PD-AAJ-451

682-0205

PD-AAJ-

ISN 954

UNCLASSIFIED

DEPARTMENT OF STATE

AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D. C. 20523

MAURITANIA

RENEWABLE RESOURCES MANAGEMENT PROJECT

682-0205

PROJECT PAPER

Approved March 30, 1978

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/DR, John L. Withers JLW

Problem: Your authorization is required for a $1,000,000 grant in FY 1978 (and $4,677,700 for the life of the project) under the Sahel Development Program (Section 121 of the FAA) to the Islamic Republic of Mauritania for the Renewable Resource Management Project No. 682-0205 and for certain procurement waivers requested for the effective implementation of the project.

Discussion:

A. Description of the Project

1. Project Purpose. One of the most basic development issues in Mauritania is how to promote self-sustained development in the rural sector in face of a deteriorating, renewable natural resource base. The forests, arable lands and pasturage, as the country's renewable resources, have been subjected to increasing stress over the past several centuries by man and his domestic livestock. As the result of shifting cultivation and overgrazing, particularly around village sites and permanent watering points, negative trends on soil condition and of rangelands are taking place. In addition, the rate of harvesting of trees for wood and fuel greatly exceeds the rate of natural regrowth. The inevitable has resulted - the country now finds itself with a stock of renewable resources which is declining. The majority of the people yet depend upon farming and herding for subsistence and cash income. The purpose of this project is to assist the Government of Mauritania (GIRM) in identifying and developing techniques and methods required to reverse these adverse environmental trends.

In order to achieve this purpose, the project proposes the three following interventions: First, the project will carry out a renewable resources survey to establish baseline data for a national renewable resource plan, as well as provide data to apply to the implementation of discrete project activities. The actual implementation of these activities is the second component of the project. These activities will test the technological feasibility and sociological acceptability of sand dune stabilization, range management and reforestation/forest management. The third component provides for training of Mauritanians in resource management, extension methods, and interpretation of satellite imagery and aerial photography.

2. Conformance to A.I.D. Country Strategy. The AID Affairs Office/ Nouakchott has developed a strategy for the application of A.I.D. resource to Mauritania consistent with the goals of the Sahel Development Program. It should be noted that this strategy is based upon the fact that A.I.D.

has virtually no historical project implementation experience in Mauritania and is therefore assuming a cautious approach as compared to other A.I.D. programs in the Sahel. Over the next five years, A.I.D. will be implementing a series of six projects, experimental in nature and moderate in size, which are designed to test the effectiveness of various technological approaches in the complex Mauritania social and economic situation. This project is one of those experimental efforts. It is hoped that sufficient information will be generated during the course of the project to allow A.I.D. and the GIRM to proceed with confidence towards implementing a larger renewable resource project sometime after 1983.

3. Beneficiaries of the Project. The following is an analysis of project beneficiaries by project components:

a. Resource Survey - The activity will train 9 Mauritanians in interpretation of satellite imagery and aerial photography and will indirectly benefit all Mauritanians by improving resource management throughout the country.

b. Project Activities - The reforestation and sand dune stabilization components will directly benefit the combined populations of Boutilimit and Mederdra - approximately 10,000 people. The range management scheme will directly benefit perhaps 200 herder families or 1,400 people.

c. Training - Besides the LANDSAT trainees mentioned in "a" above, the project will train 54 GIRM officials in various aspects of resource management.

B. Financial Summary

1. Schedule

	FY 1978 (000)	LOP (000)
Commodities	$ 220	$1,398
Technical Assistance	740	2,923.1
Participants	40	327.9
Other	-	28.7
TOTAL	$1,000	$4,677.7
Host Country Financing	102.9	788.4
GRAND TOTAL	$1,102.9	$5,466.1

2. Host Country Contribution. The most important GIRM contribution will be personnel costs for those civil servants attached to the project. Other contributions include land, water, tree seedlings and POL products.

Since this assistance is being provided under Section 121 of the Foreign Assistance Act, the host country contribution requirement of Section 110(a) is not applicable.

C. Socio-Economic, Technical and Environmental Description

1. Socio-Economic Acceptability. The social analysis concluded, it was feasible to work the indigenous social structures in those areas where project interventions will take place. It further concluded that intervention activities should succeed provided that serious attention is paid to the roles that those traditional structures may play in the project implementation. Intervention activities should be channeled through the traditional clan decision-making, communications, and implementation centers in coordination with those of the administration and the political party.

2. Technical Analysis. The project has been found to be technically sound.

3. Environmental Analysis. The project concept and purpose is to find and develop techniques and methods that will improve environmental conditions now and to an even greater extent in the future. Pilot interventions, in addition to a resource inventory and training in resource management, will be implemented to rehabilitate and revegetate areas that have experienced severe and steady deterioration due to overuse and adverse climatic conditions. The Initial Environmental Examination finds that the project will not have a significant impact on the environment and recommends a Negative Determination.

D. Major Conditions and Covenants

1. 611(a) Determination. It has been Africa Bureau policy that under normal circumstances, engineers must review all construction plans and budgets to determine their soundness and firmness of cost prior to project authorization. An exception to this policy is requested in this project for three houses to be constructed for project technicians. This exception is requested because this housing is not significant to achieving project purposes, the structures are simple and cost variations, if any, will most likely be minimal, with any cost overruns easily accommodated within the "inflation and contingency" line item in the budget. The AAO/Nouakchott will, of course, be required to obtain the 611(a) determination prior to obligation of funds for construction of these houses.

2. Waivers Required. Waivers of Geographic Code 000 (U.S. only) to Code 935 (Special Free World), and Code 941 (Selected Free World) are being requested for the purchase of some commodities. A waiver is being requested of the 10 percent limit on the amount of shelf items from Code 899 countries (Free World) that may be purchased under this project. Justification for

these waivers are attached to this memorandum.

It should be noted that a waiver is not being requested for the aircraft charter services required for the resource survey, even though the service is owned by a French citizen. It has been determined that the company is integrated into the Mauritanian economy and therefore qualified as a "local" firm. The charter service (the only one in Mauritania) is not a branch of a foreign firm, it has decision-making authority, its profits are re-invested in the local economy and its owner is a 30-year resident of Mauritania, married to a national of that country. Therefore, it has been determined that this firm, which is organized under the laws of Mauritania, has its principal place of business there and is integrated into the economy. (See Handbook 11, pages 1 to 31).

3. Major Implementing Agencies. The major implementing agencies will be the Directorate for Environmental Protection within the Ministry of Rural Development and a U.S. contractor to be selected through the A.I.D. competitive bidding process.

E. Committee Action and Congressional Apprisement

1. Final Committee Review. At the project committee review, chaired by Charles Husick, AFR/DR/SFWAP on March 13, 1978, it was decided to make several minor changes in the Project Paper as presented at the meeting prior to authorization. These changes have been incorporated into the attached Project Paper. It was further determined that no further outstanding issues remained unresolved and that an ECPR would not be necessary.

2. Congressional Advice. The project was included in the FY 1978 Congressional Presentation.

F. Responsible Officers. The officer responsible for backstopping the project in AFR/DR will be Doris Mason while the project manager in the field will be Charles Edwards.

Recommendations:

1. That you sign the attached PAF II and thereby apprcve the proposed grant of $4,677,700 to the Government of Mauritania for the implementation of the Renewable Resource Management Project (685-0205) and authorize an allotment of $1,000,000 from FY 1978 funds for this project.

2. That by your signature on the Initial Environmental Examination, included as attachment IV to the project paper, you approve the recommendation that the Regulation 16 threshold decision be a negative determination.

Drafted: AAO/Nouakchott/PRM:JMAnderson:moa:3-24-78

Clearances:
DAA/AFR:WHNorth
AFR/DR:JKelly
AFR/DR:CHusick
GC/AFR"STisa (draft)
AFR/SFWA:HGra (draft)
AFR/SFWA:ARollins (draft)
AA/PPC:BPrintz (draft)
AFR/DR:DFerguson (draft)
AFR/DR:DDibble (draft)
DS/COM:PHagan (draft)
DS/ENGR:MMorgan (draft)

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART II

Country: Mauritania

Project: Renewable Resources Management

Project No.: 682-0205

Pursuant to Part I, Chapter 1, Section 121 of the Foreign Assistance Act of 1961, as amended, (the "Act"), I hereby authorize a Grant to the Government of the Islamic Republic of Mauritania (the Cooperating Country) of not to exceed One Million United States Dollars ($1,000,000) to assist in financing certain foreign exchange and local currency costs of goods and services required for the project as described in the following paragraph.

The project shall consist of providing technical assistance, goods and related services to assist the Cooperating Country in improving its management of renewable resources by conducting a survey of renewable resource to establish baseline data for a national renewable resource plan and by testing the social and technical acceptability of sand dune stabilization in Boutilimit and Mederdra, range management and re-forestation/forest management (hereinafter referred to as the "Project").

I approve the total level of A.I.D. appropriate funding planned for the Project of not to exceed Four Million Six Hundred Seventy Seven Thousand Seven Hundred United States Dollars ($4,677,700), Grant, during the period FY 1978 through FY 1982, including the amount authorized above and additional increments of Grant funding during that period subject to the availability of funds and in accordance with A.I.D. allotment procedures.

I hereby authorize the initiation of negotiations and execution of the Grant Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, subject to following terms, together with such other terms and conditions as A.I.D. may deem appropriate:

a. Source and Origin of Goods and Services.

Except for ocean shipping, goods and services financed by A.I.D. shall have their source and origin in the United States or the Cooperating Country, except as A.I.D. may otherwise agree in writing.

Ocean shipping financed under the Grant shall be procured in any eligible source country except the Cooperating Country.

b. Condition Precedent.

Prior to the first disbursement of funds under the Grant, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence of the availability of adequate amounts of funds required to finance contributions being made to the Project by the Cooperating Country.

c. Covenant.

The Grant Agreement shall contain covenants providing in substance as follows:

1. The Cooperating Country shall assign to the Project adequate number of personnel to ensure the effective implementation of the Project and the accomplishment of the objectives of the Project;

2. The Cooperating Country shall contribute, or cause to be contributed, to the Project land and water rights necessary for the establishment of a nursery at Boutilimit and at Mederdra.

3. The Cooperating Country shall provide, within 90 days after execution of the Grant Agreement, a plan satisfactory to A.I.D. for the assumption by the Cooperating Country of a portion of the costs of POL required for vehicles and for equipment used for the Project.

4. A.I.D. shall be designated the agent of the Cooperating Country for the purpose of procuring goods and services required for the Project.

5. The procurement and use of pesticides under the Project shall be in accordance with A.I.D. pesticide regulations as in effect at the time.

6. The Cooperating Country shall establish an appropriate Interministerial Committee which will cooperate with A.I.D. in the evaluation of activities conducted under this Project.

7. The Cooperating Country shall prepare a national plan, in form and substance satisfactory to A.I.D., for the management of renewable resources in the Cooperating Country taking into consideration the activities conducted under this Project.

d. Waivers.

Notwithstanding paragraph a. above and based upon the justifications set forth in Annexes IX , X , and XI of the Project Paper, I hereby

1. Approve a procurement source waiver from A.I.D. Geographic Code 000 (U.S. only) to Geographic Code 935 (Free World) for motor vehicles and spare parts; provided, that the amount of such waiver shall not exceed $160,000;

2. Certify that exclusion of the above described motor vehicles and spare parts from the requested source country in Code 935 would seriously impede attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program;

3. Find that special circumstances exist to waive, and do hereby waive, the requirements of Section 636(i) of the Act;

4. Approve a procurement source waiver from Code 000 (U.S. only) and the Cooperating Country to Code 941 (Selected Free World) of the A.I.D. Geographic Code Book for the procurement of well drilling and construction services from SONAFOR, a Senegalese firm; provided that the amount of such waiver shall not exceed $160,000.

5. Approve the procurement of shelf items imported into Mauritania from countries included in Code 899 of the A.I.D. Geographic Code Book in the amount of $181,500.

Assistant Administrator
for Africa

Date

Clearances: As shown on Action Memorandum

INITIAL ENVIRONMENTAL EXAMINATION

Project Country: Mauritania

Project Title: Mauritania Renewable Resouces Management

Funding: FY(s) 1978-1982 $ 4,677,700

Period of Project: 1978-1983 (5 years)

IEE Prepared by: Laurance W. Bond

Environmental Action Recommended:

It is recommended that a negative determination be made and no further environmental action is required

Full IEE is attached to Project Paper as Annex IV.

Concurrence:

Robert M. Klein
Country Development Officer
Nouakchott, Mauritania

Assistant Administrator Decision:

APPROVED _____

DISAPPROVED _____

DATE 3/..../78

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART I

1 TRANSACTION CODE: [A] A ADD, C CHANGE, D DELETE

PAF

2 DOCUMENT CODE: 5

3 COUNTRY ENTITY: Mauritania

4 DOCUMENT REVISION NUMBER: [ ]

5 PROJECT NUMBER (7 digits): 682-0205

6 BUREAU OFFICE: A SYMBOL: AFR; B CODE: 06

7 PROJECT TITLE (Maximum 40 characters): Renewable Resources Management

8 PROJECT APPROVAL DECISION — ACTION TAKEN: [A] A APPROVED, D DISAPPROVED, DE DEAUTHORIZED

9 EST. PERIOD OF IMPLEMENTATION: YRS 05 QTRS 20

10. APPROVED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 78 F. GRANT	E. 1ST FY 78 G. LOAN	H. 2ND FY 79 I. GRANT	H. 2ND FY 79 J. LOAN	K. 3RD FY 80 L. GRANT	K. 3RD FY 80 M. LOAN
(1) SH	743 B	060		1,000		1,745		842.6	
(2)									
(3)									
(4)									
TOTALS				1,000		1,745		842.6	

A. APPROPRIATION	N. 4TH FY 81 O. GRANT	N. 4TH FY 81 P. LOAN	Q. 5TH FY 82 R. GRANT	Q. 5TH FY 82 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1) SH	537.1		553		4,677.7	
(2)						
(3)						
(4)						
TOTALS	537.1		553		4,677.7	

11. PROJECT FUNDING AUTHORIZED — A. GRANT / B. LOAN

(ENTER APPROPRIATE CODE(S)) 1 - LIFE OF PROJECT, 2 - INCREMENTAL, L.O.P.: A. GRANT = 2

C. PROJECT FUNDING AUTHORIZED THRU: FY 82

12 INITIAL PROJECT FUNDING ALLOTMENT REQUESTED $000:

A. APPROPRIATION	B. ALLOTMENT REQUEST NO ____ C. GRANT	B. ALLOTMENT REQUEST NO ____ D. LOAN
(1) SH	1,250	
(2)		
(3)		
(4)		
TOTALS	1,250	

13. FUNDS RESERVED FOR ALLOTMENT

TYPED NAME (Chief, SER FM FSD): John Finn

SIGNATURE:

DATE:

14. SOURCE, ORIGIN OF GOODS AND SERVICES: [X] 000 [X] 941 [X] LOCAL [X] OTHER 935

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE MM DD YY	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE MM DD YY

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/DR, John L. Withers

SUBJECT: Procurement Source/origin Waiver

Problem: Request for a Procurement Source/Origin Waiver from Geographic Code 000 (U.S. only) to Geographic Code 935 (Special Free World).

a. Cooperating Country : Mauritania

b. Nature of Funding : Grant 682-0205

c. Project : Renewable Resources Management

d. Description of Goods: Eight (8) vehicles with spare parts

e. Approximate Value : $160,000

f. Probable Source : Great Britain

Discussion: Land-rover (British) four-wheel drive vehicles are being requested under this project for several reasons. First, there is no distribution of U.S.vehicles in Mauritania nor spare parts suppliers for U.S. - manufactured vehicles. Considerable effort has been made by the U.S. Ambassador on a number of occasions to interest U.S. manufactures to enter the Mauritanian market but to no avail. Despite these efforts (over a 15-month period), only one U.S. manufacturer responded by making a visit to the country and that firm showed no evidence of further interest after a brief investigation of the problems and potential of the local market. Second, the vehicles will be used for the majority of the time in the interior of the country, and the mechanics operating in these areas are not familiar with U.S. vehicles, whereas they are with Land-rovers. Given the difficult road conditions in Mauritania, breakdowns are frequent and therefore mechanics' services are required often. The SER/COM group which studied vehicle policy for A.I.D. posts in the Sahel concluded that in Mauritania, Land-rovers were acceptable for those project vehicles which will be used for off-pavement travel outside of Nouakchott. It should also be mentioned that some repair facilities do exist in the interior for Land-rovers and some French-made vehicles.

Recommendation: For the reasons stated above it is recommended that you find that special circumstances exist requiring waiver of the requirements of Section 636(i) and conclude that the exclusion of procurement of the non-U.S. manufactured vehicles mentioned above from the source requested would seriously impede attainment of U.S. foreign policy objectives and the Foreign Assistance Program, and I recommend that you certify by approving this request for waiver.

Clearances:
AFR/DR/SFWAP:CHusick
GC/AFR:STisa (draft)
AFR/SFWA:HGray (draft)
SER/COM/ALI:PHagen (draft)
AFR/DP:WTate (draft)
AFR/DR:JKelly
DAA/AFR:WHNorth

AAO/PRM/Nouakchott:JAnderson:tc:3/25/78X28242

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/DR, John L. Withers

SUBJECT: Procurement Source/Origin Water

Problem: Request for a Procurement Source/Origin Waiver from Geographic Code 000 (U.S. only) to Geographic Code 941 (Selected Free World).

a. Cooperating Country : Mauritania

b. Nature of Funding : Grant 682-0205

c. Project : Renewable Resources Management

d. Description of Goods: Well Construction and Drilling

e. Approximate Value : $160,000

f. Probable Source : Senegal

Discussion: There will be two wells drilled and well protection structures constructed for the range management sub-activity and two wells drilled and well protection structures constructed for the tree nurseries at Boutilimit and Mederdra.

There are no local firms in Mauritania which are capable of well drilling and therefore these services have to be procured from neighboring Senegal. As the amount of construction is relatively small, it has been determined that the heavy costs inherent in a U.S. firm transporting well drilling equipment from the United States would be prohibitive and therefore a 941 waiver is being requested. At the present time, the only company capable of doing this work is SONAFOR, a local Senegalese firm based in Dakar. SONAFOR has been used for other AID-financed well-drilling activities in Senegal.

Recommendation: For the reasons stated above, it is recommended that you approve the procurement of the services described above from Code 941.

Clearances:
AFR/DR/SFWAP:CHusick
SER/COM/ALI:PHagan (draft)
GC/AFR:STisa (draft)
AFR/SFWA:HGray (draft)

AFR/DP:WTate (draft)
AFR/DR:JKelly
DAA/AFR:WHNorth

AAO/Nouakchott/PRM:JAnderson:tc:3/25/78

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/DR, John L. Withers

SUBJECT: Waiver of Ten Percent (10%) Limit on Amount of Shelf Items from Code 899 Countries (Free World)

Problem: A waiver is needed of the limitation set forth in paragraph 4(b) of Chapter 18 of Handbook 1B, that shelf item purchases for the project from Code 899 countries cannot exceed 10 percent of the total value of local currency expenditures.

a. Cooperating Country : Mauritania

b. Nature of Funding : Grant 682-0205

c. Project : Renewable Resource Management

d. Description of Goods: Basic Building Materials and POL

e. Approximate Value : $181,500

f. Probable Source : Western Europe

Discussion: Shelf items as defined in Chapter 11 of Handbook 15 and Section 13A.4 of Handbook 1.B are commodities which are normally imported and kept in stock, in the form of which imported, to meet a general demand in the country for the item. They are not items which have been specifically imported for use in an AID-financed project. Shelf items from Code 899 countries are limited to items that cost $2,500 or less per unit and cannot exceed 10 percent of the total local cost of the project, or $10,000, whichever is greater.

However, Section 18.D of Handbook 1.B indicates that Assistant Administrators who have program responsibility, acting in consultation with GC, have the authority to waive the policies peculiar to local cost financing.

Recommendation: It is recommended that you waive this limitation for this project for those shelf items which will be procured in connection with the housing construction activities (approximately $90,000 for basic building materials), well construction activities (approximately $16,000 for basic building materials), POL (approximately $72,000) and miscellaneous supplies (approximately $3,500 for plumbing fittings and bamboo matting). Total shelf item purchases will be approximately $181,500 while total local currency expenditures are estimated to be $489,500. Because of the nature of construction activities and the usage pattern of POL products, it is considered unreasonable to insist that the above mentioned items be purchased from the U.S. and transported to Mauritania. In addition the relatively small amounts makes it highly impractical if not impossible to order on a timely basis from the U.S.

Clearances:
AFR/DR/SFWAP:CHustck
AFR/SFWA:HGray (draft)
AFR/DP:WTate (draft)
GC/AFR:STisa (draft)
SER/COM/ALI:PHagan (draft)
AFR/DR:JKelly
DAA/AFR:WHNorth

AAO/Nouakchott/PRM: JAnderson:tc:3/24/78:X28242

Renewable Resource Management

6C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

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

GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b)

   (a) Describe how Committees on Appropriations 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 plus 10%)?

   This project was included in FY 1978 Congressional Presentation. As the funding level required will exceed that requested in the FY 1978 CP, a Congressional Notification will be sent to Congress.

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

   Yes

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?

   The GIRM Counsel of Ministers will be required to approve the project but historical experience has shown this process to be a formality. Unreasonable delays are not expected.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

   NA

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 the country's capability effectively to maintain and utilize the project?

   N.A.

A.

6. FAA Sec. 209, 619. 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. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?	No
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). 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; (c) encourage development and use of cooperatives, 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.	A. unknown, but probably no B. Yes C. Yes D. Yes E. Yes F. No effect
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).	The contract team which will implement this project will be American. As it is an experimental activity it will have little to no effect on US private trade and investment.
9. FAA Sec. 612(b); Sec. 636(h). 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 to meet the cost of contractual and other services.	Through a process of negotiation, the GIRM has promised to fund all those activities which require local currency contributions to the extent their budget will permit
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?	No

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria	
a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (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?	a. The whole effort of the project is to improve the lives of rural peoples, poorest of the poor in Mauritania. b. N.A.

B1

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e.g., a, b, etc. -- 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, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers; N.A.

(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

(3) [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; NA

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

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

(b) to help alleviate energy problem; NA

(c) research into, and evaluation of, economic development processes and techniques; N.A

(d) reconstruction after natural or manmade disaster; NA

(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance; N.A.

(f) 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. N.A.

81

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.	See 4.b. above
c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will 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)?	NA
d. 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?	NA
e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.	This activity will measurably increase the country's ability to plan and manage its renewable resources which are essential to further growth and development of the rural areas.
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 civic education and training in skills required for effective participation in governmental and political processes essential to self-government.	The project is directed towards helping create an environment in which Maruitania development aspirations for rural people can be realized. This is a first step which will set the stage for meeting the "needs, desires and capacities" of the people.

B1

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). 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; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?	See B.1.e and B.1.f. above.
h. FAA Sec. 201(b)(6); Sec. 211(a) Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.	The only effects upon the U.S. economy will be through the payment of salaries to US technicians and the purchase of U.S. commodities.

2. Development Assistance Project Criteria (Loans only)

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.	N.A
b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.	N.A
c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds $100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?	N.A
d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?	N.A.

	e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?	N.A.
	f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, 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?	N.A.
3.	Project Criteria Solely for Security Supporting Assistance FAA Sec. 531. How will this assistance support promote economic or political stability?	N.A.
4.	Additional Criteria for Alliance for Progress [Note: Alliance for Progress projects should add the following two items to a project checklist.]	N.A.
	a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?	N.A.
	b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?	N.A.
5.	Additional criteria for Sahel Development Program FAA Sec. 121. How will this assistance contribute to the long-term development of the Sahel in accordance with the long term multi-conor development plan for that pirpose.	This project will provide a basis for identifying and developing techniques and strategies required to regenerate the physical environment in Mauritania which have been severely damaged and subjected to increasing stress over the past several decades.

Renewable Resource Management

6C(3) - STANDARD ITEM CHECKLIST

Listed below are 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 exclusion (as where certain uses of funds are permitted, but other uses not).

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

A. Procurement

1.	FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	Yes
2.	FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes
3.	FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed?	Yes
4.	FAA Sec. 604(e). 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?	Yes
5.	FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	Yes
6.	MMA Sec. 901(b). (a) Compliance with requirement 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, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized,	Yes

AF

	are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	
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

B. Construction

1.	FAA Sec. 601(d). If a 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 interest?	N.A.
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?	N.A.

C. Other Restrictions

1.	FAA Sec. 201(d). 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?	N.A.
3.	FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interests of the U.S.?	Yes
4.	FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction?	Yes

5. Will arrangements preclude use of financing:

a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions?	Yes
b. FAA Sec. 620(g). to compensate owners for expropriated nationalized property?	Yes
c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs?	Yes
d. FAA Sec. 662. for CIA activities?	Yes
e. App. Sec. 103. to pay pensions, etc., for military personnel?	Yes
f. App. Sec. 106. to pay U.N. assessments?	Yes
g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending).	Yes
h. App. Sec. 501. to be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes

AFR/DR

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TRANSACTION CODE: A (A = ADD, C = CHANGE, D = DELETE)

DOCUMENT CODE: PP 3

1. COUNTRY/ENTITY: Mauritania

4. DOCUMENT REVISION NUMBER: 1

5. PROJECT NUMBER: 682-0205

6. BUREAU/OFFICE: AFR 06

7. PROJECT TITLE: Renewable Resources Management

8. ESTIMATED FY OF PROJECT COMPLETION: 83

9. ESTIMATED DATE OF OBLIGATION: INITIAL FY 78; FINAL FY 81; QUARTER 3

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 = 45 UM)

A. FUNDING SOURCE	FIRST FY 78 B. FX	C. L/C	D. TOTAL	LIFE OF PROJECT E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
GRANT SH	770	230	1,000	3,910.5	767.2	4,677.7
LOAN						
OTHER U.S. 1						
OTHER U.S. 2						
HOST COUNTRY		102.9	102.9		788.4	788.4
OTHER DONOR(S)						
TOTALS	770	332.9	1,102.9	3,910.5	1,555.6	5,466.1

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH CODE C. GRANT	D. LOAN	E. 1ST FY 78 F. GRANT	G. LOAN	H. 2ND FY 79 I. GRANT	J. LOAN	K. 3RD FY 80 L. GRANT	M. LOAN
(1) SH	743	060		1,000		1,745.0		842.6	
(2)									
(3)									
(4)									
TOTALS				1,000		1,745.0		842.6	

A. APPROPRIATION	N. 4TH FY 81 O. GRANT	P. LOAN	Q. 5TH FY 82 R. GRANT	S. LOAN	LIFE OF PROJECT T. GRANT	U. LOAN
(1) SH	537.1		553.0		4,677.7	
(2)						
(3)						
(4)						
TOTALS	537.1		553.0		4,677.7	

12. IN-DEPTH EVALUATION SCHEDULED: 0682

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE: Robert M. Klein, Country Development Officer

DATE SIGNED: MM DD YY

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

AID 1330-4 (3-78)

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PART I. SUMMARY AND RECOMMENDATIONS

A. Face Sheet Data

B. Recommendations

As one technical consultant expressed it during the course of this design, "The problems of Mauritania are Homeric". The requirements for development are so immense and widespread that it cannot be categorically stated any one area is the place to begin. Nevertheless, a beginning must be made and the proposed project is an attempt at addressing the problems of development in Mauritania by commencing with that which has some potential -- renewable resources. It is therefore recommended that the following be authorized:

-- 5-year Grant Project Financing (FY 1978 Grant Financing)	$4,677,700 ($1,000,000)
-- Waiver of FAA Section 636(i) to permit Code 935 procurement of eight vehicles.	
-- Waiver of Code 000 for construction services to permit 935 contracting of well drilling.	
-- Authorization for local procurement of up to $181,500 of POL products and minor commodities including those of local production.	
Total new AID Obligation	$4,677,700

C. Project Description

This project is designed to develop an ecologically and socially sound, integrated plan for the management and conservation of renewable resources in Mauritania. By the end of the project, a substantial body of information will be available on existing natural renewable resources and a cadre of Mauritanian technical and extension personnel will have been trained to help manage these resources. Together, these will provide the basis for an integrated program of renewable resource management and conservation for Mauritania.

The ultimate, or basic, goal of the Renewable Resources Project is to promote self-sustained development in the rural sector through the establishment of comprehensive programs to build a trained manpower base and develop resources required to withstand adverse climatic and environmental conditions, without disruption to continued development. The project is meant to assist the Government of the Islamic Republic of Mauritania (GIRM) in identifying and developing techniques and methods required to reverse the adverse environmental trends now affecting Mauritania so that goal may be achieved.

As herein proposed, the project has three major components to provide the GIRM the means to start addressing the problems associated with resource degradation and loss. First, the project will carry out a renewable resources survey to establish baseline data for a national renewable resources plan, as well as provide data to apply to the implementation of discrete project activities. These discrete project activities are the second component of the project and will involve carrying out a series of experimental pilot interventions. These interventions will test the feasibility of specific approaches for resource conservation and renewal. The interventions to be tested will include sand dune stabilization, range management and reforestation/ forest management.

As a third component, the project will provide for long-term training of two Mauritanians in general resource management, one in arid lands resource management, one in forest resources management and four in extension and resource personnel management and development. In addition, short-term training in extension methods for up to forty Mauritanians is to be provided along with short-term training for up to nine LANDSAT photo-interpreters. These last will be trained in Mauritania on-the-job and through "recycling" courses.

The project will be implemented by two contract teams. The first of these will be responsible for the resource survey and utilize satellite imagery and aerial photography. This team's contractual obligations will include training the up to nine Mauritanian personnel in the interpretation of satellite imagery and aerial photographs and to conduct "ground truth" surveys.

The second team of contractors will be responsible for carrying out the discrete project activities

in-country training, and working with GIRM officials to develop an overall, generalized national plan for resource utilization, conservation, management, and development. This team will include an arid lands resource specialist, a resource development planner, a forest management advisor, and an educational and training specialist.

Periodic evaluations will be carried out to determine progress and technical reliability of project interventions and to assume consistency with the national resources plan. The pilot experimental interventions will be implemented with future expansion anticipated, and the knowledge and experience gained will provide the basis for this expansion of project activities or modification by AID and other interested donors. These efforts will be very useful to the GIRM in defining what can be accomplished to advance and improve renewable resources management and conservation.

D. Summary Findings

Development planning in Mauritania requires the creation and expansion of plans for increasingly settled populations. The needs and desires of people for administrative, economic, and social advantages in the form of services has stimulated a movement towards sedenterization. This sedenterization has prompted a substantial public capital investment in the form of paved roads, public utilities, and water resources. The replacement costs of these assets, in the event that unchecked environmental degradation caused their abandonment, would be prohibitively high.

This process of sedenterization is putting increasing pressures on the land and resources in the localities where it is taking place: around urban centers such as Nouakchott and Rosso, or rural villages and "towns" such as Boutilimit, Mederdra and Kraa el Ahmar. The demand for resources such as wood and charcoal as a source of fuel is greater than the supply and the scarcity has caused price increases which have a negative economic effect on the majority of the population. Sedenterized herds of animals are causing a loss of rangeland and opening the way for an accelerated desert encroachment. The conclusion is that ways must be found to halt this trend of degradation, stabilize the resource base and begin a process of regeneration and expansion of the base.

In order to proceed with attempts at conservation and renewal it is necessary to carry out a survey to

determine that which is available. The data gathered and collated can then be applied to specific interventions and an overall plan for the conservation, management, and renewal of resources in Mauritania. The resource survey, the national plan for resource conservation and management and the experience gained from pilot experimental interventions will thus serve as the basis on which Mauritania can gain a step towards fulfilling the needs of its population for natural renewable resources.

The key to the success of the pilot interventions will lie in the persistent persuasion and direct involvement of the local people. Based on social analyses carried out during project development, it appears that the affected populations will be willing to participate, as long as information, techniques, and materials are available and supplied. This experimental approach of educating the population to the benefits derived from proper resource management, utilization and conservation, by means of small scale pilot interventions, will provide the base for possible extension of benefits from such projects to other areas of Mauritania.

E. Project Issues

Many of the issues raised regarding the proposed project are the result of a lack of "corporate" knowledge within AID on Mauritania. Until very recently, AID had no development projects under implementation in the country. The Country Development Office for Mauritania has recognized this dearth of adequate knowledge and has adopted a strategy which will help define the problems to be addressed, and develop a body of knowledge which can be used as the basis for investment in development projects. An integral part of this strategy is the carrying out of a series of closely monitored pilot experimental interventions. The experience and data gained from these experimental activities will be determining factors in future project proposals as to methodology to be followed and approaches to be discarded.

The project herein proposed accepts the CDO/Mauritania strategy as a logical way to proceed. It attempts to close the data and experimental gaps as they relate to Mauritania's existing renewable resources and the potential for further development of those resources. At the same time, specific project activities, if successful, will give direct and visible benefits to

the populations in the affected localities.

PART II. PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. Project Background

Programs addressed to the need for slowing down and, if possible, reversing natural resources deterioration in the Sahel have concerned many people. Resulting (and often eroneous) impressions of advancing desert encroachment upon the Sahelian landscape have led to various plans to solve these problems. Actual implementation of programs which attempt to arrest the process of desertification, however, are few and far between south of the Sahara. Although North African experiences are more numerous, they certainly are far from being completely successful. Development of projects based on integrated resource management which address resource improvement have not yet been carried out on a large scale anywhere in the Sahel.

1. Mauritania

Mauritania, situated on the northwest coast of Africa between latitudes 15° N and 25° N, has an area of approximately 1.1 million square kilometers. It is an area with a history of recurrent drought and the northern two-thirds of the country is desert and subdesert which is virtually uninhabited. Approximately 80 percent of the population, including all farmers and livestock owners live within a band extending north from the Senegal River not more than 180 kilometers in width.

The population of Mauritania in mid-1977 was estimated to be 1.5 million and increasing at the rate of 2.3 percent per year. The gross per capita income, perhaps $200 when the modern mining and fishing sectors are included, is estimated to be less than $70 in rural areas --one of the lowest in the world. Literacy is also very low, estimated at 1-5 percent. Except for the sedentary farmers of the Senegal River Basin, the general population has historically been nomadic with little awareness of resource conservation, development or renewal. Life has always been harsh and the short supply of resources made it difficult to eke out a bare subsistence. The continued overutilization of land resources has caused an even greater imbalance between resource supply and demand.

Geographically, Mauritania can be divided into four regions or zones: Saharan, Sahelian, Sudano-Sahelian,

and the Senegal River Flood Plain.

