

DEVELOPMENT PROGRAM

SENEGAL INTEGRATED

RESOURCES MANAGEMENT

625-0926

AFRICA

PROJECT TEAM

Paul Boden	Agronomist - Soil Conservation Service
Dalton Comeaux	Livestock Specialist - Extension Service
John Forsman	Team Leader - US Forest Service - Retired
Tom Greathouse	Forester - US Forest Service
James Hradsky	Design Officer - USAID, Africa
James Keyser	Rural Sociologist
Donald Fendleton	Range Conservationist - Soil Conservation Service

1. PID/T No.
625-926-2-6777541

4. Project/Activity No. and Title
625-0926, Africa
Development Program
(Senegal Integrated Resources Management)

PROJECT IMPLEMENTATION
ORDER/TECHNICAL
SERVICES

5. Appropriation Symbol
72-11X1026

6.A. Allotment Symbol and Charge
42E-67-625-00-69-71

6.B. Funds Allotted to:
[X] A.I.D./W

7. Obligation Status
 Administrative Reservation Implementing Document

8. Funding Period (Mo., Day, Yr.)
From 10/01/77 to 04/29/78

9.A. Services to Start (Mo., Day, Yr.)
October 10/01/77 and 10/01/77

9.B. Completion date of Services
(Mo., Day, Yr.) 04/29/78

10.A. Type of Action
 A.I.D. Contract Cooperating Country Contract Participating Agency Service Agreement Other

10.B. Authorized Agent
AID/W

Estimated Financing		(1) Previous Total	(2) Increase	(3) Decrease	(4) Total to Date
\$1.00=					
11. Maximum A.I.D. Financing	A. Dollars	0	\$87,500		
	B. U.S.-Owned Local Currency				
12. Cooperating Country Contributions	A. Counterpart				
	B. Other				

14. Instructions to Authorized Agent
Initiate a PASA with USDA for services described in Block 19.

15. Clearances - Show Office Symbol, Signature and Date for all Necessary Clearances.

A. The specifications in the scope of work are technically adequate.
AFR/DR/ARD: W. Leake, L. Clyburn [Signature]

B. Funds for the services requested are available.
SER/FM/RSD: B. Wipple [Signature]

C. The scope of work lies within the purview of the initiating and approved Agency Programs.
AFR/DR/SWAP: J. Crawford [Signature]

F. AFR/DR/PS: N. Caticchio

16. For the cooperating country: The terms and conditions set forth herein are hereby agreed to.
Signature and date:
Title:

17. For the Agency for International Development
Signature: John L. Withers
Title: AFR/DR, Director

18. Date of Issue

RECEIVED
 OCT 11 1977
 AFR/DR/ARD

Project Activity No. and Title: 625-0926, Africa Development Program
 (Senegal Integrated Resources Management Project PP Team)

SCOPE OF WORK

1. Type of Technical Services

2. Objective for which the Technical Services are to be Used

A Project Paper for a national Integrated Resources Management Project.

Description

1. The Product:

The end product should embrace in one form or another the following elements:

- a. Consent among participating services to work together in implementing an integrated resource management program.
- b. Conceptualization of a national integrated resource management program.
- c. A clear statement of the intent on the part of the Government of Senegal to implement an integrated resource management program.
- d. Criteria governing the approval and evaluation of resource management projects. (see continuation sheet)

3. Technicians

(a) Number	(b) Specialized Field	(c) Grade and/or Salary	(d) Duration of Assignment (Max. Months)
1	Senior Conservationist	\$34,000 per annum	1.0
1	State Conservationist (Range Management)	\$34,000 " "	1.5
1	State Conservationist (Agronomy)	\$34,000 " "	1.5
1	Extension Range Animal Husbandman	\$34,000 " "	1.5

4. Duty Post and Duration of Technicians' Services

AID/W and Senegal; 10/01/77 to 04/29/78

(continued page 12)

5. Language requirements

French

6. Access to Classified Information

None

BEST AVAILABLE DOCUMENT

5. Dependents Will Will Not Be Permitted to Accompany Technician

7. Financing of Technical Services

(1) By AID - \$ 84,500

(2) By Cooperating Country - 0

TITLE OF FORM: PIO/T

1. Cooperating Country
SFWA Regional

2.a. Code No.
625-926-2-67/75-1

2.b. Effective Date

2.c. Amendment
 Original OR No.

3. Project/Activity No. and Title
625-0926, Africa
Development Program (Senegal Integrated
Resources Management Project PP Team)

Use this form to complete the information required in any block of a PIO or PA, PR form.

e. Provision for a central resource fund available for project implementation through participating COS services.

f. A clear statement of procedures.

g. Description of pilot activities identified for near-term implementation and testing of criteria.

h. Description of personnel positions, facilities and operations anticipated, including cost over time.

i. Major assumptions.

j. Major issues, with pros, cons and recommendations.

k. A package of documents, including:

(i) the Project Paper following the prescribed format in AID Handbook 3, Chapter 6; and

(ii) supporting annexes.

2. Project Design:

a. Design Team and Functions:

A multi-disciplinary team will be commissioned to design the means of implementing the program as conceptualized above. While each participant will be expected to represent the skills of his own discipline, he will contribute to the design of an integrated resource management system.

(1) Senior Conservationist:

(a) Definition: An officer of the USDA Soil Conservation Service with broad experience in environmental and resource management design, including experience in designing national resource management programs in West Africa.

(b) Responsibilities:

i. for assisting with conceptualizing the program and negotiating the conceptualization with the COS;

ii. for drafting a rough outline of the program;

LIST OF OFFICIALS CONTACTED BY TEAM MEMBERS

OCTOBER TO NOVEMBER 21, 1977

- Dr. Souleymane Diallo - Director of Livestock Service
- Dr. El Hadj Gueye, Director of SODESP (Fed project)
- Mr. Malick Fall - in charge of reforestation at water and forestry headquarters - Dakar
- Mr. El Hadj Malick Sene - national Director of water and forestry service
- Mme Wane, ecologist, water and forestry headquarters, Dakar
- Boubacar Sidibe - Inspector, Eaux et Forets, Thies
- Mr. Mamadou Diop, Chef de service à l'Hydraulique
- Mr. Martin Coly - Chef de l'Hydraulique division
- Mr. Jean M. Buresi, agronomist Director of SODEVA - national extension service
- Mr. C. Diouf - chief inspector the forestry department - St. Louis
- Mr. Papaly, adjoint technique, extension service, mbidi well point
- Mr. Sow - director of the training center - Labgar
- Mr. Samba Ka - Director at Doli Ranch
- Mr. Baba Dionur - Director General and Mr. Sow - Bookkeeper - societe nationale de forage
- Mr. Claude Chasseau, ICRAT
- Mr. Bougnicourt, Director ENDA
- Mr. Gora Beye, Director, CNRA, Bambey
- Mr. Claude Dancette, climatologist, Bambey
- Mr. Hamed, Director, CNRF, Hann
- Mr. Y. Dommergue, microbiologist, CNRF, Bel Air
- Mr. Valenza, Par J. Docteur Veterinaire, Chef service d'Agros-tologie au Laboratoire National d'Elevage et de Recherches Veterinaire Dakar-Hann.

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ANNEXES

1. Trip Report - Dillard H. Gates Sr., Range Management Specialist
TAB/AGR/SWM

2. Creep Feeding Young Calves

by: Dalton J. Comeaux
Livestock Advisor
Projet Elevage
Tunis, Tunisia
1975

The same publication in French

2. Programme de Creep Feeding: Jeunes Veaux

Dalton J. Comeaux
Conseiller en Elevage
1975

3. Beef - Feedlot Fattening Program

Dalton J. Comeaux
Livestock Advisor
Tunis, Tunisia
1975

The same publication in French

3. Programme d'Engraissement de Bovins en Stabulation Libre

Dalton J. Comeaux
Conseiller en Elevage
1975

4. Conférence Directeur de l'Elevage

Mr. Diallo

5. Interview with Dr. Guèye, Director of SODESP.

6. Conférence Société Nationale de Forage:

Mr. Baba Dionur, Director General

7. Summary of Tour

Dalton Comeaux

8. Conférence - Bookkeeper for Doli Ranch.
9. Meeting with Mr. Buresi, Director of SODEVA.
10. Conférence with Mr. Mamadou Diop, Chef de Service à l'Hydraulique.
11. January 7, 1977 - Letter to Mr. James Kelly from Clyburn, Fergusson and Gates.
12. Dr. John Withers, Memorandum of January 12, 1977 to the African Executive Committee.
13. Project Implementation Orders/Technical Services.
15. Outline for 11/18/77 , Meeting with GOS.
16. Facts 1st day Louga and Thiès.
17. Letter from Mr. Norman Schoonover to Minister of Plan and Cooperation concerning Mission of Multi-Disciplinary Team.
18. Memorandum from Mr. Senne , GOS to Director, AID and Head of Evaluation Mission for Projects concerning the team's assignment.
19. Letter from Paul Rusby to John Forsman concerning use of Tittle II Food as a Development Resource.
20. Chapter 2 of the GOS National Plan-Livestock.
21. Chapter 3 of the GOS National Plan-Forests and the Protection of Nature.
22. Synthesis of the Vth GOS Quadriennal Plan of Economic and Social Development-Agriculture.
23. Chapter 5 of the GOS National Plan-Hydraulics.
24. Soil Conservation in Central Senegal
25. Biography

LAND CONSERVATION AND REVEGETATION

A. Last year, a team of U.S. and FAO experts undertake a preliminary analysis of four projects proposed by the Government of Senegal. These projects are:

- Well point development in the Sylvo-Pastoral Zone
- Acacia Albida in the Groundnut Basin
- Greenbelt development around Cap Vert
- Firebreak program in the Sine Saloum.

An initial report dated 1/13/76 was submitted to Washington for review.

B. At the request of RDO/Dakar and AID/W (AFR), Dr. Dillard H. Gates, Sr. Range Management Specialist, made a field review and evaluation of the project proposals during August 20-September 3, 1976. (Annex 1).

Dr. Gates pointed out that the Gao tree has significant and positive impacts on agricultural production. The magnitude of the impacts is related to site characteristics, density of tree cover, understory crops, other vegetation, and land use practices. The tree is also of value for wood production, wind breaks, soil stabilization and livestock feed.

He explained that controlled burning can be an effective tool in vegetation manipulation for resource management. However, repeated and uncontrolled burning can have serious adverse results. Uncontrolled fires may result in loss of life, property, forage and wood resources, and expose soils to wind and water erosion. Eaux et Forets has devoted a considerable amount of thought and effort to brush fire control. Results are good. However, there appears to be a lack of appreciation for the

need to attack the problem from the standpoint of resource management rather than just fire control. The problem of resource management is complicated by the fact that at least four GOS bureaux (Eaux et Forets, Elevage, Agriculture, and Hydraulic) are involved and there appears to be a minimum of program planning and implementation among them. If the problem of resource degradation is to be solved brush fire control must be considered but one of several corrective actions which must be taken. These must include control of livestock, improved grazing management techniques, water management and integration of uses and management of cultivated lands, forests and rangelands.

In his comments concerning reforestation Dr. Gates stated that hundreds of thousands of Senegal's forests and rangeland have been seriously degraded as a result of uncontrolled wood cutting, overgrazing, and expanding cultivated agriculture.

The GOS Eaux et Forets, a small but well trained and capable staff is actively planning and carrying out reforestation projects. The scope of plans and projects is limited by staffing and budgetary considerations. Eaux et Forets has done an excellent job of demonstrating its ability to work effectively and establish tree plantations on widely varying ecological sites. It has spent relatively little effort in developing, testing or planting other plant species for ground cover, soil stabilization and forage production. Properly established and managed herbaceous and shrub species could reduce competition to tree growth, stabilize soil between trees and provide a valuable grazing resource.

While Eaux et Forets has developed some cooperative programs with Elevage and Agriculture, it appears that too little consideration has been given to the problems that cause resource degradation in the first phase: that is a lack of resource management. Without a program of integrated resource management isolated project activities, though successful, will be but a "band aid" approach and will contribute little to solving problems of resource degradation or to land rehabilitation.

Dr. Gates concluded that:

- Resource degradation is the culmination of years of mismanagement, primarily uncontrolled woodcutting, uncontrolled grazing and farming practices.
- Problems related to water development have contributed directly to resource degradation.
- The GOS has recognized the need for resource rehabilitation and has developed significant action programs.
- Eaux et Forets has the technical capability and the core staff to ~~develop and implement~~ resource rehabilitation programs. Such programs must involve other concerned agencies within GOS.
- The solution to land rehabilitation and restoration of productivity lies within a program of integrated resource management.
- Resource degradation will continue until problems of livestock control are solved.
- Woodcutting is a major contribution to resource degradation but in total is not as significant a cause as uncontrolled grazing.

- The need exists, within the GOS, to develop a land management organization with the technical and administrative responsibility to develop and administer an overall program of integrated resource management.

Dr. Gates recommendations include:

- Project development must be considered from the standpoint of integrated resource management.

The GOS agencies in resource management and/or control must be fully involved. This will include, Faux et Forcés, Elevage, Agriculture and Hydraulic.

- Look at the broad problem of resource rehabilitation and management.

- Determine specific causes of resource degradation and develop solutions to the specific problems within the context of broad program.

- Evaluate the need for reforestation in the same context as the land rehabilitation techniques. Other forms of revegetation will be fully evaluated to meet specific resource management needs.

- Include a scheme of management to assure sustained productivity from land rehabilitation activities. (Identify the problems solve the problems, manage to prevent reoccurrence of the problems).

- The three proposed projects, bush fire control, management of rangelands around bore holes and reforestation must all be considered in relationship to overall needs for resource management. That is initiation of project activities related to any of these interventions must be a part of the implemenation of a plan of integrated resource management.

- A program of livestock control and/or management must be an integrated part of all project proposals discussed.

C. The project review committee recorded the results of its analysis of the PRP in a letter dated January 7, 1977. (Annex //) The following statements are included in the report.

1. Well-Point Development:

Some years ago a number of deep wells were drilled on the public range without instituting any form of grazing management for the areas they served. Our inspection in September 1976 revealed severe overgrazing for radiuses of about 10 kilometers from the wells, which is about the distance that a bovine will voluntarily travel for water. The land in the immediate vicinity of the wells was found to be completely denuded and severely eroded, due to overgrazing and trampling. In 1974 a project was proposed that would enclose 300 hectares around each well and plant the area in Acacia arabia as a soil binder. We recommended against the project on the grounds that grass roots and grass cover are required to stabilize top soil ("A" horizon) that tree roots are ineffective for this purpose. Further we reasoned that to get the tree started would require controlled grazing which would permit the reestablishment of grass cover, hence for the purposes indicated, the trees are superfluous.

The PRP proposed the same activity expanded to 400 hectares per well, adding as justification brouse forage to be provided by the trees and gum arabic to be harvested. For the area to be enclosed we have no indication either from the paper or from the literature that animal nutrients can be produced more efficiently from acacia than from the native grass species. In fact our experience is that it takes seven times as much groundwater to produce a unit of animal nutrients from

mesquite as it does from grass. Certainly water is a limiting factor. In view of the sector goal of self-sufficiency in food production, we cannot recommend a gum arabic project, even if it were economically feasible, as a cultivated crop has not been demonstrated.

One major concern with the proposal is that it does not address the overriding issue of land-animal balance. Where each of these wells serves approximately 40,000 hectares that are presently overgrazed, the PRP proposes to protect 400 hectares or one percent of the area affected. Such action would merely change the pattern of deterioration and this only slightly. Again, we challenge the essentiality of reforestation as a means of resource rehabilitation and management in these cases, where contrary to the PRP, the cause of deterioration is clearly overgrazing. If we are wrong, then at \$500 to \$1,000 per hectare the Sahel recovery program is in serious trouble.

2. The Sylvo-Pastoral Zone (Firebreaks):

Although we agree that fire control is an essential range management practice, it is of doubtful value when not incorporated with a complete resource management program. While the PRP recognizes the value of manager grazing (page 22) it does not propose a grazing management program.

3. Soil Conservation:

The Acacia albida is presented as a soil conservation project in the groundnut basin. The merits of Acacia albida were discussed in some detail at the PID stage and left at a low priority for research

applied to soil fertility. Soil conservation was not mentioned in the PID. In no stretch of the imagination could these trees set as recommended, 30 meters apart, provide any protection from water or wind erosion.

4. Greenbelt Reforestation:

We are aware of the need for cooking fuel, posts and poles in the urban centers, as well as of the existing Greenbelt proposals. We take issue only with the economic analysis, location and alternatives, which were not discussed. The economic analysis is inadequate to say the least. As for location, why would the high rainfall area of the Casamance not be examined for timber production? Timber production requires high rainfall, and water transport to Dakar is available.

Our recommendation is to proceed with the establishment of a comprehensive resource management program in the government which will involve the Forest Service, Animal Production Service and the Agricultural Service. The first phase of the program would of necessity deal mostly with the development of a national policy toward resource management. It is our opinion and that of those with experience in planning and implementation agricultural projects in the Sudano-Sahelian countries of Africa, that to proceed with development activities in arid areas in advance of a firm commitment to management of natural resources is not only a waste of financial resources but could contribute to an accelerated rate of environmental deterioration. The project should also include resource inventory work, training and demonstration. To provide training and demonstration

the project might opt to take on a discrete area of the "Sylvo-Pastoral" zone for integrated resource management. The experience gained here should provide the basis for a national resource management program on a larger scale.

D. Dr. John Withers submitted the official position concerning the PRP (Annex 12.) review in a letter to ECPR dated January 19, 1977./ His letter included the following points:

The PRP should be granted conditional approval. Final PP preparation should be subject to AID/W review of additional material to be submitted in an interim report, the recommended elements of which are detailed below.

The principal issue identified by the project committee was that the PRP appears to consist of the original PID-outlined strategies with only a limited attempt having been made to mesh these discrete approaches into a comprehensive or "integrated" strategy for dealing with land resource management constraints in Senegal. There is an apparent lack of focus on overall resource planning. How the various activities will reinforce each other or why the four were selected as opposed to other alternatives is not spelled out. The project overview (page 6) is illustrative of this deficiency as it characterizes the project as four distinct activities in four different geographic areas designed to accomplish four vaguely related objectives. Finally, there is no substantive treatment of GOS policy or long range strategy, either as background information or as an area to be treated by the project. The basic approach should be reexamined.

The interim report should outline an integrated strategy based on a preliminary analysis of land resource management problems facing the GOS (Pilot activities testing a truly comprehensive strategy for example, could start within a single area for later expansion in an "evolutionary" approach).

E. A multi-disciplinary team was commissioned to design ways and means of implementing an Integrated Resources Management Project. The teams (Annex 13) assignment/made no reference to the four projects 1) well point development, 2) Acacia albida planting, 3) greenbelt development and 4) firebreak construction. The PIO/T product should include conceptualization of a national integrated resource management program which the Government of Senegal agrees to implement. The product should include consent among GOS services to work together in implementing an integrated resource management program, criteria governing the approval and evaluation of resource management projects and a description of pilot activities.

Early in October Gates, Forsman and Hradsky visited with Mr. El Hadj Sene, Director Eaux et Forets, concerning the multi-disciplinary teams assignment. It was evident that Mr. Sene and other GOS officials were more interested in the four projects which they had submitted for funding that they were in developing a new project embracing integrated resource management. They felt that the four projects were sufficient for an integrated program and should be dealt with. (Annex 14) In a letter to the Director of USAID and the team leader, Mr. Sene explained that the Senegalese planning method included a system favoring integrated resource management projects. The means of

coordination is available within the Ministry of Rural Development. He suggested that the team pursue the study of the initial projects. A separate project of integrated resource management should be the subject of a separate request if the Ministry of Planning should so desire.

It was apparent from the above discussions and correspondance that new proposals should not be introduced until the US has acted upon the four projects. It was also evident aht there is a different frame of reference between the US and the GOS concerning integrated resource management projects. For these reasons the team decided to evaluate the four projects and identify those projects that can be developed into pilot integrated resource management demonstrations. These projects will be confined to logical land management units within which all important resources and values will be inventoried. An integrated resource management plan will be prepared for each pilot project area. The plan will identify the major problems such as overgrazing, over-cutting, unsatisfactory farming practices and wildfire. The changes in management needed to solve the problems and the development activities necessary for resource recovery and improved use will be included in the action part of the integrated resource management plan.

Team members will work with their counterparts in GOS while analyzing the projects and developing the plans. This should result in a better understanding of integrated resource management. Joint discussions of how the plans will be activated should identify any changes that will be necessary in the Government organization to carry out an integrated resource management effort.

F. The multi-disciplinary team reviewed the documents and visited the areas concerning three of the four projects proposed by the Government of Senegal:

- Well point development in the Sylvo-Pastoral zone.
- Greenbelt development around Cap Vert.
- Acacia albida in the groundnut basin.

Time did not permit a review of the firebreak program in the Sine Saloum. The area was not visited.

The team believes that each proposal, with certain additions and modifications, offers an opportunity for an integrated resource management project. The plans for these projects would address all of the resources and values within the project boundary and the relations of one to another.

The team suggested that an integrated resource management pilot projects, which includes Acacia Albida plantings, be designed for the groundnut basin. A major objective of the project would be to develop a process for integrated resource management. The project would include improved and diversified cropping practices, livestock grazing, animal husbandry, and other farm activities. SODEVA has a resource management program underway in this area. It was recommended that AID assist SODEVA in implementing an integrated resource project.

The team recommended that the well point development project in the Sylvo-Pastoral zone be made a part of the SODESP-Livestock Production Project (685-0224).

The purpose of the well point project is to control soil erosion at water points. The proposal includes conservation and management of range and forest resources in well areas. The purpose of the SODESP-Livestock project is rational use of water and range resources to maximize returns to herders and to overcome deficits in meat. These actions should be carried out simultaneously within the same project area.

The team offered these suggestions regarding the Greenbelt project:

1. The title be changed to "Fuel Production" which reflects the primary purpose of the project.
2. The project be designed as an integrated fuel production effort.
3. The project include:
 - a. Fuel (energy) inventory.
 - b. Survey of fuel needs
 - c. Integrated programs to meet fuel needs.
 - d. Activities include:
 - (1) Forestry
 - (2) Energy conservation through improved techniques of charcoal production.
 - (3) Alternate sources of energy such as solar, wind, and waste.

The forestry activity be continued as an important component in the overall energy strategy of Senegal unless other sources of energy become available at a more reasonable cost.

G. The team was asked to review national policy and the planning process as they relate to development of integrated resource management programs. A review () of the Senegalese planning process reveals that the country has developed a sophisticated and efficient approach to rational national and regional development. Volume I of the current National Plan places a clear national priority on environmental planning: "The modernization of the economy should not place a mortgage on the nation by polluting and degrading the national setting through an abusive and anarchic exploitation of the national resources".

The "protection of nature and national resources" is one of the major objectives of the Plan. Increasingly, the thrust of the national policy appears to favor greater rural development and resource conservation. Currently however, ecological concerns as expressed in the National Plan deal more with industrial pollution and waste disposal.

Environmental concerns are included in the elaboration of the National Plan. The emphasis on reforestation and fire control is necessary and appropriate. However, the team believes that total resource management could be strengthened by giving equal emphasis to other resource values (cultivated land, grassland, livestock, wild life).

Damage from over-cutting of forests, over-grazing, and present farming practices must be dealt with in addition to fire control. In an overview of the present system the team (and often our Senegalese counterparts) have arrived at two observations worth of mention:

1. that resource management in rural areas is often basically a sectorial concern with cooperation among the various services at the local level tending to be ad hoc.

2. The pressing demands placed on implementing agencies makes it difficult for them to systematically formulate programs with a longer-term perspective of sustained productivity, as well as monitoring the longer-term effects of project development.

It would seem useful for USAID, with the cooperation and concurrence of the GOS, to provide pertinent assistance at the national, regional or project level to counteract these tendencies.

H. On Friday, November 18, the Integrated Resource Management team met with officials of the Ministry of Rural Development and Hydraulics. They discussed the proposals of the team for expanding GOS project proposals into Integrated Resource Management systems. Agreements were as follows:

1. Well Point Development Component - The team recommended incorporation of this component into the SODESP-Livestock Development Project. GOS officials essentially agreed that the project should be further developed with SODESP. They plan to proceed, however, with reforestation at selected well points. If USAID will not fund this single activity, they will seek donors elsewhere.

2. Conservation in the Peanut Basin Component - Because of additional "terms of reference" which the team has introduced into the original proposal, the officials felt that the proposed project would have to be reviewed at a higher level. They will respond to the team's proposal (accept or reject) at a later date. They plan to go ahead with Acacia Albida reforestation with or without USAID assistance.

3. The Greenbelt Component - The team's proposal for this component is "essentially ~~OK~~" to the GOS officials. There are no fundamental disagreements.

4. Fire Protection in the Sine Saloum Component - GOS officials suggested that the team review work by previous teams and leave our suggestions for succeeding team(s).

Reflections

1. It was evident that there is not a clear understanding between the team and GOS officials as to the meaning of "Integrated Resource Management". It seemed to be poorly understood by some officials; yet others, in their presentations, showed a good understanding of what we were trying to encourage.

2. The words "pilot project" seemed to be confusing to the officials. Their concept seemed to be small experimental plots. The team explained that this was not our meaning; that we are interested in application of known technology on a larger scale, not in research on small plots.

3. The outline (Annex 15) for discussion provided ahead of time for GOS officials was too vague and general. They desired more facts, figures, details.

4. The outline did not adequately recognize the quantity and quality of work being done by GOS, Ministry of Rural Development and Hydraulics, Eaux et Forets, SODEVA, SODESP, and other departments.

5. It was apparent that Eaux et Forets felt the team's suggestions would result in an infringement on their traditional bureaucratic territory. The organization initiated action on most of the project proposals and felt they were being asked to give up substantial ground to SODEVA and SODESP.

I. Mr. Paul Rusby, Food For Peace Officer, met with the Team during discussions of the projects. He suggested the following possibilities for using PL 480 Tittle II food as a development resource (see Annex 19).

1. Greenbelt

- a. Partial payment to labor in tree planting brigades;
- b. Partial payment to dig water holes for animal grazing;
- c. Pay labor to revitalize (but not maintain) firebreaks.

2. Acacia Albida Reforestation

- a. Pay labor to increase density of acacia
- b. Pay labor to plant windbreaks to avoid erosion
- c. Pay villagers to plant and care for small trees when they receive them
- d. If fallowing is essential, and increased food production significant after fallowing, we might provide the "food not grown" as a one-time educational incentive.
- e. If crop rotation is essential, we might provide the "food not grown" as a one-time educational incentive.

3. Well Point Development (Sivan Pastoral)

- a. Educational inducement to use well points
- b. Pay labor to install more low capacity wells
- c. Plant trees around well points
- d. Build fences/corrals around each well site

- e. Build firebreaks and firetowers
- f. Lay satellite pipelines from well points
- g. Build stock ponds at satellite points
- h. Incentives to encourage herder cooperation
- i. Provide food at herder training camps
- j. Food credit bank to buy agricultural tools.
(Provide food, let the farmers buy it, their payments go into a fund to buy tools.)
- k. Food credit bank to buy animal supplements
(Farmers buy Tittle II human food, their cash payments buy animal food supplements, thereafter each animal is taxed to restore the fund.)
- l. Food inputs to promote rational range management.
(Provide food only once for the transhumit cycle.)

II PROJECT ANALYSIS AND RECOMMENDATIONS

REFORESTATION FOR FIREWOOD PRODUCTION
(Formerly "Reforestation of Urban Greenbelt")

Project NO. 685-0219 SENEGAL (Greathouse)

I. INTRODUCTION

A. Background and Objectives

1. Primary objective: Firewood (charcoal) production

The primary objective of this USAID project is to produce a continuous supply of firewood (charcoal) on 5 tracts totaling 3,000 hectares. The fuel would be used in the nearby, heavily populated Dakar-Thiès area. It is believed that the urgent need for reasonably priced charcoal justifies this project.

Demands for this fuel have increased as rapidly as the population in the last decade. Due to depletion of local forests by overcutting, many of the latter are now populated with secondary species of low quality. As a result, over 50% of present needs for charcoal are obtained from the Casamance or from eastern Senegal at distances of 300 to 500 km. Creation of 3,000 hectares of forests would supply about 40% of the nearby urban areas' demands.

2. Alternate sources of energy:

To help meet future demands and further decrease the pressure on local forests, it is suggested that an agency be created to estimate future fuel requirements and to establish a fuel source inventory to assist in planning. Alternate sources of energy, including solar and wind, should be explored as well as techniques for better utilization of present sources.

It is also recommended that expansion of solar experiments involving solar pumps, dryers and water heaters be considered if such work is not being done elsewhere in the Sahel.

3. Automatic benefits from establishing a forest
Benefits from establishing 3,000 hectares of forest will include:

- a. Improvement and protection of soil
- b. Provision of food and shelter for wildlife
- c. Moderation of the climate in the vicinity
due to shade and reduction of wind velocity
- d. Reduction of evaporation of soil moisture

4. Under intensive management, at least two other resource uses could be integrated in some areas on a small scale.

a. Production of agricultural crops between the rows of trees for two or three years after a unit is planted.

b. Limited grazing of cattle 3 years after planting, if agricultural crops are not more important.

B. Status of Areas Involved

1. As a result of requests by Eaux et Forêts, the GOS agency for managing waters and forests, the CILSS (Committee of the Club of the Friends of the Sahel interested in the struggle against the drought in the Sahel) prepared a document proposing reforestation for firewood production in the urban greenbelt area.

Specific planting sites selected were:

<u>City</u>	<u>Hectares to be planted</u>
Deny Youssof	200
Sebikotane	600
Thiès (Pout)	600
Bandia	1000
Popenguine	<u>600</u>
TOTAL	3,000

2. As of 1 November 1977, 300 hectares of this area have been treated. Additional funds are needed to continue this work under the guidance of Eaux et Forêts. It is recommended that this be done either as part of Project NO. 685-0219 or as a separate project.

C. Status of Nurseries proposed in the PRP (Projet Review Paper)

By the time this project is implemented, the proposed nursery at Pout will have been operating a year. The second nursery, at Bandia was visited. An office and residence are under construction and major clearing has been done.

