Grett Tagatt: This area contains the remnants of an earthen dike, the area around which has not been in production for at least several years. No established community exists, but numerous surrounding Haratin encampments practice rainfed agriculture in this area.



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