Saharan Zone: The Saharan Zone (sub-desert, less than 250 mm. annual rainfall) comprises 70-80 percent of the land area of Mauritania. Agricultural production consists of date cultivation, vegetables, and some grains in scattered oases. Livestock production is limited to localized seasonal nomadic grazing with sheep, goats and camels.

Sahelian Zone: The Sahelian Zone (250-400mm. rainfall) comprises 10-15 percent of the land area. Primary economic activity is transhumant livestock production, by Maure family groups. Some wet season grain production does occur using short season millets. The zone, however, is dependent on areas further south for subsistence food grains. Transhumant herds typically leave this zone for dry season grazing sites in the Senegal River Valley and the Sudanian Zone.

Sudanian Zone: Less than 4 percent of the land area of Mauritania is comprised of the Sudanian Zone (500-750 mm. rainfall annually). Family subsistence production units are of three types: transhumant pastoralists (Maures and Peuls), livestock dependent semi-transhumant groups (Maures and Peuls), sedentary crop dependent households (largely of Tancouleurs and Soninkes). The zone is normally "self-sufficient" in food grains production with some trade with drier areas to the north. Most cash income flowing into the zone, however, is generated by the export of live animals.

Senegal River Flood Plain: The most important agricultural region in Mauritania is the Senegal River Flood Plain. The Mauritanian side of the Plain extends back from the Senegal River 20 to 50 kilometers. In addition to sorghum and millet, corn and some rice and vegetable crops are grown on seasonally flooded lands. It is estimated that 20 percent of the population of Mauritania lives on the Senegal plain and produces 80 percent of the country's food grains. Several major rice irrigation schemes are in various stages of development planning. In addition, the river valley plain is an important dry season grazing area for the transhumant herds of central and western Mauritania.

Economic activity and the development of resources in Mauritania are complicated by the unique social

structure of the country. There is domination of the society, government, and economy by the "White Maures" (or Moors), and a delicately balanced coexistence between "Black" Maures (mostly former slaves of Bambara origin), Sarakolles (or Souinkes), Peuls (or Fulanis), Toucouleurs, and smaller tribal groups. All groups still recognize a distinction between "slaves" and nobility -- though it is not recognized in civil law -- and between various caste groups: woodchoppers, leather workers, jewelry-smiths, weavers, griots, marabouts, fishermen, and others. Although all appointments to governmental positions are in theory only on merit and educational attainment, the above distinctions are still important in everyday social and political life. In order to function, the ordinary citizen must negotiate among tribal and caste groups, religious duties and ingrained social customs.

Historically "Mauritanian" answers to ecological overstress has been relocation and a nomadic existence. Nomadic wandering has afforded a graceful, cheap, and effective way of keeping the ecology in equilibrium. This nomadic way of life, however, is not adaptable to the modern world and the infrastructure of a Twentieth Century developing country.

Where nomadism has not been the way of life, traditional values and deep religious and cultural reasons have determined why people may settle where they have, e.g. at one oasis rather than another. Unlike the United States, where cities have been established for convenience or commercial reasons, village sites in Mauritania have religious, traditional, supernatural, even metaphysical meanings. Mauritanians put such important non-commercial values on structures and areas that "arbitrary" relocation, even if environmentally based, will be refused.

2. History of AID Involvement

The above described milieu was undergoing radical, if not traumatic change when AID began exploring and providing extensive bilateral assistance to Mauritania in early 1973. It became apparent at that time that Mauritania would require substantial assistance from the international donor community in order to chart and implement programs that would lead to sustained economic growth and social and political stability in the face of the enormous difficulties resulting from the 1968-1973

drought.

The initial AID efforts in Mauritania were confined to emergency measures undertaken in FY 1973 to prevent starvation and reduce diseases resulting from nutritional deficiencies caused by food shortages. AID contributed emergency food aid in fiscal years 1974, 1975 and 1976 and non-food emergency aid consisting of medicines and vehicles in FY 1974. AID also negotiated the Sahel Drought Recovery and Rehabilitation Program with the Mauritanian Government in 1974. A total of $2,915,000 was obligated in fiscal years 1974, 1975 and 1976, to finance seven separate activities in range management and livestock, water development, agriculture, transportation, and health. While these efforts did much to help, they were essentially stop-gap measures. Even if the drought had not occurred, Mauritania was still in need of technical and material assistance in all sectors.

In view of the magnitude and complexity of development needs in Mauritania, especially in the rural sector, recognizing the need to help the country prepare for the almost certain eventuality of drought in the future, AID has been attempting to develop projects addressing the needs of the sector since early 1973. Original efforts concentrated on the most visibly hard hit sub-sector -- livestock. A series of studies and design missions resulted in the Integrated Rural Development Project (Selibaby) just getting under implementation and representing an experiment at an integrated approach to addressing the many problems of the interfacing of animals and crop agriculture.

At the same time that activities were being developed for the livestock sector, AID was looking into ways to begin a process of reconstituting the devastated landscape. Initial considerations were given to the most visible reconstitution, i.e., reforestation. A Project Implementation Document was submitted to AID/W for a Mauritania Reforestation Project. The PID proposal called for AID to provide a technical advisor to the GIRM in forest resource planning and management and equipment and commodities for sand dune fixation, protection of existing forest reserves and commencing a reforestation program.

The PID was approved for proceeding to the Project Review Paper with a directive to place the project in a larger resource management framework and include a training component. The PRP team, composed of members who had been working on a reforestation project in Senegal,

arrived in Mauritania in October 1976. This team took the PRP guidelines with the requirements for developing resource management and proposed an expanded program including a resource survey, training and a series of pilot activities to determine the level of effort required for full-scale projects in sand dune stabilization, forest management and range management.

The subsequent PRP was reviewed in January and February 1977 and approval given to proceed to the Project Paper, after an interim report was prepared with further "PRP level" analysis on the sand dune stabilization activity. The review committee also directed the exclusion of replacement of gum arabic trees as part of the forest management component. These were carried out and a design team was to be assembled for arrival in Mauritania by the end of June 1977.

The design team which was assembled had staggered arrival times and a mandate to design this project as well as two others. This proved to be a less than obtainable objective and thus the requirement for this revision/redesign of the project. Principal objections to the PP submitted in October 1977 included: an unclear statement of local population involvement; lack of detail of GIRM participation and responsibility; lack of emphasis on outreach aspects or spread effect of project; an unclear statement of how resource survey would be used; and the lack of a clear definition of each pilot component.

Project development has been extensively reviewed with GIRM officials, particularly in the Sixth Region where meetings were held with the Governor and Assistant Governors. The requirements of the project were also discussed with the Director of the Protection of Nature Service who specifically concurred in the proposed training. Field visits were made to Boutilimit and Mederdra Departments for this revision accompanied by the Chef de l'Inspection of the Forestry Service for the Sixth Region. It is this person who will have primary GIRM supervisory and liaison responsibility for the pilot project interventions.

Discussions were also held with the Prefects of both Mederdra and Boutilimit Departments and members of their staffs. Their opinions and views on the utility of the project were solicited. The same was done for those Maraboutic leaders available, recognizing the importance of the support of religious leaders for the success of the project. Finally, questions were asked of "ordinary citizens" who will be affected by the project.

The same scenario could be applied to previous teams visits for the PRP, Interim Report and PP. This is especially true for the PRP and PP where team members had more extensive site visits. These previous visits were evident as all GIRM officials were fully cognizant of the proposed project. They offered many suggestions and "requests" for inclusion. All discussions were frank with candid remarks by GIRM officials on the lack of personnel available and the need for extensive training. All expressed the opinion that there is dire need for the project and the hope that AID would be forthcoming with the means to carry it out.

B. Detailed Project Description

The proposed project is a five-year project designed to assist the Government of Mauritania develop an integrated program for the management and conservation of renewable resources. Project implementation will include three basic and related components addressing both general and specific problems of resource management and conservation.

The first of these components will provide the GIRM a framework in which to make decisions regarding the country's renewable resources. Discussions with government officials during various phases of the design process clearly determined that neither the GIRM nor the donor community was/is knowledgeable of the renewal resource base from which one can begin to relate to the problems of management and conservation. Resource maps, aerial photographs, and data are all out of date -- some 25 and more years. The only certainties are that the resources are being depleted and the GIRM needs trained personnel, technical assistance and material to address the problems.

The second project component will carry out a series of specific project activities on an experimental pilot basis. These interventions will provide an experimental base on which to make decisions for future activities in the resource management and conservation arena. The proposed pilot interventions will be able to test technically and socially, approaches for dune stabilization, range management and reforestation/forest management. Successful implementation of these activities will lead to proposals for their expansion and extension to other areas.

The third basic project component is manpower training. None of the above proposals will mean anything if the GIRM does not have the trained personnel to use the data gathered and collated, and to take advantage of the experience

gained. As in most developing African nations, education in Mauritania has been in the classical mode and geared to preparing people for administrative positions in the government. Mauritania is now realizing it must adjust its educational priorities to the realities of the country's environment and resources. This project will work within the general Mauritanian framework for meeting its training needs for resource management in that much of the training will rely on non-formal extension and in-service training. Where necessary, U.S. and third country training is recommended to meet the higher education needs.

1. Project Components

a. Resource Survey and Planning (See Annex II)

National resource management in Mauritania must be based upon an understanding of the nature, quantity and location of these resources in order to harness them effectively for the welfare and progress of the people. To gain this understanding, resource survey will be conducted that will provide a basis for integrated resource management. Such a survey will assist in determining, among other things, the extent and condition of various land resources in order to identify promising areas for development. The survey will further provide a base from which to monitor the changing condition of the natural domain, to recognize alterations in land use and observe the many aspects of environmental change.

The survey will be a synthesis of data collected through satellite imagery, aerial photgraphy and field observation. Satellite imagery is available through the EROS Center of the U.S. Geological Survey in Sioux Falls, South Dakota. This imagery is available during all seasons of the year, as the satellite passes over each part of the earth each eighteen days. One LANDSAT scene covers an area of 32,225 square kilometers and approximately 50 scenes could cover the entire country. For the purposes of this project, however, six scenes covering the southern third of the country should be sufficient. Because of constraints imposed by orbital dynamics, not all of the scenes will be obtained on the same day. It should be possible, however, to select a set that will have been taken over a period of no more than 10 days. This will provide a closely timed approximation of the area to be covered.

To be fully effective, satellite sensing must be complemented by conventional air photographs obtained

from aircraft, and from data obtained by ground observations. To obtain reliable terrain information at minimum cost, the resources survey program will be multistaged, exploiting equally the broad regional and synoptic coverage uniquely available through LANDSAT imagery, the precision and ease of delineation of terrain-type boundaries offered by medium-scale (c.1:50,000) aerial photography, and the reliability of data gathered through ground examination. Where ground conditions are so poorly known, as in Mauritania, an adequate program for ground examination (i.e., th` collection of "ground-truth") is essential. Ground-truth collection will be designated after the preliminary analyses of satellite imagery and air photographs. It will be intended to provide that data required to ensure the reliability of photo imagery interpretations.

There will be a concurrent gathering and synthesizing of relevant existing information on geology and mineral resources, hydrology and groundwater resources, forests, rangelands, wildlife and domestic animals, land use patterns, demography, transportation and climate. Pertinent published and unpublished data will be collected from libraries and files of concerned agencies in and outside of Mauritania (e.g. OMVS Dakar and St. Louis, Senegal and IGN Dakar, Senegal and Paris, France).

Once aerial photography and satellite imagery are obtained and other relevant data are synthesized, ground resource survey teams can be fielded to correlate imagery with vegetation/land farm types. These technical project teams will work with 4-5 GIRM counterparts who are to be trained in interpretation and the collection of ground data.

All data will be analyzed and collated to produce a series of reports, maps and overlays. These will include a photo-mosaic of souther Mauritania, a description of major vegetation/land farm units with an accurate delineation of plant community boundaries, a reliable inventory of rangeland conditions with a delineation of potential range areas, reliable delineations of soil types and hydrologic conditions and areas of crop and forest production. These data outputs will be used to establish a national resource program for southern Mauritania whereby the GIRM will have a basis for rationally exploiting, conserving and perhaps expanding the country's renewable resource base.

b. Pilot Interventions

(1) Dune Stabilization.

Two dune stabilization interventions are proposed on a pilot basis. These interventions are designed to address a general problem of a deteriorated physical environment around two important rural commercial centers which are attracting settlement by recently sedentarized nomads. If successful, it will be possible to entertain proposals for the extension of these or similar activities to other areas of Mauritania with similar problems.

Dune stabilization will be implemented in Boutilimt and Mederdra. The first is an important Maure religions, political and economic center and has been since its founding in the late 1820's. Mederdra, on the other hand, was first permanently settled in 1907 as the French established administrative hegemony over southwestern Maritania. Both towns are dominated by White and Black Maure groups and growing as displaced nomads become sedentarized and are forced to settle permanently.

At both Boutilimit and Mederdra, the primary objective is to stabilize drifting sands as quickly as possible. The vegetal cover in the vicinity of both towns has been nearly, and in some cases totally destroyed by intense grazing pressures and human and animal traffic, leaving the sand laid bare. This bare sand is easily moved by winds and invades buildings, undermining their foundations, and clogs streets with sand drifts. If left unchecked, this drifting sand will force the abandonment of significant sections of Boutilimit and Mederdra.

Stablizing the sand will require a revegetation of the dunes. Areas on the dunes are to be established and planted with a suitable association of plants. These areas will then be protected from grazing and traffic. These protected areas will be so arranged as to permit people and animals to move across the dunes along established paths, thus minimizing the impact of the introduced conservation practices on existing patterns of movement. This revegetation will reduce wind velocities close to the ground to inhibit movement of sand grains and bind together the soil to form a coherent mass. If the soil can be made sufficiently coherent, it will be able to resist high wind velocities.

The threatened areas of both towns are on relatively high ridges and exposed to the direct force of the dominant winds. These winds blow directly on bare and cohesionless soil and it is thus necessary to break up the air flows at the surface level as quickly and effectively as possible. This could bedone by using a permeable, or slot, fence about one

meter high placed at right angles to the wind. Unless winds reach very high velocities, such fences reduce velocities at ground level in their immediate vicinities.

The same effect can be achieved with living plants by planting rows of appropriate size and shape, as is proposed for Boutilimit and Mederdra. Areas presently occupied by small buildings, huts and tents will be arranged into a grid of living "slot fences" by planting rows of hedges along all property lines. The average "lot" size at both Boutilimit and Mederdra is about 30m x 30m and the total surface area will be divided into small compartments averaging approximately 900 square meters. Since these compartments are not quite small enough to produce the necessary reductions in wind velocities, the living fences will be supplemented by randomly positioned small trees and shrubs. The essentially random orientation of the living fences, made necessary by the irregular shapes of plots, will provide an added advantage to the system to cope with alternating dominant winds from the north and east, with an occasional severe storm from other quarters.

It will also be necessary to fix some areas well beyond the limits of the inhabited zones, especially those in the directions of the dominant winds. If this is not done, sand will be blown into the protected areas in large quantities, possibly to the extent of burying fences and dwellings. Accordingly, the plan is to include a defense for those areas with a pattern of plantings that will break up the surface into 100 square meter compartments, delineated by living fences and with a tree and shrubs within. The combined effect of this plan will be to reduce the near-ground wind velocities to a low value. Planting these compartments in grasses will serve as an effective soil binder.

In addition to the above, reserve areas around the towns will be planted with trees and shrubs and a living fence grid pattern established. Many of these areas around Mederdra are already occupied by stands of Acacia and will require filling in with occasional plantings. There will be planting of grasses in these reserve areas to establish an approximation of a natural tree savannah around the town perimeters. In areas where these reserve areas will not, or cannot, be established, wind breaks (or shelter breaks) will be planted. These will be concentrated in areas most affected by the predominant north and east winds, and consist of trees which can reach a height of 15 meters or more after 12 to 15 years of growth.

The large number of plants required for the planting program can only be supplied by plant nurseries to be located at the towns of Boutilimit and Mederdra. While they may differ slightly, the same basic plan will be used for both.

Well over half of a one hectare area is to be given over to production beds in which plants for transplanting will be grown. One bed will be devoted to plant testing, both native and introduced species and varieties. These will be tested to determine their suitability for inclusion in the actual production plantings. One production bed will be devoted to the planting of native grass species and the seeds harvested for use in the sand stabilization plantings.

It is anticipated that the nursery will become an important educational center where the local people will learn appropriate horticultural and silvicultural practices. Accordingly, a minimal demonstration facility is to be provided where groups of people can gather to learn how to grow and care for plants. These nursery sites will also serve as the "stations" for expartriate technicians and will require the construction of adequate facilities for comfort and safety, but austere, housing.

Each nursery is to be provided with a drilled well and pump with holding tanks. Simple distribution systems of plastic pipe will be used to provide domestic needs and to distribute the water to distribution points located in such a pattern that all parts of the nursery can be reached with short hoses.

(2) Ranage Management

Mauritania is not unlike other countries lying in the Sahelian belt in that a workable range management program tnat can be justified from a sociological and economic standpoint is difficult at best. The first consideration is that the range resources of Mauritania are no more renewable than the people themselves allow. It is important, therefore, that a process of educating the herding population of the necessity of controlling how their animals use the range. This is a long term process which will begin under this project with two pilot activities.

The first problem to be addressed will be to determine the location of activities to be carried out. It has been reported that there are areas that have not been

utilized due to lack of water development. Identification of these areas will be carried out as part of the resource survey through aerial photography, satellite imagery and ground surveys. Present information suggests an area south and east of Boutilimit between the Nouakchott-Kiffa road and the Senegal River. Once the area is pinpointed, observations will have to be carried out to determine grazing patterns and the movement of animals into and out of the area. These observations will help determine who uses the grazing areas and whether they are traditional grazing land by prior claim, common grazing lands on a first-come, first-served basis, or if they can be designated as Government Reserves.

Areas selected as grazing reserves should have a good mixture of grasses, forbs, shrubs and trees, if such areas are available. These ideal range conditions in the Sahel can provide maximum extended grazing periods, or be used for dry season grazing and as reserves for drought periods. If these areas are where water has not been developed, they will require establishment of water sources, presumably deep wells with submersible pumps.

Before any water sources are developed, however, the areas around the well sites will be developed as demonstration grazing reserves. As water sources in Mauritania are limited, development of water supply without the controls a grazing reserve implies causes a concentration of animals around the water supply, over-use of the forage supply and a resulting environmental deterioration. The project will, therefore, sensitize the location population(s) to the purpose of the grazing reserves during the period of their development. This sensitizing will include their active participation in the reserve development, exhortations as to the need for the reserve and consultations by project personnel with traditional and religious leaders concerning what the project is attempting to accomplish. Only after confidence that cooperation in the control of animals will be accomplished are the actual wells to be developed.

It is anticipated that two reserve areas will be developed within a distance of one another that is manageable by project technicians. These reserves will encompass 100 square kilometers and be delineated by ten kilometer long firebreaks, ten meters wide on their four sides. Depending on the configuration of the land scope, a well is to be placed near the center of the reserve and enclosed in barbed wire fencing one kilometer square. Within this perimeter will be planted trees and forbs, and perhaps

some grasses in a pattern to establish access corridors to the well.

The pumps for these wells will be submersible electric pumps with a generator to drive them. These generators will be placed in a secure cement block housing to permit access only by authorized GIRM personnel for their operation. Each well will have at least one 70 cubic meter watering trough which will be filled on a time schedule established by project technicians and local authority figures to control water supply and, thus, grazing.

Within the perimeter of the grazing reserves are to be established smaller grazing blocks to be protected and have controlled access. These will be small blocks protected by living fences with the exception of one block which is to be protected by barbed wire fencing.

It is recognized that any range management scheme is difficult to implement, and has a low probability of "immediate" success in the Sahelian milieu. The measures herein proposed are not palliatives for an increasingly difficult situation. If successful, however, they will provide an approach which can easily be replicated if desired, and the approach is readily amenable to modification as experience is gained and successful modes of intervening are determined.

(3) Natural Revegetation and Forest Management

The Directorate for the Protection of Nature Service has expressed a desire for assistance in the management of forest reserves and revegetation. Such activities can be extensions of the sand dune fixation aspects of the Renewable Resources Project, especially in the vicinity of Mederdra. In close proximity to Mederdra, the GIRM has established, in principle two "Forets Classe", or forest reserves. These are the Tine Yera Foret Classe and the Perimetre de Reboisement de Mederdra, each within 10 kilometers of Mederdra.

Any activities carried out under this classification will be tentative and of an exploratory nature. They will be primarily to survey the reserves and make recommendations on how to proceed with forest management and revegetation or reforestation efforts. Plantings of seedlings from the Mederdra nursery can be carried out along with the establishment of procedures for their care

and protection. Again, these will have to be on a tentative and exploratory basis as the Protection of Nature Service is manpower and equipment short to provide the necessary surveillance of a large scale reforestation program.

In view of the foregoing, the project will carry out only those activities which can be effectively done from Mederdra without straining the principal activity of sand dune stabilization. From these activities would be expected a reasonable program proposal for reforestation. To this end, the following activities are suggested:

- a survey of the Tine Yera and Perimetre de Reboisement forest reserves to establish their boundaries and extent of the stands of tree species;

- development of a program for reforestation in the two services;

- make recommendations for the types of trees necessary to meet the populations' needs for wood and charcoal;

- carry out limited plantings of seedlings of selected varieties for developing experience in reforestation and protection requirements;

- evaluate requirements for carrying out a reforestation program in terms of materials and personnel;

- carry out a campaign of local population awareness for reforestation and the demands such a program will put on that population for control and conservation;

- establish preliminary explortation rates.

From these activities should come the necessary information on which a reforestation program can be based, with necessary local participation, an adequate but controllable level of inputs and a methodology within the means of GIRM personnel. The experience of the local population and the GIRM personnel in the dune fixation in and around Mederdra should provide a measure on which to base a judgement of potential success.

(4) Training and Education

The GIRM is placing serious emphasis on

education of the population as to the benefits and objectives of this proposed project. Mass education in Mauritania, however, is hampered by the dearth of resources for training and dissemination of information. It will, therefore, be a major objective of the training and education component of the project to prepare GIRM personnel for the task of popular education of the project objectives.

The framework for training of government personnel in Mauritania is one of non-formal education with in-service and on-the-job training for lower and middle levels. These methods will be employed to meet the major portion of the training requirements for this project. An extension training specialist will be employed by the project to establish, oversee, coordinate and facilitate the extension aspects of training, i.e., in-service, on-site and on-the-job. The majority of this time will be directly involved with the training effort, including the development of materials. Other project consultants will coordinate as requested/required by the extension training specialist and where appropriate and possible, higher level GIRM technical personnel will be requested to participate.

Realizing that Mauritania cannot provide the education for persons requiring more formal higher education, the GIRM has shown a preference for third country training wherever outside-of-country training is necessary. The University of Dakar (Senegal), Hassan II University and Ecole Royale Forestiere (Morocco) have been identified as the third country institutions recommended for persons requiring higher institutional formal education not available in-country.

Two persons are to be afforded long term U.S. training in resource management. The scholarships provided will be for up to five years to permit approximately eight months of English, basic subjects up-grading and four years in resource management leading to a Bachelor's degree. These two participants will start their training in the first year of the project in order to complete by the end of the project and be prepared to carry on project related activities within the GIRM.

Personnel trained under the project will become the manpower "backbone" for the expansion and continuity of renewable resources activities in Mauritania by Mauritanians. All persons will have an outreach capability by training in methods to pass learned skills on to others, i.e., the ability for "each one teach one (or more)".

2. Logical Framework

a. Goal

The proposed project has as its Sector Goal the promotion of self-sustained development in the rural sector through the establishment of comprehensive programs to build a manpower and resource base needed to withstand adverse climatic and environmental conditions without disruption of continued development. Secondary to this, but an ultimate goal nevertheless, is to seek an improvement in the supply of natural renewable resources to meet an expanding demand without ecological imbalances.

Measures of Goal Achievement. In order to achieve the stated goal, the GIRM must have trained personnel qualified to identify plan, develop and implement programs directed towards improving natural resource management and conservation. This is a long-term objective to which the proposed project will contribute a significant beginning.

The project will also be indirectly stimulating cooperation and integration of GIRM technical and administrative services by assisting in resolving problems of natural resource management and conservation. This cooperation and integration will provide the framework in which the GIRM services responsible for natural resources (particularly the Protection of Nature Service) can repair their image and gain the comfidence and cooperation of the populace.

Relative to the secondary goal, the project will have pilot interventions designed to develop the means for increasing renewable resources and providing a framework for national exploitation. Successful achievement of of the goal and secondary goal will be a significant step towards increased efficient and effective management of natural renewable resources which can be one base on which to move towards improving the standards of living of both rural and urban populations.

b. Purpose

The project purpose is to identify, survey and confirm renewable resources thereby providing adequate data needed to develop an integrated plan for the implementation of present pilot and future interventions in renewable resource

management and conservation in Mauritania. The pilot interventions proposed will confirm approaches for the future of specific resources management.

End of Project Status. By the end of the project, a data base on natural renewable resources will have been established and available for present and future planning purposes. To insure that this data base will be useable, the project will have established and improved GIRM Protection of Nature Service officials' knowledge of land conservation techniques for planning and implementing future projects concerning renewable resources. At the same time, a cadre of trained extension personnel will be available to implement future renewable resources programs. Also at the end of the project, a population awareness campaign will have been conducted, in the areas of the pilot interventions, to educate it to the need for land management and conservation. Specific physical interventions (e.g., establishment of nurseries, well grazing reserves and sand dune fixation areas) will have been carried out to demonstrate that something can be done.

c. Project Outputs

Outputs for the project will include a completed national resource survey and inventorying of renewable resources. From these data will be developed an overall national program for the management and conservation of these resources. This program will have identified those areas which need immediate attention and recommended actions for mid-term and long-term requirements. So that the program may be carried out, two Mauritanians will have had long-term U.S. training in resource management and planning, and six others will have had third country training as resource management technicians. These eight persons will be supplemented by a cadre of up to 40 extension agents who will have had in-country, in-service short term training in extension methology. In addition, up to nine persons will have been trained in satellite imagery and aerial photo interpretation and ground survey techniques. These latter personnel will be able to carry out necessary interpretations and surveys for the GIRM to implement activities beyond the pilot interventions areas.

Physical outputs will include plant nurseries at Mederdra and Boutilimit. These will provide the necessary plants for the dune stabilization areas and two well vegetation/grazing reserves. These pilot intervention outputs will

provide the GIRM with an experimental base to continue activities in the establishment of revegetation areas and the management and conservation of renewable natural resources.

d. Project Inputs

Agency for International Development

Project inputs by AID will include two teams of technical assistance personnel. The first team will be for 12-14 months to carry out the resource survey and inventory and will consist of the following proposed personnel:

1 - Arid lands specialist/team leader (14 P/M.

2 - Soil scientists (12 P/M each)

2 - Range ecologists (12 P/M each)

1 - Arid lands agronomist (12 P/M)

1 - Resource planner (6 P/M)

1 - Remote sensing specialist 6 P/M)

The second team of technical assistance personnel will be responsible for the pilot project interventions and training of all GIRM personnel except those working with the resource inventory team. Each of the four team members will have responsibility for a specific project intervention. These team members will be composed of the following:

- revegetation and lands resource advisor/ team leader to be assigned to Boutilimit (48 P/M)

- revegetation/forest management advisor to be assigned to Mederdra (48 P/M)

- range management specialist to be assigned to either Mederdra or Boutilimit depending on the location of the two range grazing reserves (48 P/M).

- extension training advisor who will be assigned to Nouakchott, but will travel to Kaedi and other places where training

requires his presence (48 P/M)

Eight project vehicles will be procured in support of these personnel and the project generally. These will include 6 4 x4 all-terrain passenger vehicles and 2 - 4 x 4 all-terrain 1/2 - 3/4 ton pick-up trucks.

It will be required that three houses be constructed to house three technicians and that they be furnished and equipped.

Other equipment and commodities will be provided by AID project funding. These are detailed in Section IV, Part B.2, Project Procurement.

Training inputs will include eight scholarships. The GIRM has agreed to AID provision of two long-term scholarships for training in resource management in the United States. In addition they have agreed to AID provision of six scholarships for third country training. These schlarships will be divided between three and four year scholarships for study in Morocco (GIRM preference) at the Ecole Royale Forestiere and Hassan II University. Other training inputs will include materials and equipment for the extension training advisor to develop a program of in-country, in-service training.

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The GIRM inputs will be primarily for personnel, other in-kind contributions, water rights for the project and temporary use of heavy equipment for the construction of firebreaks to delineate the range grazing reserves.

Personnel are to include the following:

- 9 LANDSAT/Aerial Photo and "Ground Truth" interpreters. They will work with the resource inventory team learning the means of interpretation and contribute to the development of a national resource plan for management and conservation.

- 6 Forestry technicians, three each for Boutilimit and Mederdra to work in the sand dune stabilization program in both areas and development of a reforestation program in the Tine Yera and Keur Maur forest reserves near Mederdra.

- 2 Nusery technicians to work with the advisors on supervision of the nurseries at Boutilimit and Mederdra.

- 4 Range management technicians to work with range management specialist on range/well grazing reserves.

- Chef de l'Inspection Forestiere of the Protection of Nature Service for the Sixth Region to act as liaison and supervisor of assigned GIRM personnel.

In addition to the above personnel, the GIRM will assign part-time "extension assistants" to work at various times on project activities. These will include students from the Kaedi school who will gain practical experience and other direct employees of the Protection of Nature Service who will be going through "recycling", in-country, in-service training aspects of the project. These are expected to number at 40 over the life of the project.

Other in-kind contributions of the GIRM will include land (20,000 hectares for grazing reserves and three hectares for nurseries and technicians' housing), water rights for the production nurseries and the provision of facilities such as the Kaedi school for training and office space in Nouakchott.

Finally, the GIRM or local level authority figures will assign necessary support personnel to the project such as guardians, drivers and the local labor necessary to carry out the planting and protection of the revegetation efforts.

e. Project Assumptions

Project success and achievement of the project purpose and ultimate goal are predicated on a series of assumptions. The first of these is that GIRM will be committed to integrated interministerial and intraministerial management of natural resources and will have, or cause to provide, the means for enforcing land use regulations which might be required for resource conservation. Accepting this assumption, it must further be assumed that time and climatic factors will not work against the project and another severe drought will not occur before a capacity to withstand drought has been developed.

Once the project has been established and implemented, it is assumed that the target populations will understand and respect the goals and objectives of resource conservation and management. Without that understanding and respect, expansion of project activities by the GIRM and/or donors will be difficult, if not impossible. This latter, of course, assumes that the GIRM will continue to promote activities and projects in renewable resource conservation

and management, and that donors will be willing to support such projects. There is also the assumption that, once trained, GIRM personnel will not leave their services and will remain available for implementation of other similar projects.

Achievements of outputs and provision of inputs primarily rest on the assumption that the required technical assistance personnel will be available and willing to work in Mauritania. This is a most critical assumption, not only from Mauritania but the Sahel in general. Not only are working conditions isolated and difficult, but there is the added requirement for language capability and the uncertainties of American technicians willing to work overseas on contract with the uncertain status under the U.S. tax laws.

Other assumptions important to outputs are that appropriate educational and training programs can be organized, and that technicians will be able to impart their knowledge and techniques to Mauritanian counterparts. It is then assumed that these counterparts will then be able to convince local populations to respect project perimeters and accept the techniques and disciplines necessary for interventions to take hold.

The provision of inputs assumes (beyond the availability of expatriate personnel) that the GIRM will have qualified Mauritanian candidates forthcoming for training and will provide other necessary personnel and facilities. Other inputs assume their timely arrival including availability of commodities, expeditious execution of contracts and delivery of equipment.

PART III. PROJECT ANALYSES

The various project design teams which have concerned themselves with the Renewable Resources Management Project have considered the proposed interventions technically feasible. Emphasis in the project is to be on resource surveying, education and training of GIRM personnel, and the education and demonstration to the population of the benefits and need of sound resource management. The first two of these will lay the foundation for the second which is to be carried out through experimental/pilot interventions.

The resource survey is considered essential in meeting the purpose and goals of this project. Data derived through technical means and its interpretation are essential in identifying renewable resources for planning and resource management. Training and education of GIRM mid-level planners, and mid-level and low-level extension personnel are considered essential for the management of present and future renewable resources. Both of these, however, will be for naught if the population is not aware and willing to accept interventions which will provide the basis for resource management and conservation at the local level. Each of the pilot activities stresses the importance of cooperation of the people and is designed to ensure their active support.

The investment of AID monetary support will not see what could be characterized as a "return on investment". "Real" returns on dollars invested can be possible once the basic foundation has been laid and experimental interventions are expanded to the country as a whole.

A. Technical Analysis - Including Environmental Assessment

1. Natural Factors Affecting Renewable Resources

This project focuses on the areas around two towns for physical interventions: Boutilimit and Méderdra, both of which are in the Sixth Region. The situations in and around these towns are similar in kind, but differ greatly in degree. At the most obvious level of examination, the problem arises from the fact that the areas in the vicinities of the towns have become so denuded of vegetation that the sandy soils have become exposed to direct wind stress. Both towns are now surrounded by active sand dunes.

This situation is only a symptom of a far broader and more serious problem. As one moves through the zone between the Senegal River Flood Plain and about latitude 18° N (about 60 km N of Boutilimit), it is almost always easy to anticipate the presence of

a village or major nomad encampment well before it actually comes in view. It is evident in that the landscape in these vicinities has been stripped bare of all foliage except that on trees too high for goats and camels to reach. In the immediate vicinities of human concentrations, even that small vegetation is gone. Close examination shows that many trees have been deliberately cut down -- or their branches chopped off -- for cooking fuel. It is as if each human settlement is the center of a galaxy of devastation.

The "galaxy of devastation" around each village or encampment is almost a geometric phenomenon. The general practice is to hold the herds in the immediate vicinities of the village at night and move them to pasture in the morning, then back to the village at night. If grass and browse are abundant, the herds will hardly move away from the perimeter of the village. As the vegetation is removed, the herdsmen move the animals far away. However, there is a limit to the practical distance that can be reached. A goat requires 6 or 7 hectares to obtain enough food to meet its requirements. An unsophisticated measurement of herdsmen moving a herd rather briskly indicated a rate of movement at about 2 km/hr. Goats like to stop and nibble, so they do not move very fast. Given a 12-hour "workday," that translates into an effective maximum radius of action for goats a 6 kilometers. Camels and cattle, being larger and more amenable to discipline, can probably be moved further -- say 8 kilometers. Thus, there is a patch of devastation some 15 or 16 km in diameter, centered at each village or encampment. The zone of devastation is less intense at the perimeter, and nearly total near the village.