Funds are needed to complete site preparation and construction of buildings at Bandia.

D. Training of Forestry Specialists

It is recommended that individuals be selected for training as forestry specialists as follows:

1. Send 3 men to the U.S. for 2 years graduate training in:
 - a. Forest management, with emphasis on silviculture (nurseries and reforestation)
 - b. Forest tree improvement, with emphasis on genetic techniques suitable for Senegalese tree species.
 - c. Forest utilization, with emphasis on increasing yields of both firewood and service wood.

Note: These persons should be capable of handling improvement work on the Acacia Albida project also. For maximum benefit, 3 to 5 years experience in forestry or forestry-related work should be a requirement for selection.

2. Technicians:

Technicians, or sub-professionals will be needed for the forestry phases of this and the Acacia albida project. Exact numbers should be calculated after the GOS and USAID agree on the extent of the work to be funded.

3. Extension foresters at the technician level should be assigned to each area where forests are to be planted. The importance of informing village people of the benefits of reforestation can not be overemphasized.

E. Assistance by USAID specialists

Minimal advisory personnel are recommended since the GOS agencies involved seem able and anxious to accomplish this and other projects concerned with trees.

Three consultants are recommended for the forestry phases of the Firewood Production and Acacia albida Projects:

1. Forest Management (nurseries, reforestation) (3 months at beginning and first three months of 2nd year of project).
2. Forest tree improvement. Same duration as for 1.
3. Forest utilization. For 3 months in middle of fourth year of project.

F. Survey of Sites proposed for Project

Since the sites have already been selected, use of landsat satellite imagery does not seem needed for this project. However, soil maps, aerial photographs and ground checking are necessary to determine which species should be planted on specific sites.

It is recommended that USAID fund the cost of having aerial photographs taken.

G. Tree Improvement

A basic tree improvement program of selecting the trees which produce the most pods and foliage has been carried out for some time.

If a tree improvement specialist can be assigned to the project as recommended in E above, it is suggested that ^{he} be given the responsibility for working closely with Eaux et Forêts, CNRF and CNRA to prepare a formal project could be made the subject of a special project. It should not be included in this project.

H. Selection of species to plant and proposed spacing

The species recommended in the PRP (Project Review Paper) are believed sound except that recent research by CNRF indicates that Eucalyptus microtheca has not proved suitable. Observations indicate that only E. camaldulensis should be used on about 65% of the proposed 3,000 ha.

Choice of species was based on the soils to be reforested. This is indicated below the table.

<u>Species</u>	<u>%</u>	<u>NO. Trees/Yr.</u>	<u>Total Trees</u>	<u>Spacing, NO./HA</u>
Eucalyptus camaldulensis	65	390,000	1,560,000	(4 x 4 m, 625)
Azadirachta indica (Neem)	25	150,000	600,000	(" " ")
† Other Species (3)	10	60,000	240,000	(" " ")
SUBTOTALS	<u>100</u>	<u>600,000</u>	<u>2,400,000</u>	
++ Firebreaks (in and around plantations)	-	8,000	32,000	(5 x 5 m, 400 HA)
TOTALS		<u>608,000</u>	<u>2,432,000</u>	

+ 3 SPECIES: CASUARINA EQUISETIFOLIA, CASSIA SOAMEA, MELALEUCA LEUCADENDRO

++ ACACIA ALBIDA - 50% or 4,000 Trees/Yr.
ANACARDIER - 50% " " " "

Soils on which to use Eucalyptus Camaldulensis are:

1. on deck soils, (lithomorphic vertisols with massive structure)
2. on deck dior soils (tropical ferruginous, slightly leached)
3. on shallow soils, overlying calcareous or mal formations.

Azadirichta soils:

Those which dry out well and have low calcium content.

Casuarina soils:

Light and salty soils near the sea.

Cassia soils:

Deep alluvial soils around bottomlands

Melaleuca soils:

Areas periodically flooded and on salty soils (Popenguine).

II. DEVELOPMENT OF A PRECISE MANAGEMENT AND WORK SCHEDULE TO ASSURE
TIMELY IMPLEMENTATION OF OPERATIONS.

The GOS has shown that it can develop and implement a management and works schedule by establishment of 300 ha of firewood plantations (Eaux et Forêts).

For the purpose of this paper items needed in such a schedule include:

- 1st year : Prepare plan for clearing and planting
- a. Discuss with GOS officials (Foresters, soil specialists, etc.) and with Rural Community leaders and farmers.
 - b. Clear proposals with Eaux et Forêts, etc.
 - c. Obtain equipment and have sites prepared for planting.
 - d. Arrange for nursery production of seedlings (Eaux et Forêts)
 - e. Arrange for protection of trees from livestock damage.

2nd - 5th year: Begin implementing by establishing 750 ha. of plantations each year.

III. BENEFICIARIES

This project will benefit the lower income families in the Dakar-Thiès area by making their only source of energy for cooking and washing available at a reasonable cost.

People adjacent to the area will benefit from increased employment opportunities. Indirectly, they will benefit from soil protection and enrichment, moderation of climate and other by-products.

IV. FEASIBILITY:

The implementation of this project will depend on adequate inputs from GOS and from USAID.

A. GOS

1. Sufficient seedlings and manpower will be needed to plant 750 hectares per year for 4 years. Eaux et Forêts indicated informally that it has the capacity to produce enough trees to reforest 1500 hectares per year on this project.

2. Implementation of the work and protection of the seedlings for 2 to 4 years after planting will be required. Eaux et Forêts has the knowledge and personnel to accomplish this and is dedicated to do so.

B. U.S.A.I.D.

USAID will have to provide funds and equipment to complete the project. If funds can be made available by December 1st, 1978, the first 750, perhaps more, can be planted in the wet season in 1979 (June-September).

It is recommended that this phase of the project be expedited to meet this deadline.

V. ECONOMIC CONSIDERATIONS

Total information is not at hand on 19 November 1977 for an economic analysis, but the following information will be needed for this purpose.

A. Need for Charcoal

At least 70% of the people in the Dakar-Thiès region rely on charcoal for cooking and heating to wash clothes, etc. Artisans and fisherman depend on wood for their industry.

It has been estimated that virtually all of Dakar's wood and charcoal comes from outside the local region. Over 50% came from Eastern Senegal in 1975. Much of the balance came from the Casamance. The distances involved are 500 and 300 km. respectively.

B. Harvesting for firewood production can begin after six years. At 10 years after planting, production is expected to equal the following, based on a 10 year cutting cycle, or 300 ha per year on the 3,000 ha. involved.

Estimated Charcoal Production

11.2 tons (49.1 tons of wood)/Ha/yr. (annex B of PRP)

300 ha/yr x 11.2 tons = 3360 tons/yr.

(3360 tons = about 40% of Dakar's annual needs)

Value/ton = 30,000 CFA (\$120/ton)

3360 tons x 30,000 = 100,800,000 CFA = \$400,000/yr.

It is believed that the project will be proven to be economically feasible based on return alone. Transportation is expensive in Senegal. In addition the value of reducing overcutting of natural forests is almost inestimable.

SOIL CONSERVATION IN CENTRAL SENEGAL

A combination of population growth, emphasis on peanut production, and a net return to farmers which favors peanuts over cereal production has resulted in over-intensification of cropping with associated negative impacts. These include creation of a near-monoculture, continuous cropping system, soil depletion, shortage of subsistence crops (millet, sorghum) excessive erosion, a shortage of livestock feed, reduction of wooded areas, and dispersal of population.

The monoculturization of this area has not only resulted in unstable and depleted soils, but also in an unstable base of subsistence. Degradation of the resource base means declining yields. The seriousness of low agricultural production has far reaching impacts. Over one-third of cereals consumed during the 1971-74 period were imported. This accounted for nearly one-half of Senegal's trade deficit and more than half of the value of peanut exports was required to offset cereal imports.

Although total food supply is generally adequate when imports are included, diets for certain segments of the population are frequently inadequate, imbalanced, or both. Consumption and clinical surveys indicate seasonal malnutrition among part of the more vulnerable groups.

The GOS is attempting to alleviate the problems outlined above by encouraging in-country consumption of millet, corn and sorghum and less dependance on rice and wheat by price regulating policies. They are accelerating research on improved processing procedures for millet and corn that will make these more acceptable. Industrial production of millet bread is also being considered.

The economic situation (balance of payments) provides a growing incentive for improving crop yields and for a continuous cropping system that will maintain soil organic matter and physical condition, and control erosion. This will require considerable change in present systems of farming. Such changes are generally already advocated by the Senegalese Government and the extension service (SODEVA), as well as by leading researchers familiar with dry-tropical areas. Professeur Claude Charreau considers the potential for crop production to be much greater than is presently attained. It appears permanent agriculture (crop cultivation) is a realistic and attainable goal throughout the peanut basin where soils are suited to this use.

Deterioration of the soil has accelerated because of the increased ratio of annual cropping to fallow. Ratio of cropping to fallow was traditionally about 1:5 with up to 50 years fallow. Present ratio of cropping to fallow is reversed, about 5:1 with 4 years of less fallow. The fallow period is too infrequent and too short to have a pronounced positive effect on physical and chemical properties of the soil. Changes in percent of land tilled have not been accompanied by changes in farming practices necessary for soil maintenance.

While water erosion is not a serious problem in most of the peanut basin, wind erosion is possible in all of the basin. We saw evidence of very serious ^{wind erosion} east of M'Bake and southwest of Louga. This erosion was serious enough to account for a high percentage of reduced fertility and lower yields. Literature reviewed did not deal with wind erosion or its control. Mr. Buresi, Director of Extension (SODEVA) indicated in personal conversation that outside expertise in wind erosion control is needed.

That production of cereal crops can be increased is not questioned. We believe it can be accomplished at the same time that peanut production is increased. An increase in cultivated land is not necessary. Extension of methodology developed through in-country research is the principle key. Existing and on-going research is entirely adequate to answer questions concerning production increases. Means for extending improved cultural methods to the farmer is a problem. However, a sound extension service under able leadership is operational, and its progress has been commendable. When one compares present crop production with potential production, considers the goals of the GOS, and observes the degree of soil degradation, need for changes in cropping-management practices becomes apparent. This need requires multi-directional action, such as tree planting, erosion control, animal power, fertilization, livestock management, and crop diversification. SODEVA, the Extension Agency with responsibility in nearly all of the "peanut basin", has an on-going program that addresses these and other interacting factors in the rural community. Planting acacia trees in the peanut basin will have a positive impact. The tree is adapted to the area, it is known to increase soil fertility, and it will yield important organic by-products which can be used for fodder and soil improvement. Although nursery raised seedlings are said to have a 95% survival rate when planted under natural conditions, this figure would only be obtained under ideal conditions where animals and particularly goats are denied access. Trees will have to be protected for the first three years or until they are immune to trampling and able to survive browsing. The implementing agency (SODEVA) is aware of these problems and is prepared to address them.

The original doubts raised in review of the Acacia albida project concerned mainly the question of context. USAID reviewers asked how this project fit into a strategy of resource management which

contained mutually supporting elements and which has to do with a range of sources of degradation.

The objective of this component as expressed in PRP 685-0219 was to slow soil degradation and provide a more suitable environment for peanut production primarily by planting *Acacia albida*.

While the planting of *Acacia albida* will contribute to increase of fertility of groundnut fields, it does not by itself contribute to diversification. It is only in a context of an integrated program that this project can be justified

In our investigations we found that SODEVA had indeed formulated a resource management strategy of which the planting of *acacia albida* was only one part.

In confronting this situation SODEVA has as its strategy, diversification. SODEVA's plan is to introduce not only better methods of groundnuts production, but also to reintroduce alternative land uses, and alternative food producing activities. Although this program faces serious constraints, and the land use pattern can not be set back to that of 1900, improvements are possible and diversification offers a logical strategy. Therefore, we recommend expanding the program to work through SODEVA, assisting it in the implementation of its strategy. Close cooperation with Forestry, Agriculture, Hydraulics, and Livestock would be essential for a successful program.

If this proposal is accepted by the GOS, AID project could take place in a delimited region selected by GOS and SODEVA and would have as its objective the implementation of an integrated program dealing with all aspects of the environment. AID with SODEVA would identify and fill needed areas of capability and expertise.

Reduce balance of payment deficit, improve diets, increase production, increase efficiency, stabilize soils, and reduce erosion: there are noble goals. These and other factors are inter-related and are best dealt with as a whole. The project, as proposed, ^{In the preceding paragraph,} will have a positive impact on challenges facing Senegal and its people. The degree of extension beyond the project boundaries will govern total impact.

The Well Point Development in the Sylvo Pastoral Zone

(USAID Project 685-0219)

(Dalton Comeaux)

BACKGROUND INFORMATION

The degradation of Senegal's land and soil resources due to the drought, uncontrolled grazing, wind erosion and excessive use of forest resources is profound. Uncontrolled forest fires also causes severe damage to forest, crops and indirectly to livestock. The drought of 1969 through 1972 caused losses of 15% of the nation's cattle. Similar losses were experienced in the neighboring countries of Mali and Mauritania, thus reducing the export of cattle to Senegal.

In 1976, it was estimated that there were 2,450,000 beef animals in the country. Each year 10% are slaughtered, as the annual increase in herd size is about 13%, the net gain is 3% per year.

The following tables gives the present slaughter statistics and the projected figures for 1985 for beef.

	<u>1977</u>	<u>1985 projection</u>
30,625 tons slaughtered per year		56,160 tons
245,000 number of animals slaughtered		416,000
41,531 tons present demand		68,900 tons
10,906 tons deficit		12,740 tons
74% percentage of demands met		81 %
26% deficit		19 %

The average age of the animals slaughtered is 5 years, yet many steers are 8 to 12 years old. In addition to the steers a certain number of bullocks of the same age are sold each year.

The above information indicates a need to help the GOS strengthen its livestock industry. The GOS organization charged with the development of livestock is "Société Nationale Pour Le Développement de l'Élevage dans la zone Sylvo-Pastorale" (SODESP). SODESP has been operating for four years and is beginning to make headway.

The goal of SODESP is to promote the rational use of water and range resources, to maximize the return on investment to herders and to overcome a serious deficit in meat requirements for the urban areas. The SODESP program is divided into three phases:

- (a) cow-calf
- (b) growing
- (c) finishing.

The cow-calf operation is located mainly in the north and central parts of the country. The bull calves are purchased from the cooperating herders at weaning time or as short yearlings. These animals are then moved to the south central part of the country (Doli Ranch) where they are pastured.

The rainfall exceeds 500 mm per year. The Doli Ranch, encompassing an area of 80,000 ha, is subdivided by fencing. The longest distance any animal has to walk to water is 7 km., as several sub-watering stations have been developed. The calves placed in this area have an average weight of 110-120 kg. When transferred approximately 18 months later they average 300 kg. The third or feed not phase is located in the Cap Vert region near Dakar. The animals are finished there on concentrates until they weigh 350 to 400 kgs. This takes 3 to 5 months.

SODESP offers a number of incentives to encourage the herders to participate in the program:

(1) They provide credit for the purchase of feed supplements, minerals, health care and equipment.

(2) They guarantee a cash market value, paying a premium for well grown feeder calves which takes into account real costs of production.

SODESP has relatively good control of the herders by contracting to provide production, health and marketing assistance. When the herder enrolls in the program, non-productive animals, males and old steers and all but one bull to 25 cows are culled out for immediate sale and slaughter. As the project progresses herders will retain their breeding herd, herd sires, draft animals and heifers for replacement. All other male calves are sold to SODESP.

Note - The author recognizes the fact that one of the main objectives of the GOS and the herders alike is to build up cattle numbers to pre-drought status, and that SODESP recommends all heifers be kept by the

herders. There is no doubt that some of the heifers should be culled at a young age as soon as herd numbers have reached a desirable level. Then excess heifers should be sold to SODESP.

Extension Service

SODESP has the nucleus of a good extension service. Extension agents were at work in the area of Lagbar (headquarters for zone 1) for 18 months before they signed their first contract with a herder. Their purpose was to convince the herders of the goals, objectives and benefits to be derived from the program. Progress has been slow as herders have been doing "their thing" for centuries and are hesitant to accept new ideas. Of the 52 herders who originally agreed in 1975 to participate in the Pilot Phase, 17 honored their agreement and entered 185 animals during the first year. In 1976, the number of cattle increased to 957. By the end of 1977 SODESP expects to have approximately 5,000 animals in the program. One of the Extension Agents made the following statement, "most of the herders believe us only after they have seen results". The Extension agents and veterinarian assistants will play important roles in SODESP. In service training will be vital to its future development.

AID assistance to SODESP ties in directly to that component of its Senegal Land Conservation and Revegetation Project which concerns itself with development around deep well watering points in the Sylvo-Pastoral zone. That project proposed reforestation around watering points as well as improvement of the deep wells.

Improvement of well points without accompanying introduction of herd management practices seems likely to increase the burden on range resources. The SODESP program will work with herders who will benefit from improved watering points and reforestation designed to achieve a rational balance between livestock numbers and range resources.

Two well points should be developed each year, starting during the second year of the project. It will be impossible to develop infrastructure necessary at the sites and to obtain the number of herders necessary to operate more than two locations yearly.

SODESP has estimated the carrying capacity of the range land as one animal to eight hectares of land. The number of animals assigned to a new well site will vary from 4000 to 5000 animals. The radial distance around a well will be approximately 15 km. SODESP believes that the Peulhs have responded and will continue to respond favorably to restricting the size of herds through increased culling.

Animal Nutrition

During the rainy season the native grasses grow very fast. They are of excellent quality, fine-stemmed, succulent and high in protein. The number of days of rainfall and its distribution are the main factors in determining the richness of the natural grazing land.

Animal health improves rapidly, stimulating weight gain and increased reproductivity of the females. About two months after the rainy season

ends the quality of the forage declines rapidly, causing a corresponding decrease in herd productivity i.e., weight, growth, fertility and calving interval.

Hay should be made and stored at, or just before, the beginning of the dry season, when it is still high in nutritive values. Native grass hay along with peanut fodder can be fed to the stock during the most critical part of the dry season.

Supplementary feeds such as bran, peanut meal, peanut cake, minerals and coarse salt can be purchased and fed to the animals. That will help maintain animal health and prevent them from losing excessive weight.

Dalton Comeaux
Livestock Advisor

WELL POINT DEVELOPMENT IN THE SYLVO-PASTORAL

The GOS has submitted two separate requests to USAID concerning resources of the Sylvo-Pastoral.

Because the resources to be dealt with in the requests are so intricately interwoven, they should be dealt with simultaneously on any given area. Therefore, the integrated resource management team recommends that the well point development component of the Land Conservation & Revegetation Project (685-0219) be incorporated into the SODESP-LIVESTOCK PRODUCTION PROJECT (685-0224), and that it be further developed in consultation with SODESP.

Things to consider when incorporating the well point proposal into the SODESP Project include the following:

SOIL AND PLANT DEGRADATION

Our observations leave no doubt that well points are centers of rangeland deterioration. Obviously, the current situation, wherein large numbers of animals (5000-10,000 cattle plus sheep, goats, burros, etc) water at a well point, lays bare to erosion large acreages of rangeland adjacent to the watering points. Clyburn, Ferguson, and Gates witnessed severe overgrazing up to 10 km around established well points (report dated 1/7/77). Our own observations indicate that one month following the end

of the rainy season (Oct. 31st), the areas adjacent to and surrounding well points are denuded by excessive animal traffic and overgrazing. For the remainder of the dry season (8-9 months), the area is subject to wind erosion and contributes to air pollution and people and animal health problems.

According to studies by Dr. Valenza of SODESP, soil depletion is not a problem at well points. In fact, his research indicates just the opposite. The highest production occurs 0.5 km out from the well point. Production declines from there out, to 2.0 or 2.5 km and then increases out to a distance of 4-7 km.

He attributes this pattern to the additional organic matter and plant nutrients from animal manure deposited near the well points. Production is measured immediately following the rainy season (about Sept. 30) when herdsmen are using wet-weather ponds to hold their livestock away from the well points.

Equally as bad as at well points is the degradation of rangeland immediately around villages. This is a result of the traditional system of returning livestock to the village each night for milking, protection of livestock from predators, habit, to nurse calves (which are kept at village), and herd inspection. The wives of herdsmen apparently milk many cows, often in excess of family needs, and feed the excess back to their animals. Not only is overmilking unnecessarily consumptive of time and labor, but worse, reduces the performance of calves and creates animal traffic to and from the village. One wonders if it would be practical for the herders to select a few of their better milk

producers (enough to meet needs) and pasture them nearest the village, and keep the remainder of the herd in the grazing area away from the village at night. Calf performance would improve if they were allowed to take all of their mothers' milk, and rangeland around villages would improve as a result of reduced grazing pressure and animal traffic.

If necessary, herdsmen could use tree-to-tree corrals to prevent cattle from straying overnight. The feasibility of such a suggestion would hinge, to a great degree, on the severity of the predator situation, which was not accurately ascertained.

RANGE MANAGEMENT

In the Sylvo Pastoral, as in many areas of Mediterranean-type climate, the original native perennial plant communities have, for the most part, been replaced by communities of annual plants. The presence of at least one perennial grass (*Andropogon gayanus*) is evidence that there are, or were, perennial plants adapted to the rigors of the existing soil and climate. The annual plants produce useful forage and effective soil cover if properly managed. The goal of scientists and herdsmen with whom we talked in Senegal is to maintain or improve the present cover of annuals rather than to encourage secondary plant succession toward climax perennial species.

The primary requisite of range management on annual grasslands is balance of grazing animals with forage production to leave sufficient plant cover to protect the soil from erosion and maintain or improve soil fertility. In other parts of Senegal (Bakel area) the desirable degree of use has been suggested as 60%. We have no argument with that figure as a starting point. To suggest otherwise would be presumptuous on our part. It is assumed that this degree of use will permit natural seeding of preferred species.

In our opinion, the best method of determining desirable stocking rates which will balance forage and livestock is based on known historical use. Obviously, this method cannot be used in the Sylvo Pastoral because of grazing patterns, and the herdsman's reluctance to divulge information concerning his herd.

In the absence of historical data, an acceptable substitute involves the use of trend studies and utilization checks. Generally there are visible indicators of plant community trends which tell the range scientist if the plant cover is improving, declining, or static. These include plant composition, reproduction, vigor, residues, current use, evidence of erosion, etc. Grazing use is the product of number of grazers times the length of the grazing period. A given degree of use can usually be achieved by fewer animals for a longer period of time or by more animals for shorter periods of

time. The important thing is the percent of production (or amount of residue) left on the soil. The range scientist assigned to the project can check degree of use and trend periodically and predict with reasonable accuracy adjustments needed in number of animals or grazing period to achieve proper use under given weather conditions.

A third method of arriving at initial stocking rates is far more speculative. It consists of dividing known animal requirements into known forage production to arrive at animal units of grazing. This method presupposes accurate knowledges of plant production by soils and rainfall, animal requirements, and a host of variables, such as animal selectivity in grazing. The Bakel Range Livestock Project (p. 87) uses this approach. A word of caution:

(1) one cannot assume that 100% of the herbaceous production is acceptable to grazing animals while this may be the case under conditions of extreme overuse, it is not generally true under proper use;

(2) one must also consider leaf, twig, and fruit production of woody plants available and acceptable to browsing animals;

(3) all kinds of herbivores depend on range storage and must be considered in determining animal unit demand.

Rather than attempt to judge degree of use on the total range area, we suggest the use of key species on key grazing areas. The assumption is that if the key species and key area are correctly selected, then proper use on them will result in an acceptable degree of use on the entire grazing area.

Obviously, forage production in the Sylvo Pastoral fluctuates wildly from year to year in response to rainfall. Thus, stocking rates need to be extremely flexible. Perhaps the simplest system to accomplish this flexibility would be to stock at 65-70% of average conditions, cull hard in subnormal years, and hold over young animals to harvest extra forage in very favorable years.

You will note that we have spoken of "livestock", "grazing animals", or "herbivores" throughout this treatise. Range management must consider all animals, domestic and wild that consume range forage.

Much of the foregoing information is the literature concerning range science and management. We felt, however, that because of its relevancy to this proposed project, that a brief summary should be made a part of the report.

WATER DISTRIBUTION

Up to the 1950's there were no man-made in the Sylvo-Pastoral. Grazing use was limited by water supply to the rainy season. In the mid 1950's, donor countries and organizations installed a limited number of deep wells which provide permanent water. These permanent water points tended to sedenterize the nomadic herdsmen, who are reluctant to leave dependable water even when the available forage is exhausted. The well points thus have become centers of rangeland degradation caused by over-grazing and excessive concentration of animals. The development of additional well points or the distribution of water by pipelines and troughs must be constrained by the willingness of the beneficiaries and the GOS to control livestock numbers.

The decisionmakers (planners) should not restrict their thinking to any one practice for water distribution.

Well points, pipelines and troughs, stock ponds are all alternatives that should be evaluated on-site for economic, technical, and social soundness. Consideration should be given to installation of more smaller capacity wells for hand-drawing of water. The prototype currently in use consists of a drilled deep well to 250-300 meters. Then an auxiliary well about 1.8 meters in diameter is hand dug to a depth of

65-70 meters adjacent to the deep well. The two are connected by a pipe channel. Water rises from the deep aquifer to about 60 meters and flows into the auxiliary well. Water is hand drawn by the herdsmen and villagers using ropes and buckets. Some advantages include lower initial cost; reduced maintenance cost (no equipment breakdowns); fewer animals are watered, reducing the size of the sacrifice area at the well point; and they seem to serve a social function.

FIRE CONTROL

The indiscriminate burning of rangeland in the Sylvo Pastoral Zone needlessly destroys forage, wastes fuel, degrades wildlife habitat, and results in wind erosion and soil depletion. The team heartily endorses a program of education and facilities to improve fire prevention, detection, and control. This does not, however, preclude the use of prescribed burning as a range management tool.

Plant communities are the product of the environmental conditions responsible for their development. Those conditions include soil, climate (drought), fire, insects, and grazing by herbivores. Total exclusion of fire would result in changes in the plant composition, some of which would likely be undesirable. A rapid increase of invader type trees and shrubs could be expected without periodic burning.

Such an increase would surely result in a corresponding decrease in forage production. The total absence of fire would also lower the palatability and utility of many shrubs for browsing use.

The PRP calls for "construction or maintenance of 400 km of firebreaks around each group of 4 wells". According to at least one official of Eaux et Forêts, the 4260 km of firebreaks existing in the Sylvo Pastoral is adequate; additional firebreaks are not needed. Our observations indicate that maintenance of existing firebreaks would be more appropriate than construction of new ones.

Fire detection in the Sylvo Pastoral is inadequate. The PRP proposed a system of towers for fire detection. This is certainly one alternative. Another which should be evaluated for technical and economic feasibility is aerial detection - the use of a patrol plane, under contract. A patrol plane based at Richard-Toll, for example, would take the place of at least 20 fire towers in the Sylvo Pastoral Zone. The Canadian government is using aerial detection in the Casamance. The results of their experience should be ascertained. Either detection system, aerial or fire tower, will require radio communication capability.

We observed in the field the use of UNIMOGs for fire fighting. The PRP calls for additional water tanks for fire control. We seriously question the concept of using water for fighting bush wildfire. E. G. Van Voorthuizen (1977), Range Management Officer ADO stationed at Dakar agrees when he says: "It is of little use to fight grass fires in the arid ranges of Africa with water."

Roads, gardens, millet and cowpea fields, and hay fields located along existing or planned water distribution pipelines could serve double duty as firebreaks. Hay harvest in long, narrow strips, rather than square or circular patterns, could enhance fire suppression. Controlled grazing (by herding) on strategic strips immediately after the rainy season might serve as a pseudo-fire break, reducing fuel and serving as a backfire barrier.

REFORESTATION

The PRP proposes to plant 300-400 hectares of trees within a radius of 1 km of several watering points (4 wells each year for 4 years). Purposes include firewood, livestock forage and shade, fruits and drupes for human food, gum arabic, and erosion reduction.

In reality, the tree planting is well underway. The IV National Plan called for reforestation of 5 well sites in the Fleuve and 2 in the Diourbel Region. The V National Plan calls for completion of work already begun and adds 8 more wells points in the Fleuve (2400 ha) and 12 more in the Diourbel Region (3400 ha). Budgeted amount for the V National Plan is 1,554 million CFA. This comes to about 70 million CFA or \$280,000 per well point or about \$900 per hectare (assuming 300 hectares per well point). As far as AID funding is concerned, the reforestation part requests \$654,000 (US dollars) or \$140 per hectare. The necessity of planting trees at well points may be questioned. O first consideration should be the priority objectives or purposes. If the need for or returns from firewood, gum arabic, and fruit and drupes is great enough to justify the expense, so be it. But if the primary purpose is for livestock forage and shade, it is of doubtful utility. Why? In order for tree planting to be successful the area must be fenced and excluded from grazing for 5 years or more. It will be 10-15 years before the trees will provide substantial shade or forage, or protect any soil. In all probability, all the area needs for soil protection and forage production is a reasonable degree of protection from grazing and trampling. Indigeneous annual grasses would, under such protection,

accomplish the same thing in a far shorter period without the expense of planting trees. The fibrous roots of natural herbaceous vegetation should be superior for erosion control. Fencing alone will result in soil stabilization, and livestock can be allowed to graze up to 60% of the annual production without harm. So far as forage production is concerned, experience in the US and throughout the tropics is that herbaceous plants are more efficient than woody plants. In woody plants a high proportion of plant nutrients goes to the increase in woody tissue and the remainder to forage production. Control of shrubs on arid rangelands usually results in an increase of total forage production. I discount much of the verbage I have read concerning the amount of forage provided by tree leaves. Leaves soon grow out of the reach of browsing animals. Leaves are also generally fine, decompose rapidly after falling, and are difficult for animals to pick up. To be of real benefit, branches with leaves must be lopped off and fed to livestock prior to leaf fall.

While tree leaves contribute relatively little to livestock forage, one must remember that their fruits are often palatable and nutritious to livestock and are available at a critical time. The leaves, twigs and fruits of trees and shrubs are also valuable or even essential for certain wildlife species.