The development of the situation is readily documented. Early travelers described the zone north of the Senegal River as rich in flora and fauna. It had an abundance of trees (mostly Acacia senegalensis, A. raddiana, and several Euphorbia species), with many shrubs and a grass cover which reached heights of 1.5 meters. Trees appear to have been 7 to 15 meters apart and reaching heights of 8-9 meters in favorable areas. This relatively verdant landscape supported an abundant animal population of gazelle, zebra, elephant, ostrich, lion, jackal and hyena. When nomads moved into the region with their herds, this wildlife population declined rapidly. Wild animals were hunted for food and for their destruction because they competed with domestic animals for food and water. More important, however, was the human and domestic animal occupance that resulted in modification of the vegetation cover to which the wildlife could not adapt.

The lush pastorage and browse led to vastly expanded herds of domestic animals and eventual overgrazing. The resulting removal of ground cover was complicated and exacerbated by recurring droughts, the most recent being between 1968 and 1974. Animal consumption during the droughts began to destroy the basic structure of the

vegetation cover so heavily that there could not be a complete recovery of vegetation during a period of normal rains. These cycles have been repeated with each succeeding one showing increased vegetation impoverishment. Once the process of decline is initiated, it will continue at an accelerated pace unless a basic change is made in the system.

a. Geology and Soils

The soils of the entire zone north of the Senegal River valley are extremely susceptible to movement by wind, being almost exclusively of fine sands. During the last interglacial period, sea level stood perhaps 100 meters higher with respect to the West African land surface than it does at present. During this time, western Mauritania was beneath a shallow sea whose shoreline was well to the east of Boutilimit. The floor of this shallow sea accumulated an extensive covering of gray silt, and thick deposits of seashells. During the last glacial period, the sea retreated to well westward of its present position, leaving behind a vast, almost perfectly smooth plain. It is assumed that the plain was quickly colonized by plants from the neighboring African landmass, which at that time was presumably subjected to a considerably greater rainfall than at present. Thus, normal prairie and steppe soils developed over the whole of western Africa. As with many tropical soils, the particles were stained orange and red by a thin film of iron oxide.

As the climate became increasingly more arid, the present wind pattern, characterized by seasonally persistent winds from the north and east, developed. These winds commonly exceed 7.0 m/s for periods of many hours or days. With increasing desiccation, the plant cover of interior western Africa failed. The strong and persistent winds stripped away the soil cover, and moved it to the southwest. That component consisting of particles too large to be moved were left behind and the fine sands and silts were carried away. In the 10,000 to 15,000 years during which this occurred, much of the silt was winnowed and carried out into the North Atlantic. The residual fine sands formed into an immense system of longitudinal dunes by the alternating north and east winds.

These dunes rest directly on the gray silts and seashells of the old sea floor. Even today, as at Boutilimit, the ancient sea floor is exposed in the hollows between the dune ridges. The airstrip consists of gray silt, very fine sand, and abundant fragments of seashells. As the vegetation of western African areas adapted to the more arid conditions, the entire area was successfully colonized by plants, and both dune sands and silts were fixed in place. A normal consequence of this process is a general subsiding and rounding of the sharp crests that characterize active longitudinal dunes. The eventual result was a landscape consisting of immense

gently rounded sand ridges running generally northeast to southwest. Local variations in grain size, wind velocities, and probably other factors have produced variations in height, width, and spacing. At Boutilimit the dunes are approximately 50 meters high, and the crests of parallel dune ridges are somewhat more coarse-grained, the dunes are only about 18 meters high, and the crests of parallel dunes are about 1,400 meters apart. The interdune hollows at Méderdra are blanketed in sand only slightly more fine grained than the sands of the dune ridges. The sands of the interdune hollows are mixed, however, with gray silt, giving a distinctly gray cast to the interdune hollow soils, while the sands of the dune ridges are almost orange.

Several important considerations flow from the geological history. First, since the aridity of western Africa is of relatively recent origin, the plant species have not had time to undergo much genetic adaptation. Instead, the increasing aridity simply selectively removed all of those species of the original assemblage that were not drought tolerant. Thus, the adaptation of the vegetation to drought was not one of genetic adaptation but colonization of the entire region by those species that happened to be drought resistant. The ones that survived tended to be tough. There is no longer a way to positively establish species loss ratio, but it is estimated that macrophyte species (i.e., other than single-celled plants) fell from perhaps 2,000 to perhaps 250-300.

Another consideration is that the intense grazing pressure of recent times resulted in a different kind of selection, this time based on palatability to domestic animals. Inevitably the animals first select out those species which are most to their liking. Being eagerly sought, even juvenile plants are eaten before they can produce seeds and, thus, the most desirable species are quickly removed from the assemblage. While there are exceptions (such as jimsonweed)in general the more palatable, the more nutritious. The consequence is that the modern assemblage probably consists of the <u>least</u> nutritious plants in the original assemblage. Thus, it is almost certain that the present vegetation assemblage is much impoverished in terms of species suitable for animals. Animals today may well have to consume more biomass in order to stay alive than they did 50 years ago.

The process of species impoverishment was probably hastened by an even more subtle process. Many plants live in microhabitats created by other plant species. If the species producing the microhabitat are destroyed by grazing or browsing animals, the dependent species will also vanish. While these checks of species diversity were hardly definitive, it is of interest to note that in no case (in the vicinities of either Boutilimit or Méderdra) did the project consultants find more than 3 species

within a circle having a radius of 50 meters. In most cases the number did not exceed five and in some cases only one. The existing vegetation is, genetically, extremely impoverished. Only perhaps 25-30 species exist in any significant numbers, and many species are gone forever.

Throughout the region there is no evidence of scour channels formed by running water. Where the dunes are not presently active, the slope from dune crest to valley bottom tends to be an almost mathematical sigmoid curve. The absence of scour channels seems to be caused by two factors. First, the sands of the dune ridges are extremely permeable, and thus the inflitration rate is very high. Second, the rains are not long-lasting nor intense, and it is possible that rainfall intensity never reaches such levels as to exceed the infiltration rate.

There is evidence, nevertheless, that some of the interdune hollows occasionally contain standing water for short periods. These "phyas" are distinguished primarily by the facts that they are largely, though not entirely, free of vegetation, and that there tends to be a discontinuous line of shrubs bordering them. Since no drainage channels flow into them, it is hypothesized that on rare occasions storms of relatively high intensity occur so closely together that the sand dunes become saturated and water drains out of them at their bases and into the "phyas".

b. Climate and Hydrology

The climates of Boutilimit and Méderdra are similar, but not identical. Both are characterized by a rainy season that normally extends over a 4-month period, July through October. However, the two rainiest months are August and September, with a marked tendency for August to be wetter than September. For example, at Boutilimit about 35% of the total yearly rain (based on a 21-year record, 1956-76) tends to fall in August, and about 28% in September. The comparable values at Méderdra are about 41% in August and 30% in September. However, rainfall is very erratic, both as to amount and time. While there is always (at least through the period of record) some rain during August and September, it frequently fails to rain during either July or October and sometimes both.

There is a weakly developed tendency toward two rainy seasons, with the second occurring during December-February. However, during most years no rain other than trace amounts falls during this period. Rarely, a storm will occur in other months and some times such storms drop significant amounts of water (nearly 80 mm fell during December 1956 at Boutilimit, with 77 mm at Méderdra). These almost random falls of rain may actually do more harm than good.

If they are large enough to wet the soil significantly, they probably stimulate many of the plant species into initiating growth which cannot be maintained because of the extended dry period immediately following. The result is probably a general weakening of the plant, and some undoubtedly die as a consequence.

Total amounts of rain are small and extremely variable. The 21-year average yearly rainfall of Boutilimit is 169.7 mm, with a standard deviation of 77.1. Méderdra receives significantly more rain, with a 21-year mean annual rainfall of 247.8 mm and a standard deviation of 102.5. During the worst drought years, Boutilimit received 48.8 mm in 1972 and 41.6 mm in 1973. During the good year of 1967 it received 256.7, more than six times as much as during the drought years. The extremes at méderdra are less. During the good year of 1974 the town received somewhat more than four times as much rain as in the extreme drought year of 1972.

There are few data on wind directions and velocities, and these are suspect and for Boutilimit only. They are most likely gross estimates taken once per day, probably at noon. Information on wind directions almost certainly reflect nothing more than a crude count of days and averages. It is especially important to note that the values for velocity cannot be related to the information on directions.

As a result, the available wind data in analyses of the situations at either Boutilimit or Méderdra is inconclusive and qualitative information was obtained from local inhabitants. There was almost complete agreement that the dominant winds, especially those strong enough to move sand in large quantities, came from the north and east. This information was supported by observations of dune forms and distributions. There is, however, evidence at Boutilimit that significant winds also blow from the west as there were barchan (i.e., crescent dune) formations on both the north and south slopes of the main dune ridge that could only have been formed by strong west winds. No similar formations were seen at Méderdra and all active dune formations indicated winds alternating between north and east.

As indicated earlier, there is no surface water at either Méderdra or Boutilimit. All water comes from wells and in both cases, the water is of excellent quality, at least equal to the bottled mineral water that is sold widely to tourists in Nouakchott. There are a number of wells in Boutilimit, but no integrated water system. The water occurs in a sand stratum at an elevation of 25.0 meters below sea level. The level of the interdune hollow is about 38.0 meters above mean sea level, which means that the water must be

lifted some 63.0 meters. The local people knew little about fluctuations in level, but they were under the impression that the present pumping rates do not change the levels of water in the wells which implies an abundant supply of ground water.

The same basic situation applied to Méderdra also, except that Méderdra has a municipal water supply. It is supplied with water from a well in which the static head is at an elevation of 6.0 meters above mean sea level. The elevation of the ground is approximately 30.0 meters above mean sea level, and thus the lift is about 24 meters. The pump and well have an estimated capacity of 40.0 m^3 of water per day, although the current rate of use is only 2.4 m^3 per day. At the present rate of use, no noticeable drawdown occurs.

2. Objectives Based on Natural Factors

a. Sand Dune Fixation

The immediate and most pressing objective is to stabilize the sands in the immediate vicinities of Boutilimit and Méderdra. There is no real question that the stabilization of the sands within the vicinities of the two towns is a task within technical competence. It must be remembered, however, that the two regions are economically poor. In view of this, the method of stabilization should also make an economic contribution to the region, and be within the technical competence of the people with possible "on-the-job" training.

The economic contribution will be considered subtle. Most of the people are subsistence farmers or herders and many are both. There is a "middle class" of tradesmen, handicrafts people and bureaucrats in each town, but their numbers are small. Most of this middle class also keeps a few animals, and many (only in Méderdra) are also farmers to supplement subsistence. The sand stabilization should make it easier for the people to make a living. The best way to do this is to use living materials -- plants -- as the sand-fixing agent. If carefully designed and with the proper species mix, the areas set aside for sand stabilization could provide substantial amounts of forage, in excess of what is available now.

The Mauritanian Government (as well as the people of the region) is poor by Atlantic Community standards. Thus, the system set up for sand stabilization should use local materials to the greatest possible extent and minimize the need for precious foreign exchange. However, close examination shows that GIRM is often forced to make trade-offs between the desire to use local materials and the need to achieve a specific goal within a limited time span. Nevertheless, the use of local materials as much as possible is a guiding principle.

Once the decision to use living plants as agents to fix the sand has been made, there is the problem of providing the relatively large numbers of plants required. Contemplation of the devastation of the surrounding regions removes any hope that the problem can be solved by transplanting juvenile plants from their native habitat, there being none. The only practical solution is a nursery. A single nursery located at either Boutilimit or Méderdra was originally considered. However, the towns are connected only by a track negotiable by a 4-wheel drive vehicle, and then only slowly. The transportation and communication difficulties make a single nursery impractical and two nurseries are thus proposed -- one at each town.

The decision to use nurseries to propagate the needed plants means automatically that the project will involve a large-scale effort in horticulture and silviculture, combined with education. The plant nursery will also function as a center for local education, teaching the people how to grow and care for plants of all kinds. At Méderdra this may be easier, as the majority of the people are to some degree subsistence farmers, and a small but significant number engage in a type of commercial truck gardening for local markets. The prospects are not so hopeful at Boutilimit where public education in horticulture and silviculture must start from a non-existent base of experience.

The GIRM has agreed to provide 3 m^3 of water per day to the nurseries from municipal sources. Since it is absolutely essential that an adequate supply of water be continuously available, these sources were investigated with some care. While there are water wells in the two towns, the conclusion is that they are not adequate to the needs of the project (providing water to the nurseries and for the domestic needs of resident technicians). It is not that the water is not there. There appears to be no significant drawdown in the wells of either Boutilimit or Méderdra, even when the pumps are operating at full capacity. The bottleneck is the plumbing. For example, at Méderdra (the most modern of the two systems) the discharge of the well is a 2-inch pipe. If the pump operates at full capacity, it will theoretically supply 40 m^3 of water per day. The reality is, however, that the well is badly sanded up (it was obviously inadequately developed at the time of installation), and there is some doubt that it can significantly exceed the present use rate of 2.4 m^3 per day.

The water wells of the two towns do not appear to fluctuate with local conditions. This appears to indicate that the aquifers are not recharged by local infiltration, but supplied by distant sources. If so, then it is entirely possible, and even highly probable, that very abundant supplies of water are available.

In view of this, the project will drill new wells at both Boutilimit (about 65 meters deep) and Méderdra (about 25 meters deep), and the drilling specifications will require adequate core samples and, most especially, development. The resulting data will provide an early reliable source of information on the availability of ground water in the region. It is suggested that the requisition of reliable data on ground water availability will more than compensate for the increased cost.

The establishment of the nurseries need not wait upon completion of the wells, as local water could be used during the interim period. All construction at the nurseries will be performed by local contractors and local labor. The well drilling may require the use of a company from Senegal. To the extent possible, local materials will be used, although cement, lumber, roofing materials and plumbing fixtures will have to be imported.

The plants in the nurseries will be grown in "peat pots" of standard 12.7 cm size. While these are relatively expensive (about $.05 each) and not reusable, they will facilitate replanting enormously and reduce transplanting losses. The plants are simply left in the containers, which are placed in the ground in final position. The growing roots readily penetrate the pots as the plants mature.

It will be necessary to construct a water distribution system for the nurseries in order to care for the large number of plants. The well pump will discharge into two raised holding tanks with a combined capacity of 12 m^3. This capacity will permit two full days of operation, including domestic requirements, thus providing a safety factor against the possibility of a pump or power failure. Plastic pipe, which is readily worked by unskilled labor, will be used to distribute water from the tanks to distribution located in such a pattern that all parts of the nursery can be reached with short hoses. It should be noted that a wind energy pump may be placed at the nursery sites with funds other than those to be obligated under this project. While such a pump would probably not be as efficient as a motor driven pump it would have positive experiments value.

Three patterns of plantings are envisioned for the project areas and are designated Pattern A, Pattern B and Patter C. Pattern A is designed to fix areas well beyond the limits of the inhabited which are in the directions of the dominant winds. These areas will be planted in a pattern that will effectively break the surface up into compartments of 100 square meters. These compartments will be delineated by lining fences and have planted within one tree and one or two shrubs. The trees utilized will be of species that reach mature heights of 3-6 meters. The effect of this plan is to reduce the mean ground wind velocity to a manageable level, and then planting the compartments in grass will provide an effective soil binder.

Pattern A is intended to produce a near approximation of the tree and shrub spacing of a natural savanna and is intended to be germinal to the creation of such a structure in the surrounding region. Accordingly, the species diversity will be as great as possible. The living fences, of course, are not characteristic of natural structures but are incorporated to achieve maximum sand stabilization in the shortest possible time.

Some modest protection in the form of taller trees will be positioned as an "outer defense" of inhabited areas. These windbreaks, or shelter belts, will be designated Pattern B and are to incorporate species of trees that will reach eventual heights of 15 meters after 12-15 years. There will be species diversity and include trees of lesser heights in a pattern to reduce wind velocities. These shelter belts are to be positioned in the direction of the dominant north and east winds and should prevent a rapid accumulation of sand at the northern and eastern edges of lower plantings.

Pattern C will be planted in areas presently occupied by small buildings, huts and/or tents. The area occupied by these habitants will be broken up into compartments of approximately 30 x 30 meters by planting rows of hedges along all "property" lines. Within these lining fence compartments will be planted randomly positioned trees and shrubs. It is estimated that one tree and 2 or 3 moderately-sized shrubs should achieve the desired objective.

Annex III includes schematic diagrams of the above patterns for plantings.

Boutilimit

The endangered area at Boutilimit will be divided into 13 major compartments. Each compartment will be completely surrounded by a lining fence which will have openings to permit people and animals to move to their residences. Depending upon location, each compartment will be planted with some appropriate combination of Patterns A and C. The open lanes between compartments are designed to permit easy entrance to and exit from the town in all directions, and to give easy access to "central" part of the town. As near as is possible, these open lanes are to follow existing patterns of traffic. The shelter belts are designed to protect the town from the dominant north and east winds. However, the old French administrative complex, of historical interest, is very exposed to the occasional strong westerly winds. Accordingly, a shelter belt should be placed to provide some additional protection to that quarter. (See Annex V.)

Méderdra

The proposed planting plan for Méderdra differs in significant detail from that of Boutilimit, chiefly because it already has vegetation structures around it which can be adapted to the purposes of sand stabilization. The areas occupied by huts and tents will be planted in Pattern C, as well as the area occupied by the almost random array of buildings and walled compounds forming the northern end of town.

Existing reserve areas will be largely restored, but with significant extensions, and some simplifications of outline. Most of these areas are already occupied by a good stand of Acacia. It only requires having the holes patched with occasional planting. However, the old fences have been destroyed and in their stead, living fences will be planted around their perimeters and the larger compartments subdivided by living cross-fences. The intent is to form smaller compartments which will facilitate management. Planting these areas with shrubs and grass should provide more than adequate protection for the entire town perimeter, except on the extreme north end. That end will be protected by 3 parallel shelter belts (Pattern B) oriented to intercept the dominant north wind. These will adequately protect the area occupied by huts and tents. Additional shelter belts will also be placed in critical positions west of the town to provide additional protection from the occasional very strong and damaging west winds.

The huge ridge of active sand southeast of Méderdra, requires special treatment. While it is not threatening the town at the moment, it gives promise of doing so. Accordingly, it is proposed that a shelter belt (Pattern B) be placed just behind (i.e., southeast) the present dune crest. This belt should cause the dune crest to move slowly southeast for perhaps 75 m, and reduce its activity. At some future time it can then be stabilized with Pattern A plantings.

Supplemental Details: It is anticipated that the juvenile living fence plants will be extremely vulnerable to goats. They will have to be protected until they can protect themselves, and until the people can be educated to appreciate their value. The construction of fences out of thorny branches is common both at Boutilimit and Méderdra. It is therefore proposed that a thorn-branch fence be constructed first, along the alignments selected for the living fences. The juvenile living fence plants can then be planted inside the thorn-branch fence. Such thorn-branch fences last from 5-10 years, by which time the living fence plants will be able to fend for themselves, even against goats. The same procedure may also need to be used for other critical places, such as the shelter belts.

The desperate need for species diversity suggests that many of the shrubs planted in Patterns A and C might well be ornamentals. In general they are easy to propagate and transplant, but care will need to be taken to insure that only drought-resistant varieties are included. Some unconventional non-ornamentals are worthy of serious consideration because of their forage value.

Atriplex spp. (Saltbush). This small woody shrub provides excellent forage on a year-round basis. It is highly drought resistant and should be used in interdune hollows and along the lower dune areas.

Opintia spp. (Prickly pear). Various species could be introduced to supplement native forage. They spread quickly and in 5-10 years should measurably increase the available forage.

Acacia nilotica (L)Willd ex Del (A. Arabica). ("Brabul") ("Ardu") var. Adansonii (Astringers). The plant is not so complex as its nomenclature. It is a low busy tree and is excellent forage. The bark is also used for tanning leather.

Native grasses are now few and far between, though several species of perennial grasses native to this area were observed. It is hoped that sufficient seed can be obtained from nursery-growth plants to sow the protected areas and shelter belts. Under present grazing pressure there is no natural reseeding and most existing plants are unable to grow.

While several plants have been proposed for the living fences (notably Euphorbia balsamifera), there are many other thorny euphorbs (such as Euphorbia tirucalli) that are equally or even more suitable. A wide variety of introduced and native drought-resistant species will be nursery grown to test their suitability, and to ensure that the best species for the purpose is used.

b. Range Management

The establishment of a range management program does not present the ready technical solutions as does sand dune fixation. Because you are also not dealing with a "fixed-in-place" population, it is difficult to maintain a constant contact for educating or persuading the population to adopt practices which are foreign to them. Successful implementation of a range management program will require patient persistence and a willingness to be "educated" on the part of technicians regarding the practices of herders in the area and the authority/influence structure of the population.

Range management means the optimal use of the forage resource without its degradation. This can include management to improve the resource where previous misuse has resulted in a degraded rangeland. This, then, requires that controls be established and enforced for grazing intensity and livestock distribution which, in turn, will control the amount of plant material removed from the soil. In addition, there should be controls relating to the season as well as the duration of grazing. Thus, control of livestock numbers, time (season) of grazing and the duration livestock grazing are essential to a range management program.

Control may be attained through various means. Distribution and time of grazing may be controlled through location and management of water points and placement of mineral supplements. Stocking rate control may be achieved by limiting the numbers of livestock using a given area of range during a specified period of time. These stocking rate controls require defined boundaries and some means of monitoring livestock movements across those boundaries. Fences are the most effective delineators of boundaries and the best means of controlling movement across them. It is recognized, however, that fencing on a large scale is not practical, socially or technically in Mauritania.

Despite the difficulties, some start must be made to demonstrate that controls on the use of the range are efficacious. It is hoped that, through visual, physical demonstrations, livestock producers can produce some basic understanding of range management principles and see the advantages which can be derived from their application.

To the south and east of Boutilimit are apparent areas of "good" range lands. These areas have not been exploited because of a lack of water. As a part of the resource inventory this area will be surveyed to determine the magnitude of available range resources and which areas provide the most promising possibilities for development as grazing reserves. (See Annex II for details of this inventory.)

Once the survey has been completed and the most promising areas identified, two specific sites will be chosen as reserves. It is anticipated that the development of well watering points will be required on each reserve. These are expected to be 6-inch lined wells using submersible pumps and up to 100 meters (330 feet) deep. As with the wells described previously for the nurseries, the drilling specifications will require adequate core samples and development to provide a reliable source of information on the availability of ground water in the region.

The grazing or range reserves themselves will be 10,000 hectares in area with the boundaries delineated by 10 meter wide firebreaks. Within these boundaries will be centered the well watering point. This will include watering troughs for livestock holding up to 70 cubic meters of water*. The watering point will be enclosed in a one square kilometer area delineated by a five strand barbed wire fence. This fence will have five meter wide openings on its four sides to permit access to and exit from the watering point.

The fencing will not be designed to absolutely limit access to the watering points. It will be designed to provide a visual means of showing that the watering point is controlled. Actual control is to be based on water availability, that is, when access is to be permitted, water will be in the troughs. They will be dry when access is not permitted. To prevent unauthorized access to water, the pump housing, generator and motor will be enclosed in a secure cement block building.

Small grazing blocks are to be established close to the watering points. These will be wedge shaped blocks of land delineated by the access corridors to the well. One block is to be fenced with a traditional thorn bush fence. The remaining two will be left open. Where necessary, the blocks will be planted with trees and shrubs to enhance the area. Other small blocks (perhaps one hectare) will be protected in the open range areas outside the watering point perimeters. These again will be planted with trees and shrubs if necessary. It is assumed that the slight of the rich pasturage in protected areas will not be lost on the herding population of the region. To drive the lesson home, it has been concluded that instead of using the species least palatable to animals, species most palatable to animals will be used when planting is required.

The reserves are to be located within a radius of easy access by project technicians from a "home base" (either Boutilimit or Méderdra). It is currently estimated that the wells should be at least a day's walk apart for grazing animals -- that is to say at least 12-15 kilometers. Final decision on this will be made by the project technicians once they are on the ground. It is believed, however, that such distances will be the maximum that can be covered for purposes of monitoring and observing.

The above are the technical aspects of the range management development. Prior to any of these actions being taken, the project technicians (both American and Mauritanian) will require that "persistent patience" mentioned earlier. They will have to be aware that the grazing reserves cannot be established in

* The watering troughs will be raised concrete structures with floater-type cur off values to prevent water from flowing uncontrolled over the sides of the troughs. The sides of the troughs will be sufficiently high to prevent the animals entering them. It is not believed that they will constitute an environmental hazard.

an area just because it is the most favorable in terms of forage availability and topography. The consequences of the action of establishing a forest reserve must be considered from a sociological standpoint as well.

In deciding where the reserves will be established, the technicians will be required to observe patterns of movement of people and animals through the potential area. It will have to be established by what rights these areas are used for grazing and who gives these rights. This will involve not only talking to the herders themselves, but consultations with traditional and religious leaders of the localized populations. These latter authority figures will be the ones who can contribute to the success or failure of acceptance of proposed interventions (see social analysis following).

c. Natural Revegetation and Reforestation

The sand fixation and range management activities will be the major pilot interventions implemented under this project. The Protection of Nature Service, however, has expressed a desire for assistance in the management/development of forest reserves. In the immediate vicinity of Méderdra the GIRN has two established forest reserves -- the Tine Yera Forêt Classé and the Perimetre de Reboisement de Mederdra. Observations of these reserves showed relatively good stands of Acacia Nilotica. Growth potential for other varieties such as Commiphora Africana and Acacia Raddiana exists based on comparatively good soil conditions and access to ground water to support such growths.

However, both sites have existing prior use rights. In the Perimetre de Reboisement sedentary farmers are actively cultivating fields and have been since before the French colonial authorities established the reforestation perimeter. In the Tiné Yera classified forest, there are several government constructed wells which attract animals and people. These uses present both problems and opportunities. The problems center around initiating new activities, in areas already being used economically, without disrupting the local population. The opportunity is that precisely because there is an active population working the area, demonstrations of conservation and management will be highly visible.

It is very important, therefore, to find an area where some demonstration areas can be developed without local disruption. To accomplish this will require a similar kind of "persistent patience" as is required for the range management activities. The areas should be surveyed and their boundaries defined again. The local population and its authority figures should be continually consulted on the dynamics of the project area's uses

and develop a rapport whereby specific areas for project activities can be mutually agreed upon. Such an approach would provide for maximizing local interest and, more importantly, a hoped for cooperation and participation in the ever important question of access control.

While the above activities are carried out, information from the resource inventory will become available for planning a limited campaign of reforestation within the reserve areas. These plans should include activity alternatives for tree planting, direct seeding, species mix and types of controls needed.

It is hoped that the contrast between the qualities of the managed areas and the unmanaged ones beyond the perimeters will inspire the local population to see the benefits of management. In order to influence the local population to adopt conservation and management, the methods used to establish the protected areas should be such that they can be maintained by local people, even if at a low level. The protected areas will not wholly maintain themselves, and it is hoped that new areas will be planted on a continuing basis beyond the first perimeters. These activities need to include the local people who can and must be trained to carry them out.

3. Training and Education

One of the most critical needs to provide a modicum of assurance that project objectives will be met is training, formal and informal, at all levels, from high officials to the lowliest encadreur. Though education is "free" in Mauritania and the government pays high subsidies for scholarships, supplies and other costs, it is not prepared to handle the education and training needs of its population in development efforts. Basic education reform has yet to overcome such basic problems as sketchy programs, lack of teaching materials and inadequately trained teachers.

Education in Mauritania is organized formally and non-formally. "Non-formal" education, that is outside the official government system, centers around the traditional Koranic schools requiring little infrastructure. Men or women teachers, respected for their learning, but often with no formal training, instruct from the Koran and follow traditional methods in teaching. The government recognizes the importance of the Koranic schools, providing subsidies and sometimes suggests regrouping the schools in certain areas so that more students may benefit from teachers with different strengths. It also encourages teachers in the formal primary school system to participate in Koranic school activities to help towards modernization.

In the milieu of formally organized education there are the Madrasas, which integrate the French (or Western) type curricula with an Arabic system. There are levels for both adolescents and adults offering three general areas of studies: Islamic law, philosophy and commentaries; Arab language (classical); and the sciences including mathematics, astronomy, optics, medicine and history. All subjects may be handled by a single teacher and attendance and schedules may vary, depending on whether the school is related to a permanent settlement or nomadic encampment.

The formal, organized "classroom" education in Mauritania is generally along the lines of a French system. Primary education covers seven years leading to a Certificat de Fin d'Etudes Fondamentales (CFEF) or primary school certificate. The next level of education is the lower secondary level which leads to a Brevet des Etudes de Premier Cycle (BEPC) or lower secondary certificate. Successful completion of the requirements for the BEPC permits a student to compete for entrance to a secondary school: Ecole Nationale d'Administration (2 years), Primary Teacher Training College (3 years) or the Lycée Nationale (3 years). Successful completion at the lycée can lead to Baccalauréat (BAC) or high school certificate which qualifies a student for the Ecole Nationale d'Administration without requiring an entrance exam, the Higher Teacher Training College or university studies abroad.

Successful completion of the CFEF also permits a student to compete for further education on the vocational level including nursing and education. These vocational/technical schools turn out skilled workers, secretaries, nursing aides, bookkeepers, etc., as well as agriculture/forestry/livestock extension workers.

The Ecole Nationale de Formation et de Vulgarisation Agricole (ENFVA), located at Kaedi, is responsible for training lower and middle-level technicians in agriculture (agronomy), livestock and forestry. It is a basic three year school with two levels of training. For the first level, students who have received the CFEF are given entry for two years of general course work and one year of "specialized" training in general agriculture or animal husbandry. The graduates of this course of study become lower-level technicians in the agriculture, forestry and livestock services. The second level of training prepares middle-level technicians to work in general agriculture, livestock production, forestry and agricultural cooperatives. To be accepted for this level of training a student must have completed the first level of training and have 3 years field experience, or terminated secondary school studies with a BEPC (Brevet des Etudes de Premier Cycle), or lower secondary certificate, and are able to pass an entrance examination.

The frame of reference for the training activities proposed in this project is determined by the broad scope of the project and the Mauritanian Government. Training objectives are aimed at not only educating government personnel in the technical aspects of resource management and conservation, but also to reaching out to educate the population to the requirements and need for management and conservation. The training activities must recognize and address, therefore, both cognitive and attitudinal aspects of education.

U.S. Training

Training of resource management personnel and other higher level technicians will require training outside of Mauritania, as the country does not have the institutions capable of providing the level of training necessary. Arid lands resource management is a recognized specialty of U.S. universities, especially in the West and Southwest. The GIRM recognizes this specialty and the need for having trained Mauritanian resource management professionals. To satisfy (at least partially) this requirement, the project is providing two scholarships for training at a western U.S. university. The scholarship will be for approximately five years to cover 8 months of English language training, some basic subjects as may be required, and four years in resource management (range, watershed, forestry, etc.) leading to a bachelor's degree. These two participant trainees will be selected and start their training within the first 4-6 months of project implementation. They will be required to have received their Baccalaureate, demonstrated motivation for academic work and, though not necessarily required, have had some relevant experience which demonstrates a commitment to the program.

Third-Country Training

The next level of cognitive training will require 2-4 years third-country training in resource management, forestry management, extension and administration. Training for these skills are available in Mauritania's neighboring countries of Morocco and Senegal. It is the preference of the GIRM to have as much training as is possible, and consistent with the requirements of the Protection of Nature Service, in third countries such as Morocco or Senegal.

Institutions available and with relevant curricula are the Institut Agronomique et Veterinaire Hassan II and the Ecole Nationale Forestiere d'Ingenieurs de Salé in Morocco; the Institut National d'Agronome, the Ecole National des Cadres Ruraux, the Ecole Nationale d'Economie Appliqué, the Ecole Nationale d'Horticulture de Cambérène and the Ecole des Agents Techniques des Eaux et Forêts, all in Senegal.

Morocco: The GIRM first preference is the Ecole Nationale Forestiere d'Ingenieurs de Salé (ENFI). This school was established in 1968 with the assistance of the UNDP and FAO. It offers a 4-year course of study to train engineers in the management of water and forests. The first year of study is taken at the Institut Agronomique et Veterinaire Hassan II (IAV) for a gounding in basic science subjects. The second year, and first year at ENFI, is for additional studies in basic science courses and an introduction to the problems of resource management. The third year (second at ENFI) includes experimental learning of methods of resource management and conservation. Studies are completed in the fourth year with applied methods of forest, water and other resource conservation. This includes the students developing and implementing a small project in forest management/conversation.

The Hassan II Institute (IAV) grants degrees at the Bachelor of Science and Master of Science levels (Ingénieur en Technologie and Ingéneiurs Agronome respectively). Study for the bachelor of science equivalent degree commences with a first year of study common to all students taking advanced study in agriculture, i.e., courses for a basic grounding in the sciences. The second year concentrates on those disciplines basic to the student's technical specialty (agronomy, wood technology, etc.). Further study in the technical specialty encompasses the third year, while the fourth year is devoted to laboratory work as well as course work.

Master of science equivalent degree study is organized into three cycles which cover six years. The first cycle is the same as the first two years of study for the ingénieur en technologie degree. The second cycle covers the next two years and includes study of general agronomy, basic sciences, natural resources, equipment and social sciences. The third cycle consists of two years of specialized study either in Morocco or another country. Specialization can be in any number of areas including food technology, agricultural machinery, plant protection, water and forestry management, etc. The student, upon completion of the six years, may prolong his studies to produce a thesis to obtain a doctorate in agronomic sciences.

It should be mentioned that AID is supporting the Hassan II Institute by financing a contract with the University of Minnesota to provide six faculty members. This University of Minnesota Faculty focuses on the areas of soils and plants and will be resident until 1980 with the possibility of an extension of the contract.

Senegal: Senegal offers several institutions which provide opportunities for training relevant to the project. The Ecole Nationale des Cadres Ruraux (ENCR) is located at Bambey outside Dakar. It trains engenieurs des travaux in a three year program open to those with the baccalaureat. It has been supported mainly by FAC since its founding in 1969.

The Ecole National d'Economie Appliqué (ENEA), located in Dakar, trains middle-level managers for rural development. It accepts two categories of students: 80 percent holding the baccalaureat, and 20 percent from the ranks of agents techniques (equivalent to an agent technique in Mauritania) with four years of work experience. Courses combine theory with practical work in the field where students analyze problems at the village or arrondissement level, working closely with local population organizations. The school has five departments (college) of specialization: Planification, Animation, Coopération, Amenagement de Territoire, and Statistique.

Located in Cambérène, the Ecole National d'Horticulture de Cambérène, offers three levels of study. The first level leads to either a certificat d'aptitude professionelle horticole or a brevet professionelle horticole. Both are two year programs for those who have completed lower secondary studies. There is a three-year course of study open to those who have earned the Brevet d'etudes du premier cycle (BEPC) or diplôme du fin d'etudes moyen (DFEM). There is also a two-year course of study for those holding a baccalaureat. These courses of study lead to assignment as technicien d'horticulture and technicien supérieur respectively.

The Ecole des Agents Techniques des Eaux et Forêts, at Zigiunchor, may be of special interest for this project. It offers a three year study program for those who have obtained a BEPC and passed an entrance exam.

The Institut National d'Agronome (INA), is probably not yet sufficiently organized for consideration under this project, though it should not be ruled out. Just recently organized, it offers courses of study in crop production, irrigation, forestry and agricultural planning and management. Applicants must have the baccalaureat and successfully complete a preparatory/ probationary first year.

The above summary of institutions is to present the possibilities available for third-country training. It will be incumbent upon the CDO/Nouakchott to work with the GIRM in investigating and analyzing the most appropriate institutions to use -- after the project is approved and funding is available to approach specific institutions. Training opportunities at various levels are to be provided by the project for six GIRM employees.

In-Country Training

In-country training requirements will utilize the available resources of the proposed project, and draw on the resources of other on-going projects as they are available. The other on-going projects will be able to provide insights as to general needs in Mauritania and, because many of the available skills and disciplines are related to those of the project proposed herein, there could well be specific recommendations as to what should be required in the line of training.

The responsibility for coordination and development of training materials will rest with an extension education specialist to be assigned to the project. A primary task will be the development of materials for use by other project technicians for "on-the-job" training of Mauritanian personnel. These materials will provide a formalized method of reenforcing field work carried out.

Since the GIRM is concerned with the spread effect of training as a primary correlate of effective project implementation, the importance of extension education cannot be overemphasized. To realize the potential of extension education, recommendations are made based on the following:

(1) The foundation supporting extension education is that it will further its scope by being advanced by trained agents to people in the field. In effect, agents act as trainers. Sufficient attention, however, often is not given to the methodology of training. Focus is on content, and the assumption is that just as the content is successfully given to the agent, the agent can pass it on to another. This assumption does not follow.

(2) Development of a methodology of training establishes a process of learning that facilitates continuous learning. This develops, within the target population, the ability to incorporate information on an on-going basis as part of a process rather than as an end which becomes resistant to further impact.

It is recommended, therefore, that a "Training of Trainers Seminar" be offered to all participants in the project except those at high management levels (i.e., resource managers in receipt of university degrees). This seminar should be coordinated over a one-month period in a formal setting such as the school at Kaedi, and offered to all trained personnel. The seminar should be conducted several times over the life of the project, perhaps once each year to assure adequate coverage.

It is also recommended that in-service training be held at Kaedi where feasible. This might serve to strengthen its image as an institution with concrete relevance to development.

Based on the importance of non-formal education in reaching large numbers of the population, training of trainers should be part of the institutional capability at Kaedi. It is necessary, therefore, that the extension education have the ability to: (1) teach training of trainers -- concepts and practices; (2) develop curricula and curricular activities that are innovative and depend on resources available in a given environment; (3) develop audio-visual materials independent of sophisticated technology that can be reproduced in environments with minimal resources.

4. Environmental Assessment

An Initial Environmental Examination is attached to this paper as Annex V and recommends a negative determination. The project concept and design is to find and develop techniques and methods that will improve environmental conditions. Ways will be sought, and interventions of a pilot experimental nature implemented, to rehabilitate areas which, due to overuse and adverse climatic conditions, have experienced severe and steady deterioration of soils and vegetative cover.

Resource Inventory: The resource inventory is to be conducted to collect data and used as the basis for planning forest development and rational exploitation, revegetation, and conservation and management of range resources in Mauritania. Plans developed from this data will provide guidelines and regulations that will give direction to a conservation effort.

Training and Education: Training and education are significant parts of the project design. Their influence on the environment will be in the long term, but only insofar as trained and educated personnel will be able to inspire and guide conservation and rational use of resources.

Dune Stabilization: Dune stabilization activities to be implemented at Boutilimit and Méderdra in the Sixth Region will consist of nurseries, reserves and residential plots. They will be planted in local and exotic species of trees and shrubs on areas determined jointly by the local population and technicians. The reserves and residential plots will act as windbreaks and promote soil cohesion to prevent sand movement. The nurseries will provide the necessary plants needed for the development of these plots and reserves. It is hoped that the result of these efforts will be to restrict the movement of sand and remove a threat to dwellings, water sources and roads.

Some negative impacts on the social milieu can be expected as a result of necessary access control measures (fencing) needed for nurseries and reserves. These negative impacts, however, can be minimized, if not avoided, if proper attention and deference is paid to the social structure and implementation of activities is cognizant of social necessities.

Range Management: Range management has the greatest potential for negative environmental impacts. This intervention will directly affect 200 hectares around watering points to be developed and fenced, and less directly 20,000 hectares of grazing lands surrounding those water points. The danger of promoting overgrazing is always present when one develops watering points. Again, however, paying absolute attention to, working through the social structures which control the area and deferring development until understanding of necessary controls is assured will minimize the potential danger. This can be complemented by not having freestanding wells, but controlled provision of water as is proposed.

Natural Revegetation and Reforestation: This is a relatively minor aspect of the project and will impact on the environment only insofar as some tree seedlings are to be planted, an education compaign conducted and necessary interaction with the population will solicit some reactions.

B. Financial Analysis and Plan

The proposed project is primarily a technical assistance project with a series of pilot interventions and a study. It is a non-revenue producing project with the emphasis placed on establishing a data base through a resource survey, training, and education and the pilot activities. The project costs can be considered as an investment for the future with the return on the investment to come at some time in the years to come. As experience and knowledge are gained, other investments will be required to show this return as project interventions are expanded and replicated.

1. Project Budget

The project budget calls for a total AID contribution, including inflation and contingencies, of $4,677.7. This is broken down as follows:

Table I

AID Contribution ($000)

192 pm for Technical Assistance Staff	$1,208.0
Resource Inventory (contract only)	1,100.0
Vehicles and Equipment	338.9
Commodities	561.7
Training and Education	285.1
Construction and Well Drilling	315.0
*Other	259.0
Sub-total	$4,067.7
Inflation and Contingencies	618.0
Total AID Contribution	$4,677.7

GIRM Contribution

The contribution of the GIRM has been calculated to reflect salaries of GIRM personnel directly involved, contributed labor of the local populations if payment were required at going legal rates, land and water, and commodities including a portion of POL products for project vehicles.

*Other--House rentals $234.0; chartered aircraft $25.0.

Personnel and Labor

Personnel costs are calculated on the basis of the GIRM national budget for personnel at the levels of education and experience anticipated for the project. These range from approximately $6,000 (equivalent) annually for a service director to $1,500 (equivalent) annually for a forest guard at the lowest or entrance level of the Protection of Nature Service. Labor costs have been similarly calculated based on actual figures of approximately $75 per month equivalent for manual labor and $125 per month equivalent for a supervising laborer, that is $900 and $1,500 per year respectively.

Land

Giving a monetary value to land is a difficult process in a traditional non-market economy. In order to do so for this project, it was estimated that the productive value of the land would be if it were being cultivated in traditional crops (millet, sorghum, etc.). Recognizing that the land is marginal (though cultivated) the estimate has been purposely conservative. Also, only that land which can readily be identified with the project is included. Thus, 465 hectares with an estimated value of $100 per hectare has been included as a GIRM contribution.

Water

Water is a precious commodity in Mauritania. When it must be bought, people pay a high price--0.5 UM (approximately $0.01) per liter. The project will be using large quantities of water in the nurseries to assure plant growth. The value of this water has been calculated on the basis of having to make a daily purchase of the required 790 gallons (3010 liters). Since the state controls mineral and water rights to the land, it has been included as a GIRM contribution.

Commodities

The GIRM will be providing two commodities--POL products and tree and shrub seedlings. For POL, an agreement will be worked out to ease the GIRM into the provision of that necessary for the operation of vehicles. It will be worked out that the GIRM will provide 40 percent of the POL. Tree and shrub seedlings will be provided to the project from the government

Table 2

Summary Cost Estimate and Financial Plan

(US $000)

SOURCE	AID		GIRM		TOTAL
	FX	LC	FX	LC	
USE					
Technical Assistance	1,208.0	90.0			1,298.0
Contract services (Resource Inventory)	1,100.0	144.0			1,244.0
Vehicles & Equipment	338.9				338.9
Commodities	486.2	75.5		175.3	737.0
Training	267.5	17.6		4.4	289.5
Construction & Well drilling		315.0			315.0
Aircraft charters	25.0				25.0
Land				46.5	46.5
Water				55.0	55.0
Personnel & Labor	340.1	66.7		507.2	507.2
Contingency	169.8	33.4			203.2
TOTAL	3,910.5	767.2		788.4	5,466.1

Table 3

Costing of Project Outputs/Inputs
(US $000)

Project #682-0205 Title: Mauritania Renewable Resources Management

Project Inputs	Project Outputs					
	Survey	Plan	Training	Stabili-zation	Facili-ties	TOTAL
AID Appropriated						
Technical Assistance	-	89.6	179.1	522.4	701.6	1,492.7
Contract Services (Resource Inventory)	911.7	393.4	125.3	-	-	1,430.4
Vehicles & Equip.	14.7	3.7	55.7	70.5	245.1	389.7
Commodities	31.5	12.6	50.3	358.7	192.8	645.9
Training	-	-	327.9	-	-	327.9
Other	-	-	28.7	-	-	28.7
Construction & well drilling	-	-	-	144.9	217.5	362.4
GIRM						
Personnel & Labor	37.0	21.0	-	316.1	133.1	507.2
Water	-	-	-	8.2	46.8	55.0
Commodities	-	-	-	122.8	52.5	175.3
Land	-	-	-	38.6	7.9	46.5
Training	-	-	4.4	-	-	4.4
TOTAL	994.9	520.3	771.4	1,582.2	1,597.3	5,466.1

nursery at Rosso and through harvesting and inducing growth of slips from the local vegetation. The tree seedlings have an estimated value of $.30 each while harvested plant slips are estimated at $.08 each.

Using the above, Table 2 outlines the total financial plan for the project.

Table 3 is an estimated distribution of project input costs to outputs. It should be pointed out that these distributions are not precise in that one project output will depend upon another. For a specific example, the sand dune stabilization program depends upon successful growth of seedlings in the nurseries. Thus, how much of nurseries' costs (facilities outputs) should be attributed to the stabilization output?

Rural Development Budget

The authorized GIRM national budget for 1977 totals approximately 7.9 billion Ouguiyas (UM) or U.S. $175.8 million. This is an increase of nearly UM 2.3 billion (U.S. $50.9 million) over the budget of 1976, or nearly 41 percent. Of that total, 40 percent, or $20.3 million can be directly attributed to the national defense budget (or 42% and $21.4 million if the National Guard, part of the Ministry of Justice, is included).

Before a recent governmental reorganization, the State Ministry for Rural Advancement and its constituent ministries (Rural Development, Hydraulics, and Construction) had an authorized budget of UM 208.3 million $4.63 million). This compares with the 1976 budget of UM 178.1 million $3.96 million) for an increase of 17 percent. As a percentage of the national budget, however, a downward trend has continued with the relevant rural development ministries controlling only 2.6 percent as compared with 3.2 percent in 1976 and 3.4 percent in 1975.

Impact of Proposed Project on Rural Development Budget

If the AID contribution to the proposed project were a direct transfer of funds to the relevant rural development ministries, it would have a tremendous impact. The proposed AID project is slightly more than the combined budgets of the three ministries. Add to this the proposed GIRM contribution and the project budget amounts to approximately 118 percent of the combined budgets ($5.45 million versus $4.63 million). This is not a valid picture, however, as the project is spread over five years and 65.3 percent of the

AID contribution goes for contracted personnel and their support ($3.04 million). An additional 3.9 percent goes for vehicles, five of which will be used by the contract personnel. Therefore, only 30.8 percent of the budgeted AID costs can be directly attributed to "development" activities.

The Protection of Nature Service had an authorized budget for 1977 of UM 37.6 million (835,900), an increase of UM 5.2 million ($115,500) over 1976. Of this amount, $515,400 equivalent was for personnel and labor costs. The proposed project calls for a GIRM contribution of $788,400 equivalent over five years. In analyzing this contribution, however, one must separate in-kind contributions from required outlays of money. It is estimated that 20 percent of the labor and personnel costs will be donated by local populations reducing the actual outlay.

The remaining paid positions are already budgeted and will represent about 16 percent of the Service's budgeted personnel costs annually. Other contributions are similarly divided between in-kind (water, land plants, and school facilities) and actual expenditures of funds (POL). It is therefore estimated that $492,400 over five years will be required for expenditure. This is well within the capacity of the Protection of Nature Service to absorb as the major cost (personnel) is already accounted for.

National Budget and Defense Expenditures

Because of the conflict in which Mauritania is engaged in the northern part of the country, some special comment on defense expenditures is required.

As previously stated, the 1977 GIRM budget is approximately $175.8 million equivalent. Of this total, $56.8 million goes for national defense and security. This represents 32.3 percent of the budget. In 1976 the expenditures were $34.8 million, or 27.9 percent. The $21.4 million increase in defense expenditures is a 61 percent increase over 1976, and 42 percent of the national budget increase. Despite the defense requirements due to the hostilities, the GIRM has been attempting to maintain the actual level of services of the governmental agencies. The authorized budgets, at a minimum, are designed to keep up with inflation so that services do not decline. The Government has also been able to service its international debt, and the level of other donor investment (especially Arab countries) demonstrates a confidence in the GIRM. Though there is little doubt that defense requirements have an impact on the GIRM's available resources for development purposes, the Government is not unduly diverting resources and is maintaining its development

program. The increased defense expenditures should have minimal impact on the proposed project.

C. Social Analysis

The departments of Boutilimit and Mederdra in the southwestern part of Mauritania are within the 6th administrative region which includes a part of the coastal zone, and a part of the Sahel zone of steppes and savanna grasslands stretching in an east-west belt from Boutilimit to Nema.

As of January 1, 1977 the 6th region had an estimated population of 121,460. The departments of Boutilimit, Mederdra, and Rosso had estimated populations of 52,316; 38,971; and 33,470 respectively. These figures include estimated populations of 6,585 for Boutilimit proper and 3,358 for Mederdra proper.

The ethnic composition of the population is bidane and laratine Maure which will be discussed later in the report. The language spoken is Hassanya Arabic.

Physical Environment

Sahel is the Arabic word for border or edge, meaning the Sahara border, and in Mauritania is characterized by scrub trees, rainy season grasses, stable and semi-stable sand dunes and savanna grasslands. A portion of the Sahel belt, about 50 kilometers wide at its narrowest, western points and stretching east from Mederdra into eastern Mauritania has the greatest concentration of acacia senegal and other varieties of gum-producing trees which were the source of economic contact between Maure traders and European traders even before the colonial period. Gum exploitation among the Maures will be discussed in more detail later since it has direct relevance to projected innovation.

Rainfall in the Mauritanian Sahel ranges from an annual minimum of 6 inches in the norto to a maximum of 17.8 inches in Kankoosa in the southeast, beginning in early July and ending in September.

The southernmost part of the Mauritanian Sahel is referred to as the Chememma (Arabic) or waalo which is a narrow strip of farm land extending ten to twenty miles north of the Senegal River and is annually inundated. Rains beginning

in Guinea in April, in May for Senegal, and in June for Mali bring these annual floods. The River crests at 12 feet at Rosso by mid-October and inundates the entire valley for a width of 15 to 20 miles, filling several lakes and seasonal ponds. When the flood recedes from the bottom lands, recession agriculture begins.

Rainfall in the Chememma ranges from 12 to 26 inches annually beginning in June and ending in September.

These two ecological zones define and regulate the seasonal subsistence activities of the populations in Boutilimit and Mederdra and the total rhythm of live.

Clans: Corporate Structures and Socio-technical Interventions

A discussion of the social impact of any socio-technical intervention in Boutilimit and Mederdra should begin with some analysis of the socio-economic and political evolution of Boutilimit and Mederdra which is simply the history of the social process of founding clans, and especially that of the Awhad 1/d'Ibiri Clan whose descendents play important roles in the present Mauritanian Government (the President of the Islamic Republic of Mauritania, Mocktar Ould Daedah, is a descendent of the zawaya 2/ Awlad d'Ibiri); and the Tachemcha Maraboutic Clain Confederation in Mederdra.

It was possible to identify twelve clans 3/now existing in Boutilimit:

Awlad d'Ibiri	Baricalla
Taguenitt	Tindkha
Awlad Daimane	Ahl Etfagha Imigine
Dablekassane	Deghzeibou
Latfagha Haiballa	Baletine
Tagekanitt	Deboussa

The most important clan among this group is the Awlad d'Ibiri whose prominence in modern Mauritanian history is inextrically interwoven with the life of Shaikh Sidiyya who belonged to one of the zawaya lineages, the N'tishait, within the Awlad d'Iberi.

1/ Awlad is the Arabic plural for son; more specifically it means "descendents of, e.g. the descendents of Ibiri: Wuld is the singular form (Ould in French).
2/ Zaway is the Arabic plural for the pacifist noble branch of a clan (zawiya is the singular) as opposed to the warrior noble branch, the hassanis; the people of the book (Ou'ran) and the people of the sword.
3/ The names were confirmed with Monsieur Thiam, Bocar, Mauritanian Sociologist.

Contrary to the social structure analyses in previous AID documentation, Boutilimit has the above socio-economic and political structure which existed long before colonialism, and have evolved in such a way that the colonial structures existing in Boutilimit pulled from within the traditional clan structures for administrative personnel. This remains the case with the present independent government. The administrative and party structures found presently in Boutilimit have their roots in the clan structure. This is the same case for Mederdra in which the most powerful traditional structure is the Tachemcha, a confederation of maraboutic clans composed of the following major clans:

Awlad Daiman
Ahl Baricalla
Ideikhoub
Idiadfagha
Tindkha

The role of administrative and party officials in project implementation will be discussed later. It is important to stress at this point that the basic organizational structures through which the intervention should be channeled is the clan structures in the person of the chief of each clan. What will be required will be the assemblage of the head of each clan. What will be required will be the assemblage of the head of each clan, and especially Souliman Wuld Shaikh Sidiyya of the Awlad d'Iberi, who is currently an Ambassador-at-large and former president of the National Assembly. (It was pointed out during January 1978 interviews in Boutilimit that his decisions are final); Muhammed Lebib, head of the Tachemcha of Mederdra, who has also held a civil service post; and Muhammed Baba Wuld Ahmed Yourou of the Awlad Daiman, who is one of the political party representatives for Mederdra. Each of these men belongs to a zawaya lineage thus, for balance, it is suggested that the elder Borena Moktar (he is the father of the recently resigned Minister of Defense M'Bareck wuld Bouna Moktar and also father of the current Mauritanian Ambassador to Spain) of the Awlad d'Ibiri, but from a hassani lineage, be intimately incorporated in implementation debuts. Each of these men could serve as advisors to the project interveners concerning problem identification and solution, obstacle identification, critical points of cooperation, implementation, feedback, goal attainment measurement, and evaluation. It is important to understand how the hassanis and zawaya heads have traditionally made decisions. The former, according to Monsieur Thiam, was recognized as a temporal authority figure whose authority emanated from his prerogatives to lead soldiers and to collect tribute, but his authority was dependent upon the power invested in him by the group of elders, jama'a, who elected him. He could not take

a unilateral decision or action--these rested with the jama'a. Within the zawaya ultimate authority and power rests with the head of the zawiya group. He can make the final decision without a council of elders, though the decision is on behalf of the unit.

It must be clearly understood that each clan is considered a corporate unit holding territorial rights to identified pastoral zones containing Acacia senegal or gum trees, wells, and farm lands in the Chememma. The clan makes a corporate decision based on what it considers in its best interests. Thus, care should be exercised in discussing issues requiring a corporate decision with a clan member or a clan head in isolation of the corporate decision-making body.

Dune fixation, natural revegetation, forest management, and range management, even on a small scale and limited to a small area, could be positively or negatively viewed, depending on how the intervention will be "sold". The intervention will address itself directly to rainy season/dry season subsistence activities, e.g. free movement of livestock, gum exploitation, cutting of trees for charcoal fabrication etc., and could be perceived as restricting an environment whose resources no longer provide the possibilities for very much revenue since the drought. Likewise, the intervention could be perceived as the vehicle through which a new, however temporary, economic strategy can be exploited--this relates specifically to project monies which may be available to a person or persons requested to patrol the activities. This person or persons should be selected by the clan heads and the monies/wages will be viewed as revenue belonging, in whatever portion, to the corporate structure. This is strictly an empirical issue for which no answer can be given until someone is on the ground. This brief descriptive assessment can be further clarified by looking briefly at the social structure and social organization of a clan.

Social Structure and Social Organization

The model social structure of a clan in Boutilimit and Mederdra is two major patrilineages--the hassanis and zawayas--made up of separate lineages which oppose and complement each other in their dependence, one upon the other, for physical protection and spiritual security. These groups constitute the noble warriors and noble priests. They are the patrons. Directly under this group are the client or tributary groups who survived because they paid "protection money" (it took the form of produce, livestock, gum) to be able to go about their daily lives. Those found farming in the path of hassani raids had their land appropriated but were probably allowed to

remain on the land as producers. They became incorporated into the hassani-zawaya customs, language, etc. Below this group were captives who were in a master-slave relationship with the hassani-zawaya and at the bottom were the smiths and praise-singers.

Origins and Settlement

The original inhabitants of Mauritania, referred to as the Bafours, are believed to have been gradually pushed south from the eleventh century on by a wave of Berbers accompanying Abu Bakr iba 'Umar, the Almoravil leader. Another wave of peoples, who are believed to have been led by Hassan of southern Morocco, came in around the end of the fourteenth century and over the next 300 years flowed into the southern regions of Mauritania where the earlier wave had long been in residence. Somewhere around the sixteenth century, the southwestern region of Mauritania was inhabited by two important groups of hassanis who were the descendents of Hassan. These groups were descended from two brothers, Terroz and Barkanni wuld Haddaj, whose names were given to the two geographical areas of Trarza and Brakna.

Internal Dynamics: Hassani and Zawaya

Probably because of their military superiority as warriors, the hassani appropriated, when they were able to, "protection money" from the people they found in the area. According to Stewart's account (1973:14) the appropriation of goods and services by the hassanis finally erupted in the late seventeenth century in a battle between the hassanis and zawaya in which the latter was defeated, renounced arms and lived thereafter by the Koran.

Haratine

Both groups had clients who were unable to trace their ancestry to either of these groups and occupied the status of cultivators and herders who paid tributes to the ruling groups. They are most often referred to as haratine. One interpretation, received during a field trip in January 1978, is that a steady trickling of sudanis from the southeast, mainly Mali, installed themselves in villages in the southern regions of Mauritania as cultivators and were sometimes referred to as harase, an Arab word which means sower. It is probable that those harase who became incorporated as clients in the hassani/zawaya structures did so as a means of survival.

Their incorporation did not necessarily mean that they were enslaved, thus popular interpretations of haratine are often confusing since on the one hand they refer to haratine as "freed slaves" and on the other, as having paid a regular tribute to their patrons. What seems likely is that those who were most defenseless became important clients as producers--they were the farmers, herders, and gum collectors--the producing unit of the corporate structure. The collection of gum was the responsibility of haratine families attached to zawaya lineages. When not collecting gum and herding livestock, they farmed in the waalo or chememma.

There also seems to be a great deal of popular confusion concerning the haratine Maure and the bidane Maure. The popular reference for the former is "black" Maure and for the latter, "white Maure". These color appelations obfuscate rather than clarify what is essentially an issue of class affiliation, particularly since there are dark-skinned Maures who are hassani or zawiya. Such a spurious description should be avoided if analysis is to attain any coherence and cross-cultural comparative applicability.

Decisions concerning the marketing of gum rested with zawiya patrons. According to Stewart (p. 120) "there is no doubt that the Awlad Ibiri participated in the gum trade, quite probably on a large scale...but unfortunately, little information is available about details of the gum trade. No records were kept by the trading authorities at Podor (where the Awlad Ibiri traded their gum) of the specific tribes which came to sell, they were only known as 'Marabouts'".

Gum production has maintained its importance in the Trarza. During the January 1978 trip, it was possible to obtain some figures from the forestry post in Mederdra on production in the Mederdra department since the drought:

December 1971-March 1972	69,000 kilos
January 1973-December 1973	116,900 kilos
January 1974-December 1974	22,615 kilos
January 1975-July 1975	91,300 kilos
December 1976-December 1977	15,900 kilos

The May 5, 1969 report of the post on gum production for the December 1967-July 1968 season for the entire country was 4,961,844.5 kilos, with Mederdra alone reporting 63,200 kilos. Though the statistics available were incomplete it seems likely that the 1976-77 yield was very low due to the death of vast numbers of Acacia senegal. It is also a possibility that the relatively high yield for the 1973 season was due to abusive exploitations by cutting which would have exacerbated the

the already fragile existence of the trees due to the drought. This probable abusive exploitation in 1973 was during the height of the drought when livestock losses were alarmingly high. Traditionally, it has been the zawaya who kept the largest herds and controlled gum production. Revenue from gum yields provided the cash for clothes, taxes, etc., and the means for investing in more livestock which was a source and visible symbol of wealth. Greatly diminished livestock herds have meant in many ways a decrease in wealth. A probable economic strategy is increased abusive exploitation of remaining Acaciasenegal. This would be viewed as a rational strategy serving as a hedge against the sale of animals from an already diminished herd, for ready cash. Whether or not this is actually the case will have to be ascertained on the ground. If it is indeed the case, then a forest management intervention will be faced with the obstacle of conflicting with what is perceived as a rational economic strategy on the part of zawaya groups. Project implementation would demand (a) an alteration or even cessation of a traditional zawaya revenue earning activity, (b) deferred, decreased, or no income/consumption; and (c) the creation of new economic outlets which would maintain the patron-client or zawiya-haratine relationship. Actually this is a positive and is already taking place in the modern sector where haratine are working as night watchmen, building guards, messengers, etc. and continuing their zakat and rempetien tributes.

Slaves

The abide (sing. abde) falls outside the patron-client relationship in terms of the model of the social structure. Their status is considered inferior to that of haratine, though they may be assigned to work in the fields. The relationship here is one of noblesse oblige rather than patron-client. The enslavement of people in Mauritania was outlawed under colonialism and many "slaves" left definitively the "master-slave" structural relationship, while others have remained attached to the clans into which they were born. Their productive functions in the unit seem to be whatever they are called upon to do. Within this unit they are housed, clothed and fed, but have no effective access to what is produced or allocated by the corporate unit.

Smiths

At the bottom of the social structure model are the moualimine (sing. moualem) or smiths which includes blacksmiths, silversmiths, and leathersmiths (women are leathersmiths and men are blacksmiths and silversmiths) and the iguiou or griots who are praise-singers. In the past, the function of the

smiths was the production of war materials and the function of the praise-singers was primarily the development and maintenance of significant historical events among the hassani and zawaya. Development and maintenance could, on occasion, give way to gross fabrication if the griot felt inadequately compensated for his performance. Smiths continue to do traditional smithing--now mainly the production of traditional agricultural tools, jewelry, and pipes. During the January 1978 field trip to Aleg the design team was introduced to a group of smiths who have moved into the non-traditional occupation of vegetable production in addition to continuing with their smithing.

Boutilimit and Mederdra: Historical Development and Social-technical Interventions

The creation of Boutilimit is synonymous with the return of Shaikh Sidiyya to the Trarza. Shaikh Sidiyya's ancestry is bound up with the sixteenth century founding of the Awlad d'Ibiri by Ibir, a marabout who was a descendent of Hassan, the putative ancestor of hassani lineages who have been settled in the Trarza and Brakna probably since the last part of the seventeenth century. The warrior hassanis branched and tradition relates that Ibir, his uncles, and his brothers renounced the life of the sword and attached themselves to the Tindkha, a maraboutic clan belonging to the clan confederation called the Tachemcha 4/ which still exist today at Mederdra and Boutilimit. The Tindkha were probably Berber in origin who traced their ancestry back to the followers of the Almoravid leader, Abu Bakr ibu 'Umar.

The Tindkha was a strong lineage with long-standing residential status and a reputation as people of the book (Qu'ran) rather than as people of the sword. By attaching themselves to the zawiya Tindkha, Ibir and his uncles and brothers broke with the military tradition of their hassani ancestry and became zawiya, but of a lesser status than the Tindkha. According to tradition, ancestors of the major Ibir lineages were Ibir's five sons, his three brothers, and three uncles. The Awlad d'Ibiri was probably established in the last half of the eighteenth century as a corporate entity.

4/ During the field trip to Mederdra information was given that the maraboutic clans of the Tachemcha are traditionally teachers of the Koran--not warriors--and that they directed the sinking of almost all the wells in Mederdra since they are also (at least before the drought) large herd owners who considered the well a strategic resource.

Technical intervention in Boutilimit has a precedent in the dynamics of the relationship between the French and the Awlad d'Ibiri in the person of Shaikh Sidiyya Baba. Because previous interventions and the reaction to them is important to the project, this precedent is of direct relevance. We should first look briefly at the appearance of Shaikh Sidiyya in the Awlad d'Ibiri.

It seems that the segment of the lineage into which Shaikh Sidiyya was born, the N'tis'hait, had its origins in the latter part of the eighteenth century. According to oral tradition, Muhammed wuld Moham of the Tindkha, left the Tindkha at the end of the seventeenth century due to internal strife and joined the loose segmentary Ibir. N'tis'hait who was a son of Muhammed wuld Moham, then married a daughter of Mrabat Makka, second son of Ibir. Throughout this period the small N'tishait group maintained affiliation with the Ibir lineages and based its integration and alliance into the larger Ibir unit on marriage. By the time Shaikh Sidiyya was born in 1775, the N'tishait had realized a fairly solid integration into the Ibir lineages.

Shaikh Sidiyya's childhood was spent learning the required verses of the Koran. During his thirties, he left the Trarza to continue his studies under well known marabouts and travelled as far as Mali. After thirty-eight years of travelling and studying he returned to the Trarza, became re-integrated into his lineage, the N'tishait, then assembled together representatives of each of the lineages within the Awlad d'Ibiri. This took place in what was then an unoccupied valley, not far from the waalo or Chememma. This valley was an area in which rainy season herbage grew (it grew stalk-like and was called tilimit) and where farm lands for the Awlad d'Ibiri were staked out. This marked the beginning of the creation of Boutilimit and the sinking of the first well which is still in existence. The sinking of other wells under Shaikh Sidiyya's directions had the effect of fixing lineages around a geographical focal point. Each lineage of the Awlad d'Ibiri has its own territory which includes its grazing, range, and forest area. Five of the most important ones belonging to Boutilimit-Mederdra clans also have "good" wells. They are as follows: (A) Ainissalama, which is approximately 11 kilometers north of Boutilimit has a deep well sunk by the government. It is heavily populated due to the presence of the well and the marabout who teaches and serves as a spiritual leader. (B) Rabii, which is 5 or 6 kilometers outside Boutilimit and is the "campement" of Souliman wuld Shaikh Sidiyya (see page 4). (C) Ahl Sidi Muhammed, which is about 20 kilometers from Boutilimit is the zone of the head of the Taguenitt (see page 3). (D) Tignargue, which is about 15 kilometers from Boutilimit.

(E) Zouer and Bousdeière, which are on adjacent zones 15 to 20 kilometers off the paved road to Aleg to the northeast. These two zones are the territory of the Awlad Daimane, a maraboutic clan belonging to the Tachemcha. The population is sizeable.

The Awlad d'Ibiri's agricultural lands 5/are located in the waalo and are as follows: (A) Ard-el-Bezoul, which is approximately 10 kilometers long and 5 kilometers wide bordering the Senegal River opposite Podor. (B) Legat and Dzraa, which are adjoining strips approximately 15 kilometers from Podor.

Further research should be conducted in the area to determine the exact location, clan name, wells (and their depths), population and animal size, natural flora resources, sand dune threats, etc. The exact locale of the intervention vis-a-vis clan territories should not be made until all clan chiefs for both hassani and zawaya have been assembled as many times as necessary and fully briefed on the technical aspects, money constraints, and possibilities for future intervention spread. Full cooperation will, in all likelihood, be forthcoming once the clan leaders understand benefits which may accrue to them. Movement outside traditional structures to maximize the economic advantage has been done in the past.

5/ These lands are most usually formed according to the following contracts: (a) zakat (in French la dîme) an Arabic word connoting an Islamic tradition of giving 1/10th of your yield to charity. It has taken on a temporal relevance vis-a-vis land, livestock, and gum exploitation with the zawiya marabout/owner serving as intermediary for the collection of the charity. The word has been changed in Pulaar to assakal with the same interpretation and understanding. Whether one is a farmer, herder, or trader, 1/10 of the yield goes to charity. This holds true for haratine Maures; (b) Rempetien is a Pulaar word meaning "farm" and "let us share". Rem is the imperative of cultivate or farm and petien means "let us share". It is a 50-50 sharing between the owner of the resources and the producer. In French literature on Mauritania, the word is metiage. This sharing is often done after the 1/10 has been extracted; (c) an ancient form which is, supposedly, disappearing is where the owner appropriates the entire yield from his resource exploitation.

An example is the relationship entered into with the French by the Awlad d'Ibiri in the person of Shaikh Sidiyya Baba to negotiate a peace with lineages or lineage segments opposed to the French, in exchange for technical interventions in Boutilimit. The influence of the N'tishait had been on the upswing for many years under Shaikh Sidiyya and increased as a result of the exchange made with the French. It is possible that participation in this project intervention may be motivated, in part, by a perceived increase in influence.

The result, for the Awlad d'Ibiri in entering negotiations with the French, was the sinking of more wells under the direction and financing of the French and the establishment in Boutilimit of the French-Arabic madrasa or school which came to be the educational center for Mauritanians from all over the country. From this center they went on for further training and then occupied positions in the government ranging from minor civil servants to the presidency.

It seems that there were some clans who did not wish to assume any active involvement with the French during this period, preferring rather, to go their traditional way. This, first of all, needs to be verified on the ground and, secondly, if true, then addressed in terms of its meaning for project implementation.