If reforestation is to be done as part of the project, the team believes it should be done some 2.0 to 2.5 km out from the watering point. A stated purpose for reforestation is for shade and livestock forage. We submit that shade is not necessary for watering livestock. In addition it would tend to encourage loitering at the well point, exacerbating an already bad situation. The objective should be to get livestock to water, watered, and away from the well point as quickly as possible. Hence, we maintain the need for shade and forage is away from water, not at the well point. The reason we suggest 2-2.5 km is because according to Dr. Valenza's work that it is the distance where herbaceous forage production is lowest, and theoretically soil depletion the greatest. Tree planting here would tend to increase concentration of animal manure on the depleted soil.

Primarily in consideration of human comfort, we recommend planting small mottes (2-10 hectares) of shade trees nearer to and around the perimeter of the watering points. Obviously, it will be necessary that these thickets be fenced and protected from livestock browsing and trampling.

It may be advantageous to plant trees prior to water development. The chance of establishment would be greater if trees could be

planted about 5 years before livestock are concentrated in the area.

In a minority opinion Greathouse has made the following comments regarding the necessity for planting trees at well points.

A major objective of the Land Conservation and Revegetation project requires integrated resource management. Planting the suggested species of trees will provide valuable aerial forage in an area where terrestrial forage is more difficult to maintain due to heavy cattle traffic. Although scientific comparisons are not available informal discussions with Dalton Comeaux of the Project Team indicate that forage and pods from adapted leguminous tree species may supply more protein per hectare than available terrestrial forage.

The need for easily accessible firewood is an important consideration in the long run. The present forest trees are not being replaced as rapidly as they are filled or are being killed by a combination of fire and drought.

If trees are planted now, these should be a continuing supply of firewood at convenient locations.

Planting of gum arabic has multi-purpose value. It provides a cash crop in the form of gum, a forage crop in the form of cut branches and pods, and when it reaches maturity and needs to be replaced, some fire and service wood.

Wherever trees are found in the world, they offer shelter for many kinds of wildlife. All species provide food for some form of wildlife, whether it be limited to short periods after death (insects or woodpeckers) or is available in the form of annual crops such as produced by legumes.

Placement of the trees in a band beginning 1 to 2 km should be given consideration, although avenues of trees (perhaps 30 m wide) reaching to within 100-200 m of the watering points is believed desirable to help regulate flow of traffic and to moderate the climate for herders who must wait their turn during the hot portions of the day.

It is doubtful that loitering at the watering point will become a problem until the number of animals permitted there is reduced by some form of control measures.

The biggest problem foreseen is the protection of the trees until they are big enough not to be trampled or eaten. It is believed that this is worthwhile in a climate as severe as the Sylvo-Pastorale Zone in the hottest parts of the dry season.

ANIMAL HEALTH AND NUTRITION PROGRAM

Under the prevailing traditional system of live-stock production in the Sylvo Pastoral, cattle are grown primarily for prestige and social standing, and for (false) insurance against drought. They are sold only as needed to meet debts. They are not slaughtered and consumed by the family or villagers. There is little or no differential in the value of a calf, an old non-reproductive cow, a 12-year old steer, or a 5-year-old reproductive cow. The value lies in numbers, not meat production or potential income.

Populations are the result of birth rate minus death rate (assuming that in-migration and out-migration are equal). An animal health and nutrition program will, no doubt, result in earlier puberty among heifers, higher conception rates, reduced abortion, reduced death loss of calves at birth, and prolonged life of mature animals. It appears

that the resulting increased livestock numbers could be counter-productive to the GOS goals of (1) increased meat production to meet demand, and (2) environmental protection.

CONCLUSION:

An animal health and nutrition program must be accompanied by a commitment on the part of the herdsmen and the GOS to market all animals for slaughter except those needed for herd replacement and for draft purposes. SODESP is well aware of this and offers to herdsmen a package of incentives, under a contractual arrangement, designed to control livestock numbers.

The SODESP project (685-0224) as proposed states "Herders will retain their reproductive and draft livestock and will sell to SODESP male calves after weaning". Assuming a 60% birth rate from reproductive age cows, a 10% death loss from birth to maturity, heifers to calve at 4 years of age, cows to be replaced at 9 years (11% replacement rate), the Sylvo Pastoral Zone would be overrun with cattle in a short period under a "male animal only" slaughter. Initial efforts should be toward increasing size and quality of young animals, and by greater slaughter of young animals.

This seems make logical than increasing the number of mature reproductive animals, which have high maintenance requirements. Herdsmen, we were told, are attempting to rebuild their cattle numbers to predrought levels. This seems imprudent. The fact that 15% of the cattle population starved during the drought should be a warning that predrought numbers were too high.

WILDLIFE

It seems probable to the team that the Sylvo Pastoral was once the home of many species of wild birds and mammals. Many species of birds still inhabit the area. The capture and export of birdlife from Senegal is big business. Although exports have decreased some in recent years, upwards of one million pairs were exported annually for years. A few ortridges remain in the Sylvo Pastoral and the species is protected throughout Senegal. Probably the critical factor for mammals was water, hence their use of the area may have been limited to the rainy season. With the development and distribution of water facilities and under proper grazing use the area should be ideal habitat for several species of mammals, especially some members of the antelope family. Wild ungulates could

conceivably be a valuable addition to the welfare of the herdsmen. Research in the U.S. and Africa indicate that in many ecosystems indigenous herbivores are more efficient converters of forage into red meat than are domestic animals.

To the list of personnel needed to prepare the PRP for the SODESP Livestock Production Project (685-0224), we suggest addition of a wildlife biologist (see p. 9 of PID).

RESOURCE SURVEYS

Resource surveys to ascertain the location, extent, and condition of soil, water vegetation, and animals (domestic and wild) are a necessary part of any range improvement program. To proceed with planning and application before acquisition is to court disaster. Much of the needed information already exists in scattered repositories and needs only to be assembled for ready reference. Small scale maps, graphs, charts, etc are especially useful for planning purposes. In many cases, planning and implementation can be carried out simultaneously.

To reduce any delays in planning and implementation caused by lack of resource information, we recommend that USAID funds and support be made available immediately to begin systematic collection of baseline resource data. Such data will be needed for planning and will eventually serve as a yardstick against which progress can be measured.

A WORK ABOUT RESOURCE PLANNING

Soil, water, plants, animals, and air are basic natural resources upon which human existence and welfare depends. Quality of life (however that may be defined) is, to a great degree, dependent on a resource base adequate in extent and condition to satisfy the population's needs and wants.

Increasing populations are exerting greater demands on natural resources. Life, in perpetuity, requires that the resource base be maintained or improved. If we value the right of urban generations to enjoy life as we do, resource depletion is untenable. The use of natural resources for our own gratification is rational, just, and prudent only to the extent they can be used without degradation.

Collectively, various combinations of natural resources make up an important part of what we call our environment. Man and his environment are inter-active and interdependent. Inevitably, man alters his environment and is influenced by it. Without direction, the interaction results in both beneficial and adverse effects. Resource planning aims to increase the desirable inter-actions and reduce the number and magnitude of the adverse side effects.

Planning is a process which implies purposeful and deliberate direction of events towards a desired goal, state, or condition. Conversely, it implies an unwillingness to accept an undirected course of action. The acquisition, analysis, and evaluation of facts is the key to sound planning decisions. The role of the integrated resource management team, as we perceived it, was to ferret out the facts about the natural and human resources and help the Senegalese people formulate a systematic procedure for resource planning. Planning must be done with people, not for them.

Effective resource planning requires the input of specialists from several disciplines. Our team consisted, in addition to the overall leader of a forester, livestock specialist,

range scientist, agronomist, and economist. A biologist and soil scientist could have made meaningful contribution as well. Team members tried to consider their own disciplines as just one part of the total ecosystem.

Resource planning must be done on a discreet area. It may be a watershed, a political entity, a ranch operating unit, a grazing allotment, or a farm. But the planning unit must be manageable and it must be described. Some important and logical steps in the process include:

1. recognition on the part of the people to be affected that they do have problems, and a request from them for help.
2. resource inventories.
3. identification of problems that limit production, degrade resources, or constrain the quality of life.
4. formulate alternatives to counter the problems identifies .
5. decision making
6. implementation and followup
7. periodic plan review, modification, and measurement of progress.

There is an ever-present danger that the plan document become more important than the planning process. Care should be taken to guard against this. The plan must be open-ended and flexible to accomodate changing concepts, needs, and conditions.

In several instances, our team has refrained from suggesting specific practices. This is true where the team felt its knowledge of the facts was inadequate, and specific proposals would have been presumptuous on our part. In such cases, we generally indicated that a conservationist or extension agent assigned to the project and more familiar with the situation than we, would need to formulate specific recommendations.

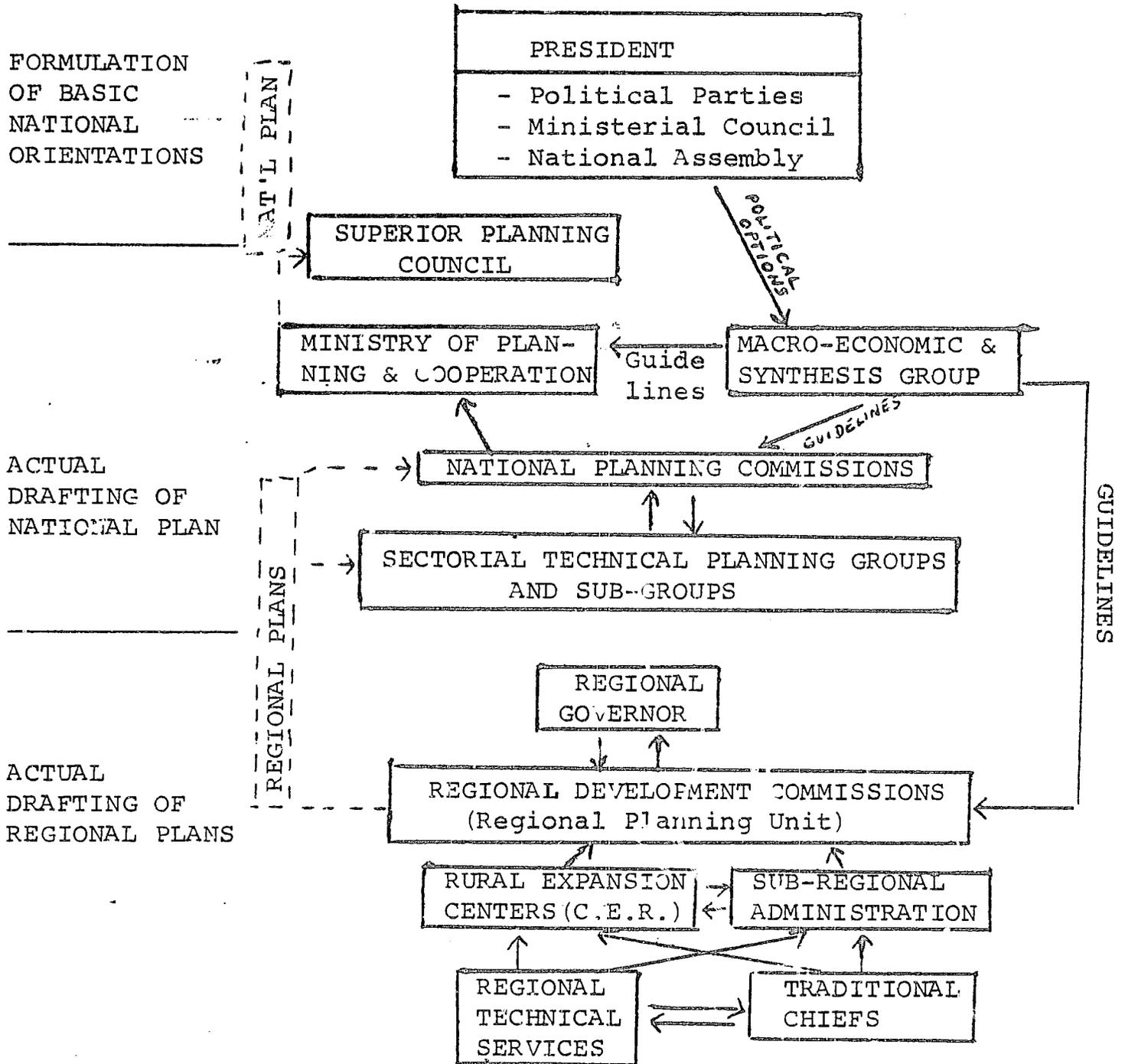
OVERVIEW OF THE PLANNING PROCESS IN SENEGAL AND ITS
IMPLICATIONS FOR INTEGRATED RESOURCE MANAGEMENT PROGRAMS

I. INTRODUCTION

As of July, 1977 the Republic of Senegal entered into its fifth four-year national development plan (Ve Plan Quadriennal de Développement Economique et Social: 1977-1981). The preparation of the latest national plan officially began in mid-1975 with a letter from the Prime Minister to all key civil servants assigning vital importance to the elaboration of the document and calling for their general mobilization (over 120 technicians actively participated in the Ve Plan) under the leadership of the Ministry of Planning and Cooperation (MPC).

The system utilized over this 2-year period to arrive at a national plan is one which undergoes continual revision and refinement. This "system" has been outlined as an organized structure in the ensuing sections of this paper. It should be noted at the outset that total planning procedure is more diversified than this structural approach could indicate, however, due to the important formulative role played by individual high-level personalities - technical, political and religious.

FIGURE 1 : NATIONAL PLANNING PROCEDURE



II. THE SYSTEM

In its current form, the national plan should be the end product of a fairly complex interaction of studies, ideas and realities from the local, regional and national levels of government. The major schematic steps in this planning process are represented in Figure 1. In general, the overall process can be described as having three chronological phases.

A. Phase 1: Inventory of economic development

In this first 6-8 month phase an attempt is made

- a) to evaluate the successes and failures encountered in the implementation of the current national plan and
- b) to present the current economic situation and the outlook for national development in the middle and long terms.

During this phase national, regional and departmental technical and administrative personnel collaborate with the MPC to form an overall evaluation of each of their respective responsibilities. The results of these evaluations are a series of written technical appraisals (notes techniques).

Concurrently, the basic national orientations which guide the development of the national plan are formulated at the highest levels of government. These options are transmitted both formally and informally from the President,

Political Parties, Ministerial Council and National Assembly to a "Macro-economic and Synthesis Group"1/ which places them into the realities of the Senegalese macroeconomic situation (balance of payments, debt capacity, absorption capacity, capital output ratio, etc.).

The "Macro Group" then issues guidelines to the National Planning Commissions and Regional Development Committees as the basis upon which sectorial programs should be developed.

B. Phase II: Project development

The second phase covers a 3-5 month time frame and permits national and regional sectorial technical 2/ groups to identify, elaborate and coordinate specific development projects.

1/ Composed of highest available levels of economic and administrative expertise.

2/ Sectorial Technical Planning Groups:
National level (approx. 10 experts per group)

- Agriculture
- Elevage, Hydraulique pastorale
- Eaux & Forêts, Protection de la Nature
- Pêches
- Industrie - Énergie - Artisanat
- Tourisme
- Transports et Télécommunications
- Commerce et Institutions financières
- Urbanisme
- Education - Formation - Animation
- Culture, Jeunesse et Sports
- Information
- Santé Publique et Affaires Sociales
- Etudes et Recherche

Regional level (small ad hoc groups, composed of Governor's "adjoit au développement" and local technical service expertise).

The previously mentioned "Macro Group" guidelines are furnished to each of the Planning Commissions who in turn draw up terms of reference for its respective Technical Planning Group (each Planning Commission is simply an expanded form of each Technical Planning Group). Once these TOR's are approved by the "Macro Group" the Technical Planning Groups can proceed with the drafting of their sectorial reports and project proposals. Each project is required to be formulated on special form (Fiche de Projet) which is illustrated in Figure 2 and includes an impressive array of economic and social criteria.

C. Phase III: Development of a Plan

The third and final phase lasts from 7-10 months and is consacrated to the synthesis and coordination of the data accumulated in phases I and II and the production of a coherent national plan. The majority of the effort during this period of time is undertaken in the national and regional commissions. The regional commissions attempt to produce their regional plans early in this period so that they may be adequately considered and incorporated into the work of the national commissions. The national commissions examine both sectorial and regional reports and send a draft proposal for each sector of the National Plan

FIG. 2 : FICHE DE PROJET

FICHE DE PROJET PRODUCTIF

IDENTIFIC.

intitulé du projet

sous-secteur n° M.P.C n° code

date de dépôt du dossier régime d'agrément code C.I.I.

ORGANISME DE TUTELLE

LOCALISATION

RESPONSABLES Tel.

" " "

" " "

2. PRODUCTION EN ANNEE DE CROISIERE				PROGRAMMATION			
principaux produits	unité mesure	capacité		19	19	19	19
I	Quantité						
	Valeur	M. CFA					
II	Q						
	V	M CFA					
III	Q						
	V	M CFA					
IV	Q						
	V	M CFA					
V	Q						
	V	M CFA					
PRODUCTION TOTALE		M CFA					

3. MARCHES VISES EN ANNEE DE CROISIERE				EXPORTATIONS			Observa
principaux produits	unité mesure	production croisière		marché intérieur	pays africains	pays non africains	
I	Q						
	V	M CFA					
II	Q						
	V	M CFA					
III	Q						

5. PROGRAMME D'INVESTISSEMENT PREVISIONNEL

PROGRAMMATIC

Investissements prévus	Produits locaux	Import CAF HT	Dr. taxes S/Import	TOTAL	19	19	19	19
F.B.C.F (total)								
dont études et recherches								
- G. Civil. infrastruct.								
- Superstructures								
- Biens d'équipement								
- Vehicules								
- Autres								
Frais d'accompagnement								
Fonds de roulement								
Formation, bourses								
Totaux *								

6. PLAN DE FINANCEMENT

Origine des financements	Capitaux		Montant total	Conditions			Observa
	sénégalais	%		capitaux étrangers	taux %	durée années	
Fonds propres							
Capital social							
Emprunts							
Totaux *							

7. RATIOS ECONOMIQUES ET FINANCIERS

Ratios	prévu(1)	réalisé(2)	appréciations
Coefficient d'intégration $\frac{\text{valeur ajoutée}}{\text{C.A}}$			
Coefficient de capital: Invest. / V.A			
Coût création d'emplois: Inv / Emplois			
Coût devises / recettes devises			
Endettement : capx propres / étrang.			
Bénéfice actualisé			

8. APPRECIATION DU PROJET

8.1 INTEGRATION DANS LE PLAN

8.2 INSERTION REGIONALE

8.3 LIENS AVEC D'AUTRES PROJETS (amont, aval)

8.4 EFFETS DU PROJET SUR LE DEVELOPPEMENT ECONOMIQUE ET SOCIAL
Effets sur les finances publiques, la balance des paiements, effets sociologiques, écologiques

8.5 PROBABILITE DE REALISATION

FICHES COMPLEMENTAIRES

à remplir et à joindre

1. FICHE DE SUIVI DU PROJET: indiquer l'état d'avancement actuel et le calendrier prévisionnel (au recto), les prévisions de financement, d'investissement, de production et d'emploi (verso)

2. FICHE DE PROGRAMME DE RESSOURCES HUMAINES:

and a list of sectorial projects by priority to the MPC who coordinates the sectorial programs into a total national plan (subject to negotiations and approval from Ministry of Finance).

Finally the Plan will require formal approval from both the Superior Planning Council and the National Assembly before obtaining legal status.

D. A Specific Example

Given the complexity of the planning structures in Senegal it would appear to be instructive to provide one simple hypothetical example of this approach.

One could suppose that the GOS is becoming concerned with the large and increasing quantities of rice she is importing at the expense of her small foreign exchange reserves. Let us also assume that the official government reaction was simply to aim for complete local production of rice (say 300,000 tons) by the end of the upcoming national plan (1981). Once this political option has been decided and approved or modified according to the exigencies of the "Macro Group", general guidelines would be passed on to national and regional commissions to meet this objective.

In all probability a project of that size would necessarily be submitted for foreign donor financing and

consequently foreign donor feasibility studies-technical, socio-economic and ecological.

The two largest rice producing regions in Senegal are Fleuve and Casamance. Both of these regions, in collaboration with the national commissions "Agriculture" and probably "Eaux & Forêts" and "Hydraulics" would explore the possibilities of regional rice production with local specialists and coordinate the resulting analysis through the local government production companies.- SAED in the Fleuve and SOMIVAC in the Casamance.

A fiche de projet would then be formulated and passed on through the technical groups to the regional and national commissions. The Ministry of Plan, once having received the fiche would collaborate with the Ministry of Finance to ascertain availability of funds. If funding appears plausible and the project is high on the priority list of projects forwarded to Plan by the national commissions, it then enters into the National Plan, subject to final authorization by the Superior Planning Council and the National Assembly.

III. ENVIRONMENTAL PLANNING

A Sector Orientation

Volume 1 of the current four-year plan places a clear national priority on environmental planning.

"The modernization of the economy should not place a mortgage on the nation by polluting and degrading the national setting through an abusive and anarchic exploitation of the national resources. Just as the protection of the environment constitutes one of the major orientations of the Ve Plan, it is translated into the following priorities:

1. The war on pollution
 - Industrial pollution
 - Sea and beach pollution
 - Fresh water pollution
 - Air pollution
 - Noise pollution
 - Domestic waste disposal
2. The protection of nature and natural resources
3. A more human urban design
4. Public disease control
5. Safe-guarding of sites and historical monuments"

Of particular relevance to this study is the above-mentioned item 2 and its specific proposal for protection of natural resources:

"Within the framework of protection of nature and natural resources, the following operations should be undertaken by order of priority:

- protective reforestation of the artificial ecosystems created by economic development.
- production-oriented reforestation
- reforestation so as to improve the general environment (reforestation in order to rehabilitate the vegetative cover in the Sahelian zone so as combat the advance of the desert; sand dune fixation through reforestation of coast from Dakar to St. Louis; specific greenbelt reforestation interventions along highways, around croplands and near urban centers)
- protection of national forest lands
- protection of wildlife, especially menaced species
- promotion of national parks".

An overview of the specifics of government policy in the environmental field would seem to indicate basic sectorial orientations in favor of reduced industrial pollution (a Ministry of Industry and Environment was created for this purpose), and, as far as rural hinterlands are concerned, a concerted effort to replant trees, both for production and for conservation.

B. National planning and PRP subprojects

Given the above-mentioned sector orientation for reforestation it is not surprising that all four PRP subprojects dealt primarily with producing (reforestation) or protecting (firebreaks) forest cover in the North and Western half of Senegal. Aside from this purely sectorial aspect of reforestation evidence can be found in the Regional Development Plans to indicate that each of the PRP projects fits into some larger outline for an integrated approach to resource management.

1. Well site improvement in Sylvo-Pastoral Zone

(Regional Plans for Louga and Fleuve). Plans for the Sylvo-Pastoral Zones of these two regions recognize that production in the zone appears limited to cattle raising and, to a less extent, gum arabic, both of which are highly vulnerable to changes in rainfall patterns such as the recent Sahel drought. The technical plan for increasing cattle production and "drought-proofing" the zone is that of the SODESP (Société pour le Développement d'Élevage en Zone Sylvo-Pastorale), which, in the long-term should have full responsibility for overall development - social and economic of the zone. SODESP's overall plan sees water as the primary obstacle to area cattle production.

According to this reasoning if there is currently a problem of land degradation around a well site it is then either a matter of distributing watering points (new wells, laterals on existing wells) to spread the number of head around or planting enough trees and forage around the existing wells so that they can support the relatively high numbers of cattle around them, 1/ or both. The last option is, of course, the PRP project proposal.

Environmental programs established in each Regional Plan are closely aligned with the project proposal, e.g.,

Fleuve 2/:

1) Increase number of well sites in zone and improve their general management to avoid animal health problems, overstocking, unnecessary destruction of pasture and other vegetation around water points;

2) Fight brush fires so as to save pasture and slow the process of desertification.

1/ As presented in the PRP this project would have included several other elements, including some control over cattle population, fire prevention and fighting programs, feed supplements, animal health, etc.

2/ p. 29, Ve Plan: Région du Fleuve

Louga^{3/}:

- 1) creation of aerial forage near well sites;
- 2) Increase in production of gum arabic in Sylvo-Pastoral zone;
- 3) Intensification of bush fire fighting effort which destroys cattle forage and accelerates the process of desertification in the zone.

2. Acacia Albida^{4/}: (Regional Plan for Diourbel).

This project proposal is only part of a widespread regional reforestation effort which recognizes two important objectives:

- having lost, in recent years, the largest share of its forest lands, an emphasis on regional forestry protection, an improvement of the plant cover through the planting of legume varieties and battling the local process of desertification through organized, widespread reforestation.
- greater integration of cattle raising with agriculture.

The Acacia Albida planted under the project proposal would serve ~~small farmer fields~~ small farmer fields, providing shade and aerial forage ~~for~~ ^{and} local soil conservation ~~practices~~ while increasing soil fertility for the farmer.

^{3/} pp. 12, 24 Ve Plan: Région de Louga

^{4/} pp. 27-29, 35, Ve Plan: Région de Diourbel.

3. Greenbelt around Cap Vert. (Regional Plan^{1/} for Thiès).

Given its proximity to Senegal's most densely populated areas the regional plant cover in general and the forest stands in particular have been severally reduced due to the high demand for construction materials, firewood and charcoal. This project proposal would reinforce the Regional Plan's stated objectives of :

- managing regional lands
- organizing national utilization of forest resource within this management plan
- protecting the soil cover.

The Regional Plan also notes that "Also in the framework of an integrated approach to the management of the rural sector the Water and Forests Service has established a series of cooperative actions in common with the other sectors, such as:

- Agro-silvaculture centered around reforestation with a goal of improving agricultural lands;
- Sylvo-pastoral integration of cattle areas with the introduction of forage plants and a rational exploitation of aerial forage. "

^{1/} p. 12, Ve Plan: Région de Thiès.

4. Firebreak program in the Sine Saloum. (Regional Plan 1/ for Sine Saloum). The Sine Saloum contributes to an important part of the national production of charcoal (22%). The region also feeds a large number of beef cattle - estimated at 480,000 head in 1976 and expected to reach 600,000 head by 1981. The proposed project could contribute to both of these production aspects by meeting regional objectives of:

- protecting pasture lands and especially the forest lands from annual ravages provoked by fire.

It would be difficult and cumbersome to represent the data and the attempt at synthesis contained in each Regional Plan. A sample of one such plan, that of the Diourbel Region, has been attached as Figure 3 for more complete examination.

IV CONCLUSION

An overview of the Senegalese planning process reveals that ~~the~~ country has, since its independence in the 1960's developed a fairly sophisticated and apparently efficient approach to rational national and regional development.

1/ pp. 42, 83, Ve Plan: Région du Sine Saloum.

Increasingly, the thrust of national policy is away from development of the urban economy in favor of the rural, small farmer and herder hinterlands.

It also becomes readily evident that environmental concerns are not forgotten in the elaboration of the Plan, but that program orientations, for the moment, are preoccupied principally with industrial pollution and waste disposal and only superficially touch upon the pressing problems of efficient land and water management in the rural areas. If there is a flaw in national rural environmental planning, therefore, it would appear not to be one of intent but rather one of emphasis-and emphasis is basically a function of funding available to underwrite it. Opportunities for rectification of this situation are not entirely lacking, however. At least three different existing mechanisms could provide environmental support to rural development programs if a strong expression of concern for overall rural resource management should be forthcoming from the Ministry of Rural Development.

1) Foreign donors:

It cannot be forgotten that over 80% of the Senegalese national development plan is financed by foreign capital.

Foreign donors have had, and will continue to have, a key role in designing individual projects. Every donor has a more or less flexible set of criteria he utilizes to best screen and select the projects he finances. In the environmental field most European and American donors utilize criteria to test ecological feasibility which resemble those which are in use in their own countries. USG norms are probably among the most strict yet proposed. Our funding of programs oriented toward our ecological concerns (e. g. integrated resource management) is one the most direct and appreciated means of illustrating the utility of these programs.

The very fact that foreign donors are concerned about the problem of environmental abuse and are willing to spend important sums of money in assuring their respective superiors and the Senegalese Government of the ecological soundness of their projects would seem to indicate that the GOS could take a leading role in directing these concerns. The foundation upon which these directives could be built would have to be based on sound research and experienced multi-disciplinary opinion so as to convince donors of their professionalism. One concrete example of this approach

is the AID-financed Soil and Water Management Unit in The Gambia which should permit the Gambian people to determine their own policy in rural resource management.

2) Fiche de projet:

One useful tool which is an existing prerequisite to recognition by the GOS of project feasibility is the Fiche de projet, which was discussed and illustrated earlier in this report. For the moment, the fiche is a tool with which the majority of planners and programmers has little formal knowledge. The MPC soon expects to lean heavily on completed fiches as the best means of technically, economically and socially arriving at a decision of project feasibility. An extra detailed section on ecological feasibility could quite easily be added so as to highlight GOS concerns for environmental planning.

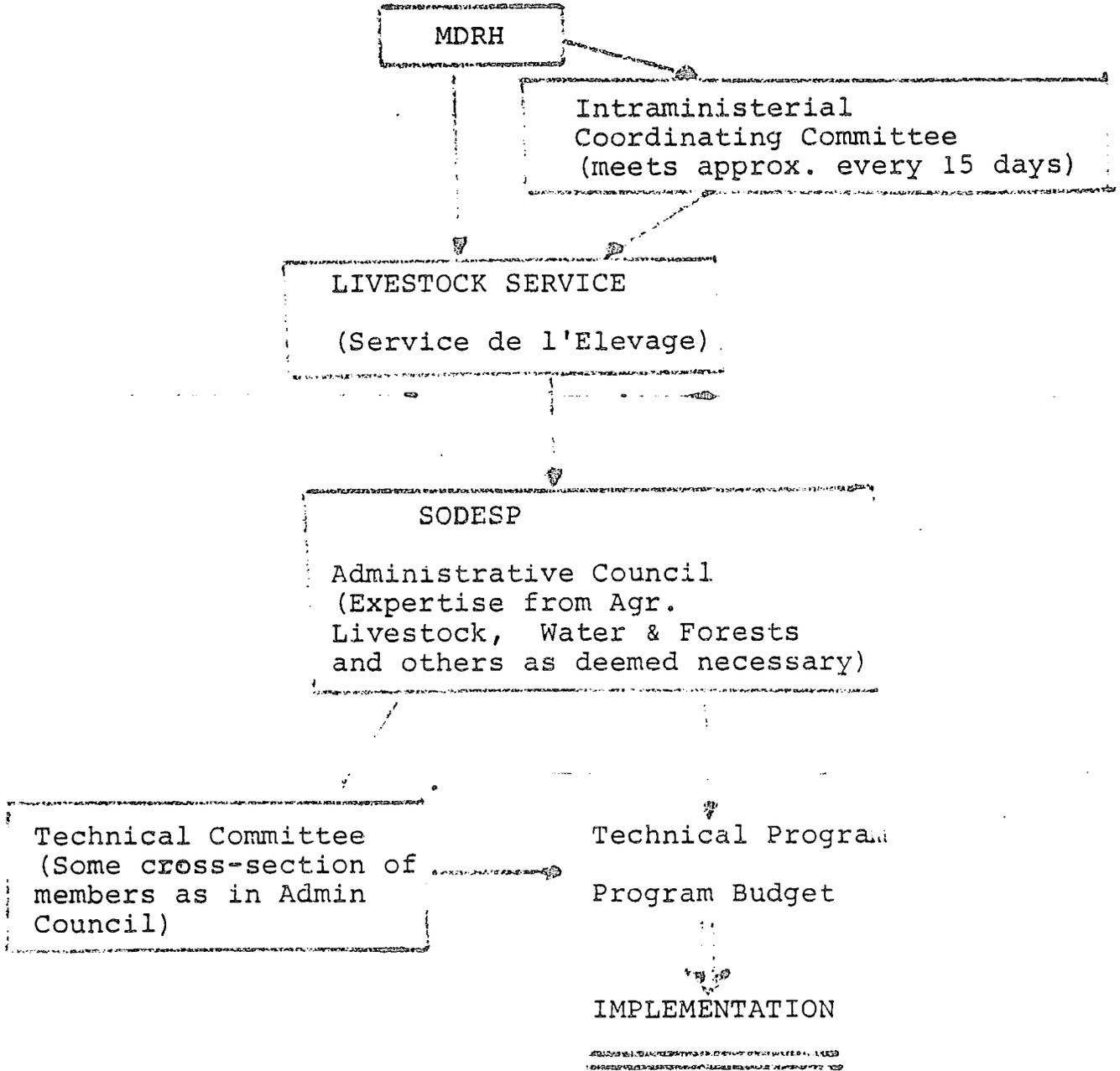
3) Société d'Etat:

The state-owned regional development companies (SAED, SODESP, SODEVA, etc) play a key role in the local-level planning and implementation of projects within their respective areas. These spheres of influence generally cut across regional administrative boundaries so as to deal with whole ecological zones. One simple example of a regional development company's administrative structure (SODESP) is illustrated in Figure 4.

Although these companies are semi-autonomous and operate with their own development budgets their programs are subject to constant scrutiny and revision by an Administrative Council made up of cross-section of development expertise. Not only would this multi-disciplinary expertise be able to understand the technical implications of integrated resource management in the field, but also should be able to provide an important, if not determining role in developing their own resource management strategies.

FIGURE 4

ADMINISTRATIVE ORGANIZATION OF THE SODESP



4) Future Programs:

a) A long term program for land use planning is being set up by the GOS and the United Nations. This program, the Plan d'Aménagement du Territoire, will attempt to direct general land use pattern development over at least the next twenty years. Although it should pay careful attention to the ecological consequences of land use development and can therefore ^{focus} ~~forms~~ public attention on problems of natural resource degradation, its' fundamentally long-term perspective precludes it from being utilized extensively for project analysis.

b) The Office de l'Environnement created in 1975 within the Ministry of Industry and Environment has a primary task of monitoring and policing problems of industrial and urban pollution. The Office's theoretical mandate from the President is to "supervise all ecological actions" but it appears unlikely that Office will serve an important role in dealing with the rural environment in the near future. Some GOS officials have already expressed interest in developing a Ministry of Environment so as to better define and emphasize the government's concern for overall environmental protection.

✓ This overview In conclusion, of rural sector environment management policy would indicate the presence of a surprizingly active and widespread planning system. The system is based essentially on professional opinion, as corroborated by extensive local research (ISRA, ORSTOM, CNRF, CNRS, etc.) and appears keenly aware of problems of environment concern.

As a country actively engaged in the modern development process, Senegal's modest means are easily outstripped by the demands placed upon her. For the GOS to "invest" in the environmental sector it must be clearly shown that there is a real "return" to the economy. Hence it is desireable that AID-sponsored programs highlight the more dynamic long-term sustained production aspects of environmental programs and not only the more static concerns of resource conservation. The integrated resource management approach is one such possibility. The GOS has long advocated such an approach and attempted to implement it to the extent of its resources.

This ^{strain} ~~section~~ on resources would appear to have left some weaknesses in the system which could be the object of USAID support. In our opinion these weaknesses include:

- a sectorial approach to rural development and an overemphasis on reforestation and fire control as a panacea to total resource management.

- a lack of emphasis on the longer-term perspective of "sustained productivity" in the planning process and a lack of systematic monitoring of the longer-term effects of project developments.

It would seem useful for USAID, with the cooperation and concurrence of the GOS, to provide pertinent assistance at the national, regional or project level to counteract these tendencies.

TRIP REPORT

NAME: Dillard H. Gates
 Sr. Range Management Specialist
 TAB/AGR/SWM

Period of Travel: August 20 - September 3, 1976

Itinerary: See attached list

Purpose: To participate in a field review and evaluation of three project proposals in Senegal

Narrative:

This report is in response to requests by CDO/Dakar and AID/W (AFR) for a field review and evaluation of three project proposals in Senegal. The proposed projects are concerned with: 1) Acacia Albida planting in agriculture and soil erosion control and 3) reforestation, including sand dune (soil stabilization).

The report is the result of discussions with AID/Dakar, headquarters and field staff of the projects and several days spent in the field observing, reviewing and discussing problems, research, nurseries and various other related activities.

The large degree of overlap among the three project proposals is recognized. However, each of the specific ideas will be briefly discussed separately. The interrelationships and need for integration of the three projects will also be discussed. Conclusions and recommendations will then be presented.

Due to the time constraints this report will not detail discussions or observations made during field trips. However, information acquired during all discussions, field trips, observations, past experience and literature will provide the basis for the final recommendations.

The kind and helpful assistance of Mr. El Hadj Sene and his staff, Hap Wilder and Frank Gray is gratefully acknowledged. Their attitudes and inputs contributed making this not only an informative and educational but an enjoyable field trip.

Acacia Albida (Acacia albida)

It is generally agreed that the tree has significant and positive impacts on agriculture and soil conservation in areas where it is adapted across the Sahel. Some of the impacts is related to site characteristics, density of natural vegetation, other vegetation and land use practices. It is related to increasing soil fertility in agriculture

areas the tree is also of value for wood production, wind breaks, soil stabilization and livestock feed.

Seed of the Gao tree has a natural dormancy due to an impermeable seed coat. Eaux et Forêts has developed a boiling water seed treatment that effectively breaks the dormancy and allows seedlings to be easily grown in nurseries. Several nurseries were visited where Acacia albida and seedlings of several other species were being successfully grown for planting in select farms. Three seedlings 30 to 50 cm tall and ready for planting were produced from seed planted in May.

Eaux et Forêts was conducting field research with Gao trees and other species in site-specific competition, spacing, tillage methods and degree of control of soil erosion. Observations at the various nurseries and planting sites confirmed the fact that Gao seedlings can be successfully planted and established at selected sites. The tree appears to be adapted to a variety of soil types from sandy (peanut) soils to heavier (millet) soils. Depending upon the site, with protection from grazing and removal of competing vegetation, Gao may grow to a height one-half one meter in one year.

The optimum number of trees per hectare to provide maximum benefit to crops appears to be undecided. Estimates by Eaux et Forêts field staff varied from 10 to 20 established trees per hectare. Estimates of the actual increase in crop production from the presence of Gao tree in the fields varied from 10 to 50 percent depending upon the crop, the site, the season, and the number of trees.

In addition to its value as a "soil builder" the Gao tree is utilized for soil stabilization and as a fine feed for livestock. Seed pods produced by the tree are suitable for livestock and provide a valuable protein source during the dry season. Both farmers and herdmen recognize the value of the tree and efforts are made to protect seedlings and allow tree establishment.

A considerable amount of research has been conducted on various aspects of Acacia albida and its relationship to soil fertility, crop production and livestock production. Inquestionable, there are information gaps concerning the tree. However, it appears that there is sufficient understanding of the site competition, planting technique, cultural requirements and benefits deriving from the tree on which to base viable development projects.

Adaptive research, such as necessary to provide answers to specific questions, should evolve from the implementation of action programs. Thus, the research would be directly applicable to solution of identified field problems and contribute immediately to resource development and management.

Bush Fire Control

The role of the Gao tree in fire control was discussed at an integral part of the work concerned with reforestation, soil stabili-

zation and water development and management. Realistically and practically, fire control must be discussed from the standpoint of its relationship to or impact upon other factors relating to resource management.

However, recognizing this fact there are technical, physical, educational and logistical aspects of the problem which can be examined separately then amalgamated with other pertinent factors as resource management plans and decisions are made.

From the ecological standpoint fire is a natural factor of the environment. Fire has played and still plays a critical role in plant succession. In many ecological zones, especially in sub-humid and arid regions, it has to some degree been responsible for the form and structure of existing vegetation types. The plant species composition and density of a given ecological site may be directly related to its fire history.

Thus, utilizing an understanding of the response of individual plant species and plant communities to fire, controlled burning can be an effective tool in vegetation manipulation for resource management.

Despite the natural ecological aspects of fire and its positive influence on vegetation manipulation when properly used, repeated and uncontrolled burning can have serious adverse results. Uncontrolled fires may result in loss of life, property, forage and wood resources and expose soils to wind and water erosion.

Thus, in the scheme of management of renewable natural resources fire is a factor that must be fully considered.

During this field trip bush fire control was discussed primarily from the standpoint of protecting tree plantations, natural forests and woodlands, rangelands and agriculture areas.

It is generally accepted fact that most wild fires, in the Sahel are man caused, accidental or intentional and for a variety of reasons. Officially, fire is generally considered to be destructive, and it has been used little if any for vegetation manipulation in resource management.

As a rule all tree plantations and forest reserves (natural or planted) are surrounded by fire breaks. Fire breaks vary in width from 10 to 15 meter wide for perimeters to 6 meters wide in interiors. They are constructed using track or wheel type tractors with blades or road graders. At end of each raining season fire breaks are (or should be) cleared of vegetation either mechanically or by hand labor. Problems of fire break construction and maintenance are related to terrain, vegetation cover, location in relation to roads, water and labor source, equipment procurement and maintenance, budget, planning and management.

Daux et Forêts would like to see the fire break construction program expanded to provide "protection" to additional forests and rangelands.

Thompson
By 1/2
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Firebreaks would be used as roads and livestock trails connecting present and proposed water points. Fire break roads would provide ready access by man and equipment, to fight fire if and when it occurred. In addition water tank trailers could be stratifically positioned along fireheads to provide water for firefighting in addition to that carried by the tank trucks (Unimog).

Unimogs are four-wheel drive, heavy duty, machines that serve as utility trucks during the wet season planting activities and as fire fighting tank trucks during the fire season. Allegedly they can "go anywhere." However, the problem of unsatisfactory tires and resultant frequent puncture on tree and bush stumps limits their real effectiveness in fighting fire on "wildlands." Heavy duty tires are available but more of the vehicles were so equipped. (See map of trail...)

Despite the fact that unimogs are rugged and heavy duty there are maintenance problems. Minor maintenance can be handled in field locations but major repairs must be made in Dakar. At present Eaux et Forets has four functional unimogs operating in the areas visited during this field trip.

It is apparent that Eaux et Forets has devoted a considerable amount of thought and effort to such fire control. Preliminary plans have been developed for an expanded fire breaks program, there is at least a skeleton crew of men trained to operate and maintain available equipment, village committees have been formed to help fight wild fires, the rudiments of an educational program has been started to teach villagers and herdsmen the values of bush fire control, and the professional and technical field staff appear to be well trained and enthusiastic.

However, there appears to be a lack of appreciation for the need to attack the problem from the standpoint of resource management rather than just fire control. (It may be that the need for integrated resource management is realized but the real problems are so overwhelming that a decision has been made to treat the symptoms and vie for time until ecologically, economically, and socio-political solutions can be found). The problem of fire control as a part of resource management is further complicated by the fact that at least four Gos bureaux (Eaux et Forets, Elevage, Agriculture, and Hydraulique) are involved and there appears to be a minimum of program planning and implementation among them.

Unknown but vast amounts of Senegal forests and rangeland are burned each year. Repeated burning is contributing directly to resource degradation and economic losses to the people and the government. However, if the problem of resource degradation is to be solved bush fire control must be considered but only as several corrective actions which must be taken. These must include control of livestock, improved grazing management techniques, water management and integration of uses and management of cultivated land, forests and rangelands.

RESTRICTED

Reforestation

Reforestation projects are planned and now being implemented in Senegal for the purposes of: 1) wood production; 2) soil stabilization; 3) wind breaks; 4) beautification and 5) forage for livestock.

Hundred of thousands of Senegal's forests and rangeland have been seriously degraded as a result of uncontrolled wood cutting, overgrazing and expanding cultivated agriculture. Problems of resource degradation have been brought into sharp forms due to the recent drought. The GOS Eaux et Forêts a small but well trained and capable staff which is actively planning and carrying out reforestation project. The scope of plans and projects is limited by staffing and budgetary considerations.

A number of tree seedling nurseries, and forest plantations and research plots were observed during the field trip. Eaux et Forêts has solved problems of nursery forest tree seedling production for many adapted species.

Research is planned or being conducted on tree-site adaptation, planting techniques, cultural methods and genetic improvement of tree species. In addition, some new tree species are being evaluated for site adaptation and effectiveness for ground cover and soil stabilization.

Tree plantations, using several adapted species, are being successful established on a wide variety of sites and locations. Sites vary from intermittently flooded lowlands through natural forests and rangelands to moving sand dunes on the coast. While there is a continuing need for research to find better adapted species and improve establishment techniques Eaux et Forêts has done an excellent job of demonstrating its ability to work effectively and establish tree plantations on widely varying ecological sites. Despite their success areas planted to date are but a small percentage of areas that are in need of rehabilitation.

Eaux et Forêts has placed nearly full emphasis on establishment of tree species. It has spent relatively little effort in developing, testing or planting other plant species for ground cover, soil stabilization and forage production. It would appear there are many opportunities to utilize herbaceous and scrub species as understory plants. Properly established and managed these plants could reduce competition to tree growth, stabilize soil between trees and provide a valuable grazing resource.

While Eaux et Forêts has developed some cooperative programs with Elevage and Agriculture it appears that too little consideration has been given to the problems that caused resource degradation in the first phase; that is a lack of resource management. Without a program of integrated resource management isolated project activities, though successful, will be but a "bandaid" approach and will contribute little to solving problems of resource degradation or to land rehabilitation.

Conclusion (Tentative)

1. Senegal has hundred of thousands of hectares of lands that are badly degraded, unproductive and in need of rehabilitation.
2. Resource degradation is the culmination of years of mismanagement, primarily uncontrolled woodcutting, uncontrolled grazing and farming activities.
3. Problems related to water development and management in many cases have contributed directly to resource degradation.
4. Resource degradation, plus the need for rehabilitation, is not limited to one area- but covers a broad range of ecological sites.
5. Resource degradation has been occurring in Senegal for decades but the seriousness of the problems has been brought into focus by the recent drought.
6. Despite resource degradation there still exists a resource base (vegetation - soil - water) with the productive potential to contribute significantly to the food, fibre, and energy needs of Senegal and beyond.
7. The GOS has recognized the need for resource rehabilitation and has developed significant action programs.
8. Basic causes of resource degradation have been identified but action programs to solve the problems have not been developed.
9. DRAH et FORTEC has the technical capability and the core staff to provide leadership to resource rehabilitation programs. Such programs must involve other concerned agencies within GOM.
10. The solution to land rehabilitation and restoration of productivity lies within a program of integrated resource management.
11. Resource management problems must be viewed from the holistic standpoint and solutions developed to solve specific problems but always within the context of the relationship to the whole.
12. Resource degradation will continue until problems of livestock control are solved.
13. Woodcutting is a major contribution to resource degradation but in total is not as significant a cause as uncontrolled grazing.
14. The need exists, within the GOS, to develop a land management organization with the technical and administrative responsibility to develop and administer an overall program of integrated resource management.

15. There is a great amount of information available concerning Acácia albida which has been developed from research, experience and field observations.

Recommendations (Continued)

1. Project development must be considered from the standpoint of integrated resource management.
2. The COS agencies with resource management and/or control must be fully involved. This will include, *Chaux et Forêts, Elevage, Agriculture et l'Hydraulique*.
3. The AID design team must include several resource management subject matter disciplines including, forestry (semi-arid), range ecology, soils conservation, livestock husbandry, dryland agriculture, agriculture economics and sociology.
4. The team will look at the broad problem of resource rehabilitation and management.
5. The team will determine specific causes of resource degradation and develop solutions to the specific problems within the context of broad program.
6. The team will evaluate the need for reforestation in the same context as the land rehabilitation techniques. Other forms of revegetation will be fully evaluated to meet specific resource management needs.
7. The project design will include a scheme of management to assure sustained productivity from land rehabilitation activities. (Identify the problems, solve the problems, manage to prevent reoccurrence of the problems).
8. The COS must develop land management laws and/or policies to provide guidelines for development and to create an environment in which basic scientific principles of resource management can be applied.
9. Training in semi-arid to arid land management must be an integral part of the project. This training will involve degree training in the U.S. in Rangeland ecology and management; forestry (semi-arid), livestock management and dryland agriculture. This is an absolute requirement to develop the leadership and philosophy of management necessary for implementation and sustained management of resource rehabilitation and development projects.
10. Non-degree training will also be required both in the U.S. and as in-country short courses, workshops, seminars and on the job training.

11. The three proposed projects, bush fire control, management of rangelands around bore holes and reforestation must all be considered in relationship to overall needs for resource management. That is initiation of project activities related to any of these interventions must be a part of the implementation of a plan of integrated resource management.
12. Initially, research work on Acacia albida should be limited to a state-of-the-art study. If the SOTA study identifies important information gaps the research projects can be considered to answer specific questions.
13. Production of Acacia albida seedlings in nurseries for distribution to farmers should be encouraged when it can be intergrated with production of seedlings of other tree species.
14. A program of forest control and/or management must be an integral part of all project proposals discussed.

DISTRIBUTION

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BEST AVAILABLE COPY

Schedule for Dr. Dillard Gates

Monday, August 23, 1971

Visit reforestation project and firebreak in Sine-Saloum; return Dakar

Tuesday, August 24, 1971

Visit reforestation project sites; return Dakar

Wednesday, August 25, 1971

Visit projects in the morning; return Dakar

Thursday, August 26, 1971

Visit sand bar and other sites in vicinity Kebemer, continue to Saint-Louis.

Friday, August 27, 1971

Visit sites of reforestation projects at TAPKI and Canadian projects at MBEDF.

Saturday, August 28, 1971

Visit sites of reforestation projects.

Sunday, August 29, 1971

Proceed to Nouakchott, Mauritania.

Monday, August 30, 1971

Consult with all personnel in Mauritania?

Tuesday, August 31, 1971

Return to Dakar

Wednesday, September 1, 1971

Complete write-ups - MBEDF/Dakar

Thursday, September 2, 1971

Debriefing, MBEDF and Forests

Friday, September 3, 1971

Depart Dakar for Paris.

Dr. Dillard Gates will be accompanied by Messrs. Casey and Wilder, also by Mr. Eugene Chabert if time possible.

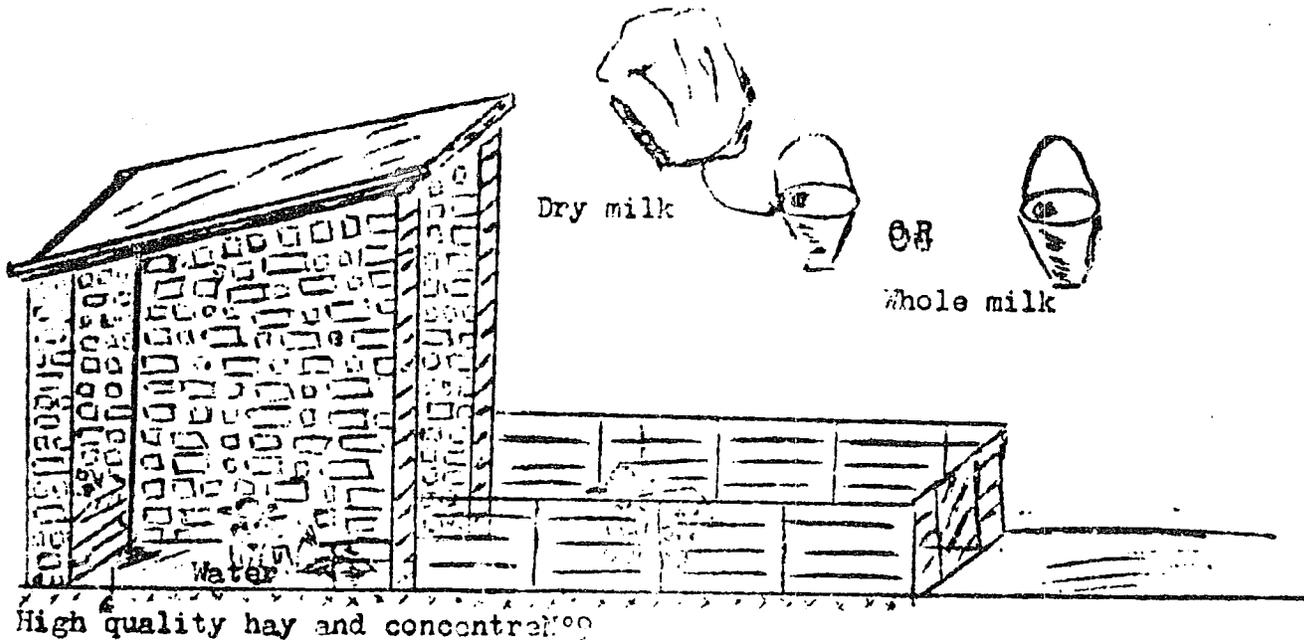
"Creep feeding" Young Calves

Dalton J. Comeaux
Livestock Adviser
Projet Elevage

1975

Annex 2

2/2/75



Creep feeding young calves is very important when a farmer wishes to raise outstanding animals for replacements in his own herd, sell pure bred animals or conduct an intensive fattening program. The development of an animal during the first six months of its life is very important to its total potential growth.

The best way to raise a calf to its full potential is to give the animal all the milk it can consume or an average of eight liters per day for the first six months of its life. The next best system is to follow the "creep" feeding program as outlined below:

1. Give the colostrum milk to the calf three times per day for the first three days and then continue with the mother's milk, twice a day for the next four days. Thereafter, powdered milk may be substituted for the mother's milk as shown in Table I. The powdered milk is mixed with warm water and fed in a bucket according to the schedule for 16 weeks. Follow directions on the Table I below.

2. Concentrate No. 9 and high quality hay are fed free choice starting the third week and continued until the calf is six months old. Alfalfa hay is the best hay obtainable and should be used whenever possible.

3. The animals must have access to fresh water at all times.

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4. When the calves are six months old they should weigh 160 kgs or better. The heifers can then be placed on a growing ration and the bulls put on a fattening program.

5. One of the most successful methods used in raising calves is the individual pen system where each animal is kept separate until they are one month old. They are then placed in group pens where the animals are loose and also have access to an outside area. Exercise and sunlight are essential for good healthy growth. The difference in age in each group should not exceed 30 days.

6. Animals that appear sick should be separated from the others.

7. Farmers must use good sanitation practices to keep the milk and powdered milk as clean as possible. Milk buckets must be scrubbed and disinfected after each feeding. Many calves are lost each year from calf scours due to unsanitary handling of milk or milk substitutes.

Table I - Distribution of Milk by Weeks for Baby Calves

1st week	2nd & 3rd week	4th & 5th week	6th & 7th week	8th through 12th week	13th & 14th week	15th & 16th week
Colostrum						
and mother's milk	3 ltrs.	4 ltrs.	5 ltrs.	6 ltrs.	4 ltrs.	2 ltrs.

Total 504 liters of milk or 50 kgs of powdered milk.

Colostrum is the first milk produced after calving. It is especially rich in protein, minerals and vitamins but is not high in fat. It also contains antibodies that help protect against disease bacteria which may invade the blood stream of the calf.

The whole milk can be replaced by powdered milk by mixing 1 kg of powdered milk with 10 liters of water. The water should be heated to a temperature of 37°C.

A rule of thumb to follow: feed one liter of milk for each 10 kgs of live weight.

Demonstration procedures

1. Select a farmer who has purebred calves on second and third generation crossbred calves.

2. Three to five calves born within a 30 day period should be selected.

3. Place the calves in individual pens or in a group pen that has at least 2 m² per calf.
4. Give the calf milk according to directions on table I.
5. The calves must have free access to fresh water all times.
6. Give concentrate no 9 and high quality hay free choice starting the third week and continue until they are 6 months old.
7. Keep the pens clean and covered with fresh straw.
8. Weigh the calves at the beginning of the demonstration, three months later and when they are six months old.
9. Analyse your cost of feed and weight gain per day.

USAID/TUNIS/AGR
February 1975

Annex 3

Beef-Feedlot Fattening Program

Dalton J. Comeaux, Livestock Advisor



A CHOICE ANIMAL FOR MARKET

There are many systems used in feedlot operations. Some are complex and vary from farm to farm, thus requiring some individual assistance. It is essential that a feedlot fattening demonstration start with good thrifty calves weighing approximately 180 to 210 kgs and usually they are 8 to 12 months old. The animals should be treated for external and internal parasites 8 to 10 days before the demonstration starts. If the animals are in a drought stricken area, they should be given a shot of A.D.E. vitamin. All rations should contain 2% salt and trace minerals or have mineral blocks available for the animals to lick.

The calves should be placed in a pen containing a minimum of 10 m² per animal. If an existing building on the farm is available, part of the space utilized can be inside of the building, and the remaining space on the outside. It is also possible to conduct a fattening demonstration in a pen without an enclosed building. All that is needed is a lean-to where animals can get under during heavy rain or hot sunny days. Being outside during hot or cold weather does not prevent animals from obtaining satisfactory gains. The animals should have a minimum of 60 cm of trough space, hay rack and a water trough sufficiently large to contain enough water for two or three days. When animals are started in a feedlot they should be given 1 kilo of concentrate per day for the first week and then gradually increase the amount during the next three weeks to equal the amount recommended on the charts below. The amount of hay or silage or green forage should be given as recommended on the charts.

Demonstrations have shown that good quality crossbred or purebred animals have gained from 900 to 1300 grams per day and local animals gained 600 to 1000 grams per day when fed a sufficient amount of a balanced concentrate ration and quality hay or silage or green forage.

The net profit made in feedlot operations depends on many factors, such as fixed costs, variable costs, management and marketing. The fixed cost includes buildings and equipment. The variable costs are comprised of cost of animals, cost of ingredients, death losses and labor. Supply and demand determines the marketing conditions and may vary greatly during the year. The finished weights of the animals range from 275 to 375 kgs for local breeds and from 400 to 450 kgs for purebred and crossbred animals.

Table I - Concentrate - Quality Hay

Purebred and crossbred animals				Local bred animals			
Weight of calves kgs	Amount of concentrate/kgs	Amount of hay kgs	Water	Weight of calves kgs	Amount of concentrate/kgs	Amount of hay kgs	Water
200	4	6	at will	180	2,5	6	at will
250	5	6	at will	200	3	6	at will
300	6	6	at will	250	4	6	at will
350	7	4	at will	300	4,5	5	at will
400	8	4	at will	350	5	5	at will

Table II - Concentrate - Silage

Purebred and crossbred animals				Local bred animals			
Weight of animals kgs	Amount of concentrate/kgs	Amount of silage/kgs	Water	Weight of animal kgs	Amount of concentrate/kgs	Amount of silage/kgs	Water
200	4	10	at will	180	2,5	10	at will
250	5	10	at will	200	3	10	at will
300	6	8	at will	250	4	8	at will
350	7	5	at will	300	4,5	8	at will
400	8	5	at will	350	5	8	at will

Table III - Concentrate - Green Forage

Weight of calves kgs	Amount of concentrate/kgs	Amount of green forage/kgs	Water	Weight of calves kgs	Amount of concentrate/kgs	Amount of green forage/kgs	Water
200	4	15	at will	180	2,5	15	at will
250	5	15	at will	200	3	15	at will
300	6	10	at will	250	4	10	at will
350	7	10	at will	300	4,5	10	at will
400	8	10	at will	350	5	10	at will

Demonstration Procedures

1. Select good thrifty calves weighing approximately 18- to 210 kgs.
2. Treat the animals for internal parasites with TBZ and for external parasites with Agent L 60 eight to ten days before the demonstration starts. Follow the directions on the containers.
3. Assist the farmer in selecting or designing a suitable feedlot location for the demonstration.
4. All animals must be housed in the feedlot and have free access to water at all times.
5. Dehorn the animals and castrate them if the farmer desires.
6. If the animals have not consumed concentrate before, give them 1 kilo per day for the first week and then gradually increase the amount during the next three weeks to equal the amount recommended on the charts.
7. Feed the animals according to the program selected.
8. Weigh the calves once a month and figure your gains.
9. Analyze your results at the end of the demonstration.