Up to this point the report has dealt with traditional existing structures in Boutilimit and Mederdra and it is necessary to re-emphasize the primacy of recognizing these structures as the ones through which the innovation should be channeled.

There are, of course, the governmental and party structures which are also very important. As for the governmental structure, the recently installed prefect of Boutilimit worked at some point in the past in the forestry service and conversations with him revealed a keen sensitivity to the gravity of the environmental situation and the need for interventions to address the situation. The prefect at Mederdra is also recently installed coming from Atar. The clan affiliation of neither is known for this report and may or may not be important. Only an on-the-ground assessment can determine the importance of this factor.

The chief of inspection for the forestry service is stationed in Rosso and is theoretically equipped with transportation and a budget to carry out his functions which include visits to the forestry post in Mederdra and the one in Boutilimit which is to be reestablished for this project. In fact, he is not and operates on an inadequate budget, though he is apparently of a "noble" class and studied at Boutilimit with other who are of importance to modern-day Mauritania. The

The service will obviously have to be strengthened in terms of more adequate and effective transportation and an increased operating budget.

During discussions and interviews it was forthcoming that the service has not enjoyed a popular reputation. It has been seen, rather, as an agent of repression due to its concern with the cutting of trees for firewood, animal food, etc., which has been translated into fines and tongue lashings against the offender. The public image of the service should be changed which will require mass popularization of the functions and duties of the service. Since it is rare to find a home that does not have a transistor radio this could be an effective means of communication of environmental issues and, at the same time, create a new image for the forestry service. Another seemingly excellent avenue of communications and probably the most effective, would be "campments" and a new residence grouping containing a marabout who probably regularly receives hassani nobles, haratine clients, smiths and griots in its capacity as spiritual leader and teacher and temporal land owner.

Political party representatives in Boutilimit and Mederdra tend to be members of important clans such as Muhammed Baba wuld Almed Yourou of the Awlad Daimane/Tachemeha. He is a section party representative and in his double role as a member of the modern political structure which in many instances can be mapped onto the traditional political structure, his role in project implementation will be critical. This holds true for Souliman wuld Shaikh Sidiyya of the Awlad d'Ibiri in Boutilimit.

In spite of what seem to be very conservative and traditionally oriented clans, leaders have foreseen the importance of exploiting revenue earning strategies in the modern sector such as directing the procurement of jobs as night watchmen, janitors, chauffeurs, and messengers for haratine Maure clients who formerly farmed, shepherded livestock or collected gum. The patron-client relationship is maintained, and, in all probability, so is the zakat and rempetien--it has simply moved into a new sphere of operation. The extent of this phenomenon is not known, but seems worth investigating in terms of its meaning for receptivity to monies/wages for local-hire project personnel.

Findings and Recommendations

The most significant findings and recommendations are as follows:

1. There does exist viable structures other than the governmental administrative and political party structures in Boutilimit and Mederdra. What is even more significant is that the present administrative and political structures have their base in the traditional clan structures, especially the Awlad d'Ibiri clan.

2. Within the Awlad d'Ibiri and other clans of Boutilimit and Mederdra can be found the (a) decision-making, (b) communications, and (c) implementation centers necessary for channeling intervention activities.

3. Government structures which have the same centers mentioned above have always integrated into clan structures concerning problem resolution.

4. Motivation for participation in the project seems to be rooted in (a) the desire to preserve the physical historical significance of Boutilimit by the most influential clans whose existence is synonymous with the founding of Boutilimit, (b) a perceived increase in influence and status resulting from acting in the capacity of communications and implementation agents for the intervention, and (c) though not definitely determined, it is highly likely that monies which may be available through the project for surveillance personnel will be of interest to clan leaders. Care should be exercised in explaining this aspect to clan leaders.

5. The historical character of the Awlad d'Ibiri in terms of receptivity to interventions has a significant precedent in the dynamics of the collaboration between them and the French resulting in the sinking of more wells for the clan and the establishment of the first French-Arab educational center at Boutilimit.

6. Intervention activities should succeed provided serious attention is paid to the historical importance of the inter-relationship between the evolvement of Boutilimit and the growing influence of the Awlad d'Ibiri.

Intervention activities should be channeled through the traditional clan decision-making, communications, and implementation centers in coordination with those of the Administration and the political party. There will be several striking instances of overlap.

D. Economic Analysis

This analysis relates to the series of pilot interventions in reforestation, natural revegetation and general resource management and conservation. The goal of these intervention is to preserve and extend the country's natural resource base.

1. The Renewable Resource Base - Structure and Problems

The economic analysis is concerned with those kinds of natural resources that maintain their productivity over time -- the renewable resource base of the country. Renewable natural resources might be compared to capital assets that have perpetual lives. Natural resources, like any capital asset, provide a stream of income over time, and the present value of a natural resource represents the sum of its discounted future earnings. The feature that distinguishes all natural resources from capital assets is the relative inelasticity of supply to changes in price. For analytical purposes there may be a distinction between "renewable" and nonrenewable resources (or "wasting" resources, i.e. those used up in the process of production), in the real world this distinction between renewable and nonrenewable resources is not so sharp. For example, where a renewable resource may take up to a generation to regenerate itself, it takes on the characteristic of an exaustible resource, similar to extractive resources, such as minerals.

The renewable resource base of the Mauritanian economy includes the country's forests, grasslands, and arable soil. In Mauritania, as in all the Sahel countries, the renewable resource base is extremely small in relation to the country's geographic expanse and consumable needs of the population as well as production requirements. The country's geographic and climatic situation imposes a limitation on the scale of the renewable resource base. The recent prolonged drought further diminished its scale. But, the critical factors affecting the renewal resource estate are the demands imposed by the basic consumption requirements of the population, and the demands of the economic activities employing these production factors. The exploitation of renewable natural resources tends to carry high social opportunity costs. These social costs -- covering various kinds of environmental opportunity costs -- have tended to be greater than the private costs facing individual users of resources. From this standpoint, private users benefit at the expense of society as a whole. To the extent that the renewable resources base is regarded as a public good, (i.e., use is equally open to all), negative consumption externalities may result from excessive use by individuals or groups within a society.

Consumers maximize utility if they are free to make their consumption decisions in line with individual preferences. However, if the welfare of other members in a society is affected by these choices, these preferences are said to be "external effects". Where such conditions exist, new social-political decisions may be called for in order to modify consumption behavior and to minimize the negative welfare effects on society as a whole. The negative external effects underly the

the suggestion for "fencing," or the protection of land, in order to limit excessive exploitation of rangeland, for example, by cattle producers.

a. Economic Significance of Renewable Resource: Forests

Next to agriculture, the forest estate is the second most important sector from the standpoint of development priorities. The condition and scale of the forest estate in any African LDC have far-reaching implications. This resource plays a pivotal role in terms of its potential contribution to such macro-economic variables as income, employment and foreign exchange. Output generated by the forest estate figures heavily in the present consumption patterns of the subsistence sector as well as urban, income-earning consumers. It serves also as an intermediate good in the production of goods and services. It follows then that for those countries which have limited forest areas, proper forest resource management is imperative. Misuse and lack of management and planning not only have bad environmental implications, but negatively affect employment opportunities, rural welfare, and limit a reliable supply of forest products at reasonable prices to low-income households.

Table I shows the estimated distribution, by sector of origin, of output in Mauritania's traditional sector. In 1976 the forestry sector accounted for approximately 2% of total output in the traditional sector. The greater proportion of this output represents gun arabic production and forest fuel, either in the form of firewood or wood converted into charcoal. Most other forest products must be imported. Construction wood imports were valued at 67.0 million UM (C.I.F.) in 1976. While its size is small relative to the total, its impact on the rural economy in terms of employment, monetization and income are greater than its weight in the total distribution of output indicates. Forest product production is labor intensive, so that its employment potential is significant. Moreover, its output provides a source of cash earnings to the rural population since the major proportion of output enters the monetized sector of the economy. Forest fuel isa critical product for the Mauritanian economy and one of immediate concern to forest-related products. In this specific instance, the project deals with micro-pilot interventions, but the objective is to indicate how this relates to larger issues of forestry in development, and to identify issues in firewood economics.

Table I

Estimated Gross Domestic Product in the Traditional Sector at Current Prices, 1973 - 1976 (estimated)

(UM millions)

	1973	1974	1975	1976 (est.)
Total traditional sector output	2,904	4,582	4,582	5,176
Livestock	1,629	3,220	3,718	3,977 (77%)
Agriculture	236	421	361	254 (5%)
Fishing	771	833	628	750 (14%)
Forestry	47	67	83	98 (2%)
Handicrafts	21	41	62	77 (1%)

Source: IMF, Mauritania: Recent Economic Developments (May, 1977)

b. The Energy Requirement

In Mauritania, as for other African countries, fuelwood is a major energy source. The rural sector demand for fuelwood is derived from a multiplicity of energy needs including food preparation, heating, blacksmithing, grain drying, etc. Since it is a subsistence commodity, the consumption demand for fuelwood is assumed to increase at the same rate as the rate of population increases (the Sahel-wide FAO estimate of average annual firewood consumption is o.8 m3 per inhabitant. The equivalent weight in kilograms of charcoal is 150kg.) The consumption demand for fuel is met by both commercial and non-commercial sources. At the village level, firewood for the major purposes of cooking and drying grain may be gathered directly from the nearest available source. But frequently, especially in wood-scarce areas, charcoal is purchased.

For both the rural and urban houshold, fuel is an important budget item. In the case of low-income households, it probably ranks just below expenditures on food. A rough judgment is that as much as 20% of low-income household purchases may go to fuel. Of the oil-based energy sources, kerosene for lighting purposes is a widely used home fuel among the low-income population. Alternative fuels, such as gas for food preparation are limited to upper-income urban households. Charcoal is the main form of energy for low and middle-income urban households, for purposes of cooking, heating, ironing.

The preference for charcoal stems from reasons of its price relative to other forms of domestic energy sources, and to the household's need for an assured fuel supply.

c. The Production of Fuelwood

The domestic charcoal industry is made up of a fairly large number of small producers in the area of the Senegal River Valley. There is some importation of charcoal, with extensive unofficial trade in charcoal which escape reported statistics. An average annual figure of about 25,000 MT has been cited.

Since the basic input, wood, is subject to free exploitation, the major production costs are wages paid to labor for harvesting, burning and bagging operations. Other major outlays include the cost of packaging material and transport. Charcoal has a sufficiently high value per unit of weight so that it is transported over fairly long distances to the wood deficit regions north and east. Charcoal is one of a group of basic commodities that is subject to regulated prices. (Official prices are set for all major consumer purchases including rice, sugar, tea.) The retail price is currently fixed at 6 UM per kilogram. Fixed retail prices mean that producer returns as well as marketing margins are held within certain maximum limits so that short-run changes in supply and demand do not immediately show up in changes to market prices.

However, over the longer term, if changes should occur in underlying supply and demand conditions, a revision will have to be made in official prices to reflect such developments. When it is necessary to increase the prices of basic commodities that figure heavily in the consumption patterns of low-income groups, this leads to changes in the relative distribution of income; low-income groups tend to become worse off as a result of such price increases. This result would occur in circumstances where a dwindling area under forests leads to reduced production of forest fuel.

2. Social Costs of Fuelwood Production

Although for the foreseable future, the use of alternative energy sources is limited, it is widely recognized that the production of fuelwood imposes high social costs on any Sahel country. The limitation imposed on choice of energy sources by their stage of development and income levels means that conservation, rigorous management, education of the population on the impact of forestry resources on their own material welfare, must be used as methods to co unteract the social costs.

These social costs relate to equity and efficiency in forestry resource use over a period of time. First is the environmental issue. A resource may have a value in addition to its output, and this value may be realizable only if it is not exploited. Secondly, woodland in drier areas can take on the property of an exhaustible resource. Once destroyed, the period of time for regeneration can be so long that exploitation gives rise to "user costs", which represent the foregone value of future output. Closely related to this is the concepts of irreversibility of damage to the original soil and biological environment: a point may be reached where the restoration of an area after severe depletion of its forest may not be technically feasible.

The cost of charcoal in terms of the amount of wood consumed in production is high. An estimate prepared in connection with the CILSS forestry project proposals suggests that one ton of wood is required to produce 250 kg of charcoal (Forestry engineers often point out the high cost of converting firewood to charcoal. The high 4:1 ratio is partially offset, however, by the easier and lower costs of transporting charcoal, and its longer burning period.) This implies that the production of fuelwood has a high opportunity cost in terms of resource use. In a meaningful sense forest production competes with agricultural production if it occupies tracts of fertile land that would otherwise be allocated to agricultural output. Table 2 shows FAO estimates of the demand for firewood and new hectarage required to be brought under production in Mauritania over coming years. The hectarage estimates to fullfill urban demand suggests that better soils will be brought under tree production. This may well involve withdrawing land from agricultural uses and reallocating it to forest production. Given the large variation yields as a function of soil quality, a choice will have to be made between expanding the hectarage allocated to forest production or reducing hectarage but using more valuable land for forest production.

Table 2

Estimates of Firewood and Reforestation Demands, Twenty year Period 1970-1990

Year	Urban Demand	Rural Demand	New Hectarages Required 1/
	New Hectarage Required, 1980 to 1990 (in thousands of cubic meters and in thousands of hectares)		
1970	89	636	- - -
1980	176	822	14.6 to 44
1990	264	1,008	22 to 66

1/ These estimates assume that land is brought under cultivation only to satisfy urban demand and that rural demand can be supplied through natural growth. The range of hectarage required is based on assumptions of quality soil with 12m3 per hectare yields.

Source: FAO, Report on Basic Needs of the Sahel, 1976.

3. Conservation Efforts

Conservation efforts should be viewed against the longer background of the distinctive features of geography, population distribution, and changes taking place in the economic activities of the population. It is these factors, together with the investment of capital in infrastructure in the rural sector, that places this intervention in the context of a strategy of development planning. The first group of factors concerns the structure of population settlement, its geographic dispersion, the isolation of towns and settlements, and regional isolation. It concerns changes in modes of living, set in motion since the drought, that are affecting the geographic distribution of the population. The second factor relates to the preservation of investment in public overhead in the area.

Although known, it is important to review Mauritania's geographic situation, for this crucial factor strongly influence development planning scope and content. The northern half of the country's total surface is pure Sahara. In the center, there is a belt of subsahara, while the south consists of sahelian-type forest and grassland. Close to 80% of Mauritania's total population, and almost all of its traditional agricultural population, are concentrated on a belt of land 50 to 150 miles wide along the southern border. This area accounts for less than 15% of total land surface. While traditional economic life is heavily concentrated in the south, the country's capital and modern economy are located in the north, Nouakchott is isolated from the south and lies 100 miles in the livestock zone. Mining and fishing enclaves of Akjoukt, Nouahdibou and Zouerate are located much farther north of Nouakchott, in middle of the desert. The choice of capital location was made so as to provide a link between these two areas.

Its geography, isolation of the population, as well as its major activities, are heavy disadvantages to Mauritania's development in terms of transport, communication, exchange of goods and services, and provision of social services, health and education. At the same time, the density of the population relative to arable land in the southern region imposes a different set of problems.

Development planning in Mauritania necessarily involves plans for the creation and expansion of towns for settled populations. Development implies that peoples come less to live in isolated, shifting, self-sufficient units. The administrative, economic, and social advantages (in the form of services) provided by towns will be increasingly sought as nomadism dimishes and sedentarization occurs. The drought experience of the 70' s has already contributed to this process.

Administrative centers such as Boutilimit and Mederdra are examples of settlements whose populations have grown as a result of the sedenterization of nomads. Their importance stems from administration and social services provides to peoples in relatively isolated regions. Schools, dispensaries, administrative facilities and public utilities represent substantial investments of public capital where such facilities are found with great infrequency. The replacement costs of these assets in the event of total environmental degradation would be unacceptably high. It is wothwhile, therefore, to establish conservation efforts in such areas to protect the environment and reduce, if not remove, the threat to these investments.

PART IV. IMPLEMENTATION ARRANGEMENTS

Implementation of the various project components will be carried out by contractors. Because of the lack of administrative capability within the Ministry for Rural Development, the necessary contracts will be with USAID. These contracts, to the extent practicable, will be by competitive selection procedures and procured from the United States. It is, however, anticipated that construction contracting for housing and the nurseries at Boutilimit and Mederdra will be with a local contractor. The cost of these contracts will be too low to either interest American firms or make it worthwhile and profitable to cover mobilization costs. Procurement of commodities should be through a commodity procurement agent. It is recommended that the Afro-American Purchasing Center (AAPC) be queried as to its interest and ability to provide these services and at what cost.

A. Analysis of the GIRM and AID Administrative Arrangements

1. Government of the Islamic Republic of Mauritania

The implementing agency for this project will be the Directorate for Agro-Pastoral Protection and Management, Protection of Nature Service. The directorate had 189 budgeted positions for 1977, of which 68 were professional or semi-professional. These latter positions included seven senior level engineers (B.S. or M.S. degrees), five junior level engineers (three years beyond the secondary BEPC at Bambey, Senegal or Banco, Ivory Coast) who were chef de 1' inspection, 20 project controllers (three years beyond the BEPC at Kaedi) and 36 resource monitors (technical agents with three years vocational at Kaedi beyond the primary school certificate). The rest of the staff consisted of 54 forest guards and secretaries, chauffeurs, building guards, laborers and mechanics.

Participant trainees for the project will be drawn from the above staff plus some additional which the GIRM will be required to recruit. They will be assigned to the Protection of Nature Service to extend its national and regional coverage.

The Protection of Nature Service is the largest division of the Directorate and will be the most concerned with the project through its forestry service. The Service is administratively divided into four "Inspections" or regional headquarters. The four Inspections cover the country's 13 regions as follows:

First Inspection, Nema: Regions 1, 2 and 3
Second Inspection, Kaedi: Regions 4 and 10
Third Inspection, Rosso: Regions 5, 6, 9 and 11
Fourth Inspection, Atar: Regions 7, 8, 12 and 13

Each inspection contains several cantounements which, in turn, are divided into posts. Most political regions are covered by one cantounement, with posts covering a prefecture.

The Resource Inventory team will work out of, and be responsible to the offices of the Directorate for Agro-Pastoral Protection and Management in Nouakchott. The Directorate will assign laborers and mechanics.

Participant trainees for the project will be drawn from the above staff plus some additional which the GIRM will be required to recruit. They will be assigned to the Protection of Nature Service to extend its regional coverage of the country.

The Protection of Nature Service is the largest division of the Directorate and will be the most concerned with the project through its forestry service. The Service i s administratively divided into four "Inspections"or regional headquarters. These are located at Atar in the North, Nema in the southeast, Kaedi in the south, and Rosso in the southwest.

The Resource Inventory team will work out of the offices of the Directorate for Agro-Pastoral Protection and Management in Nouakchott. The Directorate will assign counterpart personnel to the team as well as have the responsibility for coordinating with other ministries as required.

Pilot project interventions will take place and be directly responsible to the Protection of Nature counterpart personnel to the team as well as have responsibility for coordinating with other ministries as required.

Pilot project interventions will take place in and be directly responsible to the Protection of Nature Service Inspection 3, located in Rosso. Physically, the activities will take place in the Prefectures of Mederdra and Bautilimit. The Chef de l'Inspection for Inspection 3 will be the immediate GIRM contact and have supervisory responsibility for GIRM assigned personnel.

The Protection of Nature Service Post at Mederdra currently has three persons assigned to it--two resource monitors and one forest guard. It will be necessary for the Service to augment this staff by 2-3 others. The post at Boutilimit was closed due to lack of activities. The Service has agreed to reopen the post and it will require at least four persons.

In order that he is able to carry out his necessary duties and supervision of the project, the Chef de l'Inspection will have a project vehicle assigned to him.

Other GIRM personnel who will be actively concerned with the project will be the Prefects of Medardia and Boutilimit and their staffs. It is anticipated that they will play a coordinating and legitimizing role. In addition local political, religious and traditional leaders and authority figures will play an important role (see Social Analysis). Their support for legitimizing project interventions to a conservative traditional society will be imperative.

The activities of the proposed project ultimately extends over the authorities of several ministries. To assure coordination of efforts and priorities of action, periodic reports will be given to the inter-ministerial committee for the Protection and Conservation of Nature. This committee was activated by decree of President Ould Daddah on February 28, 1977. It consists of the following:

President: The Minister charged with the Protection of Nature or his delegate;

Vice-President: The Minister of Plan or his delegate;

Secretary General: The Director of the Directorate for Agro-Pastoral Protection and Management.

Members include the directors for livestock, agriculture, hydraulics, rural engineering, registries and stamps, tourism, culture, fish, mines and geology and the director of budgets and accounts.

The committee is required to meet at least two times annually and have established a permanent executive committee of four members.

2. Agency for International Development

Anticipating a general build-up of the AID staff capabilities in Mauritania, the CDO/Nouakchott will be assigning a project manager to the Renewable Resources Project. The project manager will have the overall responsibility for monitoring and evaluating project progress and the smooth flow of necessary paperwork. This person will be the contact point for contracted project technicians with AID, and the liaison between the contract teams and higher Ministry officials other than those with whom they have daily contact. The absence of this person designated as project manager will put a serious strain on the already overburdened staff of the Country Development Office.

The CDO will be required to carry out several activities in preparation for the arrival of project contractors upon signing of the project agreement. The first of these will be to arrange housing for project personnel. This will require construction of three houses, one each definitely at Boutilimit and Mederdra, and the third dependent upon the location chosen for range management activities. The construction of the houses at Boutilimit and Mederdra will be carried out by a local contractor. They will be constructed of soil-cement blocks with cement plaster and be of Mauritanian design. While austere, they will provide adequate standards of safety and comfort. Each house will have two bedrooms, a living/dining area, storage and laundry rooms, kitchen and bath. They will be surrounded by a block wall for protection against drifting sand. Cost estimates for construction have been given in Nouakchott at $40,000 equivalent. It will be necessary to install water storage, a septic tank, and a 15 kw generator at each house, in addition to normal furnishings. These items are estimated at an additional $25,000. Contact with USAID/Nouakchott will be maintained by single sideband radio on a frequency already established under the Integrated Rural Development Project at Selibaby. Nine houses will be required for rental in Nouakchott. One of these will be for the five year life of the project and the others for one year each. The CDO may consider rental of one additional large house for use by short-term consultants (less than 12 months) who will be unaccompanied by their families.

It is anticipated that, because of the difficult material circumstances under which the project team will be required to live, they will have access to WACASC facilities. It is therefore requested that AID/W issue the appropriate approvals as was done for the Integrated Rural Development Project.

Because of the long lead-time required for certain items, as soon as is practicable after project authorization and the signing of the project agreement, the CDO will initiate the procurement of vehicles and other necessary equipment and commodities. Other items will be ordered as required and recommended by the project team.

3. Project Implementation Teams

Project implementation will be contracted to United States firms. Two contracts are contemplated. The first will be for the resource inventory which will include aerial photography, development of photo mosaics, photo interpretation, satellite imagery interpretation and a "ground-truth" survey. The contractor will also be responsible for training Mauritanian counterparts in satellite imagery and photo interpretation. The contractor for the resource inventory will be chosen by competitive selection procedures in the United States. Advertisement for interested companies will be in the Commerce Business Daily and through AID's Small Business Office. While the contract will be directly with AID, it is proposed that GIRM officials take part in the evaluation and selection of the firm.

The second project implementation contract will be for carrying out the pilot interventions in the 6th Region around Boutilimit and Mederdra, and conducting the in-country training activities and identifying U.S. and third-country participant trainees. The CDO will be responsible for the processing of these participants once chosen. This contract will call for four persons for 48 project months each. Advertisements for proposals will again be in the Commerce Business Daily and through the AID Small Business Office. The same procedures for evaluation and selection as above are recommended. Position descriptions are summarized as follows:

Arid Lands Resource Manager/Chief of Party

(a) The Arid Lands Resource Manager will be the principal advisor for the dune stabilization program at Boutilimit. He will have responsibility for the establishment and supervision of one nursery (Boutilimit) and assist and make recommendations for the second nursery (Mederdra) in conjunction with the forestry advisor at Mederdra.

(b) This person will survey the project area cataloging resources and in preparation for the establishment of reserve areas.

(c) In conjunction with the Extension Education/Training Advisor, this person will have a responsibility to the development of a National Renewable Resources Plan.

(d) As project team leader, this person will have overall responsibility for assuring that team members are meeting project objectives as well as overall project reporting and administration for the contractor. Acting as team spokesman, this person will require a good command of French at an S-3/R-3 level.

(e) In conjunction with other consultants, the Resource Manager will assume timeliness of project inputs and choice of participant trainees.

(f) The position will require a Masters of Science Degree, or equivalent experience, administrative/management exposure and sufficient experience with or in developing countries to be sensitive to the need for displaying a combination of enthusiasm, dedication, and respect for the cultural traditions of the target population.

Extension Education/Training Specialist

(a) The Extension Education/Training Specialist will assist the Ministries of Education and Rural Development in compiling extension educational training data and identifying and planning overall project training and extension needs as required.

(b) In conjunction with other consultants, this person will assist the GIRM in selecting candidates for training at various levels to include training in the U.S., third-country, and Mauritania.

(c) He will have responsibility for liaison with other technical groups in Mauritania to identify training needs and materials as they relate to renewable resources, and then establishing and conducting the more formalized seminars at Kaedi Technical School or similar sites.

(d) He will also review formal and non-formal on-the-job training aspects of project implementation and make recommendations for necessary modifications.

(e) The position will require a Master's level degree in Education and Training with emphasis on extension education and program planning. He should have active

experience in rural extension work and experience with developing countries. An S-3/R-3 level in French is also required.

Forest Management Advisor

(a) This specialist will be responsible for the dune stabilization program at Mederdra, the nursery and developing and approach to reforestation activities in the Tine Yera Reserve and Rebaisement de Mederdra.

(b) Advisor will determine best methods for plantings of vegetation and plant placement to assure survival on dunes.

(c) The Forest Management Advisor should have a B.S. degree in Forestry and Forestry Management with experience in arid lands vegetation. A S-3/R-3 French language proficiency is also required.

Range Management Specialist

(a) Will survey the project area for the demonstration units and make a final selection for their establishment and supervise the trial period during the life of the project.

(b) Advisor will also be responsible for the supervision of development of watering points.

(c) Monitor the condition of rangelands in the project area and vicinity.

(d) Coordinate construction and maintenance of firebreaks delineating the perimeters of the grazing reserves.

(e) The Range Management Specialist should have a minimum B.S. degree in Range Management with experience in arid lands and developing countries. The position will require a sensitivity to the cultural and social aspects of the target population and a recognition that land and resource management is not a traditional practice. An S-3/R-3 level in French will also be required.

B. Implementation Plan

1. Project Implementation

Much of the successful implementation of the project will be heavily dependent upon the performance of

expatriate personnel. Actions taken immediately after the approval of the project paper will have a principal objective of soliciting proposals and negotiating contracts for necessary expatriate project personnel. Related to this will then be procurement of necessary vehicles, equipment, and commodities for their support and ability to commence project implementation.

Housing will be the first problem to solve in country, especially for Boutilimit and Mederdra. The CDO/Nouakchott will be required to secure drawings for REDSO Engineering review and then solicit proposals from local contractors for construction. The CDO will also be required to see that furnishings are ordered and installed.

The first of actual project activities will be the Resource Inventory, including the satellite imagery and aerial photography. The contractor should prepare and submit a plan to the CDO. The information from the survey will be of importance to the carrying out of other activities.

The consultants responsible for implementing the on-the-ground activities will be required to submit a preliminary work plan shortly after their arrival and orientation. This plan, in broad general terms, will provide a bench mark against which later, actual project progress can be later measured. After 3-4 months experience in the field and familiarity with the area and population, annual work plans will be required as guidelines for further project implementation. These plans are to be submitted to the CDO assigned project manager so that he/she will have a measure against which to monitor project progress.

The two nurseries to be established will be under the supervision of the resident on-site contract personnel. It is anticipated that the first transplantings from these nurseries will be accomplished in year three of the project--needing two years to establish seedlings which can survive transplanting. Initial seedlings will be provided by the GIRM from the government nurseries at Rosso.

Perhaps the most difficult work will be that of the extension education specialist assigned to the project. Having the responsibility of preparing materials for both formal and non-formal training activities, he will be required to maintain a close liaison with other project technicians as well as government officials. In order to carry out his activities, the extension education specialist must become familiar with all other aspects of the project. The preparation of annual training work plans will have to be closely

coordinated with the other specialists' annual work plans. The training requirements must be covered without conflicting with the needs of the personnel to be trained performing other necessary duties in project implementation.

The CDO/Nouakchott, project manager, will work with the extension education advisor and relevant government officials to prepare third-country and U.S. participant trainees. The CDO project manager will prepare the necessary PIO/Ps and communicate with SER/IT and the USAID missions in Rabat, Morocco and/or Dakar, Senegal for assistance in getting the trainees enrolled in their relevant Universities.

2. Procurement

Project procurement will include contracts for technical assistance and for the Resource Inventory, construction services (including well drilling), commodities, vehicles and equipment. Except for vehicles, some commodities (including POL) and construction services, these will all be of U.S. source and origin. Details of the project procure- with estimated landed costs in Nouakchott are included in the Project Procurement list.

(1) Contracted Services

Two contracts will be required to meet the objectives of the project. The first of these will be for the services required to carry out the Resource Inventory and related activities. This contractor will be responsible for the purchase of the necessary satellite imagery and arranging the aerial photography. The contract will also allow the contractor to purchase requisite materials to carry out a training program for GIRM personnel in satellite imagery and photo-interpretation.

This contract is to solicit through regular competitive selection procedures with advertisements in the Commerce Business Daily and by the AID Small Business Office. The second contract required will be for the provision of four technical assistance personnel. It is estimated that they will be required for 48 project months each as follows:

Range Management Specialist	48 p.m.
Arid Lands Resource Manager	48 p.m.
Extension Training Advisor	48 p.m.
Forest Management Advisor	48 p.m.

This contractor is to be provided through regular competitive selection procedures with advertisements in the Commerce Business Daily and by the AID Small Business Office.

Because of the lack of administrative capabilities within the relevant GIRM agencies, the above two contracts will be directly with AID.

(2) Vehicles and Equipment

Eight vehicles are to be procured for the project. They will include the following: 6 4x4 all-terrain long-wheel base passenger vehicles equipped with a trailer hitch in the rear, towing attachment for a towing cable or bar in the front, and 2 side-view mirrors, and 2 4X4 all-terrain ½ 3/4 ton pickup trucks equipped as above.

A waiver of Section 636(i) of the Foreign Assistance Act is requested for the purchase of these vehicles and their relevant spare parts to permit Geographic Code 935 procurement. The request for this waiver is based on the fact that American vehicle manufacturers do not maintain representation in Mauritania nor are necessary spare parts for vehicle maintenance available. These vehicles are critical for project purposes in order to maintain the necessary mobility of project personnel and transport of project commodities for implementation. It is not anticipated that any American manufacturers will have any (or adequate) facilities in Mauritania or nearby countries in the near future. As a consequence, 935 procurement is necessary.

Other project equipment can and will be procured from the United States. These requirements are listed in the Project Procurement List.

(3) Commodities

Except for POL products, building material and some minor commodities (split bamboo mats made by local artisans, and some miscellaneous plumbing fixtures--shelf item procurement) all commodities will be of U.S. source and origin. Authorization is therefore requested to purchase up to $72,000 worth of petroleum products locally, $106,000 of building materials and $3,500 worth of locally made shelf-item commodities.

The remaining commodities will be of U.S. source and origin and are detailed in the Procurement List, Annex

with estimated landed cost, Nouakchott. It will be noted that 1,000 pounds each of an insecticide and a rodenticide are included on the commodity list. These are for use on the two pilot nurseries to be established. They will be procured according to AID regulations and by separate PIO/Cs.

It will be noted that powders would provide easier and safer handling by local personnel. All applications will be under the direct supervision of contracted project personnel.

Where possible, U.S. Government excess property will be used if they can be delivered on a timely basis. Inquiries will be made before the initial orders are placed. Assistance from the REDSO/WA procurement advisor and/or SER/COM, AID/W will be requested to determine when and if excess property procurement will be attempted.

C. Evaluation Arrangements

Project evaluation will be a continued process as part of project implementation. This is especially necessary given the fact that, though specific interventions will be carried out, the project is designed to gather information and determine the types of activities which have the most probability for successful expansion and duplication. This continuous evaluation will allow for the flexibility required to make changes when and where necessary.

Annual work plans are to be prepared by each contract specialist to provide indications of what accomplishments should be expected during the work year. Each work plan should provide specific measurable goals and detailed evaluation methods to be used in determining success. The review of progress under the work plans will then provide

a basis for planning the following year's activities. These work plans will also provide a basis by which the Country Development Office project manager is able to monitor project progress.

Semi-annual progress reports will also be required for review by the project manager and relevant GIRM officials. These reports will make it possible to determine if changes in project implementation procedures are necessary. These progress reports will also be another tool for project monitoring.

The annual work plans, and the periodic review of progress against them, and the semi-annual progress reports will provide the basis on which annual project appraisal reports are prepared. The CDO/project manager will submit these PARs based on the above and additional inputs from the consultants and GIRM officials. They will reflect the progress being made towards achievement of the goal, purpose, and outputs of the project. AID and the GIRM will then be able to review this progress with the consultants and make sound decisions on the continued project implementation.

Project consultants' work plans and semi-annual progress reports, CDO PARs, correspondence and PIOs will make up the record of the project. They will be the means by which the outside observers are able to view project progress in achieving objectives. Six to eight months before project termination, a decision will have to be made as to whether the project has or is proving to be successful. It will be decided at that time if AID should support continued efforts in renewable resources similar to this project. As part of that decision-making process a team of independent observers should be fielded to carry out a formal project evaluation. As part of its task, this evaluation team should make a determination of the desirability of continuing the project in other areas of Mauritania based on the performance in meeting objectives and being accepted by the target populations. The terms of reference for the evaluation team should be prepared by the CDO/project manager in consultation with the contract staff and the GIRM. Officials of the latter should participate in this detailed evaluation.

D. Conditions, Covenants and Negotiating Status

Preparation of project documentation has included numerous meetings with GIRM officials. The close cooperation has kept them aware of progress towards completion of documentation and the issues being addressed. Any issues which

may remain after review of the project will be negotiated at the time of the project agreement which will contain certain conditions and covenants.

The project agreement will formally reflect the USAID and GIRM understanding on the support the two parties are giving to the project. Conditions precedent to disbursement of funds will be required for those items of support essential to satisfactory project implementation and progress toward project objectives.