Nov.8, 1977

Livestock Advisor:
Dalton Comeaux

CONFERENCE 4

CONFERENCE DIRECTEUR DE L'ELEVAGE - Mr. DIALLO

Brief Notes

The objective of the UP Farm was outlined for Mr. Diallo. His statement was "we have the same idea as you on an Integrated Resource Management project. It must encompass every section, forestry, water, grazing management and food production".

List of problems discussed:

1. Too many animals at one watering point.
2. Decentralization of cattle in a must.
3. New wells or extension of watering points through pipe lines.
4. Separate herds into group areas and migration of cattle.
5. Tie program to SODESP
6. Need for Extension Service in all phases.
7. Forestry is important in each section.
 - a. As leaves and pods are excellent feed for cattle during the dry season.
 - b. Soil conservation - trees assist in controlling rain and wind erosion.
8. Irrigation - possibility to insure millet crop, their staple food and introduction of gardening. Irrigation for forage production - hay.
9. Better communication needed - radio etc.
10. Improved farm to market road.
11. Fire control.

Mr. Diallo said they had a similar program in the Senegal Oriental Region, plus they have the program de Promotion Humaine. This phase teaches the local peasants the laws of the country and how the law affects their zone and benefits derived. They introduce small poultry flocks, organize women for classes in health care, sanitation, economy and managements, etc. fire fighting and others.

He suggested that after we have completed our first outline that a copy be given to each division, Forestry, Livestock, Hydraulic, Agriculture Extension etc. Let them study the outline and then have a general meeting so everyone can have their inputs into the project.

Dakar, October 26, 1977

Livestock Specialist:
Dalton Comeaux
Range Management:
Donald Pendleton

6.11.77

Brief Notes

Interview with Dr. Gueye: *Interview of Gueye*

According to Dr. Gueye, SODESP knows the needs of herders and has many ideas concerning s... y. The means of application is the limiting factor. For example the European development fund which finances the program imposes some undesirable constraints.

Three years ago SODESP attempted to promote forage production on a large scale by the use of mechanization. They felt they could produce 4-5 tons of dry matter per hectare. But the donors told SODESP that success of such a program would depend on the herdsmen themselves producing the crop.

Herdsmen, encouraged to grow and harvest their own hay as cooperators with SODESP, elected instead to gather hay elsewhere from natural grassland for inspectors to see. The amount gathered was nearer one ton than the needed 10 tons. Furthermore, when the inspector had gone, the herders used the hay to tatch the roofs of their huts. The attitude of the herdsmen is: why should I work to cut hay and haul it to my cattle when they can walk to graze it.

On an experimental plot of 15 hectares, Dr. Gueye and staff produced six tons of hay per hectare at a cost of 8 CFA per kilo and offered it for sale to the herders for 10 CFA per kilo. It was all sold in 15 days. Last year (1976) SODESP produced and harvested 300 tons of forage and had sold it all in one month. The conclusion is that herdsmen will buy forage but will not grow it. Why? They are herdsmen, not farmers. The growing season is short and so is labor during the harvest period. The hay harvest season coincides with that of food crops, and the harvest of food crops takes precedence.

The crop which he proposes to grow is "niebe fourrage" (cowpeas or field peas), a legume. The fruit is eaten by people, and the foliage by stock. Herdsmen buy the hay with credit extended by SODESP for 1 to 5 years.

According to Dr. Gueye, the donors now agree that his plan will work.

It takes about 4-6 years to produce a mature animal (cattle) under the traditional system, 3-4 years under the SODESP program. The middlemen (including butcher, slaughterhouse, transportation, et al) all get their prescribed slice of the value of the (carcas) animal. The maximum price of meat to the consumer is fixed by political mandate. However, the fixed maximum price is not always adhered to. The set price now is 350 CFA, but the current over-the-counter price is 600 CFA/kg. No beef

would be sold at the set price. Producers could not afford to grow beef for that price, considering the cost of inputs. SODESP enters into agreements with herdsmen. The organization agrees to provide concentrates, vitamins and minerals, immunization-animal health program, equipment for haying, etc. It also guarantees the herfer a market for his cattle, returning him 15% above costs. The herdsman agrees in return to sell his cattle and increase production. The guaranteed price is renewed yearly. Generally speaking the annual needs for a herdsmen is 3,500 CFA/cow for feed, 1,000 CFA/cow for equipment, and 500 CFA for animal health, or a total of 5,000 CFA per mature cow unit.

SODESP works with individual herdsmen in the SYlvo-Pastorale Zone. This is a cow-calf area. Their goal is to buy calves at 8 months of age weighing 125 kg (310⁺). Price is 240 CFA/kg. These calves are taken south to areas of higher rainfall and more grass (Doli Ranch Area), where they are grown out the grower gets 180 CFA/kg for cattle weighing 300 kg.

From the growing out area, the cattle are moved to fattening pens near the major markets in the Dakar-Thiès area. The feeder is guaranteed a price of 240 CFA/kg for animals weighing 450 kg. These are slaughtered and sold on community markets at or above the fixed price.

In each of the three phases, the producer, grower and feeder is given direction and technical assistance by SODESP extension agents.

If SODESP loses money in the program, it is subsidized by GOS. If the organization makes a profit, the money is recycled to provide benefits to participants in all three phases of the program.

The SODESP project started three years ago. Prior to its initiation, the idea was tested for three years in sort of a pilot project, "conditioning" the cooperators. Currently there are 140 cooperators in the program with 2,500 cow units. This number is limited only by funds. There is a waiting list.

To date only 55 animals have been carried through the third phase fattening. There are 994 in the second phase. Up to this point in time SODESP has not had to slaughter any cattle. Commercial private entrepreneurs have bought all finished animals at or above the 240 CFA guarantee.

Note: In the future SODESP should set up its own mill.

Concentrates for cattle: There is only one large feed-mixing mill in the area. SODESP prescribes the formula and has the feed mill prepare the mix. The mill sets the cost. The mill capacity is inadequate to meet needs and has no competition. Consequently the cost of preparing concentrates is unreasonably high - 40 CFA/kg. During the peanut season

there is a plentiful supply of peanut products. Peanut meal (oil removed) currently sells for 50 CFA/kg, however, SODESP is able to buy it for 30 CFA by contract for large volumes.

Improved Forage Program: Dr. Gueye thinks such a program would work close to the fattening program and the consumer. Then the grower would have the alternative of going direct from pasture to slaughter or via the feedlot for 50-60 days prior to slaughter. The Thiès region has ground water available at 250-300 meters depth in amounts of 250 m³/hour (1100 gpm). Irrigation of hay and pasture is feasible, according to Dr. Gueye.

October, 1977

Livestock Advisor:
Dalton Comeaux

CONFERENCE "SOCIETE NATIONALE DE FORAGE"

Discussions

Director General: Mr. Baba Dionur
Bookkeeper : Mr. Sow

2-11-77

Brief Notes:

Mr. Dionur informed us that he was Director of Eaux et Forets at the time that the well were drilled in the Sylvo-Pastorale Zone. So he feels that was his "baby". The zone covers an area of 70,000 km square.

The original plan was to stop migration of the people but they did not realize some of the social aspect of the problems involved. Due to the number of animals at each well site the forage was quickly consumed and people had to leave. There also seems to be a concentration of the animals in the 7-8 km radius and grazing left at the 15 km extremes.

Need education for peasants; trees for forage for animals; gum-arabic harvested from November to June and produces an income for the people; special type of trees to produce wood for carvings, an important industry for tourist; and more watering areas.

The carrying capacity of that land was original set at 8 ha per cow. Depth of water which has an unlimited supply are for the following areas:

Louga	280 m
Labgar	250 m
Doli	318 m
MBidi	200 m
Tieoul	125 m

The center of the country seems to be the deepest.

The cost of drilling a well is as follows:

10 in. well -

Drilling the wells and casing	15,000,000
Water tank (100 dubic meter capacity)	6,000,000
Two troughs	3,000,000
Cabin for mechanic	5,000,000
Cabin for engine	1,500,000
Taps for human	500,000
Sub Total	<u>31,000,000</u>

Engine

?

?

Note:

Other information yesterday was 70,000 CFA or \$280,000 for a turn key job.

This well will produce an average of 40 cubic meter of water per hour (10 inch. well).

The estimate is that the maestrichtian water supply is 3 hundred thousand billion cubic meter and underline the whole country.

This company "SONAFOR" have drilled 130 new wells in the last two year assistances was received from a number of foreign countries for projects.

The director does not recommend laterals of 6 to 10 km from well.

Reasons:

- (1) Lost of water pressure-must put buster pumps.
Normally no reserve tanks are placed in the area.
- (2) Cost about 3,000,000 CFA per km of pipes.
- (3) Must use larger pipes if constructed.
- (4) Upkeep is very expensive.

Tuesday, November 1

Livestock Advisor:
Dalton Comeaux

SUMMARY OF TOUR

Brief Notes

Mr. Toure, tour guide Forestry Division.

1. First stop - St Louis.
2. We were in the Sahel zone with an average rainfall of 300 to 500 mm.
3. In the Sudano Sahelian zone the rainfall is about 1000 mm?
4. Mr. C. Diouf, St. Louis, Chief Inspector for the Forestry Department said their main objective was conservation and protection. Protection of the forest against fires and conservation of forage for livestock and soil conservation. They needed more equipment for communication for fire protection. More fire lanes and equipment to keep them up. This year they had 54 fires, mostly set by farmers, kids making tea and carelessness. Need an educational program for the peasants. Mr. Diouf indicated the desire to have a rural development program totally integrated, forestry, livestock division, agricultural division and others, as well as the protection of wild animals.

Friday 28th

1. First stop after forestry reserve, area put aside to control hunting, reforestation and agricultural crops. They prevent hunting, cutting of trees for fire wood and planting of crops but do not control livestock grazing.
2. 1st well at Taiki. 23 year old, could not get any information on cattle production from the farmer.
3. 2nd well point in MBidi.
Talked to the extension agent or vet. assistant, Mr. Papaly, adjoint technique.

Compulsary vaccination of three diseases - starts in October.

1. Peripneumonie bovine
2. Peste bovine
3. Charbon.

Other diseases that are severe sometime but not compulsory for vaccination are:

1. Botulisme - caused by drinking stagnant water near wells, grazing in pastures that are overgrazed. This is the main disease for "MBidi".
2. Others: (list on big sheet).
4. 3,000 head females (count made from vaccination for this water well; average calf crop 20.5%; 60 families here.) Deaths 2.6% of total animals in area. Defficiency in mineral and vitamins, poor quality grazing, herders are not educated. Need help in animal husbandry. Drought of 68-73 - thousands of animals died. Sheep survived better than cattle.

5. Herders would like to join SODESP program because they have seen the benefits of the program. Drought again this year.

6. Marketing:

1. Between herder
2. To Diagoula and Zifarka - Diagoula are richer. *Diagoula is richer*
3. 15 to 30 days to reach market in Dakar on foot

7. Management:

1. They castrate (extension agents) all males but 3 to 5 bulls for breeders per 50 cows.
2. Boeuf are mature at 4 year of age and weigh 350 to 450 kgs.
3. Three km. around well site has degradation.
4. They sell sheep and goats in advance of their religious holiday.
5. Sell goat milk and butter and other by-product if close to village to buy items for family needs. Sell boeuf if they need large items as equipments or clothing, otherwise they keep them until the animals are 8-12 year old. Seldom sell females.
6. Pre-green May-June and July are the severe months on cattle.
7. They produce no hay. They hmove when there is absolute no pasture forage left.
8. Family Food

The herders live on milk and milk by products, millet, sugar and tea. Some may eat meat once a month, or on special holidays or if a stranger comes over as their guest.

8. Taxes

Since 1973 herders do not pay taxes on their herds, but still herders do not vaccinate but 1/2 - 3/4 of herd due to fear to taxes.

Saturday 29th - Lagbar Area - SODESP - Zone 1

1. SODESP has established one zone with three centers up to now, limited funds.
2. Botulism is a severe problem, overgrazing, lost of phosphorus, salt and other minor elements.
3. Supplement feeding - 150 days (control herd).
 - 1) 2 kgs of hay/day/animal
 - 2) 300 grams of peanut meal (tourteaux)
 - 3) 150 grams of bicalcium phosphate.

The feeding period may have to be increased to 180 days due to droughts. This control herd are owned by many farmers and is used as a demonstration herd - teaching method. They give the animals a complete health care package better bulls for breeding and use good herd management practices.

4. SODESP Program

1975-76 they had 185 animals on the program - 17 herders.

1976-77 they had 695 animals on the program

1977-78 they have prospect of 5,000 animals.

5. They hot iron brand each animal for identification. Herders are ready now to join as they have seen its value.

6. The herders have to pay for treatments for their herd but as a subsidize price sometime 50% (to encourage them).

7. Hay Production

Niebe-cowpeas 2 ton production/ha average
 300 tons on 80 ha.

a. 1st year sold to farmers - cost of production 8 f. per kg sold for 10 f. Farmers are willing to buy hay but not to produce it. They are not equipped to produce hay.

b. This year they will keep all the hay for SODESP use on control herd. Planned for 300 ha but planted only 80 and got a poor stand at that. Rain-fall 218 mm, short of 250 average, come late.

c. Harvesting local forages (native grasses) where it is tall enough.

d. They sold to herders - mowing machines, animal traction, water tanks and carts for 100,000 CFA but only 2 farmers produced hay - 3 tons.

e. Fertilizer used 10-10-8 amount ?

1. Training Center - Mr. Sow, Director of the Training Center for herders and agriculture.

Established (funded) in 1970 but OK by Government in 60.

a. The trainees come there on a voluntary base but with a few criteria set up. 8-9 months.

1. Must own cattle

2. Must return to his village

3. Apply his training and become a leader in community

4. Must be 25-45 year of age

5. Must be a membe of a cooperative which loanes him materials such as traction equipment, plows, etc. and he must repay in 5 years.

b. 155 trainees have completed.

c. Cooperatives works well with peasant farmers but not herders - Cooperatives loan money for equipment and assist in marketing with farmers. Herders need cash until be sells cattle but crop. Do not loan cash.

"Jouber" - cattle buyer will loan a herder money until he sells cattle.

2. C.R.E., Center of Rural Extension, is the organization that does the follow up after training; not enough extension agents in the area therefore very little follow-up. Trainees are asking for help from extension agents. They hope SODESP will pick this up.

3. Last class 20% of trainees did not return to villages, next training period they will involve women or couples. Health care, gardening, and other type of studies.

4. Interview of farmer:

1 herder joined this year with SODESP
11 heads (3 heifers - 8 cows) 6 cows calves this year, he has 5 sheep and 5 goats.

5. Needs - water in first. He is 9km from water. Second is feed - and of that forage is first and second is supplement feeds and minerals.

Je is now buying peanut meal and minerals from SODESP and is very well pleased.

6. The second herder has 35 cows and 17 have calves. He milks all cows that have female calves and bull calves gets all of the milk because they will be sold at 6-8month of age through SODESP. That is a big change from the traditional system.

He would like a market for his milk. Makes butter, cheese and give the by-products left back to the animals.

7. He would cultivate a garden if water would be available - closer. He produces the millet needed for his family.

8. Last year, he produced 3 tons of hay as a result of his training in school. This year, drought and no hay, therefore he will have to purchase supplement feed and that will raise his cost, cheaper to produce hay.

4th Well Site

1. Tessekre Center - 10,000 beef animals. Each zone established by SODESP has 4 centers. Last year this center had 1 herder with 80 head of cattle, this year there are 13 herders and 700 animals on the SODESP program. They have 111 heads as a check herd.

2. The agent told us that most herders do not know how many animals they have as they just recognize their animals. They never count them. Herders are 18 years old or older. They have brazilian zebus bull in the control herd. A teaching method which is producing results. Their bulls are heavier quartered animals than their local bulls.

3. Problems

a) Lack of water is the 1st problem. If they have a pump break down it may not be repaired for weeks.

Two motor pumps are necessary.

b) Sanitation - Herders would be willing to pay for vaccination against major diseases.

Sunday 30th

Left Lagbar and going south to Doli Ranch.

1. 40 km out community well - 13 pullets - 2 gal. of water each pull. well 2-3 meters wide - 180-210 ft deep.

2. Later witnessed a forest fire that has been burning for 10 days, started 45 km from Doli ranch. 4-5,000 ha. of Doli ranch was burned.

Monday 31st

Doli Ranch - Mr. Samba Ka, Director at Ranch.

Purpose of Doli Ranch:

1. To allow farmers to sell their young animals
2. To assure a market of beef for Dakar
3. To assist herder to have an organized marketing system
4. It has a social factor - "extractors" - three traders - "Digoulas" (ricker) and "Tefanka" are eliminated.
5. The Doli Ranch is a Government organization and depends on the Livestock Service direction. They are a commercial organization to buy, fatten and sell cattle. They are buying all age cattle and have a set price for each size or type of cattle.

Weight	Price
180-200 kgs	130 F/kg if castrated
	128 F/kg if not castrated
200-300 kgs	140 F/kg if castrated
	138 F/kg if not castrated
above 300 kgs	150 F/kg if castrated
	148 F/kg if not castrated.

The purchase animals that are 2-8 year old.

6. The extension education is only within their herder group.
7. They use salt as the only minor element fed to cattle.
8. SODESP collaborates with Doli ranch and has two pastures with 930 heads. Doli ranch has no cattle in the third phase - fattening pens. Construction is not complete but should be ready soon to accommodate those cattle that are finished on grass.
9. Doli ranch has a second well dug but not equipped yet. Unexhaustable water supply.

10. The estimate of water cost at 2 CFA per cubic center meter.
11. The extreme chateaus are 300,000 liters capacity and all those in between are 1/2 that size. If a breakdown happens they have a 15 day reserve of water.
- 12 March-April and May are the worst months and require the most water.
13. There are two major breeds of cattle - Gorba - NDamba and a cross between those two.

Doli ranch also purchases about 20% of their cattle from Mauritania called Zebu Maure.

Nov.8, 1977

Livestock Advisor:
Dalton Comeaux

CONFERENCE - BOOKKEEPER FOR DOLI RANCH -

cc to file 8

Brief Notes

Number of slaughter houses in Dakar

1. municipality
2. Filfili
3. other well established - 4
4. others with minor facilities in small villages

All slaughter houses are inspected by a veterinarian or his assistant

In Dakar, they slaughter 225 animals - beef per day. They supply about 80% of their needs on the average.

- sheep ?
- goats ?

From Doli ranch to Dakar it takes an average of 12 days to walk the animals during the green grass period. During the dry season they walk the animals to M'Bake and then truck them into Dakar for slaughter.

They like to slaughter animals at a minimum weight of 330 kgs and some animals may weigh as much as 540 kgs.

The cost of the deep well at Doli in 1968-69 was	13,000,000
for the 7 extension outlets	61,000,000
Total	<u>74,000,000</u>

It is estimated that 74% of the population eat beef meat, and the per capita consumption is 13 kgs

Table I Beef Production and Projection

<u>1977 Production</u>	<u>1985 Projection</u>
30,625 tons slaughtered per year	56,160 tons
245,000 number of animals slaughtered	416,000
41,531 tons present demand	68,900 tons

1977 Production

1985 Projection

10,906 tons deficate	12,740 tons
74% percentage of demand met	81%
26% deficate	19%

15% of the total cattle population was lost during the drought of 1959-72

The average age of the animals slaughtered is 5 years.

Tn 1976 it was estimated that there were 2,450,000 beef animals in Senegal and they are slaughtering 10% per year. The growing rate of herds is 13% therefore the net gain is about 3% per year.

There are three main organizations involved in the livestock industry.

1. SODESP - growing of young animals - cow-calf operation in the Sylvo-Pastoral area.
2. Soci t  Nationale de Production de viande
This societe supervises Doli ranch and the fattening program in the Cap Vert area.
3. SERAS - deals with management of slaughter houses - meat by-products, hides, etc. No cold storage facilities.

They can keep meat for about 2 days only. They are working on program for cold storage.

SODESP is the only organization that loans money for equipment and feed to herders. Feed is on short term loans and equipment on long terms.

When the Doli ranch started to buy cattle they hired a number of people to buy cattle for them. They have lost a total of 7,800,000 CFA from men who left with the money and never returned. Most herders were afraid and would not sell them cattle, but now they have confidence and will bring in their cattle and say "pay me when you have the money".

Doli has 4,100 animals at present. They have a capacity for 10,000 animals. They are in financial trouble but hope the reorganization of the ranch into a private corporation firm within the next few weeks will give them the finances they need. Many countries, organizations and individuals are interested in the stock. The GOS will also be a stockholder.

The GOS has set the price for slaughtered animals at 420 F/Kg but they are now selling at 450 f.

The consumer pay 500. to 600 F/Kg. no one obeys the government pricing.

There are 4 or 5 herder cooperative but they are not well organized and need leadership. There is a lot of talk among herder for such organizations.

There is no imports of frozen meat as they have no cold storage facilities.

They do buy cattle from the neighboring countries.

Thursday 10/11/77

Meeting with Mr. Buresi - agronomist
Head of SODEVA - national extension service

Brief notes

Dalton Comeaux, Livestock advisor

Mr. Buresi said that they had an AID sponsored program in the Thies, Diourbel, Sine Saloum and Louga area - four administrations. There are 180,000 forms in the four areas.

In 1976 the acreage of crops were as follows:

- 1,033,000 ha of peanuts
- 493,500 ha of millet
- 164,500 ha of sorghum
- 45,000 ha - cowpeas - estimated
- 12,900 ha - corn for human consumption

(a) by-product of corn goes to cattle and some organic matter the millet crop is very important to the livestock producers they pull up the whole stalk and stack it for feed during the dry season.

Three important factors for crop production;

1. soil preparation
2. fertility - soil fertilization
3. organic matter - manure.

They have a program on reforestation in communities for firewood and wind breaks. They are difficult programs to administer as it is on an individual basis and not a community effort. Cattle breaks or eats the small trees during off crop seasons. The program lacks uniformity. They must find a system of community corporation. The Rural Development program has been established on a national level but does not function in all communities yet.

His view point are:

1. varieties of forestry trees are limited
 - (a) neem grows well but wood can be used for heating only
 - (b) eucalyptus; is not adapted to all areas; excellent for timber but youngs trees are killed by termites if not controlled with chemicals
 - (c) research on other varieties of trees is not sufficient.

In those four departments there is very little land that is not tillible. They are the classified forest, sand-dunes along the sea and the low salty land in the Sine Saloum area. The pressure for cultivated land in the Thies, Diourbel, Bambey and Louga area does not allow many farmers to follow part of their land. In the Kaffrine, Linguere and lower Sine Saloum area (edge of sylvo pastoral zone there is a fair amount of fallow land. Land that is out of production for 2 to 4 years and some land that is in continuous pasture.

Percentage of fallow land:

Sine Saloum 10%	North Center 1%
South Center 5%	North Louga 7%

Livestock Program (Beef)

(1) Introduction of beef (boeuf) animals for traction power. Vaccination, nutrition and protection. By success but not enough boeuf in the area so they introduced heifers 2-3 years old as draft animals. They give these animals complete health care-feed supplement and also follow through with the care of their young calves.

(2) This program of feed supplement, deworming, vaccination and etc, is done only for the draft animals and is free to the cooperator.

(3) The Livestock Division takes care of all other animals, that is mainly the compulsory vaccination program.

(4) They have just started a program of supplementary feeding of milk cows. That complements their young calf program.

- (a) they have doubled the milk production
- (b) the average loss of calves after birth and before weaning is 25%. Now with their "save the young animal", program they are saving nearly 100%.
- (c) some of the herders in the area are now buying young calves and applying their programs with great success.

(5) The milk is used for home consumption, making of butter and cheese, very little is sold.

(6) The average family has only 2 or 3 beef animals and the same number of goats and sheep.

(7) All animals are kept at home and tied to a tree as staked out where they can graze during the cropping season. All farmers cut forage and haul it to their animals. They also utilize the grasses removed from the field when weeding.

(8) Fattening - many farmers fatten animals for the market 1-5 animals. There are 4 or 5 herders that fatten as many as 100 animals at a time. They mostly have young animals. In most cases they feed what they have on the farms plus some supplement feed. Not necessarily a balanced diet.

(9) They tried to fatten old cows but they did not have very much luck with that program. Many of the cows were bred during the fattening period therefore the farmer decided to keep the animal and they were added to the breeding herd.

(10) There are 3,700 peasants using the SODEVA fattening program and about 4,000 others that are using the traditional system.

Sheep.

They supervise sheep fattening program also. In 1976-77 they supervised the fattening of 9,400 heads with an average of 2 to 3 animals per peasant. This program could greatly increased as it is mostly handled by women and are very interested in it.

Milk Cows

In the Sine Saloum area only they supervised 3680 family milk cows and saved 6270 calves in their program. The number of calves saved in because it is extended to all young animals of the cooperating farmers.

Bull for breeding

They have introduced better bulls in the region.

System of Extension Work

They work only with farmers who volunteer to joint their program. The farmers must show an interest.

The first two year they give all the medical material and service to the farmer. The concentrate is paid for by the farmer but the Extension Service makes it available to them . After the second year the farmer pay for all the medication. They learn fast that is pays.

In the Linguere area last year the Extension Service furnished feed and minerals to the farmers to the value of 2,000,000 F.

Feed mills

There are three feed mills in the country and SSEPC is the largest. They can manufacture sufficient feed to meet the needs if they have the basic ingredients. They have corn and sorghum if imported.

Credit

They need credit for farmers to buy farming equipment, bulls or cows for tractions, feed supplement, etc.

Technicians

There is a great need for technicians, mainly in the field of agronomy.

Training

Need to set up more in-service training for the present agents. Bring in teachers here to teach those courses. Then select a few to send abroad for further studies. Try to select those with a few years of experience.

Water

A complete study is already made of the Louga area. There are but a few deep wells in the area. Water is need first for human and livestock and then if there is still some available it could be used for irrigation of small plots to insure a food supply.

November 16, 1977

Livestock Advisor?
Dalton Comeaux

CONFERENCE WITH MR. MAMADOU DIOP
Chef de Service à l'Hydraulique

10/16

A conference was held with Mr. Diop who is Chief of Hydraulique Studies. He told us that Mr. Abdoulaye Fall was the Director of Studies and Programing. There are two divisions, hydrological and hydraulique. The telephone number of Mr. Fall is 235-30.

We discussed the water depth of various "napes". There are four water bearing strata: one at 20-30 meters; 60-80 m, and 110-120 m and 250-300 m deep.

The find out is very poor and can go dry in 3 or 4 hours of hard pumping or lifting out by water buckets. The second water layer is 60 to 80 meters deep and very good. The water is removed by hand - rope and bucket. A motor and pump is usually used to draw the water from the otehr two types of deep well. On some occasions they will drill a deep well to the 250-300m. strata, and then hand dig an auxillary well next to it. They will install a pipe channel from the deep well to the shallow well at about 10 meters. Water rises in the deep well to 60m and therefore flow into the shallow well. The peasants also obtain their water here with long rope and buckets.

The calcareous nap (60-80m) extends from Louga to Kébémér, Mékhé, Baba Garage, Sagata and back to Louga. Wells drilled south and east of those regions becomes brackish.

Mr. Diop said that it cost approximately 100,000 CFA per meter to drill a well.

A short conference was also held with Mr. Martin Coly - also in the hydraulologic division.

He indicated that there are about 5 deep wells in the 200 to 300 m depth range in the Louga region. There are at least 10 wells at the 80m depth within a 50 km radius of Louga.

There is a possibility of drilling deep wells in the 110 to 120 zone for irrigation purposes. They have obtained a discharge of 200 cubic meters per hour on those wells.

The Director of this section is Mr. Mamadou Sakhé, Adjoint Director is Mr. Bocar Cissé and Mr. Coly is third in line.

UNITED STATES GOVERNMENT

Memorandum

Kelley
John Heave

TO : AFR/DR, Mr. James Kelly

DATE: January 7, 1977

FROM : AFR/DR, Lloyd Olyburn/Donald Ferguson
TA/AGR, Billard Gates

SUBJECT: The Senegal Land Conservation and Revegetation PRP

While we believe that a resource management program is a necessary element for the long-term economic development of Senegal, we have found that it is neither technically nor financially feasible for the project as described to achieve the stated purpose and goal. We do not propose that the purpose and goal be downgraded to fit the project, as our confidence in it working at any level, except for the woodlot activity, is extremely low. Rather, we propose that the goal statement be adjusted to a biologically feasible statement which supports the sector goal of self-sufficiency in food production over the long-term. The purpose should be adjusted to support the goal. Our analysis follows:

A. GOALS:

1. "To provide a broad base of renewable resources to sustain increased production of energy, livestock, agriculture and forest land related productions."

The AID evaluation specialist would remove the primary verb phrase a subordinate to the final verb phrase which is the ultimate statement thus the goal. We reject it on the grounds of unessentiality: the resources are in place and no project is required to provide them. The goal statement, "to sustain"... requires grammatical adjustment. While energy and livestock may be treated as common objects, agricul and land may not. The merit of increasing livestock is far from established in the paper. It could be counterproductive to the sector goal of practical self-sufficiency in food production. The objective should be optimization of livestock production in relation to the availability and demand for natural resources.

2. Measure of Goal Achievement: "The arrest of degradation and soil deterioration. The stabilization and regeneration of natural resources in forest, rangeland and savanna zones of Senegal."

While this cannot qualify as a measure of goal achievement it contains certain elements of a valid goal statement, with corrections. If there is a problem of regeneration of natural resources the resource manager would go for regeneration before stabilization. This is in fact necessary for goal achievement, due to the fact that we may have stabilization with zero level output. Again the prepositional objects, forest zones, rangeland zones and savanna zones are not necessarily parallel.

3. Means of Verification: "Increased production of agriculture, livestock and wood for energy and other uses with no apparent adverse effect upon the environment."

While this is not a means of verification, it has elements of a verifiable indicator provided that it is quantified.

4. Assumptions for Goal Achievement:

a. "The major natural catastrophes to further upset the ecological balance in the project area."

This is not a valid assumption. To the contrary, to the extent that the drought cycle is understood the project should be adjusted to accommodate it.

b. "The Ministry of Rural Development and Hydraulics is able to coordinate the activities of its various technical divisions to obtain an operational and comprehensive plan of resource development and conservation."

Under the circumstances of the PRP, this is a legitimate assumption. This was not negotiated in the course of developing the PRP. It should be presented to the ECPR as an issue and negotiated to resolution in the course of developing the PP.

c. "Donor support necessary to fully attain project goals continues to be available."

B. PURPOSE:

Although the purpose statements are subject to the same degree of analysis as the goal statements we assume that we have made our point with the latter.

If the project has a strategy it is revealed in the purpose statement (logframe) as incremental; that is, the purpose of the project is to

achieve certain measures of the goal. If this is accepted as stated, then the project is disqualified on the grounds of financial non-feasibility. The PID estimated the cost of establishing the 3,000 hectares of woodlot and rehabilitating 7,500 hectares of rangeland to be slightly over \$500 per hectare. The PRP estimate was considerably in excess of 10 million hectares. If we use the figure, 10 million hectares, we have a \$5 billion program. Whether this amount of money is likely to ever be available for this purpose was not addressed. The point is that the scope of the project is so small and so limited that it cannot ever have any impact on national resource management, and if it is implemented it will likely tie up all available management from now on. To us it seems that a purpose reflecting institutional capacity would be most appropriate.

C. PIDs:

In October 1975, ADO/Dakar submitted a PID for applied research of Acacia albida, against the hypothesis that the tree growing in cropland would increase crop yield by- implacing plant nutrients, principally nitrogen, on the soil surface through leaf drop. The PID was based on the proposition that Acacia albida has been measured to deposit the following substances on the surface:

dry matter (leaves) - 50 to 60 MT/ha
nitrogen - 300 kg/ha
potassium chloride - 50 kg/ha
magnesium - 25 kg/ha
lime - 100 kg/ha

Such yields are sufficiently high to arouse skepticism. Our examination of the proposal, both the paper and a ground inspection, led us to conclude that although an Acacia tree in a field is probably a good thing, a concentrated campaign to establish it artificially does not appear to be the most effective means of increasing the supply of plant nutrients to support increased crop yields. Considering the many bottlenecks to agricultural development in the Sahel we were compelled to assign research on Acacia albida to a low priority. The absence of the knowledge is no critical to development, considering that at the present there appears to be alternative approaches to supplying nutrients in a shorter timeframe than is promised through Acacia albida. Nevertheless we recommended the hypothesis be pursued through a state-of-the-art survey. The Unive of California at Riverside (TA/AGR contract) is preparing a proposal at our request.

In addition to research, the PID called for the establishment of nurseries to propagate the tree for general distribution. Our view was that the implementation of this phase should await the conclusions from the proposed research.

In May 1976, AID/Bahar submitted a PID which proposed two activities. One was to plant a 3,000 hectare woodlot or "greenbelt". The other activity was the reclamation and tree-planting of 300 hectares around each of 25 stock walls that had deteriorated from severe overgrazing. These measures would cost a little over \$500 per hectare.

These activities were sprung from the proposition that reforestation is the "one universal ingredient" in resource management in the Sahel. The PID stated, "the need for large reforestation projects in the Sahel has been generally accepted by commentators and donors alike". This generalization was challenged at the PID review as was this one, ... "it is agreed that local climatic effects of reforestation can be quite significant".

Our evaluation was: "while the discussions of soils, erosion and environmental factors contain an element of fact the discussions are weak and misleading, and conclusions are drawn on the basis of faulty logic and misinformation."

This entire section needs to be significantly strengthened to show that the proposed project activities are valid from a technical and scientific point of view."

Our conclusion was that these approaches applied band-aids to the symptom without treating the cause, which in most cases, is uncontrolled overgrazing. Worse, the system would tie up scarce management and promote the delusion of useful activity.

Another PID requested assistance with bushfire control, again without an element of resource management.

Our recommendation was that the pertinent services of the Ministry of Rural Development and Hydrology devise a combined resource management program. A PIO/T was drafted and a design team was recruited and briefed accordingly.

B. PROJECT DESCRIPTION:

The PRP presented the same four activities proposed in the PIDs with one exception: the research element of Acacia albida was dropped and an implementation activity was described.

1. Well-Point Development: Some years ago a number of deep wells were drilled on the public range without instituting any form of grazing management for the areas they served. Our inspection in September 1976 revealed severe overgrazing for radiuses of about 10 kilometers from the wells, which is about the distance that a bovine will voluntarily travel for water. The land in the immediate vicinity of the wells was found to be completely denuded and severely eroded, due to overgrazing and trampling. In 1974 a project was proposed that would enclose 300 hectares around each well and plant the area in Acacia arabis as a soil binder. We recommended against the project on the grounds that grass roots and grass cover are required to stabilize top soil ("A" horizon) that tree roots are ineffective for this purpose. Further we reasoned that to get the trees started would require controlled grazing which would permit the reestablishment of grass cover, hence for the purposes indicated, the trees are superfluous.

The PRP proposed the same activity expanded to 400 hectares per well, adding as justification brouse forage to be provided by the trees and gum arabic to be harvested. For the area to be enclosed we have no indication either from the paper or from the literature that animal nutrients can be produced more efficiently from acacia than from the native grass species. In fact our experience is that it takes seven times as much groundwater to produce a unit of animal nutrients from mesquite as it does from grass. Certainly water is a limiting factor. In view of the sector goal of self-sufficiency in food production, we cannot recommend a gum arabic project, even if it were economically feasible, which as a cultivated crop has not been demonstrated.

Our major concern with the proposal is that it does not address the overriding issue of land-animal balance. Where each of these wells serves approximately 40,000 hectares that are presently overgrazed, the PRP proposes to protect 400 hectares or one percent of the area affected. Such action would merely change the pattern of deterioration and this only slightly. Again, we challenge the essentiality of reforestation as a means of resource rehabilitation and management in these cases, where, contrary to the PRP, the cause of deterioration is clearly overgrazing. If we are wrong, then at \$500 to \$1,000 per hectare the Sahel recovery program is in serious trouble.

The paper mentions several activities for Promotion Humaine which are not integrated into a reasonable development hypothesis.

(The project, of Promotion Humaine in this case may be challenged. See Cranlack's paper on Chad Integrated Rural Development.)

2. The Sylvo-Pastoral Zone (Firebreaks): Although we agree that fire control is an essential range management practice, it is of doubtful value when not incorporated with a complete resource management program. While the PRP recognizes the value of managed grazing (page 22) it does not propose a grazing management program.

3. Soil Conservation: The Acacia albida is presented as a soil conservation project in the groundnut basin. The merits of Acacia albida were discussed in some detail at the PID stage and left at a low priority for research applied to soil fertility. Soil conservation was not mentioned in the PID. In no stretch of the imagination could these trees set as recommended, 30 meters apart, provide any protection from water or wind erosion.

4. Greenbelt Reforestation: We are aware of the need for cooking fuel, posts and poles in the urban centers, as well as of the existing Greenbelt proposals. We take issue only with the economic analysis, location and alternatives, which were not discussed. The economic analysis is inadequate to say the least. As for location, why would the high rainfall area of the Casamance not be examined for timber production? Timber production requires high rainfall, and water transport to Dakar is available.

D. AID AND RELEVANT EXPERIENCE:

1. Acacia albida: AID's experience with Acacia albida in Niger and Chad has not been evaluated, thus it remains inconclusive.

2. Greenbelts in Upper Volta and Niger: Insufficiently documented, to say the least.

3. Mobile units: AID and predecessor agency experience with mobile information units have been uniform failures. Not a single country that ever accepted a US-donated "mobile unit" kept the program going after the US stopped supplying vehicles.

E. RECOMMENDATION:

Our recommendation is to proceed with the establishment of a comprehensive resource management program in the government which will involve the

Forest Service, Animal Production Service and the Agricultural Service. The first phase of the program would of necessity deal mostly with the development of a national policy toward resource management. It is our opinion and that of those with experience in planning and implementation agricultural projects in the Sudano-Sahelian countries of Africa, that to proceed with development activities in arid areas in advance of a firm commitment to management of natural resources is not only a waste of financial resources but could contribute to an accelerated rate of environmental deterioration. The project should also include resource inventory work, training and demonstration. To provide training and demonstration the project might opt to take on a discrete area of the "sylvo-pastoral" zone for integrated resource management. The experience gained here should provide the basis for a national resource management program on a larger scale.

UNITED STATES GOVERNMENT

Memorandum

TO : The Africa Executive Committee
for Project Review (ECPR)

DATE: January 19, 1977

FROM : AFR/DR, John Withers JK (4.1)

SUBJECT: Issues Paper - Land Conservation and Revegetation PRP
(Senegal)

I. General

The subject PRP was reviewed by the project committee on December 14, 1976. While strong support was expressed for the resource conservation thrust of the project, the project committee felt that additional analysis and design work was necessary, prior to proceeding to PP preparation.

Recommendation: The PRP should be granted conditional approval. Final PP preparation should be subject to AID/W review of additional material to be submitted in an interim report, the recommended elements of which are detailed below.

II. Issues

A. Integration

The principal issue identified by the project committee was that the PRP appears to consist of the original PID-outlined strategies with only a limited attempt having been made to mesh these discrete approaches into a comprehensive or "integrated" strategy for dealing with land resource management constraints in Senegal. There is an apparent lack of focus on overall resource planning. How the various activities will reinforce each other or why the four were selected as opposed to other alternatives is not spelled out. The project overview (page 6) is illustrative of this deficiency as it characterizes the project as four distinct activities in four different geographic areas designed to accomplish four vaguely related objectives. Finally, there is no substantive treatment of GOS policy or long range strategy, either as background information or as an area to be treated by the project. The basic approach should be re-
vised.

Recommendation: The interim report should outline an integrated strategy on a preliminary analysis of land resource management problems. the GOS ^{1/} (Pilot activities testing a truly comprehensive strategy, example, could start within a single area for later expansion in an "onary" approach.)

suggested that Dillard Gates, (TA/AG) participate in the elaboration of the strategy as a follow-on to his August 1976

B. Environment

The PRP contains no formal initial environmental examination (IEE) and the project committee identified several potential problem areas, such as (a) the use of pesticides and herbicides for fire break control, (b) animal and human health consequences of well point development due to the increased concentration of people and animals, (c) possible lowering of the water table around well points due to the increased off take and piping of water to adjacent sites. In addition, ENGR/ENS has made the point that the project involves four discrete activities, each within distinct ecological systems. Separate environmental examinations should be carried out for each one.

Recommendation: The interim report should include a standard IEE for each sub-project component recommended.

C. Counterpart Resources

The PRP is somewhat vague concerning the magnitude of the counterpart human resources commitment necessary. (Judging from material presented on page 11, more or less thirty may be required at the professional level.) Also, eight technicians are to be trained at the Masters level. There is no institutional analysis to provide confidence that a counterpart staff necessary for implementation can be mounted.

Recommendation: The project paper should contain an institutional analysis including personnel, budget and management resources and constraints. Obviously, the scope and level of the project should be tailored in accordance with the findings of the analysis. Also, recurring costs should be detailed together with a breakout of exactly what is to be subsidized and for how long, by whom (AID and other donors, as well as the GOM "counterpart" commitment).

D. Other Donor Participation

The PRP suggests (page 35) that FAO might assist in personnel recruitment and program supervision. More information is needed, however, on FAO interest, commitment, capacity, etc. before any decisions are made.

Recommendation: The proposed AID/FAO relationship should be spelled out for Washington consideration prior to final negotiations.

E. Well Point Development - Livestock

The livestock element of the well point component was singled out by the project committee for special attention primarily due to associated costs \$1.30 million, and lack of information. The PRP proposes to fund livestock, including health, animal supplements, pesticides, marketing, etc. in the indicated amount, some of which

(we do not know how much) would go to farmers on credit. How such credit would be delivered, managed and recovered is not treated. There are other significant gaps in the project description. Essentially, what is the project strategy in the livestock area? The project committee also expressed concern over the issue of potential overgrazing and the delicate land/animal balance.

Recommendation: Given the magnitude of the livestock element, \$1.86 million, a PRP level analysis (financial, technical, economic, and social) should be presented in the interim report.

F. Resource Survey

The PRP proposes, as part of pre-project implementation, to finance a resource survey which would provide a basis for integrated planning for resource development. A nationwide survey is to be conducted with a high degree of remote sensing utilizing landsat satellite imagery together with aerial photography. Institutional arrangements and counterpart resources for the survey are not discussed. The project committee supported the notion, but felt that more properly it should be part of the project in terms of AID funding and management. Also, given the magnitude of the remaining project development work necessary and the review process, it is difficult to imagine such a survey being conducted in FY 77.

Recommendation: The interim report should include new treatment of necessary land use survey work which would incorporate it as part of the project as a whole. Also, necessary GOS institutional support should be spelled out with some indication that it will be forthcoming.

III. Other Observations

A. Economic Analysis. The economic calculations, pages 35-37, are so optimistic as to be difficult to accept. The PP should show in much more detail how such extraordinary returns are calculated, including a full analysis of all costs and subsidies. In addition, there should be a micro level benefit calculation for various typical producers within specified project areas.

B. Farmer/Herder Training. Very little information is provided concerning direct farmer/herder training, especially in connection with well point development. As this training appears critical as a success factor, more description and feasibility material should be developed for the PP. The capacity of Promotion Humaine to handle the training effectively should be substantiated, plus the efficacy of the mobile unit concept, as the latter has a very mixed record in AID experience. The Peace Corps commitment should also be firmed up prior to PP submission, since PRP cost calculations will be based on it.

C. Lack of Clarity. A host of questions in the review process revolved around "who does what to whom, how, where, and at approximately how much cost". Generally speaking, the PRP was considered weak in both project description and technical analyses. For the PP, much more

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complete sub-project descriptions should be developed, including the overall management task. Also, since a number of assumptions in the logical framework appear vital to project success, and it was felt that they deserved much more extensive treatment than they received in terms of validity and criticality.^{1/} All important purpose and output assumptions should be discussed in the PP. Those that are truly critical to project success should be flagged as issues and covered in depth. In addition, the phasing of the project is not clear. Exactly what will AID be asked to approve, i.e. LOP funding, the first three years, two projects consecutively, or what? Some thought should be given to the possibility of a phased approach in terms of funding. This should probably be covered in the interim report. Finally, construction and procurement plans are not outlined sufficiently in the PRP. The PP should contain plans and specifications, or evidence of same to satisfy 611(a) criteria plus all necessary procurement waivers.

Clearances:

AFR/GC:STisa(draft)
AFR/DR:JKelly(draft)
AFR/DR:LClyburn(draft)
PPC/DPRE:JWelty(draft)
AFR/DR:DDibble(draft)

^{1/} For example, an output assumption is that sufficient numbers of qualified persons will be identified and made available for training.

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Cooperating Country
SFWA Regional

1. PID/T No.
625-926-2-6777541

3. Original or
Amendment No.

PIO/T

PROJECT IMPLEMENTATION
ORDER/TECHNICAL
SERVICES

4. Project/Activity No. and Title
625-0926, Africa
Development Program
(Senegal Integrated Resources Management)

DISTRIBUTION

5. Appropriation Symbol
72-11X1026

6.A. Allotment Symbol and Charge
42E-67-625-00-69-71

6.B. Funds Allotted to:
 A.I.D. M...

7. Obligation Status
 Administrative Reservation Implementing Document

8. Funding Period (Mo., Day, Yr.)
From 10/01/77 to 04/29/78

9.A. Services to Start (Mo., Day, Yr.)
Between 10/01/77 and 10/01/77

9.B. Completion date of Services
(Mo., Day, Yr.) 04/29/78

10.A. Type of Action
 A.I.D. Contract Cooperating Country Contract Participating Agency Service Agreement Other

10.B. Authorized Agent
AID/W

Estimated Financing		(1) Previous Total	(2) Increase	(3) Decrease	(4) Total to Date
\$1.00=					
11. Maximum A.I.D. Financing	A. Dollars	0	\$87,500		\$87,500
	B. U.S.-Owned Local Currency				
12. Cooperating Country Contributions	A. Counterpart				
	B. Other				

13. Mission References

14. Instructions to Authorized Agent

Initiate a PASA with USDA for services described in Block 19.

15. Clearances - Show Office Symbol, Signature and Date for all Necessary Clearances.

A. The specifications in the scope of work are technically adequate
AFR/DR/AFD: W. Leake, L. Clyburn

B. Funds for the services requested are available
SER/FM/RSD: B. Wipple

C. The scope of work lies within the purview of the initiating and approved Agency Programs
AFR/DR/SFWAP: J. Kelly, T. Crawford

D.

E. AFR/SFWA: J. Langlois

F. AFR/DR/PS: N. Caticchio

16. For the cooperating country: The terms and conditions set forth herein are hereby agreed to

17. For the Agency for International Development

18. Date of

Signature and date:

Signature: John L. Withers

Title:

Title: AFR/DR, Director

PIOT

Activity No. and Title: 625-0926, Africa Development Program
(Senegal Integrated Resources Management Project PP Team)

SCOPE OF WORK

19. Scope of Technical Services

A. Objective for which the Technical Services are to be Used

A Project Paper for a national Integrated Resources Management Project.

B. Description

1. The Product:

The end product should embrace in one form or another the following elements:

- a. Consent among participating services to work together in implementing an integrated resource management program.
- b. Conceptualization of a national integrated resource management program.
- c. A clear statement of the intent on the part of the Government of Senegal (GOS) to implement an integrated resource management program.
- d. Criteria governing the approval and evaluation of resource management projects. (see continuation sheet)

C. Technicians

(1) <u>Ref Number</u>	(2) <u>Specialized Field</u>	(3) <u>Grade and/or Salary</u>	(4) <u>Duration of Assignment (Mon Months)</u>
1	Senior Conservationist	\$34,000 per annum	1.0
1	State Conservationist (Range Management)	\$34,000 " "	1.5
1	State Conservationist (Agronomy)	\$34,000 " "	1.5
1	Extension Range Animal Husbandman	\$34,000 " "	1.5

(2) Duty Post and Duration of Technicians' Services
AID/W and Senegal; 10/01/77 to 04/29/78

(3) Language requirements
French

(4) Access to Classified Information
None

(continued page 12)

(5) Dependents

Will

Will Not

Be Permitted to Accompany Technician.

D. Financing of Technical Services

(1) By AID - \$ 84,500

(2) By Cooperating Country - 0

PIO/T

Project/Activity No. and Title
625-0926, Africa Development Program
(Senegal Integrated Resources Management Project PP Team)

20. Equipment and Supplies (Related to the services described in Block 19 and to be procured outside the Cooperating Country by the supplier of these services)

A. (1) Quantity	(2) Description	(3) Estimated Cost	(4) Special Instructions
N/A	N/A	N/A	N/A

B. Financing of Equipment and Supplies
(1) By AID - \$ N/A

(2) By Cooperating Country - N/A

21. Special Provisions

- A. This PIO/T is subject to AID ~~XXXXXXX~~ (PASA implementation) regulations.
- B. Except as specifically authorized by AID, or when local hire is authorized under the terms of a contract with a U.S. Supplier, or authorized under this PIO/T must be obtained from U.S. sources.
- C. Except as specifically authorized by AID/W, the purchase of commodities authorized under this PIO/T will be limited to the U.S. Geographic Code 000.

D. Other (specify): Project Manager: Donald Ferguson
AFR/DR/ARD
AID/W

PIOT

Project Activity No. and Title
625-0926, Africa Development Program
(Senegal Integrated Resources Management Project PP Team)

22. Reports by Contractor or Participating Agency (indicate type, content and format of reports required, including language to be used if not English, frequency or timing of reports, and any special requirements)

One copy of draft PP including Technical Annexes to ADO/Dakar prior to team's departure. One copy of same to James Kelly, AFR/DR/SFWAP, and one to Donald Ferguson, AFR/DR/ARD, as soon as possible following team's return to U.S.

23. Background Information (Additional information useful to Authorized Agent and Prospective Contractors or Participating Agency; if necessary cross reference Block 19.C(4) above.)

Project Review Paper, guidance cables and other documents available in AFR/DR/ARD and AFR/DR/SFWAP

Additional background information will be provided during briefing in AID/W prior to team's departure for Senegal.

24. Relationship of Contractor or Participating Agency to Cooperating Country and to AID

A. Relationships and Responsibilities

Team leader reports to ADO/Dakar.

B. Cooperating Country Liaison Official

To be determined as appropriate by ADO/Senegal

C. AID Liaison Officials

James Kelly, AFR/DR/SFWAP
Donald Ferguson, AFR/DR/ARD
Norman Schoonover, ADO/Dakar

LOGISTIC SUPPORT

Provisions for Logistic Support	IN KIND SUPPLIED BY		FROM LOCAL CURRENCY SUPPLIED BY		TO BE PROVIDED OR ARRANGE BY SUPPLIER
	AID	COOPERATING COUNTRY	AID	COOPERATING COUNTRY	
A. Specific Items (Insert "X" in applicable column at right. If entry needs qualification, insert asterisk and explain below in C. "Comments")					
(1) Office Space	X				
(2) Office Equipment	X				
(3) Housing and Utilities					X
(4) Furniture		N/A			
(5) Household Equipment (Stoves, Refrig., etc.)		N/A			
(6) Transportation in Cooperating Country					X 1/
(7) Transportation To and From Country					X
(8) Interpreter Services Secretarial					X
(9) Medical Facilities					X
(10) Vehicles (official)		N/A			X
(11) Travel Arrangements/Tickets					
Other (Specify)					
(12)					
(13)					
(14)					
(15)					

B. Additional Facilities Available From Other Sources N/A

- APO
- PX
- COMMISSARY
- OTHER (specify, e.g., duty free entry, tax exemption)

C. Comments

1/ Rental cars - funds contained in illustrative budget.

7-14 (7-62)
CONTINUATION SHEET
FORM SYMBOL

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

PAGE 6 OF 14 PAGES

TITLE OF FORM: PIO/T

1. Cooperating County
SFWA Regional

2.a. Code No.
625-926-2-6777541

2.b. Effective Date

2.c. Amendment
 Original OR No: _____

3. Project/Activity No. and Title
625-0926, Africa
Development Program (Senegal Integrated
Resources Management Project PP Team)

Use this form to complete the information required in any block of a PIO or PA/PR form.

- e. Provision for a central resource fund available for project implementation through participating COS services.
- f. A clear statement of procedures.
- g. Description of pilot activities identified for near-term implementation and testing of criteria.
- h. Description of personnel positions, facilities and operations anticipated, including cost over time.
- i. Major assumptions.
- j. Major issues, with pros, cons and recommendations.
- k. A package of documents, including:
 - (i) the Project Paper following the prescribed format in AID Handbook 3, Chapter 6; and
 - (ii) supporting annexes.

2. Project Design:

a. Design Team and Functions:

A multi-disciplinary team will be commissioned to design ways and means of implementing the program as conceptualized above. While each participant will be expected to represent the skills of his own discipline, he will contribute to the design of an integrated resource management system.

(1) Senior Conservationist:

(a) Definition: An officer of the USDA Soil Conservation Service with broad experience in environmental and resource management design, including experience in designing national resource management programs in West Africa.

(b) Responsibilities:

i. for assisting with conceptualizing the project and negotiating the conceptualization with the COS;

ii. for drafting a rough outline of the project;
(continues next page)

15 (12-59)
UATION
HEET
SYMBOL

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

PAGE 7 OF 14 PAGES

TITLE OF FORM

1. Cooperating Agency SFWA Regional	2.a. Code No. 625-926-2-6777541
2.b. Effective Date	2.c. Amendment <input checked="" type="checkbox"/> Original OR No: _____
3. Project/Activity No. and Title 625-0926, Africa Development Program (Senegal Integrated Resources Management Project PP Team)	

Use this form to complete the information required in any block of a PIO or PA/PR form.

iii. for orienting the design team; and

iv. for representing the project design to AID.

(c) Functions: Working with Dillard Gates, AID Senior Ecologist, and James Hradsky, REDSO/WA Design Officer,

i. review the terms of reference (Clyburn 3/31/77) with the Minister, Chief of Cabinet and Directors of Rural Development and from the review derive a concept of the project. If the concept is reasonably consistent with AID directives, including cables and the above-mentioned TOR, proceed to the next step. If not, report the outcome to ADO/Dakar and AID/W and await further instructions.

ii. with Gates, Hradsky and senior Senegalese officer, make a brief field trip for personal clarification of the project concept;

iii. draft a rough outline of the project;

iv. orient the team as to its job and procedures; and

v. be available for two project committee meetings in AID/W.

(2) Conservationist/Technical Team Leader

(a) Definition: The incumbent should have a background in range conservation at the state or regional level. The major requirement is that he possess the capability to conceive of a national, integrated resource management program and the ability to express it to an ad hoc, international team.

(b) Responsibilities:

i. for the whole design and the final paper; and

ii. for the work of all AID-financed persons assigned to the team.

(c) Functions:

i. orient the team as to:

- the terms of reference;

- provisional design criteria and guidelines;

(continued next page)

DEPARTMENT OF STATE AGENCY FOR INTERNATIONAL DEVELOPMENT TITLE OF FORM: PIO/T	<input checked="" type="checkbox"/> Worksheet <input type="checkbox"/> Issuance	PAGE 8 OF 14 PAGES
	1. Cooperating County SFMA Regional	2.a. Code No. 625-926-2-6777541
	2.b. Effective Date	2.c. Amendment <input checked="" type="checkbox"/> Original OR No:
	3. Project/Activity No. and Title 625-0926, Africa Development Program (Senegal Integrated Resources Management Project PP Team)	

Use this form to complete the information required in any block of a PIO or PA/PR form.

ii. participate with the senior Senegalese person concerned in assigning design work;

iii. provide supervisory guidance to the team members;

iv. resolve professional differences among team members; and

v. serve as co-spokesman (with his Senegalese counterpart) for the design team in all cases but in particular on the following points of design:

- national proclamation on integrated resource management;
- central fund management;
- inter-service and inter-ministerial cooperation; and
- criteria and guidelines for project approval.

(3)(4) State Conservationist (Range Management) and State Conservationist (Agronomy):

(a) Definition: The title indicates substantial capability in conceiving of, designing and negotiating conservation programs in the individual's discipline that integrate with programs pursued by others.

(b) Functions:

i. work with other members of the team in drafting project criteria and guidelines;

ii. work with the other conservationists, rural sociologist, and host-country counterparts in designing a long-range survey activity, showing:

- ecologically manageable land units;
- present land use;
- present land condition;
- potential land use capability under varying levels of technology and management; and
- tradition claimants. (continued next page)

1. Cooperating County
SFWA Regional

2.a. Code No.
625-926-2-6777541

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2.c. Amendment
 Original OR No.:

3. Project/Activity No. and Title
625-0926, Africa
Development Program (Senegal Integrated
Resources Management Project)

TITLE OF FORM: PIO/T

Use this form to complete the information required in any block of a PIO or PA/PR form.

iii. work with other members of the team in designing pilot projects.

Range Conservationist:

- design the appropriate range development and management scheme for all pilot activities considered, including description of required technical assistance and commodities and implementation plan;

- pass on ecological soundness of water development activities.

Agronomist:

- design the appropriate soil conservation scheme;

- design the appropriate soil-crop management systems to achieve soil improvement.

(5) Extension Range Animal Husbandman:

(a) Definition: The title implies that the person should have experience in designing range animal management programs which include practical management procedures and the demonstration thereof.

(b) Responsibilities:

i. for designing a baseline inventory, including means of evaluating productivity; and

ii. for suggesting a national range/animal management program compatible with the available feed resources, with the constraint of little or no surplus labor being available to cultivate animal feed as such;

iii. with the Range Conservationist, for designing ecologically sound rangeland management schemes whereby grazing pressure can be reduced without bringing undue hardship to the participants in such programs;

iv. for designing detailed animal adjustment and management schemes for pilot programs and projects; and

v. for documenting his design.

(continued next page)

CONTINUATION
FORM SYMBOL

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

PAGE 10 OF 14 PAGES

1. Cooperating Country
SFWA Regional

2.a. Code No.
625-926-2-6777541

2.b. Effective Date

2.c. Original OR Amendment No.

TITLE OF FORM: -PIO/T

3. Project/Activity No. and Title 625-0926
Africa Development Program (Senegal
Integrated Resources Management Pro-
ject PP Team)

Indicate block
bars.

Use this form to complete the information required in any block of a PIO or PA/PR form.

(c) Procedure:

- i. design an inventory and evaluation procedure to accompany the resource inventory;
- ii. draft a paper on proposed principles of range/animal management in Senegal, based on observations; and
- iii. design livestock management schemes for planned pilot activities, to include technical assistance, commodities, and implementation scheme.

(6) Forester (Semi-Arid Lands):

(a) Definition: A person experienced in integrated forest management in semi-arid lands.

(b) Responsibilities:

- i. for proposing an integrated national forestry development program that is optimal in terms of economic alternatives for the provision of cooking fuel and structural material; and
- ii. for appropriate pilot activities, including:
 - tree management in designated forest areas;
 - village woodlots in village integrated resource management programs;
 - urban fuel production where economically feasible; and
 - special conservation measures where appropriate.

(c) Functions:

- i. coordinates with other forestry activities (including the Canadian mission) to arrive at a draft forestry position;
- ii. participates in the drafting of project approval criteria and guidelines;
- iii. participates in the design of integrated

CONTINUATION SHEET
FORM SYMBOL

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

PAGE 11 OF 14 PAGES

TITLE OF FORM: PIO/T

1. Cooperating Country
SFWA Regional

2.a. Code No.
625-926-2-67775

2.b. Effective Date

2.c. Amendment
 Original OR No: _____

3. Project Activity No. and Title
625-0926, Africa Development Prog
(Senegal Integrated Resources Man
agement Project PP Team)

Indicate block numbers.
19.B.

Use this form to complete the information required in any block of a PIO or PA/PR form.

resource management programs in designated forest areas:

- tree management;
- personnel;
- procedures;
- commodities; and
- budget.

iv. designs village forest projects for pilot village programs; and

v. designs appropriate urban cooking fuel, post and pole supply systems (wood production) where appropriate.