It will therefore be a requirement that the GIRM show in satisfactory form and substance that the personnel required are budgeted for and firm assurances that they will be assigned to the project. It will also be required that the GIRM formally donate the two nursery sites (Boutilimit and Mederdra) to the project with requisite water rights to the wells put in. Part of the project agreement will reflect AID being designated as procurement agent for the GIRM with the right to redelegate procurement to an outside agent such as the Afro-American Procurement Center. It will also be required that the GIRM agree and present a plan for assuming part of the cost and provision of necessary POL for vehicles and equipment being provided by the project.

Conditions precedent will therefore be the usual requirements for a legal opinion and designation of responsible GIRM officials, plus plans for the provision of personnel, land and POL products. A special covenant will be the establishment of a GIRM interministerial/USAID evaluation program as part of the project. A second special covenant will be the presentation by the GIRM of its plans for following through on the project developed national plan for management and conservation of renewable resources. These last two are required as part of the objective of fostering GIRM intra-governmental cooperation in renewable resources.

LOGICAL FRAMEWORK

ANNEX I

GOAL	MEASURES OF GOAL ACHEIVEMENT
To promote self-sustained development in the rural sector through the establishment of comprehensive programs to build a manpower and resource base needed to withstand adverse climatic and environmental conditions, without disruption of continued development.	1. Sufficient members of GIRM personnel become qualified to plan and implement development programs in renewable resource management and conservation. 2. Increased cooperation and integration among GIRM technical and administrative personnel in solving problems of natural resources management. 3. Increased production of renewable resources with a decrease in per capita imports of wood and wood by-products. 4. Continued development to show a measurable increase in the standard of living of the rural population as a result of the efficient management of natural resources.
PURPOSE	**END OF PROJECT STATUS**
To survey existing renewable resources and implement a series of pilot interventions which, together, will provide sufficient data to develop an integrated program of renewable resource management and conservation in Mauritania.	1. An established data base on natural renewable resources available for present and future planning purposes. 2. GIRM Protection of Nature Service officials have sufficient knowledge of land conservation and resource management techniques to proceed with confidence on similar projects. 3. A cadre of trained extension personnel available to implement other programs in resource management. 4. Population in project areas sensitized to concepts of land conservation and management. 5. Physical interventions in place and showing results.

MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Goal	**Goal**
1. GIRM official personnel statistics. - 2. Project evaluation reveals the approaches to problem solving indicating increased interagency cooperation. 3. GIRM and other statistics on consumption and imports of products which relate to renewable resources. 4. Other projects in renewable natural resources being implemented.	1. GIRM committed to integrated inter-ministerial and intra-ministerial management of natural resources. 2. Regulations for the conservation of resources will be enforced. 3. Another severe drought will not occur before a capacity to withstand drought has been developed. 4. Other donors and GIRM support and implement projects in renewable natural resources.
PURPOSE	**PURPOSE**
1. Results of resource survey and final reports. 2. Project evaluation and progress reports. 3. GIRM statistics, AID documentation, project progress reports and evaluation. 4. On-site inspections and project evaluation.	1. GIRM will promote additional projects and continue on-going programs when donor activity is completed to carry out a national program in resource conservation and management. 2. Project objectives are understood and respected by local population where activities take place. 3. Personnel trained will remain with their GIRM services responsible for implementing resource projects.

OUTPUTS	MAGNITUDE OF OUTPUTS
1. Completed resource survey, inventory, and data base.	1. Completed by calendar year 1980.
2. National plan developed for management and conservation of renewable resources.	2. Completed by calendar year 1980.
3. Personnel trained for Protection of Nature Service.	3. a) Two top level technicians have U.S. university training; b) Six technicians completed third country training; c) Forty GIRM employees receive in-country extension training; d) Nine participants complete LANDSAT/aerial photography interpretation training in-country.
4. Dune stabilization in pilot areas with experience gained for replication.	4. Stabilization programs established in two pilot areas.
5. Pilot facilities established.	5. Two demonstration plant nurseries and two 10,000 ha. grazing reserves established; and two areas for reforestation activities prepared for a project implementation.

INPUTS

AID
1. Technical assistance with support.
2. Resource inventory.
3. Vehicles and equipment.
4. Commodities.
5. Training.
6. Construction and well drilling.
7. Other.

GIRM
1. Personnel and labor.
2. Water.
3. Land.
4. Commodities.
5. Training.

IMPLEMENTATION TARGET ($000)

AID	FY 78	FY 79	FY 80	FY 81	FY 82	FY 83
1	-	286.0	370.5	370.5	370.4	95.3
2	740.0	690.4	-	-	-	-
3	60.0	262.3	67.4	-	-	-
4	60.0	292.9	215.3	77.7	-	-
5	40.0	45.5	83.3	83.2	47.9	28.0
6	90.0	172.0	100.4	-	-	-
7		5.7	5.7	5.7	5.8	5.8
Total:	1,000.0	1,744.8	842.6	537.1	424.1	129.1

IMPLEMENTATION TARGET ($000) (continued from Page 3.

GIRM

	FY 78	FY 79	FY 80	FY 81	FY 82	FY 83
1	56.4	116.2	102.1	95.1	95.1	42.3
2		7.6	13.8	13.8	13.8	6.0
3	46.5	-	-	-	-	-
4		20.0	36.5	54.5	54.0	10.3
5		1.1	1.1	1.1	1.1	-
Total	102.9	144.9	153.5	164.5	164.0	58.6
Project Total	1,352.9	1,639.7	996.1	701.6	588.1	187.7

MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS	**OUTPUTS**
1. Report submitted by resource survey consultants. 2. Publication of national plan. 3. AID reporting on participant training, technicians' reporting on in-country training, GIRM placement of trained personnel. 4. On-site inspections. 5. On-site inspections.	1. Resource inventory can be carried out by a contractor as anticipated. 2. GIRM will use information of inventory and work with technicians to expeditiously develop plan. 3. U.S. and third country universities accept Mauritanian candidates, and relevant programs for in-country training can be developed and carried out. 4. Stabilizing plants take root and local populations respect project perimeters. 5. Areas identified and to be identified are conducive to development and populations will contribute to and respect development.
INPUTS (AID)	**INPUTS**
1. Contract for team of technicians. 2. Contract with firm for carrying out resource inventory. 3. PIO/C's and shipping documents. 4. PIO/C's and shipping documents. 5. PIO/P's. 6. Contracts with firms to carry out construction and well drilling.	1. Qualified American technicians can be recruited and willing to work long-term in Mauritania. 2. Contractor willing to take on resource inventory and train Mauritanians while doing so. 3. Vehicles, equipment and commodities can be procured for timely arrival. 4. Qualified Mauritanian candidates for training are forthcoming. 5. GIRM will provide personnel as required and local population willing to contribute labor as needed.

ANNEX II

RENEWABLE RESOURCE INVENTORY COMPONENT FOR THE MAURITANIA RENEWABLE RESOURCES MANAGEMENT PROJECT

A priority necessity of the GIRM is the identification, evaluation and quantification of the country's natural resources. This would provide a basis for determining the optimal use of Mauritania's land resources through integrated resource planning, management and development. Optimization of land resource use is vital for satisfying both short and long term development needs.

More specifically, such an inventory is required to carry out the pilot interventions in natural resource management planned for the Boutilimit and Maderdra areas, that are components of this overall project.

If Mauritanians are to have limited assistance and internal resources with which to work, they must make the most of the development resources available to them. They cannot afford the luxury of errors in judgments among land use decisions and project sites. Hence the renewable resource inventory and evaluation provides some rational means by which to select activities and their sites with a reasonably, empirically based projection of results.

The land resource inventory and evaluation activity involves the collection and integration of information, principally of an ecological nature. It will include data on geology and mineral resources, morphopedology and soil characteristics for agricultural use, hydrology including surface water resources, forest and rangelands, vegetation, wild and domestic animals, road access, population density, and past and present land use.

Once the information has been collected and integrated, the potential use of the land, based on current and potential physical and human conditions, can be determined. The inventory and its evaluation will enhance existing economic and ecological guidelines for development.

GOAL

The goal of developing the natural resource inventory is the rational use of Mauritanian resources by the GIRM for attempting to meet short term and sustained needs of the Mauritanian people. The verifiable indicators are: 1) the extent to which the GIRM uses the inventory and its outputs in allocating development resources and selecting projects; 2) the extent to which the inventory is used in carrying out the training, dune stabilization, forest management and range management components of this overall project; 3) the extent to which integrated resource management, using the resource inventory as a fundamental tool, is institutionalized in the land use planning process by the GIRM; and 4) evidence that needs of the Mauritanian people are more effectively being met through resulting rational land use, and integrated resource management.

PURPOSE

The purpose of developing the renewable resource inventory is to have a comprehensive data base and to begin an evergrowing body of knowledge about the resources of Mauritania. The data base is to be accessible to all potential users. This particular project will focus on the approximate southern third of the country. Developing the inventory will require the cooperation of government officials and scientists from all countries having applicable information. This inventory and analysis will provide the technological base for planning and implementing optimal use of renewable resources.

The verifiable indicators are the: 1) development and publication of a systematic resource inventory, mosails and maps, mapping legends, descriptive legends, interpretive legends and their accompanying overlays and narratives, and tabular data; 2) development of production estimates for the different kinds of Mauritanian land units; and 3) establishment of a repository in Nouakchott of all pertinent information concerned with the Mauritanian natural resource base.

LOCATION AND EXTENT OF COVERAGE

The area to be covered is the southern portion of Mauritania (see map, A-15). This area is approximately bordered by 14° N and 19° N latitudes and 5° W and 17° W longitudes. The 195,000 square kilometers that this southwestern portion includes will all be covered by LANDSAT. Six scenes would be required, each scene covering 32,225 square kilometers.

For the more precise and detailed survey needed for Boutilimit and Mederdra and their surrounding areas, aerieal photography will be used. This approximate area for aerial coverage is 15,500 square kilometers. The Slibaby area will have aerial coverage under the (Selibaby) Integrated Rural Development Project (682-0201). The results of this coverage will be available for this survey and the eventual ground study.

TECHNICAL APPROACH

To accomplish the designated purpose the contractor will use a dual-level approach. A reconnaissance inventory, which is based primarily on LANDSAT imagery at 1:200,000, enlarged from 1:1,000,000 scale, will be the first level. This will provide a synoptic view of Mauritania's whole southern third and indicate potential resource development or conservation areas which need to be scrutinized more closely.

The second level involves the more detailed survey showing mapped data at a scale of 1:50,000 and 1:25,000 in some cases. The Boutilimit and Mederdra areas and Selibaby have already been selected for this degree of inventory and in fact for this project, at this larger scale, the only areas. For additional areas deserving detailed survey as indicated by the reconnaissance inventory, GIRM will be responsible for this extended work.

PROCEDURES

In order to accomplish the purpose, the following procedures are prescribed. If for some reason the contractors believe another set of procedures will more effectively and efficiently produce the desired project goal and the inventory most useful to Mauritania, discussion with AID and Mauritanian project personnel is desired. This procedure provides tested guidelines, but it is not meant to be extremely rigid or opposed to changes which may be merited due to unique qualities of Mauritania, new inventory methods, or preparatory techniques of a contractor.

A) PRELIMINARY

- Existing information on geology and mineral resources, soils, vegetation, agriculture, morphology, hydrology and ground water resources, forests, rangelands, wild and domestic animals, livestock and fisheries, land use patterns, demography, transportation and climate should be assembled and synthesized. The pertinent published and unpublished data will be collected from libraries and files of concerned agencies in and outside of Mauritania.

- A reconnaissance low level overflight utilizing a small aircraft is strongly recommended to familiarize the study team with the general terrain characteristics and ecological complexity of vegetation soil patterns and to provide preliminary guidance for planning logistics of developing the inventory.

- If deemed necessary, surface reconnaissance of the four project regions to be covered by aerial photography may also be made. This would provide specific, but preliminary information concerning land form and vegetation and soils characteristics. This information can be essential to subsequent photo-interpretation and to the development of the mapping legend which is required for cartographic display of mapped resource characteristics.

B) RECONNAISSANCE PHASE - MAPPING BASED ON LANDSAT IMAGERY

- Lay the 1:200,000 scale uncontrolled mosaic from black and while images of bands 5 and 7.

- Mark areas that appear to be similar to one another and make initial interpretations.

- Overfly and/or ground-truth selected sample areas to check initial interpretation and to obtain information to assist in establishing further delineations.

- Delineate vegetation-soil units of a size consistent with scale of the imagery and that insofar as possible, contains a homogeneous unit.

- However, the often complex arrangement of vegetation-soil is recognized. In cases where it is cartographically necessary, up to three vegetation-soil units may be enclosed in a single delineation. In such cases, identify each unit, estimate its relative area contributing to the entire delineation, and describe it in the legend.

- Where due to cartographic necessity more than three vegetation-soil units are enclosed in a delineation, map it as a complex and describe each vegetation-soil unit enclosed in the delineation fully.

- Delineate on the mosaic or overlays, present characteristics that include, but may not be limited to: 1) geology and mineral resources, and fracture; 2) present land use including agriculture, forestry and grazing; 3) hydrology and surface water; and 4) town, cities and roads.

- Develop a tentative numerical legend to define, by name, the vegetation-soil delineations, and the other existing resource characteristics that have been delineated by numerical symbols.

- Develop a descriptive legend which fully defines all characteristics delineated thus far.

- Obtain photo records showing typical characteristics of each mapping unit during the final ground-truthing phase of the study.

- Check all determinations for accuracy through ground-truthing and aerial overflights.

- Change determinations where necessary and finalize mosaic, overlays, numerical legend and the descriptive legend.

- In collaboration with planners, and based on descriptive data of actual resource characteristics in the southwestern third of Mauritania, delineate land capability on one overlay and suitability on another. Land capacility should be determined using primarily ecological criteria. To determine land suitability, all available information about the country, i.e. pressing commodity needs, employment needs, access to potential development areas, capital resources available, terms of trade, cultural and social patterns, should be analyzed through an integrative process. Possible classifications for both capability and suitability may include, but not be limited to: 1) areas suited to rainfed agriculture; 2) areas with potential for irrigated agriculture; 3) areas suited for livestock grazing; 4) grazing areas with improvement possibilities; 5) candidate areas for surface or ground water development; 6) areas suited for forestry; 7) road construction possibilities; 8) potential village sites; 9) estimated population shifts; and 10) economic activities location.

- Develop two interpretive legends, one which fully defines the land use capability delineations and the other, land use suitability delineations, made on their respective overlays.

- Provide on the interpretive legends, estimates of potential productivity under different levels of input for each major mapping delineation.

- In determining optimum use, which will be reflected in the interpretive maps, overlays and legends, a comprehensive view of Mauritania and its development goals must be at work.

C) DETAILED PHASE FOR THE THREE SUB-PROJECT AREAS BASED ON AERIAL PHOTOGRAPHY

- Lay 1:50,000 scale uncontrolled mosaic from black and white aerial photography for Boutilimit, Mederdra, Selibaby, and their surrounding areas (see map, attached).

- Follow same procedure as outlined for reconnaissance inventory, but delineate all characteristics to the degree of detailed allowed by the larger scale and by the source of information.

- Develop the legend sets and accompanying overlays, consistent with those for the reconnaissance inventory. (For example in the reconnaissance survey, 300 may notate natural vegetation and 320, the shrub dominant life forms. In the more detailed survey then, 322 would notate thorn bush (Acacia spp. communities).

- If the scale of 1:50,000 portrays areas potentially significant to agriculture or another critical land use function, obtain imagery at 1:25,000 scale for that particular area to more accurately interpret data and effectively implement projects.

- After completing the more detailed survey for the three project areas, data may be available to make the reconnaissance inventory more accurate. If there appears to be more than insignificant discrepancy, the contractors will correct the reconnaissance inventory.

OUTPUTS

Number of Units	Description
	Reconnaissance Level
10	Copies of 1:200,000 scale mosaic from black and white LANDSAT images (bands 5 and 7) of southern Mauritania bordered approximately by 14° N and 19° N latitudes and 5° W and 17° W longitudes. Imagery forming the mosaic will be from one season from a single year. The mosaic will display vegetation-soil units distinguished by lines that are unobtrusive to other data.

OUTPUTS (con't)

Number of Units	Description
10	Copies of all overlays delineating all other resource characteristics suggested in the procedure. (The vegetation soil units and other resource characteristics can be delineated (either on the mosaic or on overlays, as seen fit by the contractor)).
10	Copies of numerical legends defining by name the vegetation-soil units and the other resource characteristics that are categorically delineated.
10	Copies of descriptive legend fully defining all resource characteristic delineated thus far on the mosaic or overlays.
10	Copies of land capability overlay.
10	Copies of land suitability overlay.
10	Copies of interpretive legend defining land use capability and suitability that are categorically delineated.
	Detailed Phase for Three Subject Project Areas
10	Copies of 1:50,000 scale uncontrolled mosaic from black and white aerial photography for Boutilimit, Mederdra, Selibaby and their surrounding areas (see map). Vegetation-soil units will be marked on the mosaic.
10	Copies of matching overlays with the additional land characteristic delineations. (The contractor can decide on using the mosaic or overlays for marking the various delineations.)

OUTPUTS (con't)

Number of Units	Description
10	Copies of numerical legend defining by name vegetation-soil units and other characteristics that are categorically delineated. The categories will be consistent with those of the reconnaissance inventory, but will vary in the degree of detail due to what is possible at this larger scale consistent with that for the reconnaissance inventory.
10	Copies of descriptive legend fully defining all resource characteristics which have been categorically delineated.
10	Copies of land capability overlay. The suggested categories are listed in the procedure.
10	Copies of land suitability overlay.
10	Copies of interpretative legend defining land use capability and land use suitability that are categorically delineated.
	Outputs for Both Levels of Inventory
10	Copies of tabular data reflecting kinds, amounts and location of present and potential crop, range, forest and other yields, at two to four technically feasible levels of inputs for each mapping unit. As a rule, the crops addressed will be the staples of the region. Range yield coefficient estimates will be made for each appropriate mapping unit in terms of kilograms of usable forage per hectare per grazing period. The forest yield coefficient will be determined for each applicable mapping unit. Other yield coefficients will be determined as the inventory progresses, and the important categories present themselves.

OUTPUTS (con't)

Number of Units	Description
10	Copies of all reports relating to work performance and preparation of documents listed in the procedure and output sections. All reports should be written in French and English and accompanied with data, maps, diagrams, plans, specifications and all appropriate documents. The reports are as follows:

a) The preliminary report will indicate the proposed work plan for fulfilling the program of work. It will be accompanied with preliminary findings that will substantiate the work planned.

b) The program report will be submitted every three months to AID and Mauritian project personnel. They will include a summary of all work done, temporary conclusions, recommendations and all appropriate information that should be made known to national authorities, and the program planned for the upcoming period.

c) The special report will be forwarded to the host government and USAID when an important, interesting and unexpected discovery or particular event occurs.

d) The temporary report which includes all findings and outputs, the resources inventory/evaluation itself, will be reviewed and commented upon by USAID and Mauritian officials. When all parties agree on the temporary report, the final report will be submitted for printing.

e) The temporary and final reports shall include, but not be limited to the following documents: 1) bibliography of compiled studies and documents; 2) all outputs of inventory as detailed, beginning page 6; 3) notes on investigations and any explanatory diagrams; 4) recommendations for further inventory work in Mauritania; 5) full exam-

OUTPUTS (con't)

Number of Units	Description
	ination of economic and ecological costs and benefits of various land use alternatives; 6) outline of organization, expertise and equipment needed for Mauritania to be self sufficient for carrying out inventories; 7) development program detailed and priced indicating hypothesis for productivity, the calculation of various land use cost and benefits; and 8) recommendations for the organization and realization of the resource development program.

- The verifiable indicators for the outputs are: 1) interim reports by implementing agencies; 2) properly compiled maps, mosaics, overlays with appropriate legends, narratives, tables and field notes; and 3) final outputs.

- The major assumption is that the required inputs are available from Mauritania and the contractor to produce the outputs.

INPUTS

- The inputs will be jointly determined by the contractor, AID and the host government. The following serves as a possible guideline:

1) Personnel

2 soil scientists, 12 months
2 range ecologists, 12 months
1 resource planner, 6 months
1 geo-hydrologist, 12 months
1 remote sensing specialist, 6 months
1 arid lands agronomist, 12 months
1 team leader, 14 months (arid lands specialist)
1 secretary, as needed for project duration
2 interpreters

INPUTS (con't)

2) Commodities

4 5-passenger land rovers complets with gas and emergency maintenance equipment (AID).
safari equipment for 22 people (AID).
1 reconnaissance aircraft (aerial photographic equipment may be necessary) (contractor).
___ permits valid for project duration for additional flights that may be necessary for interpretative checks for aerial photographs (GIRM).
___ permits valid for duration of the project for taking either 35 mm or 70 mm photography of vegetation, soil, land use conditions (GIRM).
___ LANDSAT imagery and aerial photos (contractor).
___ Office space in Nouakchott with table, chairs, lights, desk supplies (GIRM/AID).
___ Photo interpretive equipment provided by the contractor.

- The inventory experts and inventory equipment with the exception of vehicles and camping equipment, will be provided by the contractor.

- Mauritanian counterparts should be involved at every phase of inventory development, for training and full participation in directing the inventory process.

- The verifiable indicators are appropriate involvement of all designated personnel and utilization of equipment for producing the inventory.

- The major input assumption is that the GIRM will be able to provide suitable counterparts.

RELATIONSHIP TO OTHER PROJECTS

In addition to the Renewable Resources Management Project (682-0205), of which this is a part, there are two current AID projects for Mauritania which will be able to greatly utilize this inventory.

1) Mauritania Integrated Rural Development Project (682-0201) - A series of interventions in range management, livestock control, animal health and agronomy will be tested in order to determine the acceptability of these interventions by the local population. These interventions will take place upon a 400 hectare range management unit and three other units in the Tenth Region near Selibaby, the regional capital. The subject inventory is planned to include Selibaby as noted in the procedure, and hence prove valuable for the rural development project in carrying out its interventions.

2) Rural Sector Assessment (RSA) and Manpower Employment Study (MES) (RSA + MES = RAMS) (682-0211) - This project will consist of carrying out a program of studies and developing related Policy Papers which focus on rural sector development including manpower development and employment. There are six major activity groups in the project. The activities of Groups I and II, Aggregative Studies and Production Sub-sector Studies respectively, are directly related to land use and require a natural resource data base. A description of agro-ecological zones is called for as well as information on the development potential for irrigated agriculture, dryland (rainfed) agriculture, livestock, oases agriculture and inland fisheries. The Resources Inventory and Analysis data generated and assembled for the subject Renewable Resources Management Project may also provide demographic and other indicators needed for the RAMS project.

The RAMS project area is principally the southern third of Mauritania, which is the same general area for the subject project. However, the intensity and detail of the survey may not be sufficient for some areas important to the RAMS project. It will be necessary, therefore, for the RAMS team to provide the necessary detail.

3) Senegal River Basin - The Senegal River Basin includes portions of three countries, Senegal, Mali and Mauritania. The three countries have come together for cooperative development of the basin with the Organisation Pour la Mise en Valeur du Fleuve Sénégal (OMVS).

The OMVS wishes to develop the river for transport, power generation and agriculture. Two major projects are in various stages of planning: 1) A large upstream dam on the major tributary, the Bafing River, at Manantali, Mali for regulating the river flow at 300 m^3 per second; and 2) a low level salt water intrusion Dam at Diarra, Senegal (between Mauritania and Senegal) in the river delta. The construction of these dams will permit development of intensive double cropping agriculture, inland fisheries and river navigation. At the same time provide power for expanding developing the mining and processing of phosphates, iron ore and potentially bauxite. With the development of irrigated agriculture, improved, increased livestock production and forestry development will be possibilities, as well as the construction of food processing plants.

AID is supporting the OMVS with several projects including: 1) Agriculture research; 2) Manpower development; 3) An environmental study of the entire basin; 4) A hydrological study; 5) A basin mapping survey.

The Renewable Resource Inventory will cover areas adjacent to and within the Mauritania portion of the Senegal River Basin. The satellite imagery will include the entire Mauritanian part of the basin, the aerial photography of the range management activities are within the basin confines, and the ground surveys include the range management area and parts of the Tenth Region within the basin while the areas surrounding Mederdra and Boutilimit are adjacent. The inventory for the Mauritania Renewable Resources Project thus will be valuable for developing specific information for activities planned for the basin, and for providing common ground for collaborating on sub-activities of basin development through the OMVS and bilaterally with the GIRM.

RESOURCE INVENTORY BUDGET ($000) [1]

Personnel in Mauritania [2]

Team Leader (14 months)	$ 55.75
Soil Scientist (12 months)	46.00
Soil Scientist (12 months)	39.75
Resource Planner (6 months)	25.80
Geo-Hydrologist (12 months)	52.60
Remote Sensing Specialist (6 months)	25.80
Arid Lands Agronomist (12 months)	39.75
Range Ecologist (12 months)	39.75
Range Ecologist (12 months)	33.50
Secretary (12 months)	21.75
	$ 380.45
Overhead [3]	261.25
	$ 641.70

Interpreters (local)	$ 10.00
Home office personnel and overhead	$ 35.00
Per Diem for home office personnel in IRM (90 days at $60)	5.40
	$ 40.40
Aerial photography	$ 60.00
Equipment, supplies, processing, printing and duplicating	$ 50.00
International Travel - 32 at $1,700	$ 54.40
U.S. Travel - 12 at $250	$ 3.00

250 kilograms air freight each long-term consultant[4/]	$	45.00
100 kilograms air freight each short-term consultant[5/]	$	4.00
Storage of HHE		20.00
General and Administration[6/]		68.2
Fee[7/]		102.3
TOTAL CONTRACT		$ 1,099.00
(For Project Paper say ..... ±		$ 1,100.00)

Notes to Budget:

1/ For contract only. Does not include vehicles and housing which are AID/Project provided.

2/ Cost of these personnel includes all allowances; 2 six months specialists expected to be TDY and per diem in lieu of allowances included.

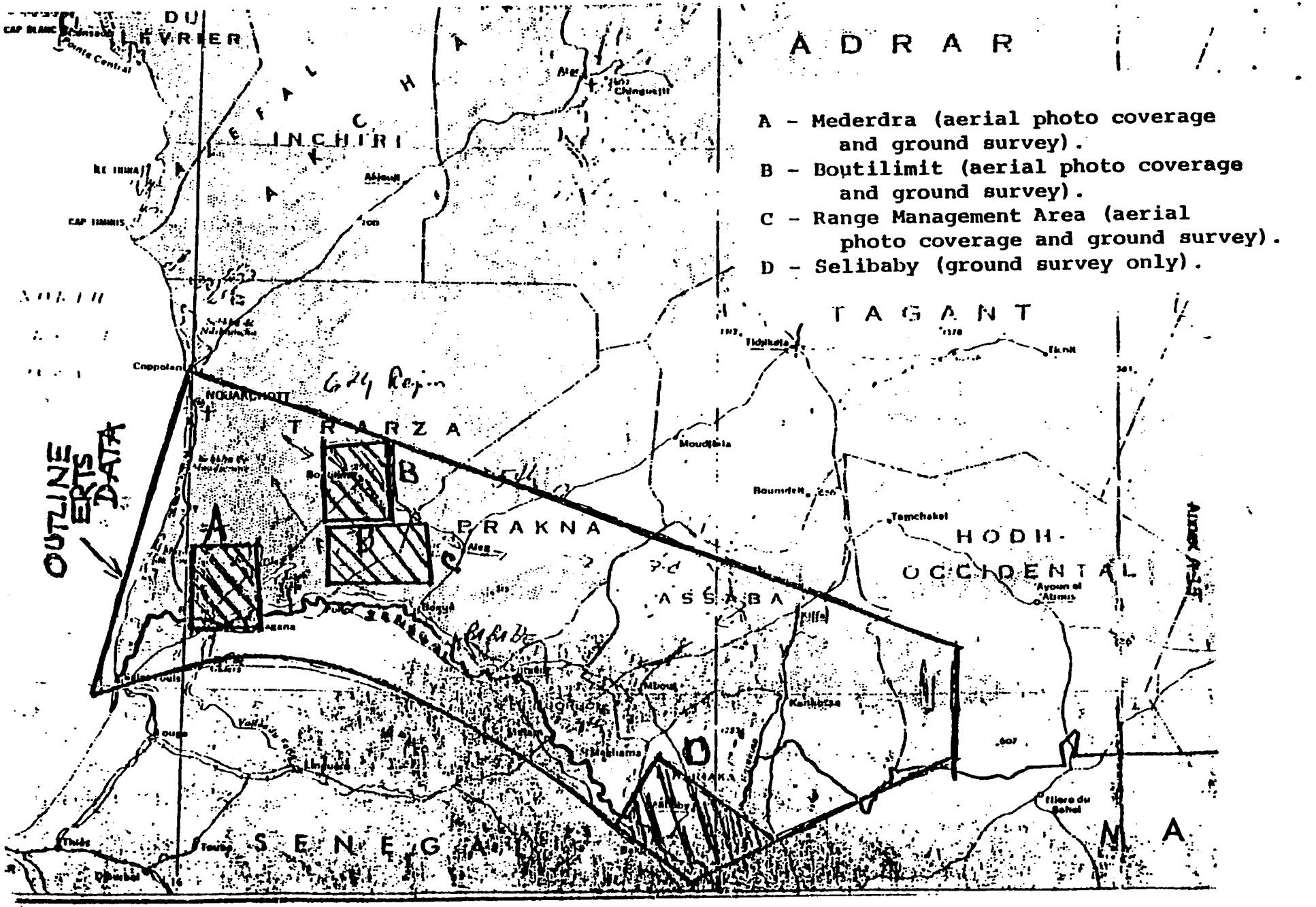
3/ Overhead calculated at 110% of direct salaries of $237,500.

4/ Allow air freight of limited HHE in lieu of sea shipment of HHE and POV as consultants for 12 months only.

5/ Same reasoning as 4 above for 6 months consultants.

6/ Based on 10% of cost of personnel.

7/ Based on 15% of cost of personnel.



A - Mederdra (aerial photo coverage and ground survey).
B - Boutilimit (aerial photo coverage and ground survey).
C - Range Management Area (aerial photo coverage and ground survey).
D - Selibaby (ground survey only).

Annex III

Project Procurement List

Item	Source	Estimated Cost
Contracts		
Resource Inventory	U.S.	$1,100,000
Technical Assistance	U.S.	$1,208,000
House Rentals	Local	$ 234,000
Construction	Local	$ 155,000
Well Drilling	Local or 935	$ 160,000
Aircraft Charters	Local	$ 25,000
Vehicles & Equipment		
8-4x4 all-terrain vehicles w/trailer hitches and towing cable attachments	935	$ 120,000
2-200 liter water tanks-trailer mounted	U.S.	$ 8,700
3-15 kw generators (diesel)	U.S.	$ 75,000
4-3.5 kw generators (gasoline)	U.S.	$ 12,000
4 submersible water pumps 20 gpmc 200 feet	U.S.	$ 8,000
4-4.5 kw generators (gasoline)	U.S.	$ 16,000
3-20 psi rotary water pumps (manual)	U.S.	$ 1,500
3 site marker w/accessories transits	U.S.	$ 6,600
2-7-1/4" rotary power saws (electric)	U.S.	$ 400
2-18" chain saws (gasoline)	U.S.	$ 900
2 3/8" power drill sets (electric)	U.S.	$ 600
3-general purpose tool kits (carpenter w/some plumbking tools)	U.S.	$ 2,200
8-vehicle maintenance tool kits	U.S.	$ 3,500
2-standard meterological stations for field sites	U.S.	$ 3,500
3-single side band radios	U.S.	$ 4,500
6-60 gallon fuel storage tanks w/rotary hand pumps	U.S.	$ 4,800
Spare parts for vehicles generators and pumps	935 & U.S.	$ 50,000 ($40,000 935)

Item	Source	Estimated Cost
Commodities		
Camping equipment	U.S.	$ 3,500
3 million jiffy peat pots - 5" diameter	U.S.	$254,000
1,200 kilograms grass seed	U.S.	$ 8,700
200-100' rolls 4x4 mil polyethyline sheets	U.S.	$ 3,200
200-8 mil 100' x 100' polyethyline sheets	U.S.	$ 25,000
1000 lb. ea - rodenticide and insecticide	U.S.	$ 9,000
20-5 gallon fuel cans (metal)	U.S.	$ 600
200-3 gallon buckets (metal)	U.S.	$ 1,000
200-8 liter watering cans (metal)	U.S.	$ 2,800
400-long handle shovels (200 square point-200 round point)	U.S.	$ 5,300
400-long handle garden hoes	U.S.	$ 5,300
400-garden trovels	U.S.	$ 1,750
4-wheel barrows	U.S.	$ 3,900
3,000-8' steel fence posts	U.S.	$ 28,500
3,000 post anchors	U.S.	$ 22,500
3,000 fence stays	U.S.	$ 2,850
20 fence installation kits	U.S.	$ 3,500
54-150' water hoses	U.S.	$ 8,200
2,000 feet-1" polyethyline pipe and fittings	U.S.	$ 1,000
800 meters 6' chainlink fence fabric - 9 gauge with toprails and line posts	U.S.	$ 13,000
8 corner posts	U.S.	300
12 terminal posts	U.S.	400
2 drivein gates	U.S.	500
4 walkin gates	U.S.	300
miscellaneous plumbing fittings	Local (935)	$ 1,000
2,500 feet split bamboo matting	Local (935)	$ 2,500
POL	Local (935)	$ 72,000
Educational materials	U.S.	$ 12,500
50,000 meters barbed wire	U.S.	$ 17,500

Item	Source	Estimated Cost
Home Furnishings		
36 12,000 BTU Airconditioners or evaporative coolers	U.S.	$12,600
12 18 cu. ft. refrigerators	U.S.	$ 8,400
12 12 cu. ft. freezers	U.S.	$ 5,400
12 clothes washers	U.S.	$ 4,800
12 clothes dryers	U.S.	$ 4,200
36 stepdown tranformers (12 ea. 500w, 1000w, 1500w)	U.S.	$ 2,300
12 hot water heaters (40 gal. capacity)	U.S.	$ 2,400
12 living room sets	U.S.	$ 14,400
12 dining room sets	U.S.	$ 14,400
24 bedroom sets	U.S.	$ 31,200
12 gas ranges	U.S.	$ 3,600

ANNEX IV

INITIAL ENVIRONMENTAL EXAMINATION

Project Location:

In the Sixth Region of Mauritania, in the southwestern corner of the country, north of the Senegal River. One small area of the Tenth Region, in the southcentral part of the country is included for a ground survey of renewable resources.