(7) Rural Sociologist (Communications):

(a) Definition: This position requires an extension/information generalist with an academic background in rural sociology. Rural sociology is the root discipline of agricultural extension and agricultural information. This is a job for a rural sociologist as applied to communications through social systems.

(b) Responsibilities:

- i. with the other specialists, the design for an integrated social-political-bureaucratic approach to integrated resource management;
- ii. for designing message systems for the implementation of the program; and
- iii. for the social soundness of the total design.

(c) Functions:

- i. design a system for determining predominant class on land surveyed in the (above) proposed resource inventory;
- ii. describe the prevalent hierarchical order of influence and communications among the indigenous social systems;

(continued next page)

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

CONTINUATION SHEET

1. Cooperating Country
Senegal Regional

2.c. Code No.
625-926-2-6777541

2.b. Effective Date

2.c. Original OR Amendment No.

FORM SYMBOL

TITLE OF FORM: PIO/T

3. Project/Activity No. and Title 625-0926, Africa Development Program (Senegal Integrated Resources Management Project PP Team)

Indicate block numbers.
19.B.

Use this form to complete the information required in any block of a PIO or PA/PR form.

iii. prescribe a system of person-to-person and person-to-group interchanges between the Government and the indigenous social systems, extending from the cabinet to the village;

iv. design the appropriate public information system for the support of the program, utilizing person-to-person and person-to-group communication, direct mail, and mass media, including a description of the required technical assistance, commodities, personnel and cost; and

v. pass on the social soundness of other design elements.

19.C.

(1)(a) Number	(b) Specialized Field	(c) Salary	(d) Duration
1	Forester (Semi-arid Lands)	\$34,000 per annum	1.5
1	Rural Sociologist (Communications)	\$34,000 " "	1.5
1	Conservationist (Technical Team Leader)	\$34,000 " "	1.5

<input checked="" type="checkbox"/> Worksheet	<input type="checkbox"/> Invoice	PAGE 13 OF 15 PAGES
1. Cooperating Country SRWA Regional	2.a. Code No. 625-926-2-6777547	
2.b. Effective Date	2.c. Amendment <input checked="" type="checkbox"/> Original OR Not	
3. Project/Activity No. and Title 625-0926, Africa Development Program (Senegal Integrated Resources Management Project PP Team)		

TITLE OF FORM : PIO/T

Indicate block numbers.

Use this form to complete the information required in any block of a PIO or PA/PR form.

Illustrative Budget

1. <u>Salary, Benefits, Leave Factor</u>	
- Salary: 10 mm @ \$2,616	= \$26,160
- Benefits: 10mm @ \$300	= 3,000
- Leave Factor: 10 mm @ \$485	= 4,850
2. <u>Domestic and International Travel</u>	
Point of origin to Washington, D.C. to Dakar and return, including 10 Kg excess baggage (2 trips for Senior Conservationist and 1 each for others)	= 12,000
3. <u>Per Diem and Miscellaneous</u>	
- U.S.: 19 days @ \$50	= 950
- Senegal: 294 days @ \$55	= 16,170
- Transit and Misc: @ \$200/person/trip	= 1,600
4. <u>Car Rental</u>	
3 cars X 21 days @ \$50	= 3,150
5. <u>Overhead @ 25% of Above</u>	= 16,970
	TOTAL = \$84,850

Outline for 11/18/77
Meeting with GOS

ANNEX 15

SENEGAL INTEGRATED RESOURCES MANAGEMENT PROJECT

The multi-disciplinary team has reviewed the documents and visited the areas concerning three of the four projects proposed by your Government.

- Well point development in the Sylvo-Pastoral zone.
- Greenbelt development around Cap Vert.
- Acacia albida in the groundnut basin.

Time did not permit a review of the firebreak program in the Sine Saloum.

We believe that each proposal, with certain additions and modifications, offers a good opportunity for an integrated resource management project. The plans for these projects would address all resources and values within the project boundary and the relations of one to another.

We suggest that an integrated resource management pilot project, which includes Acacia Albida plantings, be designed for the groundnut basin. A major objective of the project would be to develop a process for integrated resource management.

We recommend that the well point development project in the Sylvo-Pastoral zone be made a part of the SODESP-Livestock Production Project (685-0224) and offer

additions which will make this an integrated resource management program.

We have these suggestions regarding the Greenbelt project:

I. the title be changed to "Fuel Production" which reflects the primary purpose of the project.

2. the project be designed as an integrated fuel production effort.

3. the project include:

1. Fuel (energy) inventory

2. Survey of fuel needs.

3. Integrated programs to meet fuel needs.

4. Activities include:

1) Forestry

2) Energy conservation through improved techniques of charcoal production

3) Alternate sources of energy such as solar, wind, and waste.

The forestry activity should be continued as an important component in the overall energy strategy of Senegal unless other sources of energy become available at a more reasonable cost.

An outline of each project proposal follows:

SOIL CONSERVATION IN CENTRAL SENEGAL

Our review of the Acacia albida project, the planting of acacia trees in the northern coastal sector of the peanut basin, was essentially favorable. The tree is adapted to the area, it is known to increase soil fertility, and it will yield important organic by products which can be used for fodder and soil improvement. Although nursery raised seedlings are said to have a 95% survival rate when planted under natural conditions, this figure would only ^{be} obtained under conditions where animals and particularly goats are denied access. Trees will have to be protected for the first three years or until they are ~~immune~~ to trampling and able to survive browsing. The implementing agency (SODEVA) is aware of these problems and is prepared to address them.

The original doubts raised in review of the Acacia albida project concerned mainly the question of context. Reviewers asked how this project fit in to a strategy of resource management which contained mutually supporting elements and which had to do with a range of sources of degradation.

In our investigations we found that SODEVA, the principal extension agency in the groundnut basin had indeed formulated a resource management strategy of which the

planting of acacia albida was only one part.

Opportunities as they present themselves to individual farmers decree overwhelmingly that the major investment in land and labor be in peanut production. The result has been the elimination of wooded areas, the dispersal of the population, and the creation of a continuous cropping system that ~~is~~ results in creates unstable soil conditions.

The monocultirization of this area has not only resulted in unstable and depleted soils, but also in an instable base of subsistance. Degradation of the resource base means lower yields. Opportunity structure which decrees monoculture and climates alternative sources of livelihood leads to increased risk.

In confronting this situation SODEVA has as its strategy, diversification. SODEVA's plan is to introduce not only better methods of groundnut production, but also to reintroduce alternative land uses, and alternative food producing activities.

Although this program faces serious constraints, and the land use pattern can not be set back to that of 1900, improvements are possible and diversification offers a logical strategy. Since the planting of Acacia albida

will have as its major contribution the increase of fertility of groundnut fields, it does not by itself contribute to diversification nor are its major beneficiaries the rural poor. It is only in a context of our integrated program that this project can be justified. Therefore, we would recommend expanding the program to work with SODEVA, assisting it in the implementation of its strategy. The AID project could take place in a delimited region selected with the advice of GOS and SODEVA and would have as ^{its} object, the implementation of an integrated program dealing with all aspects of the environment. AID with SODEVA would identify and fill needed areas of capability and expertise.

The project would serve as an applied experiment that would always aim at replicability. A possible strategy of implementation might follow this scheme.

1. Resource inventory. Aerial photographing, literature search - pedologie, applied research.
2. Cropping pattern survey.
3. Animal census - sampling techniques can be used to estimate totals and mix (age, sex, type of animal)
4. Household inventory - household economics, consumption, time budgeting, decision models, energy needs, diet.

5. Decision model for farmers , Relative return from investment-short and long term.
6. Identification of needs and interventions.
7. Implementation and applied research. (Cost benefit, acceptability, long term effects, replicability and spread).

The major effort of the project would be in the areas of improved and diversified cropping practices, animal husbandry, and other farm income and food producing activities. We would also probably want to approach problems from other points of view, as well, however. The mechanization of post harvest activities is one example. Clearly an investigation of alternative sources of energy could reduce pressure on village forests. Housing presently takes vegetative resources and continual maintenance. The modern alternative, *cinder* block and corrugated metal, is uncomfortable and unhealthy. Project designers would, for example, survey alternative housing projects, and make certain trials. Improved diet, sanitation, and other public health measures would be included in the effort.

We have not arrived at a clear identification of the various disciplines to be represented in the project. This will depend on further discussion with SODEVA, identification of in-country capabilities and needs, and an agreement concerning strategy; priorities and timing of inputs. It is likewise premature to begin to discuss costs at this time. Major capital inputs should be kept to a minimum, however, to enhance opportunity for replicability, spread, and cost effectiveness.

Well Point Development in the Sylvo-Pastoral Zone

(Continued)

Purpose

The purpose of the well point component of the Land Conservation and Revegetation Project (685-0219) is: Conservation and Management of Resources at selected Well Locations (from p.38, PRP). Two focal points of the component are enumerated: (1) improvement of range resources, and (2) improvement of igneous vegetation for forest products and livestock forage. Activities planned include (1) planting trees, (2) control of livestock, (3) improved livestock health and nutrition, (4) control of bush fires, and (5) decentralization of water points. The component proposes to develop four well sites each year for 4 years.

Team Activity

The integrated resource management team has reviewed many documents concerning the well point development component of the proposed Land Conservation and Revegetation Project (685-0219). These included the PID, PRP, and Washington comments. Further, the team made a cursory survey of the situation at and around several well points (Tatki, MBidi, Lagbar, Tessekere, Doli Ranch).

Problems

1. Poor distribution of grazing animals
2. Overuse of the forage resource and excessive animal traffic at existing watering points, resulting in soil degradation (wind erosion).
3. Watering points too few and far between; livestock must travel too far for water.

4. Concentration of animals (cattle, sheep, goats, burros, horses) too great at existing watering points.
5. Uncontrolled burning of bush which destroys forage, wastes fuel, degrades wildlife habitat, and results in wind erosion and soil depletion.
- 6.* Insufficient animal care.
- 7.* Malnutrition of livestock during the dry season.
- 8.* Unavailability of credit, both short and long term.
9. Poor marketing system. This includes (a) the prevailing traditional system which is not market-economic oriented, and (b) poor marketing facilities for those who want to sell or can be induced to sell more livestock.
10. Inadequate transportation system (hard surface roads) into and out of the area, and a system of auxiliary graded roads within the area.

Conclusion

Our study and field observations support the PRP premise that "deep bore wells are the center of deterioration of renewable range resources." It is logical that a program of resource rehabilitation and management begin around well points. We concur in the need for early action.

Probable Solutions

1. Adjusting livestock numbers so that grazing use is in balance with annual forage production. Goal should be to use no more than 60% of the annual production at selected key grazing areas, leaving 40% for soil protection and improvement.
2. Developing additional watering points to reduce the concentration of animals and trampling damage at existing ^{watering} points (assumes control of total numbers).
3. Reduction of uncontrolled burning through education and improved fire prevention, detection, and control (does not preclude prescribed burning).
4. Planting trees (outside the perimeter of watering points - in the grazing area) to protect the soil, and provide dry season forage for grazing and browsing animals.

(*) Related or indirect problems that should be addressed simultaneously.
~~How about fuel wood?~~

5. Improved animal health and nutrition through accelerated assistance of veterinarians and supplemental feed program (this probable solution is predicated upon the assumption that increased livestock numbers will be marketed and slaughtered to meet urban demand for red meat).
6. Providing credit for herdsmen as an inducement to participate in the project.
7. Alteration of prevailing traditional livestock values (status and prestige), re-orientation toward an economic incentive for production, and participation in a marketing system such as that developed by SODESP.
8. Construction of a transportation system to facilitate resource management and marketing system.

Controlling Livestock Numbers

One of the major failures of the traditional livestock production system prevailing in the Sylvo-Pastoral zone is that there is no way to assure that livestock numbers remain within the carrying capacity of a given area.

Under the communal system of pasture utilization, an individual herdsman usually grazes as many animals as he can. His rationale is that greater numbers of livestock minimize his risk during drought, maximize his share of the communally-owned pasture, and enhance his social standing in the village. He sees no incentive for controlling livestock numbers or for improving the soil and forage resource which he does not own.

The FRP recognizes this problem. It states: "An important aspect in managing rangeland resources is to institute a method of regulating grazing based upon the carrying capacity of the rangelands." (p.14). This team concurs, and believes the prime requisite of range improvement in the Sylvo-Pastoral zone is the control of livestock numbers and distribution. We recognize the difficulties likely to be incurred in gaining control of grazing. But to proceed with "beneficial" practices such as water distribution and animal health and nutrition programs without control ^{will} ~~could~~ result in waste of financial resources and acceleration of environmental degradation. How grazing control is to be achieved is a socio-cultural consideration the answer to which must evolve from the people affected and their government.

Recommendations

Whereas control of livestock is so vital to range improvement in the Sylvo-Pastoral zone

And whereas the consequences of improved water distribution facilities and animal health and nutrition programs without livestock control will be overstocking and resource degradation in additional areas (acts contrary to GOS national policy)

And whereas the well point development component of Project 685-0219 is so closely related to the goal and purpose of Project 685-0224 (SODESP-Livestock Production)

And whereas we understand that SODESP is responsible for total and integrated [resource conservation and] development in the Sylvo-Pastoral zone, but has concentrated on livestock development activities.

We therefore recommend that the well point component not be funded as a part of the Land Conservation and Revegetation Project (685-0219), ^{but} ~~and~~ be made a part of the SODESP-Livestock Production Project (685-0224). The provision for water distribution facilities, animal health and nutrition programs, tree planting, and fire control could serve as additional incentive to induce herdsmen to participate in the SODESP program.

We further recommend that SODESP be provided funds to hire expertise in additional disciplines as needed to enable the organization to ^massure full responsibility for integrated resource planning and development in the Sylvo-Pastoral zone.

I. Introduction

1. Background and Objectives of project

1. Land area to be developed for Dakar-Thies area.

2. Reduce fuel consumption of local "forests".

3. Reduce amount of charcoal transported.

4. In cooperation with appropriate GOS units,

(a) create a program to estimate present and future fuel requirements and establishing a fuel source inventory for future planning;

and (b) explore alternative sources of energy (solar and wind) and techniques to improve utilization of present sources.

Recommend expansion of solar experiments and pilot projects such as dryers, dryers and water heaters; and recommend for items 3 and 4 (b).

5. Integrate other specific objectives for use of area

a. Improve soil fertility

b. Improve standards of living for low income areas

c. Provide natural shelter for wildlife

d. Reduce water evaporation by shading

e. Moderate wind effects by shade and reduction of wind velocity

f. Produce natural crop between tree rows as firewood permit (first 2-4 years)

g. Provide natural storage (aerial and terrestrial) for cattle during dry season for 2-5 years, perhaps natural firebreaks.

2. Status of areas involved

As a result of ILSF project proposal SEN N 303, 300 ha of firewood production areas already established. Other areas have been selected for development.

3. Status of projects proposed in PRP.

1. Market for fuel (fines) already established. Could and should use for expansion.

2. Market at Bandia is being established: partial construction of office and residence, and land clearing, has been accomplished.

3. Need funds to complete Bandia, acquire equipment, develop market.

C. The write up on nursery development, size of nursery needed, etc., in annex B, pages 7-9. will be incorporated in my full report.

D. Assistance of staff is provided by U.S.A.I.D. Minimal advisory personnel should be needed since the GOS agencies involved seem able to handle them to accomplish this and other projects concerned with forestry.

Three consultants are recommended during the project:

- | | | |
|--|---------------|------------|
| 1. Forest management (nurseries, reforestation); | <u>months</u> | 1-3, 13-15 |
| 2. Forest tree improvement | <u>months</u> | 1-3, 13-15 |
| 3. Forest silviculture | <u>months</u> | 55-57 |

E. Survey of sites proposed for project

Since sites have already been selected, item 1 in the PRP (use of Landsat satellite imagery) seems outdated.

However, soil maps, aerial photos and ground checking are necessary to determine which species should be planted on specific areas.

F. Tree Improvement Program

There is no program for Acacia albida. (A simple program of collecting seedlings from trees with outstanding yields of foliage and seeds and with wide crowns, (if all can be found in suitable areas) is a must before reforesting 50,000 to 100,000 hectares). Use of Acacia albida in firebreaks could serve as a good test area.

G. Selection of species to plant and proposed spacing (NEXT PAGE)

1. Selection of species to plant and proposed spacing (NEXT PAGE)

G. Selection of species to plant and proposed spacing (4 year period)

<u>Plantations</u>	<u>No. Tree/yr</u>	<u>Total/trees</u>	<u>Spacing (No/Ha)</u>
<u>Eucalyptus Camaldulensis</u>	240,000	960,000	(4x4m, 625)
<u>Eucalyptus Microtheca</u>	150,000	600,000	(" ")
<u>Azadirachta indica</u>	150,000	600,000	(" ")
<u>Other Species (3)</u>	60,000	240,000	(" ")
1. <u>CASUARINA EQUISETIFOLIA</u>	600,000	2,400,000	<u>TOTALS</u>
2. <u>CASSIA SCAMPA</u>			
3. <u>MELALEUCA LEUCADENDRON</u>			
<u>Increments (1 and 2)</u>			
<u>Acacia saligna</u>	3,000	32,000	(5x5m, 400/ha)
<u>Acacia saligna</u>			
<u>GRAND TOTALS</u>	<u>608,000</u>	<u>2,432,000</u>	

II. Development of a detailed management plan and work schedule to assure implementation of the plantation.

1. Site selection and preparation - planted 200 ha (Eaux et Forêts)

2. Site selection and preparation - for U.S.A.I.D. Project Planning.

a. Consult with local water professionals (foresters and related staff) and community leaders and farmers)

b. Consult with local government agencies. Obtain Rural community support.

c. Obtain necessary data to plan clearing and planting.

3. Planting schedule

[Faint, illegible text at the bottom of the page]

Feasibility

- a. Depends on availability of Senegalese personnel
- b. Needs to be supported by various agencies to support program. This is true of all agricultural extension-specialists to show farmers that the program is a real program.
- c. Depends on financial support by various COS agencies.
- d. Cooperation of local government will be valuable.

VI. Economic Analysis

- a. Fibre production 10 years after planting
 - 1. Estimated area = 3000 ha.
1000 trees/ha = 3,000,000 trees
= 300,000 MT fibre
 - 2. Value per tree = 30,000 CFA (\$120)
 - 3. Value per year = 300,000 trees x 30,000 CFA = 100,000,000 CFA
= \$400,000
- b. At least 70% of the Dakar-Thies region depend largely on charcoal for cooking and water. Virtually all of Dakar's charcoal comes from outside Senegal. Over 50% comes from East Senegal.

CONFIDENTIAL DOCUMENT

The Team was asked to review national policy and the planning process as they relate to development of integrated resource management programs. A review of the Senegalese planning process reveals that the country has developed a sophisticated and efficient approach to national national and regional development.

development. Volume I of the current National Plan places a clear national priority on environmental planning: "The modernization of the economy should not place a mortgage on the nation by polluting and degrading the national setting through an abusive and anarchic exploitation of the national resources".

The "protection of nature and national resources" is one of the major objectives of the Plan. Increasingly, the thrust of the national policy appears to favor greater rural development and resource conservation. Currently however, ecological concerns as expressed in the National Plan deal more with industrial pollution and waste disposal.

Environmental concerns are included in the elaboration of the National Plan. The emphasis on reforestation and fire control is necessary and appropriate. However, the team believes that total resource management could be strengthened by giving equal emphasis to other resource values (cultivated land, grassland, livestock, wild life).

Damage from over-cutting of forests, over-grazing, and present farming practices must be dealt with in addition to fire control. In an overview of the present system the team (and often our Senegalese counterparts) have arrived at two observations worth of mention:

- 1) that resource management in rural areas is often basically a sectorial concern with cooperation among the various services at the local level tending to be ad hoc.
- 2) the pressing demands placed on implementing agencies makes it difficult for them to systematically formulate

programs with a longer-term perspective of sustained productivity, as well as monitoring the longer-term effects of project development.

Several potential means of rectifying these problems have been suggested by the Team. The most widely recommended of these suggestions was the development of a permanent coordinating body of cross-disciplinary expertise located in the MORH which would have the role of planning, coordinating, monitoring and evaluating integrated resource management actions. A similar unit was recently established in The Gambia through USAID financing.

If the GOS is receptive to further exploring this suggestion, the Team would be available to assist them in formulating the terms of reference for such a unit in the context of the present project.

FACTS FIRST DAY - LOUGA & THIES

Dalton Cameaux

Livestock Advisor

Brief Notes

1. There are areas for cultivation and area for grazing.
2. Many area are overgrazed; excessive number of cattle during drought; migration of cattle from Mauritania:
 - Due to friendly relations and political ties between the two countries they cannot stop the migration of cattle. Veterinarian check the number of cattle and health certificates on those cattle.
3. They do control cattle grazing in new tree planting area - use of gardians example 1 for 150 ha.
4. A small percentage of the land is owned by individuals and the rest by the Government. In dense populated area the land is controlled by a village council and allocated to families - both crop land and grazing land.
5. Acacia Albida trees have been recognized by the natives of being an excellent tree for control of soil erosion, increase soil fertility when leaves and fruit are allowed to be incorporated into the soil due to its high protein (nitrate nitrogen) value: It is high in food value (17% protein). Animals eat both leaves and the fruit (or seed pods); main source of feed in late spring; in april seed pods are gathered by farmer and seed as a feed for cattle. Law against cutting these trees: fine 24,000 to 240,000 CFA.

6. Albida trees are planted 10 m. apart in straight lines and this allows the natives to cultivate the area in between with peanuts or other crops, thus putting the land to multiple use. Also reduce the cost of weeding the area by forestry service.

7. Herders or cattlemen do not plant any forage crops in this area. Only graze native grasses and feed peanut hay during the dry period. Also farmers group their cattle and migrate to other areas looking for greener pastures.

- Mr. Sene - Inspector

- Mr. Lingui - FAO expert

4 p.m.

Eucalyptus tree planting in the Thies area:

1. 1975 plantings: trees were 10 to 15 ft. tall, spaced 2 x 2 meters apart.

1976 plantings: land preparation, trees 4 to 6 ft. high.

1977 plantings: land not pre-prepared, trees 2 to 3 ft. high.

2. Allow farmers to cultivate the area starting the second year, control grasses and give the farmers an income if there is sufficient rains.

Saves weeding cost to the forestry departments; put land in multiple use.

3. Farmers allowed to graze the land starting the second year thus having excellent pastures. This land produced very little grazing before it was cleared due to shade produced by low lying trees. One cow to 20 ha. now and for the next 10 years. One cow to 5 ha. depending on rainfall. The native forage produced is fine stem, succulent and tender. These grasses grow as tall as 3 to 4 feet and when dry is considered as hay.

4. Have not considered any cultivated or improved forage crops in this area. The inspector believes that native grasses can be sustained in this area if not overgrazed.

5. Water supply is available in low spots throughout the area and the Forestry Department leaves lanes for the cattle to travel to those areas.

6. During the three years of this project they planted three hundred ha. out of a goal of 2.000 ha. Lack of funds!!

7. During the fourth year, 1/2 of the tree population will be removed having about 800 trees per ha. Eucalyptus tree have a narrow leaf and a growth system perpendicular to the soil (or trunk) thus allowing sunlight and possibility for grass plant growth.

8. Normal rainfall is 550 mm; last year: 370, this year: 320; very poor for all crops produced.

9. Land area/population: 1.2 ha. per person.

10. Cultivation in new land in between trees with millet, eggplant, okra, tomato, cowpeas and melons is profitable. Income of 480,000 CFA, 4 months work. A farmer and two sons cultivated 3 ha. and grossed an income of 480,000 CFA. This was done during a 4 month period.

a. Allow to plant crops, grain, nuts or vegetable in area of reforestation as it is proven that cropping does not damage the trees.

b. Allow graxing in the reforestation area of Eucalyptus. Due to the cultivation of the land, excellent forage is produced.

c. Control grazing: Number of animal units per ha. allowing sufficient amount of grass to mature for reseeding and use as dry hay in the field.

d. Education of the farmers: through local village council and use of extension agents.

e. Method and result demonstration: use of $P^{2}O_{5}$ and "N" in the sandy soils and use of "N" in the heavy soils. Double and triple the forage production. Increase your carrying capacity per ha., 4-5 times. Insist each farmer produces a certain amount of hay for each animal he owns to supplement the peanut hay he may have.

Groundnut basin Problems:

1. Cropping practices
2. Overgrazing
3. Fire
4. Overcutting

Questions:

What forages are to be grown^a

in the Acacia area ? cattle can't graze here.

MINISTRY OF PLAN AND COOPERATION

Dear Mr. Minister:

The United States Government, through its US.AID representatives, Mssrs. Gates, Forsman and Hradsky, is currently preparing an outline for a final feasibility study of four projects proposed by your Government and which concern national resource management. These projects are:

- Well point development in the Sylvo-Pastoral zone
- Greenbelt development around Cap Vert
- Acacia Albida in the Groundnut basin
- Firebreak program in the Sine Saloum

and represent a total investement of some \$10-12 million.

As you may already know, a team of U.S. and FAO experts undertook a preliminary analysis of these projects and submitted an initial report to Washington earlier this year. Official reaction to this report was generally favorable to the continued examination of the four projects but some misgivings were expressed about basic project design. Important rectifications were called for prior to proceeding to the final stage of project approval, especially the development of an approach which would integrate these project into a larger strategy for environmental protection.

The USG, who has extensive domestic experience in the field, wholly shares the concern of many international forums (UNCOD in Nairobi, OUA, UNEP, Club des Amis du Sahel) for the rapidly deteriorating natural resource base in the fragile Sahelian ecological zone. We wish to promote resource management programs in the zone which permit not only the increased short-term production aspects so vital to national economic development, but also a balanced concern for long-term sustained production and a reversal of current resource degradation trends.

Within this frame of reference, the principal criticism raised by environmental specialists in Washington was that the preliminary study made no substantive attempt "to mesh the four discrete approaches to environmental management into a comprehensive or "integrated" strategy for dealing with land resource management in Senegal... and a lack of

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focus on overall resource planning". It became apparent that until such an approach could be formulated the four projects in question would not receive final approval for financing and implementation.

The previously mentioned, three-member US-AID team has now spent two weeks visiting with GOS officials, and, respecting the desire of the MDRH to avoid unnecessary delays in project implementation, has proposed the following plan of action. We propose to undertake:

- 1) a final feasibility appraisal of the four projects in question on one level, and, simultaneously, on a second level.
- 2) examine, with the cooperation of the GOS, the existing planning and programming structures, identify weaknesses and propose solutions to insure the systematic application of optimal resource management principles. We would then propose a package to finance the program identified above, including where appropriate,
 - Technical assistance
 - Supplementary training for Senegalese planners, technicians and extension personnel
 - Research as needed, including satellite and aerial land use surveys
 - Equipment support
 - Some operating costs.

In recent joint meetings the MDRH indicated its interest in proceeding with the project at both levels of analysis but indicated that we should solicit the cooperation of your Ministry on all matters concerning the national planning system. This letter represents, therefore, our formal request for your cooperation in facilitating the examination of these issues. We currently anticipate that the largest share of our time will be spent within the MDRH structures, but some input from your Ministry will inevitably be required - probably limited to several frank exchanges of ideas with your technical and administrative personnel.

Permit me to inform you in closing that full multidisciplinary

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team composed of specialists in conservation planning, agronomy/soil science, animal husbandry, range management, forestry, rural sociology and agricultural economics will be in the field later this week, so as to carry out a detailed study and make final recommendations for project financing. At the end of their mission (est. late November) a draft copy, in French, of these recommendations will be submitted to your Ministry for review and discussion.

We would appreciate your rapid attention to this matter so that this team may proceed on a fully operational basis in their mission while in Senegal.

Sincerely yours,

Norman Schoonover
Regional Development Officer

MEMO for the attention of the Director of USAID and the Head of the Evaluating Mission for the Projects under references.

Analysis

Reference Projects

- Development of the Sylvo-Pastoral zone
- Green belts
- Acacia Albida
- Forest Planning in the Sine Saloum

The Administration of Water and Forests has already entered into unofficial contact with the evaluating mission. From these contacts it appears that:

1) the present mission is not convinced that the projects presented enter into a clearly defined policy of national resource management in Senegal;

2) that it is not very wellacquainted with the existence of criteria guiding the choice of priorities by Senegalese planners in the elaboration of projects;

3) that the Senegalese planning method would seem not to include a system favouring the definition of integrated resource management projects.

Summary explanations have already been provided to the mission concerning the process through which Senegalese planning must travel before culminating in the individual projects, all of which are situated within a predetermined approach. The means of coordination available within the Ministry of Rural Development were clearly stated.

The outcome of this was our affirmation that the projects

are solidly entrenched in an integrated resource management approach, but with a well defined policy for each region.

This is why we fell that:

- 1. The mission should pursue its study of the initial projects;

2. A global study of the method employed by the Senegalese in planning, selecting criteria and setting up an apparatus favouring a "better appreciation" of ecological requirements, and a definition of the global resources management plan in Senegal, although valid, are included in the definition of our general policy and taken into account when each plan is established;

- These new terms of reference should not be considered as prerequisites to the continuation of the projects under reference.

- The study recommended and the global plan which would result cannot be reasonably worked out in such a short period of time, nor express the national motivations and approach better than the plans themselves, and that in any case it should be the subject of a separate request if the Ministry of Planning should so desire.

Monsieur El Hadj Sene
Director du Service
des Eaux et Forets
Dakar, Senegal

UNITED STATES GOVERNMENT

Memorandum

Amended 17

TO : John Forsman, Team Leader, Integrated Resource Management DATE: November 10, 1977

FROM : *[Signature]* Paul Rusby, Food For Peace Officer

SUBJECT: PL 480 Title II - A Development Resource

REF : My Memo of September 7, 1977

Listening to a full days discussion by your team members suggested numerous possibilities for using PL 480 Title II food as a development resource along the lines mentioned in my memorandum of November 7, 1977. These possibilities are enumerated hereafter:

Title II food might be used as a development resource (to) (as):

I. GREENBELT

1. Partial payment to labor in tree planting brigades;
2. Partial payment to dig water holes for animal grazing;
3. Pay labor to revitalize (but not maintain) firebreaks.