Project Title:

Mauritania Renewable Resources Management

Funding:

Fiscal Years 1978-1982 $4,677,700

Life of Project:

Fiscal Years 1978-1983 (5 years)

IEE Prepared by: Date:

Laurance W. Bond February 14, 1978

Environmental Action Recommended:

It is recommended that a negative determination be made and no further environmental action is required (see page 6).

Concurrence: Date:

Robert M. Klein
Country Development Officer
Nouakchott, Mauritania

Assistant Administrator's Decision:

Approve:_____ Date: _____

Disapprove:_____ Date: _____

DESCRIPTION OF PROJECT

The proposed project for Renewable Resources Management in Mauritania, has as its long-term goal the promotion of self-sustained development in the rural sector through the establishment of comprehensive programs to strengthen a manpower and resource base needed to withstand adverse climatic and environmental conditions, without disruption of continued development. The project concept and purpose is to find and develop techniques and methods that will improve environmental conditions now and to an even greater extent in the future. Pilot interventions, in addition to a resources inventory and educational training, will be implemented to rehabilitate and revegetate areas that have experienced severe and steady deterioration of soils and natural vegetative cover due to over use and adverse climatic conditions.

The proposed project includes several components, the first of which is a renewable resources inventory. This inventory will utilize satellite imagery, aerial photography and "ground truth" surveys to develop maps and photo-mosaics showing vegetation, soils, water and terrain features needed for renewable resource planning and management. In addition, Mauritanian technicians will be trained in photo-interpretation, resource planning and ground truth surveying.

The second component of the project provides for the training of Mauritanians in resource planning and management through the provision of scholarships for United States and third-country training, and in-country training as an integral part of the project. It is expected that two scholarships will be provided for U.S. training and six for third-country training. Up to 40 Mauritanians are expected to receive in-country training in extension methods for promoting resource conservation and management.

A series of pilot interventions in sand dune stabilization, range management and reforestation will comprise the third component of specific activities. These basic activities will attempt revegetation of areas that have experienced advanced degradation, and introduce proper management techniques for rangelands and forest areas. The key to all of these interventions will be the degree to which the local population will be involved at all stages of these interventions.

See pp 12-18 fo Project Paper for full description of interventions.

By the end of the project, a substantial body of information will be available on natural renewable resources. This knowledge will have been integrated with the results of the pilot interventions to develop plans suitable for expansion to other areas of Mauritania. Knowledge and experience will have been gained by the local population and GIRM on annual and perenial vegetation required for protecting and expanding the natural resource base. Trained technical and extension personnel will be available for future project implementation and rational management of Mauritania's resources.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-Areas	Impact Identification and Evaluation *
A. LAND USE	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Increasing the population	N
c. Land clearing	N
d. Changing soil character	N
2. Altering natural defenses	M+ H+
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
B. WATER QUALITY	
1. Physical state of water	N
2. Chemical and biological states	N
3. Ecological balance	N
C. ATMOSPHERIC	
1. Air additives	N
2. Air pollution	N
3. Noise pollution	N
D. NATURAL RESOURCES	
1. Diversion, altered use of water	N
2. Irreversible, inefficient commitments	N
E. CULTURAL	
1. Altering physical symbols	N
2. Dilution of cultural traditions	N-L
F. SOCIOECONOMIC	
1. Changes in economic/employment patterns	N
2. Changes in population	N
3. Changes in cultural patterns	N-L
G. HEALTH	
1. Changing a natural environment	L + M+
2. Eliminating an ecosystem element	N
H. GENERAL	
1. International impacts	N
2. Controversial impacts	L
3. Larger impacts	N

* Use the following symbols:

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

DESCRIPTION OF POSSIBLE IMPACTS

A. LAND USE

1. Changing the character of the land through:

a. Increasing the population of people or animals in an area. It is believed that there will be no significant in-migration of people to the project areas. Neither Boutilimit nor Méderdra have attractions which can compete with Rosso or Nouakchott in the Sixth Region vicinity. There is little economic opportunity beyond being "petits commerçants". If there is a significant increase in rainfall over the next several years there may be an increase in cattle numbers as herders would then restock their herds, but this is over a longer term than the project. Range management activities will be within the social context of the locality which determines who can use grazing lands, when and for how long.

b. Extracting of natural resources such as minerals or water. No natural mineral resources will be extracted. Four wells are anticipated for the project, but the drawdowns from the aquifers are not expected to be significant. In addition, the wells' development is to include adequate core samples and testing to determine the capacity of aquifers. At present, the indications are that the aquifers are recharged at some considerable distance from the well sites.

c. Land clearing. It is possible and probable that up to 800,000 square meters of land will be cleared to delineate grazing areas (80 kilometers of 10 meter firebreaks). This is insignificant when compared to the 100 million square meters of land to be delineated (2 grazing areas of 100 square kilometers).

d. Changing the character of the soil. There will be no change in the character of the soil other than it may become more cohesive around Boutilimit and Méderdra as a result of the vegetation planted for the sand stabilization.

2. Altering some of the significant natural defenses provided by an area. The alteration of natural defenses are to be positive in nature by increasing them. Tree, shrub and grass plantings will help to stabilize the soils where they are planted. Project implementation will introduce to the project population the importance of conserving these resources. A locally moderate to high positive impact is anticipated.

3. Foreclosing important and better uses of the land. The lands to be affected by the project are best suited for the planned interventions. No wildlife habitats will be altered or destroyed. No construction which will foreclose use of the land are included and, in fact, every intervention is designed to conserve and protect the land.

4. Jeopardizing man or his works because either is put into a zone of potential disaster. The project is in the Sahelian/sub-Saharan zone of Mauritania where people have been living for centuries. The only known potential disaster is another prolonged period of drought. Project interventions are designed to help the area and its people increase the chances of surviving such another disastrous occurence.

B. WATER QUALITY

1. Changing the physical state of the water. There will be no change in the physical state of the water in the project area. No deforestation is to take place and there will be no sedimentation or contamination of water used or obtained for project purposes.

2. Changing the chemical or biological states of the water. There will be no change in the chemical or biological states of the water. There will be a limited use of pesticides on the nurseries to protect plant seedlings. These are on the AID approved list (Insecticide - Malathion, 50% WDP, Sched. B. No. 599.2035; Rodenticide- Warfain 0.025% Concentrate, Sched. B. No. 599.2010). It is not believed that their limited use will present an environmental hazard. If it is believed and shown otherwise, they could probably be eliminated without too serious a consequence for the project.

C. ATMOSPHERIC

1. Air Additives. No air additives of any kind will be introduced to the project area.

2. Air Pollution. No air will be polluted by the project as no major pollutants are incorporated.

3. Noise Pollution. Noise pollution will be be a problem.

D. NATURAL RESOURCES

1. Diversion, storage or increased use of water. There will be no diversion of water and only very minor storage (2-12 m^3 storage tanks and 2 - 70 m^3 watering troughs) at Boutilimit, Méderdra and on the grazing reserves. Four walls are to be developed, but it is not expected they will significantly affect the aquifers (see paragraph A. 1.b. above).

2. Irreversible or inefficient commitments of natural resources. There will be no irreversible or inefficient commitments of natural resources. The project is aimed at conserving the natural resource base -- the land and its vegetation.

E. CULTURAL

1. Altering or destroying important physical symbols of a culutre. There will be no alteration or destruction of important cultural symbols.

2. Diluting or adulterating the indigenous culture and traditions. As with most projects, there will be requirements for change put on some of the cultural practices of the project-affected population. These required changes will be introduced, however, through traditional cultural structures to limit the impact of these required changes.

F. SOCIOECONOMIC

1. Changes in patterns of economic growth and employment. There will be no major changes in the existing socioeconomic patterns. There will be a tendency developed through the project to encourage the population to take an active role in protecting areas of revegetation. This is a conscious decision that will have to be made by the population, based on information and education for understanding the conditions under which they live, and measures required to improve and protect their environment. Protection of the physical environment will, by extension, preserve the social and physical infrastructure for the population to be able to continue and develop economic activities.

2. Movement, resettlement, or changes in population. There will be none of these for the project-affected population.

3. Changes in cultural patterns that could affect socioeconomic patterns in a major way. There will be no changes required which will affect socioeconomic patterns in a major way. Those changes necessary for the protection of the environment will be introduced through the traditional cultural structures to limit any potential for adverse impact.

G. HEALTH

1. Altering or destroying a natural environment. There will be no destruction of a natural environment. The only alteration will be the promotion of a renegeration of lost vegetative cover. There is expected to be a local law to moderate possible impact.

2. Eliminating an element in an ecosystem. No ecosystem elements are in danger of being eliminated.

H. GENERAL

1. Activities that will affect the United States or other nations. There are no significant impacts of regional or international concern or interest attached to this project.

2. Activities that are matters of controversy locally, nationally or globally. There are no activities of a controversial nature nationally or globally. The only potential local controversy will be the introduction of natural and unnatural fencing. The unnatural fencing will be of limited scale, enclosing only range management watering points (2 - 100 hectare areas). The natural, or "live" fences will be a part of sand stabilization and revegetation and introduced as part of that activity. Both will be introduced through the traditional social structures so that any adverse impacts will be minimal.

3. Activities that are part of a longer program whose total effect would require an appraisal of environmental impacts. The project is complete as described in the project paper. The experience gained could eventually provide the basis for similar projects in other areas of Mauritania.

RECOMMENDATION FOR ENVIRONMENTAL ACTION

In all its aspects, the proposed project addresses itself to the problems of the project area environment. Its main thrust is to conserve and extend natural renewable resources and, where possible, restore vegetative growth. Except for the resource inventory and training, the project will introduce interventions through the existing and traditional social infrastructure to the maximum extent possible. Therefore, a minimum of social and/or cultural disruption can be expected. Any physical impacts on the environment will be positive insofar as stabilizing of sand dunes, revegetation and range management conserve and regenerate natural renewable resources.

Based on the analysis in this Initial Environmental Examination, it is recommended that the threshold decision for this project be a Negative Determination that no further environmental studies or action are required.

Annex V

Pilot Activities

1. Estimates of Plants
2. Pattern A Planting
3. Pattern B Planting
4. Pattern C Planting
5. Reserve Areas
6. Recommended Watering Method

7-9 Boutilimit Sketches

10-12 Méderdra Sketches

13. Méderdra Forest Reserves
14. Range Management Sketch
15. Grazing Reserve Well Sketch
16. Schematic of Plant Nursery

Estimates of Numbers of Plants Required

Boutilimit		No. of Plants
Pattern A (cell plantings), 33 hectares		
Living fences*		297,000
Trees and shrubs (3 plants/cell)		9,900
Grass, 16.5 hectares (13kg/h)		214 kg seed **
Pattern B (shelterbelts) 3,800 m		
Trees and shrubs (6 plants/m of belt)		22,800
Pattern C (Local populace), 60 hectares		
Living fences #		240,000
Trees and shrubs (3plants/unit property)		2,000
Totals		
Trees and shrubs:	Pattern A	9,900
	Pattern B	22,800
	Pattern C	2,000
		34,700
Living fence plants:	Pattern A	297,000
	Pattern B	0
	Pattern C	240,000
		537,000
Grand Total:		571,700 plants

Mederdra		
Pattern A (cell plantings)		None
Pattern B (shelterbelts) 4,880 m		
Trees and shrubs * (6 plants/m of belt)		29,280
Pattern C (Local populace), 31.5 hectares		
Living fences#		126,000
Trees and shrubs (3plants/unit property)		1,050
Reserved Areas, 82.5 hectares		
Trees (estimated)		2,000
Shrubs (1plant/200 m2)		4,125
Living fences (18,200 m, 5 plants/m)		91,000
Grass, 82.5 hectares		1,072.5 kg seed**
Totals:		
Trees and shrubs	Pattern A	0
	Pattern B	29,280
	Pattern C	1,050
	Reserved Areas	2,000
		32,330
Living fences	Pattern A	0
	Pattern B	0
	Pattern C	126,000
	Reserved Areas	91,000
		217,000
Grand Total		249,330 plants

Notes to Preceding Estimates

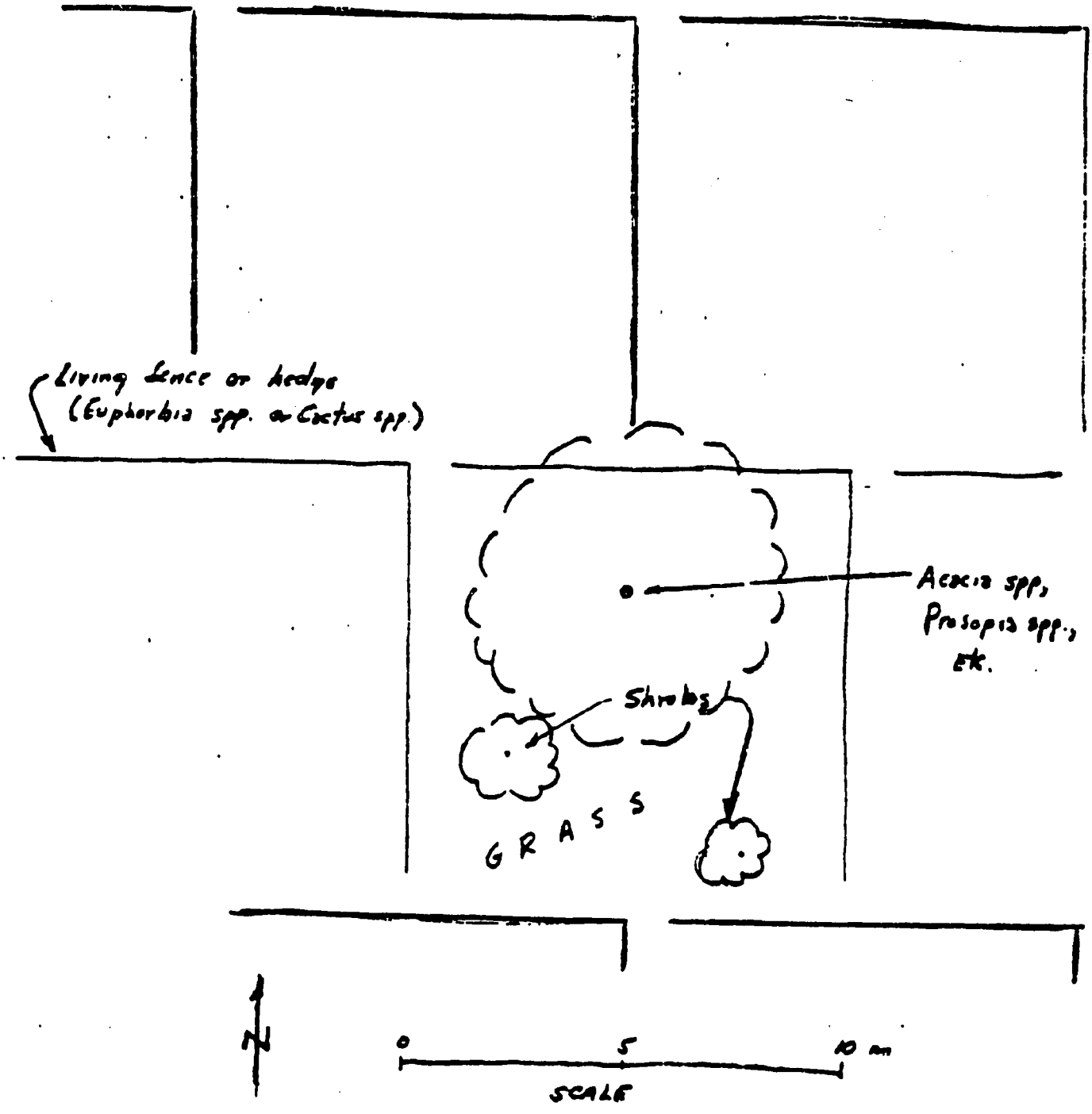
*Calculated by: $\frac{A(10,000)L \cdot n}{a}$: number of plants

When: A : area in hectares
a : area of unit cell : 100 m2
L : length of living fence per unit cell : 18
n : number of plants per meter of fence : 5

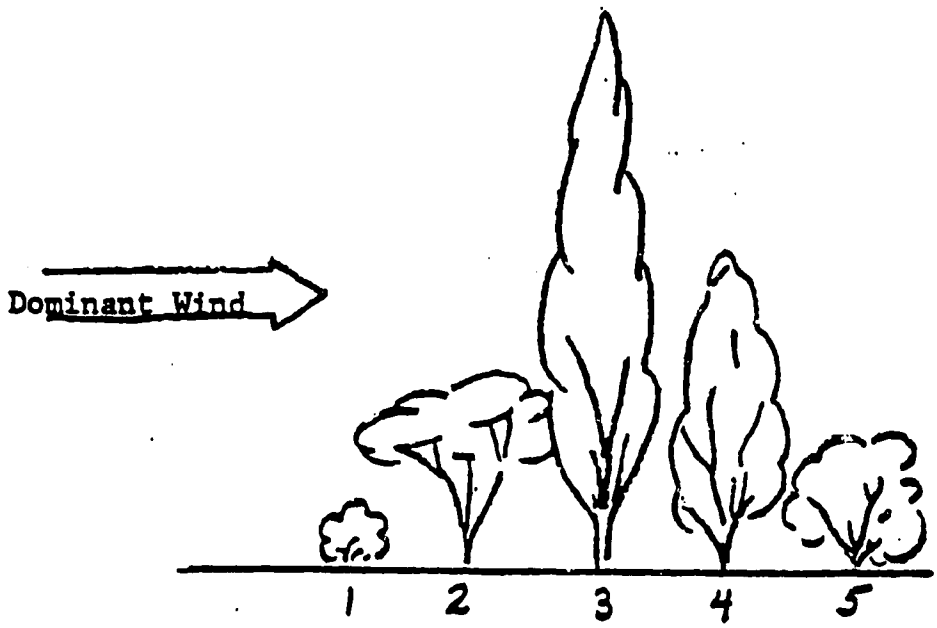
#Calculated by: $\frac{A(10,000) \cdot 4\ P.f.n.}{P}$: number of plants

When: A : area in hectares
P : average area of a property : 900 m2
f : overlap factor (some of the boundary fences will be common to two properties)
n : number of plants/m of fence : 18

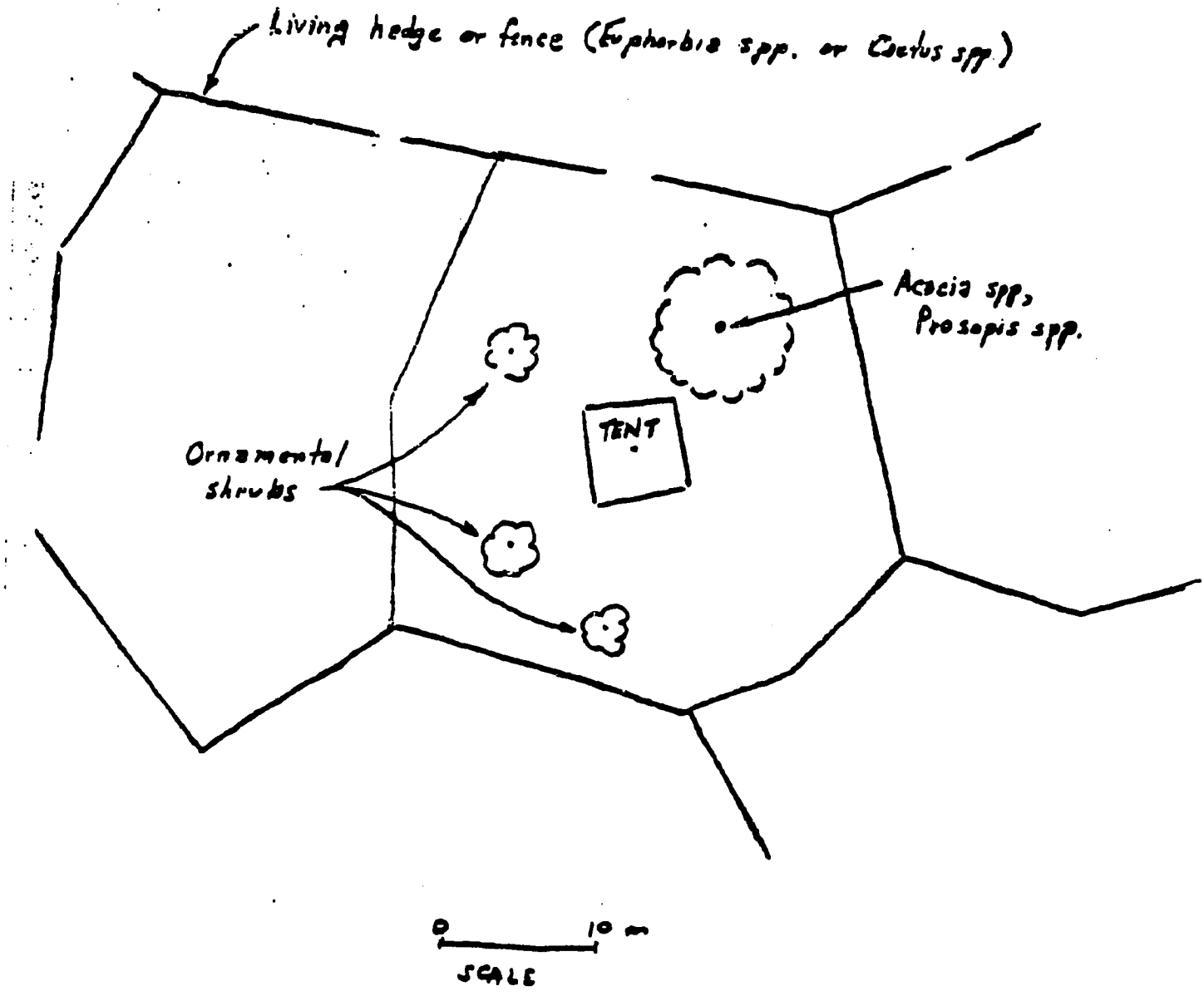
** Creating a complete grass cover in the Reserved Areas at Mederdra within 3 years may not be possible. It is estimated that mature grass of the native species that appears most promising will produce about 45.5 grams per m2, assuming fully mature plants. The essential difficulty is that grazing pressure is so intense that none of the wild plants are yet to produce seeds. The plants are also quite rare. Nevertheless, wild plants could be collected by diligent search and placed in nursery bed. In such an ideal situation they would undoubtedly grow rapidly and produce seeds. It is estimated that at best a bed at 1000 m2 could be created in this way. The product would be approximately 45.5 kg of seed. At normal seeding densities of 1 kg per 750 m2, this amount of seed will cover about 3.4 hectares, which is less than 4% of the 82.5 hectares in the Reserved Areas. This grass will not mature for another 2 years, so it cannot be used to produce additional seed. The next year of production from the nursery grass plot will seed perhaps another 4 hectares. But it is obvious that complete grass cover, using the selected native species, will require several years. The alternative is to sow the entire area with an introduced species for which seeds are readily available. If this is done, it is likely that the native species will eventually crowd out the introduced species, especially if it is encouraged to do so by judicious planting.



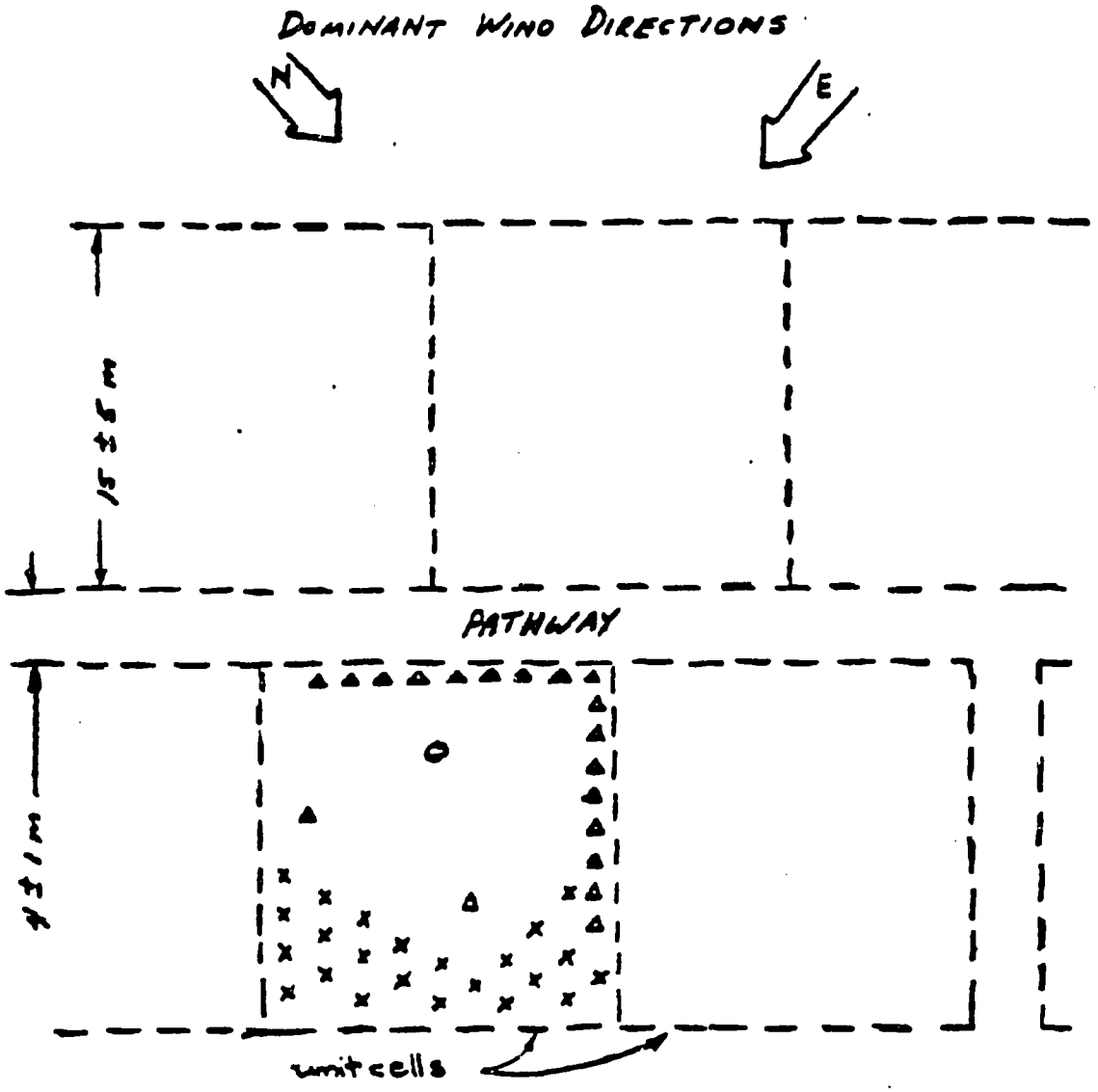
Schematic Representation of Pattern A Planting



Schematic Cross Section of Pattern B (Shelterbelt) Planting



Schematic Plot of Pattern C Planting



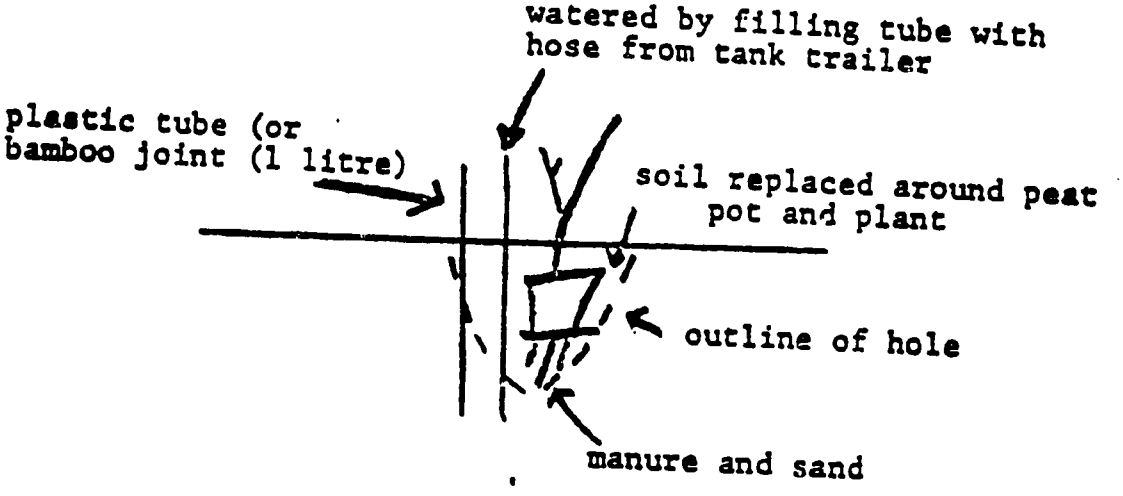
LEGEND:

o Tree (Acacia senegal, Acacia raddiana, Prosopis chilensis, etc.)

Δ Shrub (Euphorbia balsamifera, Cactus spp., Leptadenia spp., etc.)

x Grass (Chrysopogon aucheri, Aristida stipoides, Cenchrus ciliaris, Spenbolus variegata, Schoenfeldia gracilis, Eragrostis spp., etc.)

Tentative Layout Pattern for Reserve Areas



Suggested method of watering plantings

Legend

A Permanent dwellings and tents

B Reserve areas

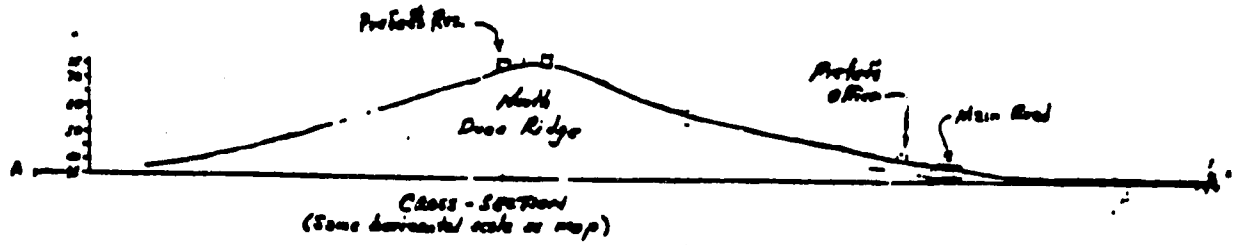
C Live Dune area

D Outer perimeter

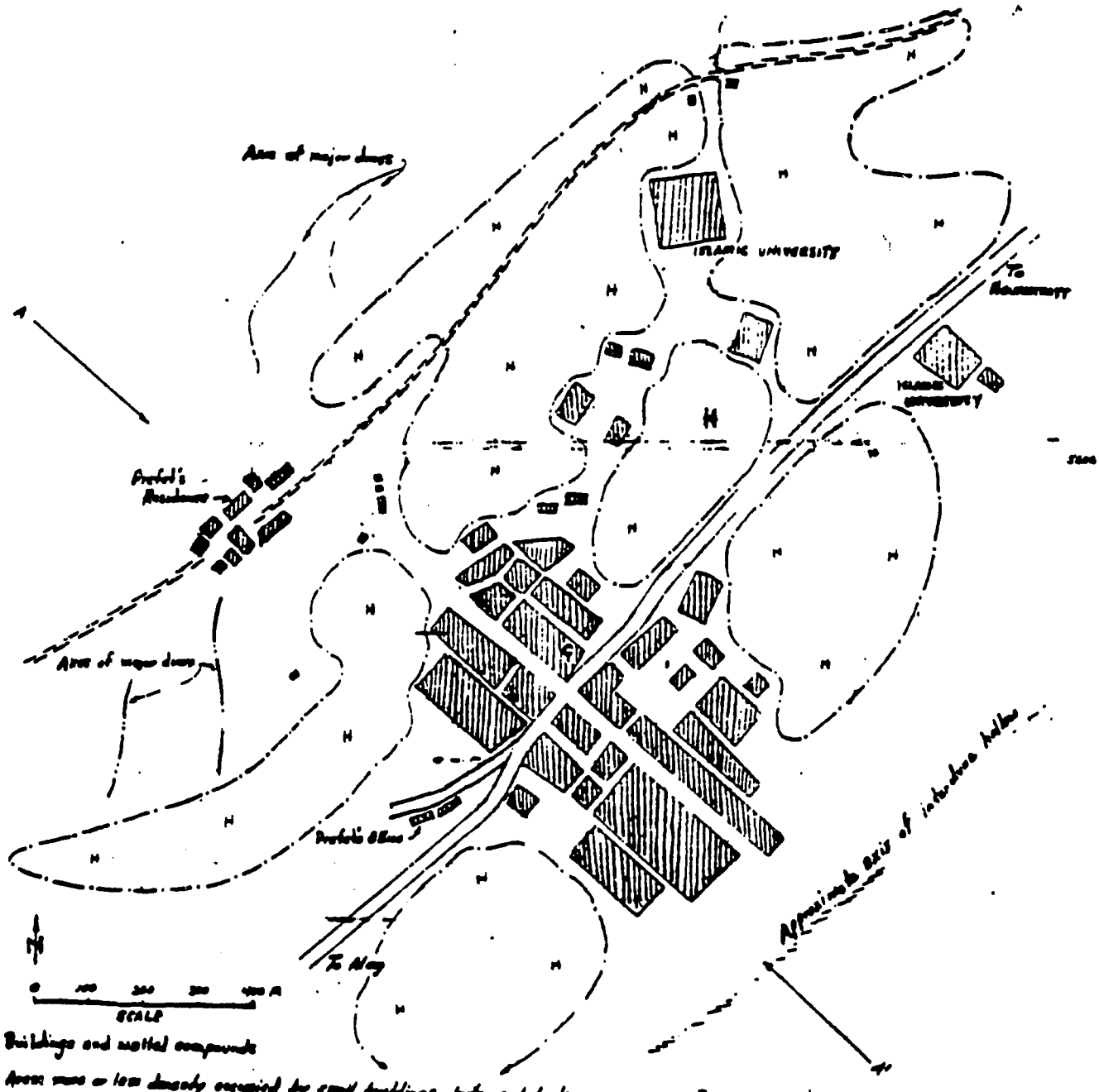
W Wells

P Prefecture's residence

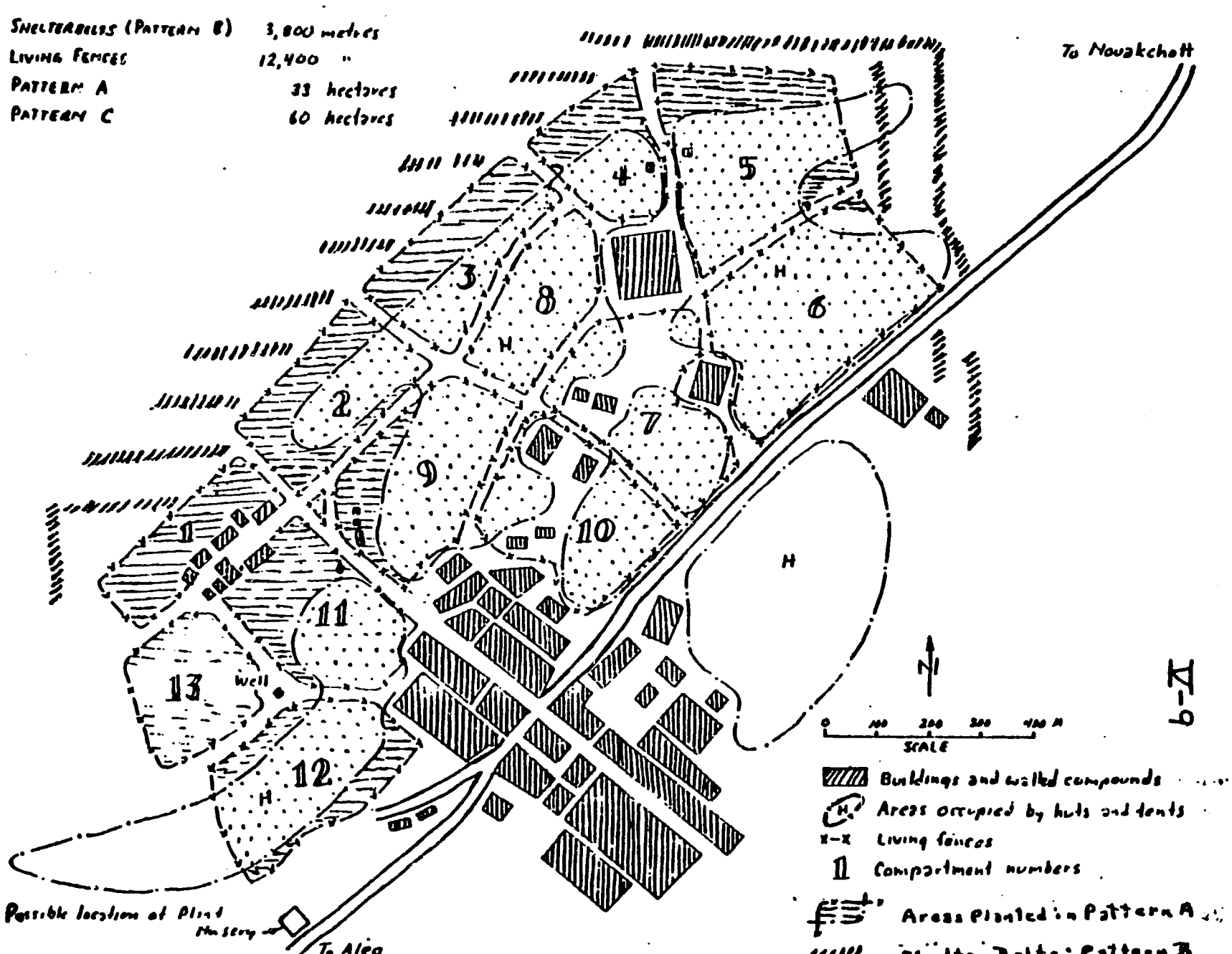
Sketch Map
Boutilimit



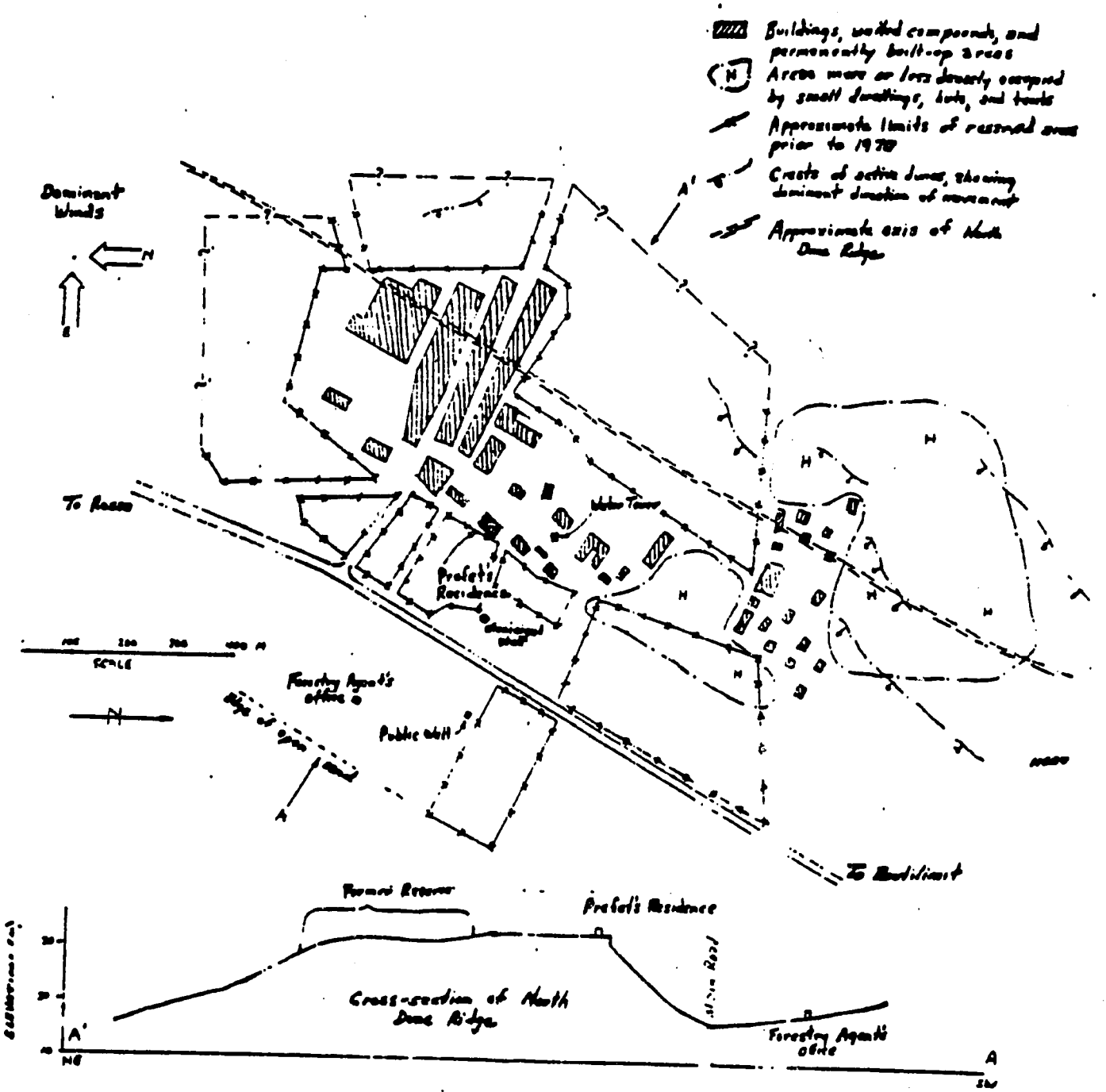
CROSS-SECTION
(Same horizontal scale as map)



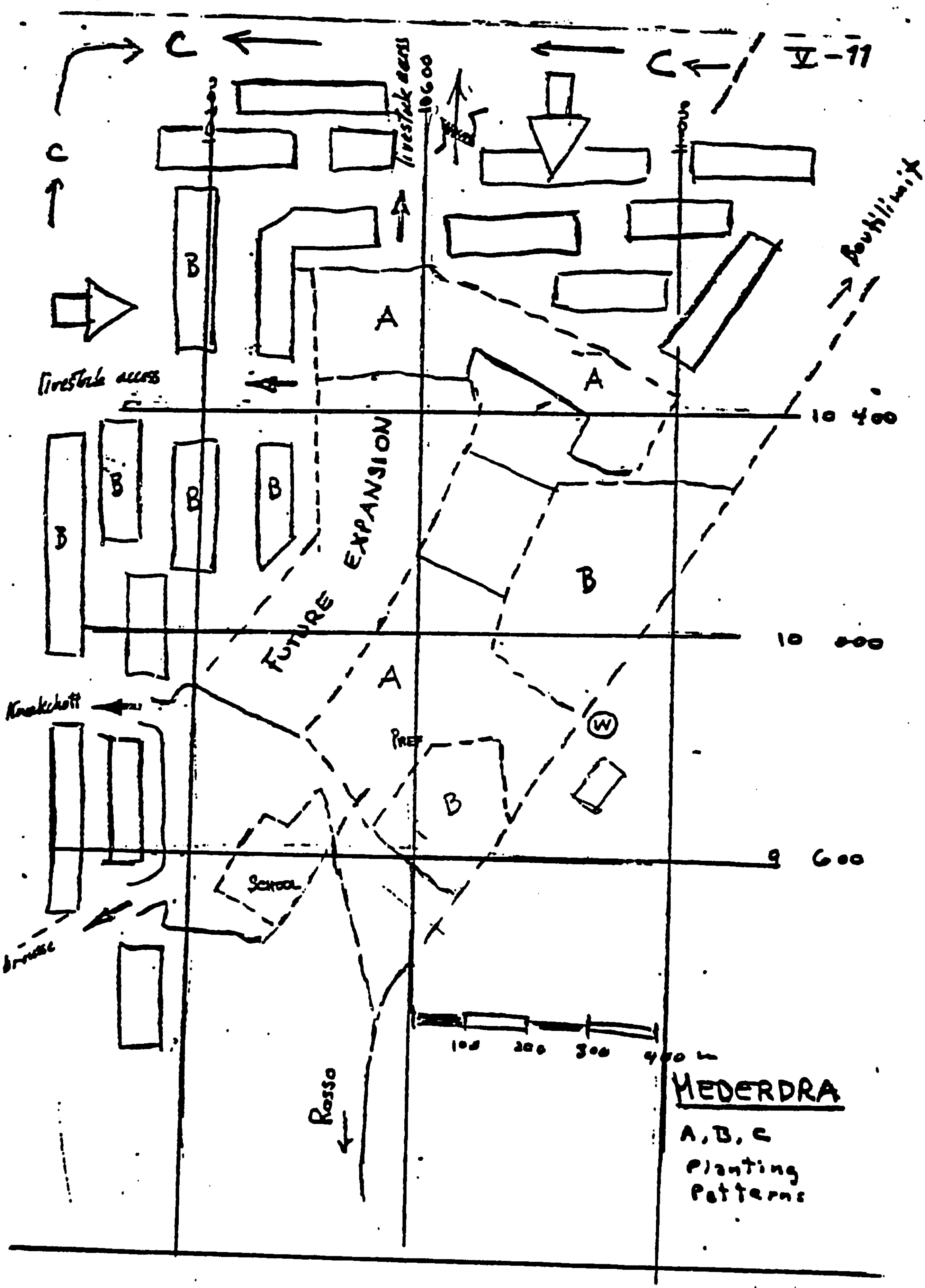
BOUTILIMIT



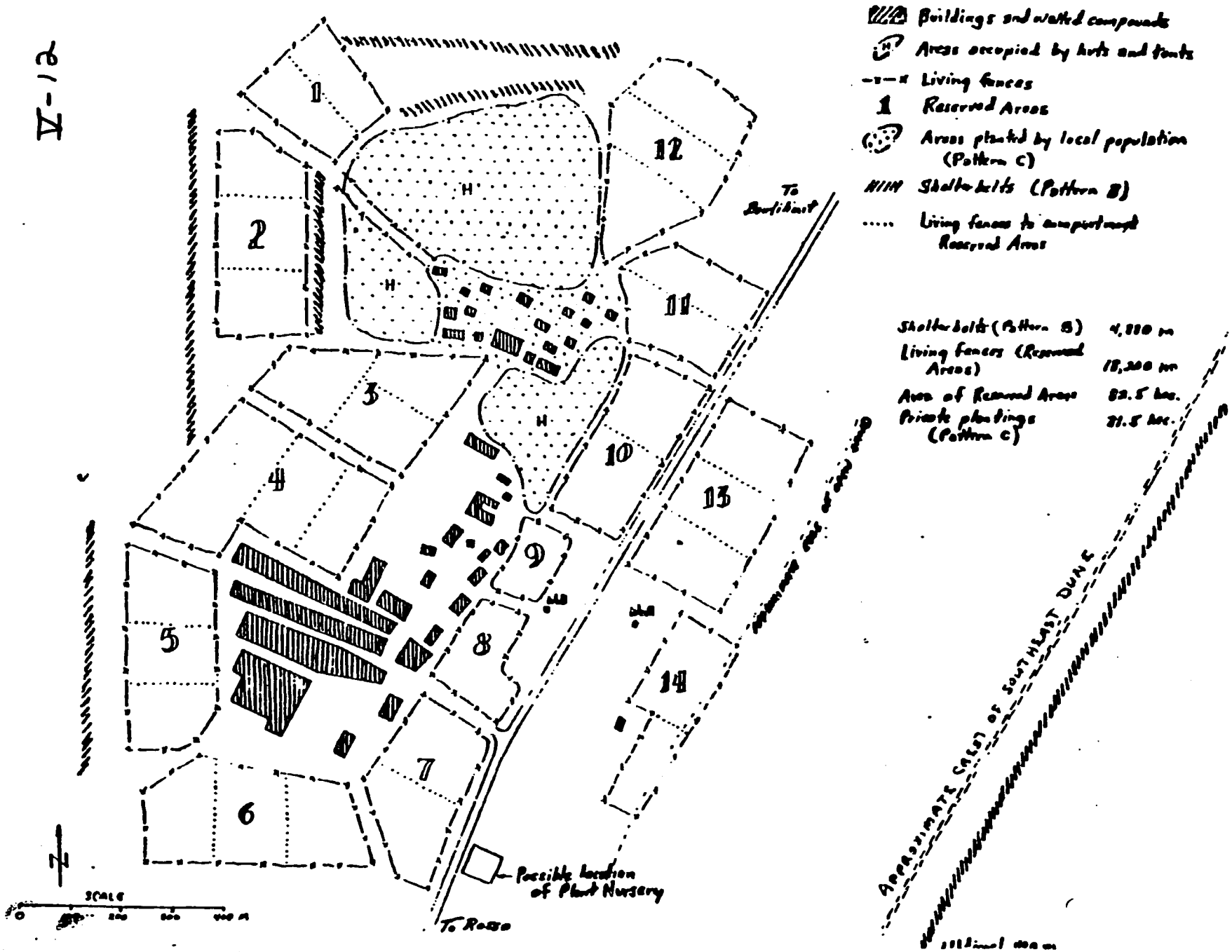
Tentative Planting Plan for Boutilimit



Sketch Map of Maderdra

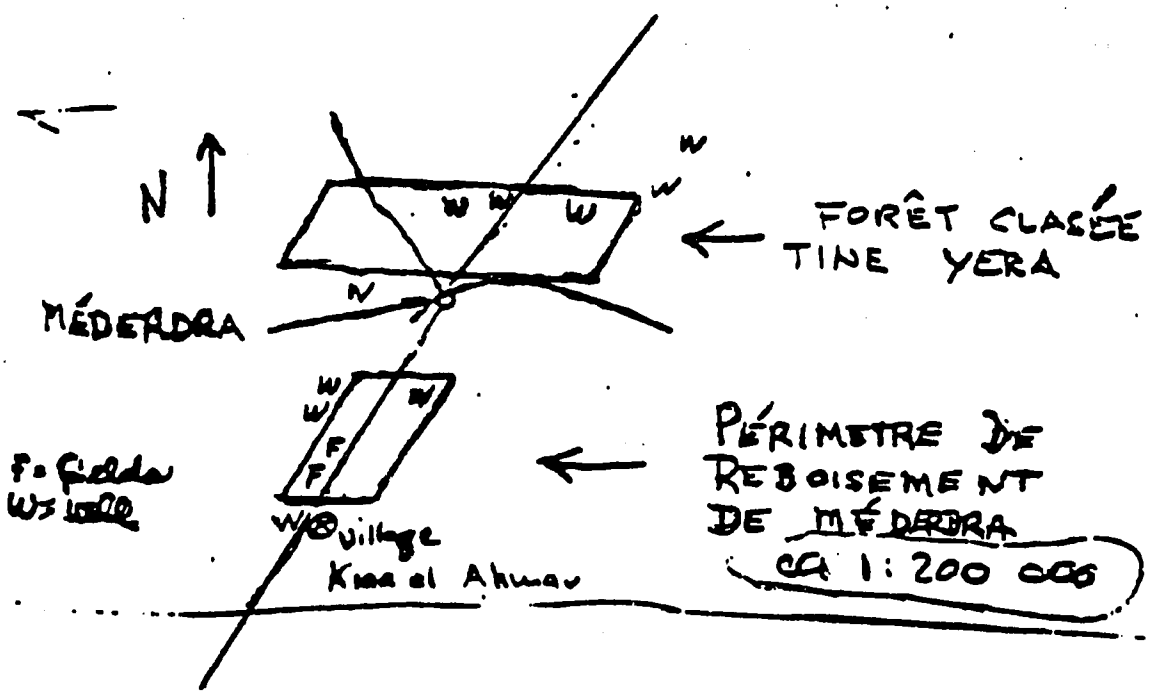

V-11
C
C
C
livestock access
livestock access
Boutilimit
A
A
A
B
B
B
B
B
B
B
FUTURE EXPANSION
Nouakchott
PREF
SCHOOL
W
10 400
10 000
9 600
10 600
100
200
300
400 m
Rosso
MEDERDRA
A, B, C
Planting
Patterns

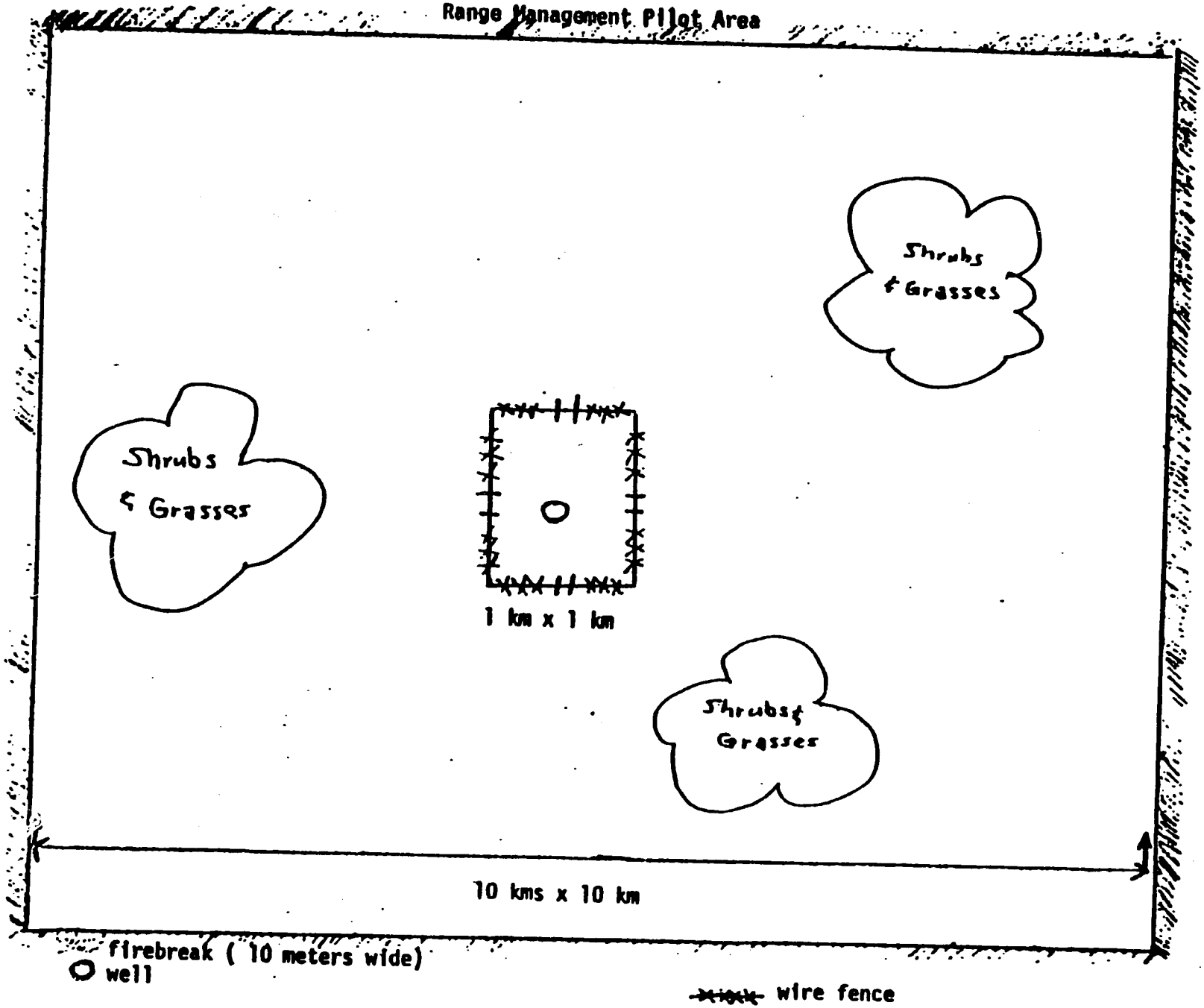
TENTATIVE PLANTING PLAN FOR MEDERDRA



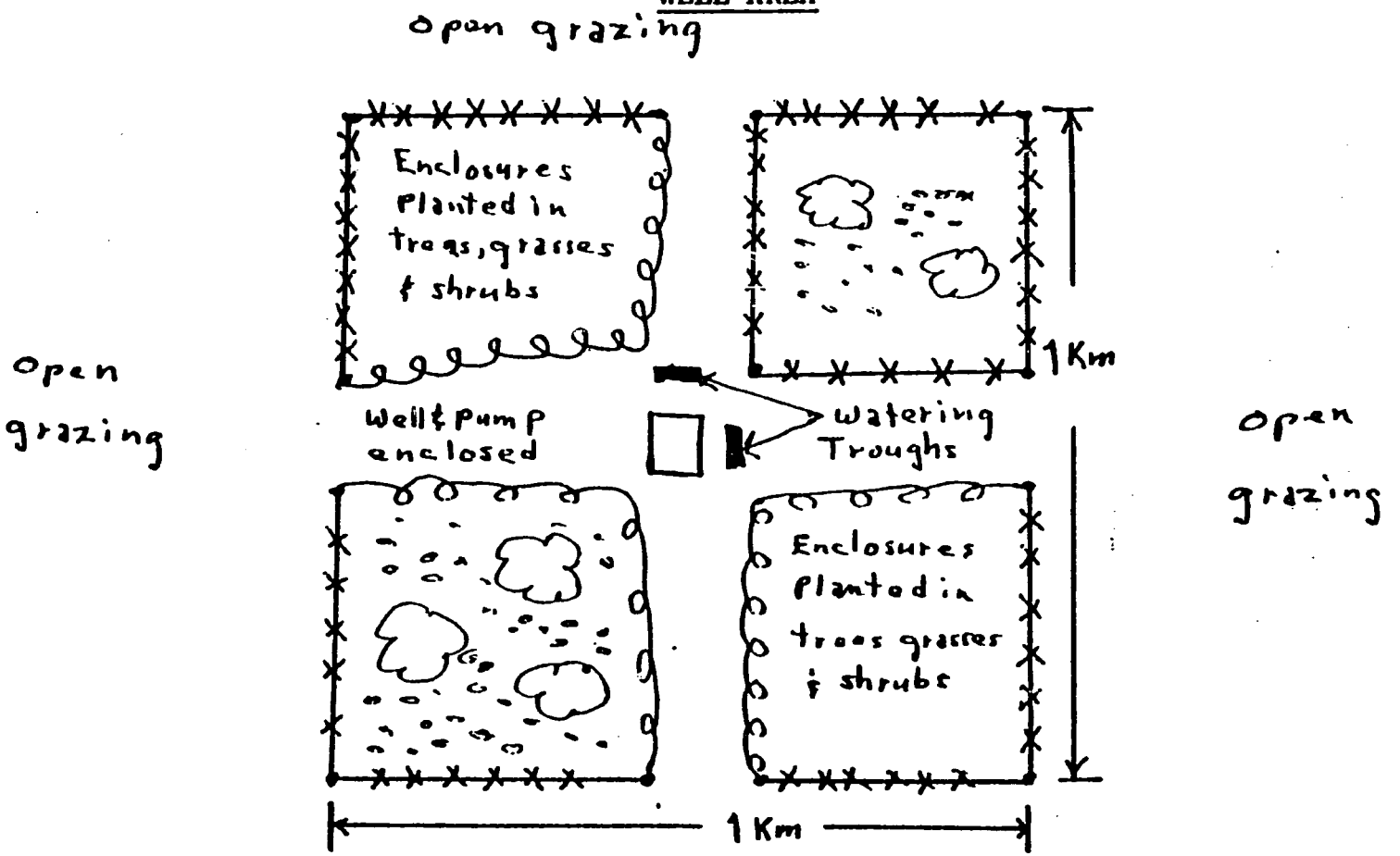
FOREST RESERVES

MÉDERDRA



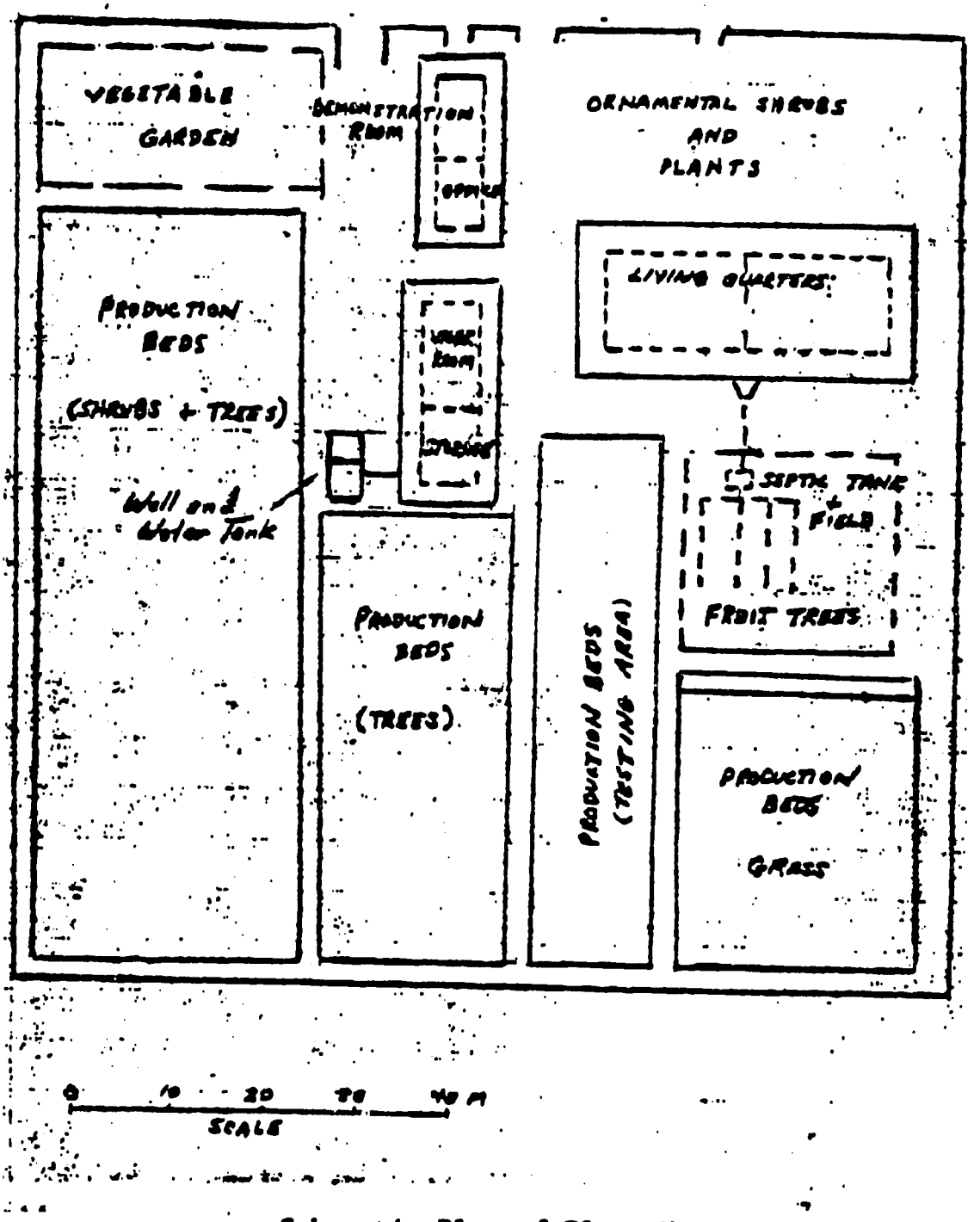

Range Management Pilot Area
Shrubs & Grasses
Shrubs & Grasses
1 km x 1 km
Shrubs & Grasses
10 kms x 10 km
firebreak (10 meters wide)
well
wire fence

GRAZING RESERVES
WELL AREA



XXX barbed wire fencing

~~~ "live" fencing
~~~



Schematic Plot of Plant Nursery

ANNEX VI

REPUBLIQUE ISLAMIQUE DE MAURITANIE — HONNEUR - FRATERNITE - JUSTICE

PRESIDENCE DE LA REPUBLIQUE

DECRET N° 77 054 /

portant réorganisation du Comité pour la Protection et la Conservation de la Nature.

LE PRESIDENT DE LA REPUBLIQUE

SUR le rapport du Ministre d'Etat à la Promotion Rurale,

VU la Constitution,

VU le décret n° 62 75 du 2 septembre 1975 portant règlement organique relatif aux attributions des Ministres d'Etat et des Ministres,

VU le decret n° 48 76 du 3 mai 1976 fixant les attributions du Ministre du Développement Rural et l'organisation de l'Administration Centrale de son Département,

VU le décret n° 59 168 du 30 décembre 1959 portant création d'un Comité pour la Protection et la Conservation de la Nature,

LE CONSEIL DES MINISTRES ENTENDU :

D E C R E T E

ARTICLE 1 : Le Comité pour la Protection et la Conservation de la Nature, créé par le Décret n° 59 168 du 30.12.1959, est dans sa constitution et son fonctionnement réorganisé par les dispositions du présent Décret.

ARTICLE 2 : L'avis préalable de ce Comité est obligatoire pour toute action susceptible de modifier le milieu naturel et pour toutes questions relatives :

- à la protection des sols, des ressources hydrologiques, de faune et de la flore,
- à la conservation et à l'utilisation rationnelle des ressources naturelles
- aux parcs nationaux et réserves de toute nature.

ARTICLE 3 : Ce Comité est composé comme suit :

PRESIDENT : le Ministre chargé de la Protection de la Nature ou son délégué

VICE-PRESIDENT : le Ministre chargé du Plan ou son délégué

SECRETAIRE GENERAL : le Directeur de la Protection et de l'Amélioration de l'Espace Agro-Pastoral

../..

MEMBRES : le Directeur de l'Elevage
le -"- de l'Agriculture
le -"- de l'Hydraulique
le -"- du Génie Rural
le -"- de l'Enrégistrement, des Domaines et du Timbre
le -"- du Tourisme
le -"- de la Culture
le -"- des Pêches
le Directeur des Mines et de la Géologie
le -"- du Budget et des Comptes

ARTICLE 4 : Le Comité se réunit au moins deux fois l'an à la demande de son Président et désigne une fois pour toutes une commission exécutive permanente de quatre membres, recrutés en son sein. Le Secretaire Général est, de droit, Secretaire Général de la Commission ; il peut être assisté d'un Secretaire Adjoint.

ARTICLE 5 : Le Comité et la Commission exécutive permanente peuvent inviter à leurs travaux tous spécialistes et toutes personnalités dont la présente serait souhaitable.

ARTICLE 6 : Le Secretaire Général est chargé des relations entre le Comité et les organismes administratifs.

ARTICLE 7 : Le Ministre d'Etat à la Promotion Rurale est chargé de l'exécution du présent décret qui, abrogeant les dispositions du décret n° 59 168 du 30 décembre 1959, sera publié suivant la procédure d'urgence et au Journal Officiel.

NOUAKCHOTT, le 28 février 1977

MOKTAR OULD DADDAH

AMPLIATIONS :

PR	3
AS. Ntle	5
Ts Min. ETAT	16
Ts Min.	42
Dr INTERESSES	12
J.O. R.I.M.	3

LE MINISTRE D'ETAT à la PROMOTION RURALE
ABDOULAYE BARO

P.C.C.C.

LE SECRETAIRE GENERAL DE LA PRESIDENCE DE LA REPUBLIQUE

MOHAMED ALI CHERIF.

ANNEX VII

DESCRIPTION OF PROJECT

The proposed project for Renewable Resources Management in Mauritania, has as its long-term goal the promotion of self-sustained development in the rural sector through the establishment of comprehensive programs to strengthen a manpower and resource base needed to withstand adverse climatic and environmental conditions, without disruption of continued development. The project concept and purpose is to find and develop techniques and methods that will improve environmental conditions now and to an even greater extent in the future. Pilot interventions, in addition to a resources inventory and educational training, will be implemented to rehabilitate and revegetate areas that have experienced severe and steady deterioration of soils and natural vegetative cover due to over use and adverse climatic conditions.

The proposed project includes several components, the first of which is a renewable resources inventory. This inventory will utilize satellite imagery, aerial photography and "ground truth" surveys to develop maps and photo-mosaics showing vegetation, soils, water and terrain features needed for renewable resource planning and management. In addition, Mauritanian technicians will be trained in photo-interpretation, resource planning and ground truth surveying.

The second component of the project provides for the training of Mauritanians in resource planning and management through the provision of scholarships for United States and third-country training, and in-country training as an integral part of the project. It is expected that two scholarships will be provided for U.S. training and six for third-country training. Up to 40 Mauritanians are expected to receive in-country training in extension methods for promoting resource conservation and management.

A series of pilot interventions in sand dune stabilization, range management and reforestation will comprise the third component of specific activities. These basic activities will attempt revegetation of areas that have experienced advanced degradation, and introduce proper management techniques for rangelands and forest areas. The key to all of these interventions will be the degree to which the local population will be involved at all stages of these interventions.

By the end of the project, a substantial body of information will be available on natural renewable resources. This knowledge will have been integrated with the results of the pilot interventions to develop plans suitable for expansion to other areas of Mauritania. Knowledge and experience will have been gained by the local population and GIRM on annual and perenial vegetation required for protecting and expanding the natural resource base. Trained technical and extension personnel will be available for future project implementation and rational management of Mauritania's resources.