II. ACACIA ALBIDA REFORESTATION

1. Pay labor to increase density of acacia
2. Pay labor to plant windbreaks to avoid erosion
3. Pay villagers to plant and care for small trees when they receive them
4. If fallowing is essential, and increased food production significant after fallowing, we might provide the "food not grown" as a one-time educational incentive.
5. If crop rotation is essential, we might provide the "food not grown" as a one-time educational incentive.

III. WELL POINT DEVELOPMENT (SILVAN PASTORAL)

1. Educational inducement to use well points
2. Pay labor to install more low capacity wells
3. Plant trees around well points
4. Build fences/corrals around each well site
5. Build firebreaks and firetowers

.../



6. Lay satellite pipelines from well points
7. Build stock ponds at satellite points
8. Incentives to encourage herder cooperation
9. Provide food at herder training camps
10. Food credit bank to buy agricultural tools.
(Provide food, let the farmers buy it, their payments go into a fund to buy tools.)
11. Food credit bank to buy animal supplements
(Farmers buy Title II human food, their cash payments buy animal food supplements, there-
~~after each animal is taxed to restore the fund.~~)
12. Food inputs to promote rational range management.
(Provide food only once for the transhumit cycle.)

CHAPTER 2. NAT'L
5TH PLAN

LIVESTOCK

ANNEX-20

As a result of the drought of 1972-73, livestock suffered extensive damage; 15% loss of total no. of livestock costing 6 billion CFA. Indirect losses included loss of animal production in general and overall animal malnutrition. Due to this insecurity, there was an increase in the no. of animals marketed during the period. Since the drought, there have been a couple of ~~xx~~ fairly good years, during which the herders have begun to rebuild their herds, resulting in less animals marketed, putting pressure on ~~x~~ meat prices. There is an immediate need to create adequate conditions in order to increase the no. of animals marketed, joining forces with the herders and increasing the weight of the animals. The present price level should also be advantageous.

What may have saved the livestock on a national scale was the development of a livestock-safeguarding program, directed by the Livestock and Animal Industry Service, financed by 600 million CFA, 235 million of which came from the national budget. The program has been well-received. Even so, in spite of the theoretic priority given to animal production in the 4th Plan, there still exists a problem of lack of means.

Up until 1970, the cattle herds ~~grew~~ grew at a rate of 3.3% per year, attaining 2.6 million head. By 1973 that no. had fallen to 2.25 million; with 2.4 ~~xx~~ million in 1975 (regaining the 1966 level) For sheep and goat herds, the same is true: in 1971, there were more than 2.8 million head, which by '75 had fallen to 2.6 million (the 1969 level).

In 1975 ~~the~~ the added value of the sector rose to 26.1 billion CFA, equalling 30% of the total added value of the primary sector and 8% of the internal gross product. From 1960 to 1971, the average % of increase of CFA flow was 6.7% per year: after the drought years, the rate in 74 was 32% and 31% in 75. It should be noted that during the last 15 years, the relative importance of livestock has increased as much in the primary sector as in regards to the gross internal product. In 1960, the added value of livestock was 18.4% of the primary sector and 29.8% today; between 71 and 72, this % fell from 26.4% to 20.9%. In 1960, added value of livestock represented 4.5% of gross internal product and 7.9% in 75. The price rise explains this in part: at the end of 1975, the total value of livestock in the country was estimated at 118.7 billion CFA, 90 billion of which was from cattle alone.

The average consumption of meat was estimated in 74 ~~at~~ at 13kg/person.

II. The Balance Sheet of Projects Developed in the IV Plan

The projects retained in the IV Plan after readjustment represented a global investment of 7,202 million CFA, of which 6,333 million ~~were~~ were acquired and 1,676 million were spent. In total, 10 projects were carried out of are in the process of being carried out, the most important being:

1. livestock project in the Sylvo- Pastoral Zone - ongoing- financed by the FED.
2. livestock project in Senegal Oriental - financed by World Bank, Kuwait and BADEA
- 3.. livestock project - Bakel- financed by USAID
4. cold storage construction - financed by Canada
5. the postponed projects include a sheep-LPA program and a tannery project.

The 6,333 million ~~xxxx~~ acquired is 88% of the total monies of the sector:

There are various obstacles which can only be dealt with on the long term: ~~xxx~~ poor organisation, both in terms of production and marketing; no. of co-ops is insufficient; few training officers and those that exist often ~~lack~~ lack proper qualifications; lack of water and admin. ~~w~~ top-heaviness.

III. Development Strategy

The general goal is ~~isx~~ to reduce dependence on other countries for meat and animal products. Policies are based on ecologic and human conditions. ~~xxx~~ Country is divided into 5 eco-zones, which do have a certain inter-regional dependence

I. In the Ferlo Basin, the practices in the Sylvo-Pastoral Zone include the calving process, followed by raising on the Doli Ranch and finally the marketing process in the Peanut Basin. Thanks to further development of pasture lands, migration of herds will be reduced. Better animal health ~~willx~~ and food will help reduce death rate of young and increase fertility of females. Pricing policies will encourage herders to sell young males.

II. In the Fleuve Valley, the accent will be on forage production and intensive integration between farmer and herder. Further industrialisation of cattle to reduce imports will also be needed. Finally, there will need to be increased milk production.

III. In the Peanut Basin, the goal will be to create necessary reserves of peanut shells and tops, millet stalks, cotton seed cakes and peanut shell cakes. This will permit adequate fattening in accord with the Sylvo-Pastoral Zone program.

IV. The regions of Casamance and Senegal Oriental will follow basically the same three-step process ~~xxx~~ as in the Sylvo-Pastoral Zone.

V. In the Cap Vert Region, the focus will be on the industrialisation and marketing of the animals and animal production, through use of modern facilities.

VI. Pig raising will be developed in Cap Vert, Casamance, the Petite Côte and the Sine. Diffusion of the Large-White race will be encouraged and production increased to reduce imports.

VII. Goat Raising for milk will be encouraged to the detriment of traditional meat production.

VIII. Horse raising will involve better breeding of English and Arabian races to be conducted at Dakar. However, the overall no. of horses and mules will not be increased.

IX. Poultry farming will be encouraged as a source of protein.

X. Bee keeping will be ~~x~~ carried out in Casamance, Senegal Oriental and Sine Saloume.

IV. Project goals: increase of 3% per year in cattle, 5% in sheep, 4% in pigs and 6% in poultry. 1980/81 - Production goal: average increase of 5% in sector ~~R~~ production/year - total 33.4 billion CFA; meat production should be 21.8 billion during V Plan, milk production - 7.9 billion, eggs, miel and wax - 5.9 billion.

The local need for meat however will only be 74% satisfied at best

the greatest deficit being in sheep and goats.

V. The Program of Action

Eighteen projects listed in order of priority - total cost - 15.148 million CFA, 5,843 of which coming from internal sources, the rest from external sources.

Among the "national" projects, there are certain small ones to be financed by community budgets totalling 517 million CFA. Nearly 40% of all investment will be in the Fleuve, followed by Senegal Oriental.

Personnel problems will be dealt with by: adding 10 veterinarians per year; the opening of an intensive year long program in zootechnology at the Inter-State School for Veterinary Science and Medicine in Dakar. This year of specialisation will allow for the entrance of students coming from the Agronomic Institute of the Sahel.

Projects:

1. Cattle Raising in the Sylvopastoral Zone - 2nd phase; designed to assure herders of sufficient food and water provisions for cattle, as well as sure marketing provisions; zone to become a center for calving - 17 new deep-bore wells in addition to the 3 already dug during the 1st phase
2. Improvement of Livestock Raising in Senegal Oriental. Improvement of 1.4 million ha. of pasture land...100 wells to be dug and 30 to be rehabilitated. Training to be done by SODEFITEX.
3. Improvement of Livestock Raising in the Casamance: goal is to integrate livestock with agriculture; use of ag. by-products as forage; digging of wells.
4. Sheep Raising
 - a. In Sylvopastoral Zone, the same three step process used for cattle will be continued.
 - b. In Casamance and Senegal Oriental - animal health and construction of pens in the villages.
 - c. two centers for sheep (Touabir race) raising.the agencies involved will be the 5 major, para-statal organisations
5. Poultry Raising goal will be to increase production of a protein substitute for meat. Centers will be in Dakar, St. Louis, Thiès and Kaolack
6. Improvement of pastures and livestock raising in Bakel; same type of program as in Senegal Oriental, but covers 150,000 ha.
7. Equipping livestock markets with scales
8. Regional slaughterhouses
9. Cold Storage
10. 8 other projects, including a ranch for raising and marketing in Senegal Oriental and a farm of the type in the Fleuve.

I Situation and evolution of the sector

The activities of this sector are primarily concerned with the protection and exploitation of domestic natural plant, wild life and piscicultural resources; they are likewise aimed at improving and beautifying the environment.

The so-called "classified" natural forests comprise 197 tree stands and encompass an area of 3.9 million hectares, or approximately 20 % of the national territory. In addition to the stands classified as belonging strictly to forests or the sylvo-pastoral zone, they include the (six) national parks, wildlife preserves and hunting grounds. If to these lands are added those lying fallow or not yet settled, the number of hectares of forest land and savanna demanding the attention of the water and forest administration can be calculated at 10.5 million.

The economic contribution of this sector is difficult to put into figures. Only the quantities and values coming under the supervision of Government agents are recorded.

Local consumption of wood, extensive in the peasant environment, is undertermined..

There is still less of an appreciation of the economic role played by the forest in the protection and improvement of topsoil and rangeland, and in the fight to halt the desert's advance, with these blanks taken into account, revenues from exploitation of the national forests in 1974 were estimated at 7.5 billion francs CFA. Out of these revenues, 3 billion or 40 % came from the cutting and sale of wood: charcoal, firewood, construction timber, poles and posts. Wild produce, in particular gum arabic

and product of the palm tree and the baobab, provided 9.5 billion, or 60 % of the estimated production value of the sector. In relation to the primary sector, for which the gross domestic product in 1974 was 80.7 billion, the national forests represented only 9 %.

The number of operating staff within the sector (sawmill, coal depot, animal roundup, hunting and touristic safaris) in 1974, is estimated at 1, 800 ; they provided some 15,000 jobs, or over 8000 jobs on an animal basis

Since the second half of the sixties, the gross domestic product for the sector rose at an rate higher than that of the primary sector as a whole : it went from 7 % to 9 % of the primary gross domestic product. From 1965 to 1974 the composed annual growth rates attained 9 % for charcoal, 7 % for firewood and construction timber, and 5 % for poles and posts. While in the case of charcoal and firewood production evolved at a family regular rate, for construction timber and poles and posts the rate varied sharply.

Due to the lack of data, it is impossible to detect a tendency in the evolution of the subsector comprising wild produce certain expendable articles (gum sterculia, palm wine, palm kernels and palm oil, monkey bread, and tamarinds) showed a stable progression. On the other hand gum arabic, most of whose production is exported, underwent extreme fluctuations: the volume _____ went from a high of 6,436 tons during the 1970/71 season to 1,525, 144 and 575 tons during the three following seasons. This may be attributed to the combined effects of the major drought and the erratic movements of world exchange.

Senegalese fauna includes a large number of species.

Consequently its exploitation, which takes three forms: hunting for sport, commercial roundups and visits to the national parks, constitutes an increasingly profitable source of revenues, as much for the Government which delivers licenses, as for private operators. Since 1969, Government revenues have multiplied four times; nevertheless, thanks to the increase in the number of protected animals, the number of licenses has increased only very little. On the other hand, the capture of decorative birds for export is on a constant rise.

The number of pairs of birds destined for export is approximately one million per year.

II Evaluation of the IVth Plan

The evaluation of the IVth Plan points out the lack of financial resources allocated to national forests and wildlife. The bulk of these resources is provided by the national budget; for despite the prime interest represented by the exploitation and development of the sector, foreign sources of financing hesitate to steer their efforts in this direction.

During the IVth Plan the total financial effort came to 1,520 million francs CFA, compared with a financial goal of 3,955 according to the revised plan, or an achievement percentage of 38 %.

The difficulties of the sector arise essentially from the following causes:

- degradation of the forest potential due to brush fires and the effects of the drought (an average of 20 % of vegetation is destroyed by fire annually);

- encro_____ of agricultural crops;
- uncontrolled exploitation of wood produce, in particularly an intensification of fuel extration.
- insufficiency and discontinuity of financing, unwieldiness of the mechanism for mobilization of funds, thus leading to the interruption, delay or indefinite postponement of important operations;
- insufficiency of personnel and equipment to ensure an effective decentralization of inspection services, and hence, a supervision and technical assistance which could assure that needs are met.

EVALUATION OF THE ACCOMPLISHMENTS OF THE IV TH PLAN

<u>PROJECT AND SOURCES OF FUNDING</u>	<u>PREV. IV TH PLAN</u>	<u>FIN. OBTD.</u>	<u>PAID</u>
1. Campaign against Brush fires	998	585	292
2. Protection of woodland areas	240	16	16
3. Afforestation of major road arteries	176	16	16
4. Botanical Parks	23	-	-
5. Popular participation in reafforestation	114	83	82
6. Shelters and windbreaks	95	20	20
7. Studies on gum trees and rangeland forests	131	119	46
8. Development of the sylvo- pastoral zone	122	23	5
9. Study for the development of the forests of Casamance	178	168	
10. Reafforestation of teak and gmelina	187	99	98
11. Cashew tree programme	280	14	14
12. Tree stands in the Green Belt	161	136	58
13. Protection of the Niayes	355	20	20
14. Aforestation of the Fleuve Delta	72	48	40
15. Afforestation of dunes along the Grande Côte	458	74	71
16. Natural Forest Stands	179	5	5
17. Equipment of forest lookout points	73	29	29

18. Development of hunting grounds and zoological parks.	115	65	-
TOTAL SECTOR	3955	1520	974

III. GENERAL ORIENTATIONS OF THE SECTOR

Actions to protect and exploit the forest and wildlife sector should act as a check on the deterioration of the country's plan and animal resources, and develop the nation's natural inheritance, thus implying:

- the consolidation and intensification of current programmes dealing with sylvical maintenance and management, reafforestation and new planting;
- the protection and development of the forest and wildlife area through more rational methods, in particular concerning the fight against brush fires, land clearing and exploitation for production;
- the normalization and more rigorous supervision of forest production and exploitation of fauna;
- improvement and beautification of the natural environment;

IV. DEVELOPMENT STRATEGY OF THE SECTOR

A. AIMS

In conformity with the proposed orientations, current efforts toward the replenishment, improvement and monitoring of the country's renewable natural resources should be intensified during the Vth Plan.

The goal of reafforestation and extension of woodland

areas encompasses 30,000 hectares, or an average of 7,500 hectares per year. These actions are concurrently directed at both protection and production. To the extent that a distinction can be made between these two ends, protective reafforestation covers areas amounting to 22,000 hectares and may take different forms depending on the type of activity or the area under protection : windscreen, planting of land for regeneration, and protection of market crop basins for agriculture, planting for improved of tree fodder and in the vicinity of deep wells for stock raising, reafforestation for replenishment of vegetation in the Sahelina zone and for the reorganization of the agrarian landscape in the groundnut basin, afforestation for stabilization of dunes along the Grande Côte, aligned planting along the major road arteries, tree stands in the green belt, etc.

Reafforestation and efforts at regeneration for productive ends are aimed above all at meeting domestic needs in wood products and wild produce. Consumption of charcoal in particular attained a level of 1.2 million quintals in 1974; by the end of the Vth Plan (1981) this figure could go as high as 1.7 million. Such a volume of production would lead to an annual average of 17,000 hectares felled, thus imposing the need for ad hoc reafforestation, particularly in the west and around the large urban centres.

Other reafforestation will be carried out according to the production of commercial timber (particularly teak and gmelina) poles and posts and wild produce (particularly cashews and gum arabic). These will cover eight to nine thousand hectares. Such extensions of woodland areas should be accompanied by measures

protecting and improving already existing forest stands over approximately 15,000 hectares. In addition, 28,500 hectares call for regeneration and reconversion efforts, including 20,000 hectares intended solely for the production of charcoal and fire-wood.

More attention should also be given to the nation's wildlife inheritance. Despite the interdictions and restrictions provided for by the decrees of Lay 30, 1967 and DEcember 10, 1969, a number of species are seriously endangered. Today, close to thirty species are fully protected, while some twenty others are partially so. During the IVth Plan, national parks and protected wildlife preserves were created in the Ferlo, five hunting areas were set aside, the Niokolo-Koba national park was enlarged, and parks were created in the Basse Casamance, the Djoudj, the Langue de Barbarie, and the Iles Madelines. Four other areas will be set aside under the 5th Plan.

B. POLICY MEASURES

To accomplish these objectives, support should be sought from the related measures and programmes. These programmes themselves are articulated as specific projects which are addressed to the attention of financial sources.

The following measures are to be considered as general conditions serving as a backdrop for the effective implementation of the projects:

- a. National Plan for Regional Land Use: This Plan should play a major role in the protection of natural

forest land and ecosystems; it should likewise promote the constitution of reserves of wood capable of meeting the people's future needs and even, in some cases, being exported. Any attempt to limit crops, such as the groundnut crop, for example, is in danger of remaining ineffective if it is not based on an imperative scheme aimed at restricting the invasion and abusive exploitation of regions and land which are indispensable to the equilibrium and long-term productivity of the natural environment.

b. Training: The training of high and middle-level personnel as well as specialists in ecology, pisciculture, wildlife and the protection and development of forests and prerequisites for the efficient management and exploitation of forest and wildlife resources. In the light of the extension of protected areas under the IVth Plan, and faced with the need for technical personnel arising from a more rational protection and exploitation of existing resources, the number of high-level personnel and specialists called for can be estimated at over 200, and the number of middle-level personnel and technical officers needed to monitor the area and the execution of the tasks provided for on the programme, at over 400.

c. Financing: The funds provided to the sector should increase more rapidly over the coming years. While the first three plans called for a total financing of 853 million F CFA and the financing of the IVth Plan exceeded the level of 2.2 billion, approximately, under the Vth Plan a financial package of 11.9 billion, including local and

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V. The Programme of Action of the Sector

The projects listed in the Vth Plan represent an overall package of 11,891 million francs, of which 4,142 million will be assured by the national budget and 389 by local and communal budgets.

In Senegal-Oriental and the Sine-Saloum, investments will exceed 2 billion; in the regions of Louga and the Fleuve they will come to about 1.8 billion.

The projects of the sector have been grouped into different programmes which express their common goals or generic content. The actions provided for under the Vth Plan are classified into six distinct programmes:

Protection and Development of Forests, Reafforestation for production, Reorganization of agrarian landscapes and rangeland, Reafforestation for the Environment, Wildlife, and equipment Infrastructures.

A) Protection and Development of Forests

1. Campaign against bush fires

This project is carried over from the IVth Plan and serves as a follow-up to current work to set up firebreak networks, equipment for fire-fighting brigades and the construction of forest lookout points. This project, whose cost is estimated at 1,331 million francs CFA, involves five regions: Casamance, the Fleuve, Louga, Senegal-Oriental and the Sine Saloum.

2. Protection and Development of Forests

The goal aimed at is the development of 150,000 hectares and the regeneration and replenishment of 20,000 hectares. Both the protection and exploitation of national forests are to be ensured, as is a facilitation of the potential production of 150,000 tons of charcoal and other wood and non-wood matter. The project, which costs an estimated 1.709 million, will particularly benefit the Senegal

Oriental, followed by Casamance, the Sine Saloum and the Fleuve.

3. Protection of Botanical Resources

This project is intended to preserve certain special or typical plant formations and associations which are in danger of disappearing or being reduced if they are not accorded full protection as botanical parks. This project would cost 35 million and would be undertaken in four regions: Cap-Vert, Casamance the Fleuve and the Sine Saloum.

4. Creation of a botanical garden

Still in the conceptual stage, this garden is to be situated in the Dakar area. Its estimated cost is 300 million FCFA.

B. Reafforestation for Production

5. Planting of teak and gmelina

This project is part of the continuation of a programme which dates back several years. 2,500 hectares have already been planted; the planting of 1,500 hectares is envisaged, including 500 of teak and 1,000 of gmelina; previous years attainments must also be consolidated through the installation of a system of fire-breaks, and the thinning and clearing of the remaining 2,500 hectares. This project calls for a global financing of 435 million, and takes place entirely in Casamance.

6. Cashew-tree project

There are sizeable plantings of cashew trees in three zones of Senegal: the coastal zone of Thies and the Cap-Vert, the region of South Diourbel and the Sine-Saloum. The project aims to valorize existing stands through the installation of of shelling unit, the replenishment of 1.000 hectares and the extension of stands over 5.000 hectares. The global cost is estimated at 1.129 million; its greatest benefits will go to the Sine Saloum.

7. Mbiddi Project

Begun on an experimental basis under the IVth Plan as the "Mbiddi gum arabic" project, this operation has made it possible to perfect methods of reafforestation in the arid zone using indigenous species such as the acacia. The project consists of spreading the results obtained over larger zones in the regions of the Fleuve and Louga, and thus promoting the regeneration of natural gum tree stands. These actions should lead to a doubling of gum production between now and 1985, at a cost of 205 million.

C. Reorganization of agrarian

Landscapes and rangeland

8. Reafforestation in the Fleuve Delta

Already introduced under the IVth Plan, this project is continuing with the reafforestation of 2,000 hectares to serve as fuelwood, protective covering and windbreaks. The costs of its execution will come to approximately 340 million.

9. Reafforestation and development of the Sylvo-Pastoral zone.

This operation got on the road to completion under the IVth Plan with the planning and reafforestation of five deep wells in the Fleuve Region and two deep wells in the region of Diourbel. The aim is to complete any work on deep wells which is already underway, and to reafforest eight other wells in the Fleuve region over an area of 2,400 hectares and twelve deep wells in the Diourbel area covering an area of 3,600 hectares. The total cost is estimated at 1,544 million.

10. Reorganization of the agrarian landscape

This is a long-term project begun under the IVth Plan by the Agricultural Law Programme. It aims to increase the number of

trees in agricultural landscapes. The Vth Plan provides for the protection of 80,000 hectares through the planting of the equivalent of 6,000 hectares, especially of caddes (acacia albida) and palmyra. Between now and the year 2,000 this protection should be increased to cover 1 million hectares (out of the 2 million hectares currently under tree crop). The cost of realigation of the phase provided for under the Vth Plan is estimated at 700 million. The Regions concerned: Diourbel, Louga, Senegal-Oriental, Sine-Saloum, and Thies.

D. Reafforestation for the Environment

11. Stabilization of dunes and protection of the Niayes on the Grande Côte

This project pursues the reafforestation operation begun in 1974, and which is to be extended along Senegal's Northern Atlantic coast, from Dakar to Saint Louis (180 km). It has two aspects, the stabilization of moving coastal dunes over an area of 2,500 hectares and the protection of market crop basins (Niayes), or approximately 4,000 hectares of agricultural land, through the installation of windbreaks and protective tree stands over 500 hectares. Global financing comes to 1,100 million.

12. Green belts

The installation of densely wooded green belts will cover approximately 5,000 hectares, including in particular the line running from Dakar to Thies (2,500), the future town of Keur Farah Pahlavi (1,000), Senegal Oriental (500), the Sine-Saloum (500) and Casamance (Djibelor forest). The cost is estimated at 1,019 million.

13. Popular Participation in Reforestation

Initially known under the name of Forest Weeks, this operation has a certain continuity to it. It has as its objective the annual production of 300,000 large saplings (forest and fruit trees). Its financing will come to 183 million.

14. Major Road Arteries

Planting along the major road arteries have amounted to an average of 150 kilometers per year under the IVth Plan. The rythm sought after during the Vth Plan is 250 kilometers per year, or 1,000 kilometers in all. All of the regions are involved in this project, expected to cost 240 million.

E. WILDLIFE PROGRAMME

15. Equipment of Hunting Grounds

The IVth Plan marked the creation of five hunting areas, some of which are in need of equipment for the improvement of signs, setting up of camping grounds, and management and supervision. Other zones are in the process of being created in In lowax in the South of the Department of Linguère in Mbégué in the Bao-Bolong, and the Niomboto. These zones will likewise have to be provided with the equipment necessary. In all, the cost is estimated at 199 million.

16. Equipment of National Parks

The project aims to complete the equipment of the six existing parks, some of which have only been recently created. The project will likewise make it possible to acquire the logistical means for the administration of national parks. The global cost of constructions and material amounts to 221 million.

F. EQUIPMENT INFRASTRUCTURES

Since 1960, only a few ranger's lodges have been built. A renovation and extension effort is thus called for. In addition to repair work on the facilities of the national headquarters in Dakar, the Vth Plan has provided for the setting up of four forest headquarters in Koalack, Diourbel, Tambacounda, and Thiès, the development of twenty forest sectors in different regions and the construction of twenty forest stations in Casamance, the Fleuve region and Senegal Oriental. The global cost is estimated at 796 million.

Forests and Proection of Nature:
List of Projects Considered

A. National Project	Total Cost (millions)	Annual Breakdown	Domestic Fin.		Foreign Fin.	
			Total	NEB	Total	Obtained

1. Campaign against brush fires
2. Protection and development of forests
3. Protection of botanical resources
4. Creation of a botanical garden
5. Planting of teak and gmelina
6. Cashew tree project
7. Mbiddi project
8. Afforestation of the Fleuve Delta

9. Reforestation and development of the sylvo-pastoral zone
10. Reorganization of the agrarian landscape
11. Reorganization of dunes and protection of the Niayes along the Grande Cote
12. Green belts
13. Popular participation in reforestation
14. Afforestation of the major road arteries
15. Equipment of hunting areas
16. Equipment of national parks
17. Equipment infrastructures.

B. Total Sector.

Forests and Protection of Nature:
Regional Breakdown of Projects Considered

Regions	Total Cost (million)	Annual Breakdown	Domestic Fin.		Foreign Fin.	
			Total	NEB.	Total	Obtained

A. National Projects

- Cap Vert
- Casamance
- Diourbel
- Fleuve

Louga

Senegal Oriental

Sine Saloum

Thies

B. Local and Communal Projects

Total Sector.

SYNTHESIS OF THE VTH GOS QUADRENNIAL PLAN OF ECONOMIC
AND SOCIAL DEVELOPMENT (AGRICULTURE)

The Vth GOS Plan of Economic and Social Development is aiming at very ambitious goals in the field of agriculture. The cultivated area covers 2.6 million ha. i.e. 12% of total Senegal area. A substitutional budget (48.2 billion CFA Francs i.e. 12% of the total investment in the Vth Plan) is allocated to the agricultural sector and will be jointly financed (GOS and other donors). Despite all efforts devoted by GOS, the Senegalese agriculture is far ^{from} meeting the needs in food for populations and the food deficit rotates around 300,000 tons per year out of which 2/3 in rice. Objectives cover almost all aspects of agriculture. Substantial efforts are oriented toward big productive projects all over the country under the supervision of Agricultural Development Agencies: SODEVA (in Thiès and Sine-Saloum Regions), SAED (in the Senegal River Basin [Fleuve Region]), SOMIVAC (in the Casamance Region) and SODEFITEX (in Upper Casamance and Senegal-Oriental Regions). There is also a pressing need for crop diversification along with plans of building dams (Manatali, Diama, Bignona, Baïla, Soungrougrou, etc.) The construction of dams should stop salt water intrusion and enable availability of sweet water for irrigation purposes (2 rice crops a year could be obtained). Water control should then be one point to focus on. This will certainly lead to a rice production increase but actually rice production is still at low stage ~~in~~ ^{in exports} and the deficit is covered by imports.

The main cash crop in Senegal is peanuts which dominates GOS ^{in exports} exports. Senegal is experiencing a shortage of peanuts production mainly due to drought conditions these

Poor Farming

last years. The target of 1,200,000 tons a year would be hard to get because of the uncertainties of rainfall. Under these conditions alternative crops are being introduced and promoted in Senegal such as wheat, soy bean, etc. Soy beans have a high nutritional value because of their high protein content. Their yield on rainfed conditions in station during four years averaged around 30.8 quintals/ha. They can grow in an area of 800 mm of rainfall or more and GOS plans to plant 2,000 ha of soy bears by 1981. However extensive research should be conducted on soy beans to determine varieties adapted to the climatic conditions of Senegal.

In horticulture, the objectives are mainly oriented towards increasing production for local supply and export. These goals could be reached especially under irrigation conditions. Exports should amount to 25,000 tons in 1981 and imports of potatoes and onions (80% of ^{the actual} vegetable ~~in~~ exports) should drop down to 1/2). Per capita consumption of vegetable should go from 21 to 25 kg.

Crop protection is also part of the overall agricultural objectives. 330 million CFA Francs are destined to crop protection to considerably reduce damages caused to agricultural production.

Training programs for farmers who are direct beneficiaries of the agricultural programs as well as technicians of Development Agencies falls within the priorities of GOS in the Vth Plan. The farmers training is conducted in local dialects by the development agencies and deal with literacy, introduction of cultivation methods, use of fertilizers, etc. Technicians guiding the farmers should be well trained either locally or abroad to gain a useful knowledge profitable to Senegalese agriculture in general.

Research, which is the very base for any development is given a priority. In fact ISRA, Senegalese Institut of Agricultural Research is conducting a great deal of research but is operating only with little financing (1,364 million CFA). More Senegalese technicians are needed in research along with adequate equipment and facilities. More stations fully equipped both in research personnel and facilities should be created.

Difficulties and obstacles obviously exist in the successful conduct of this Vth Plan. One of them remains the uncertainties of climatic conditions, rainfall in particular. Senegalese agriculture depends mainly on rainfall which is not regular. This is the reason why drought periods have severely hampered agricultural production during the past years especially in 1972. GOS is trying hard to remedy the situation by improving cultivation methods and agricultural equipment and by extending areas for irrigated crops, (rice for example in the Senegal River Basin and in Casamance), and by planning to build dams. Since the construction of dams is a mid-term plan, food deficit would still prevail and enormous quantities of food crops would be imported to meet the needs of populations. The objectives of getting 1 million ton of cereals in 1981 taking into account losses and seedings might be reached and would at least partially reduce cereals imports.

In conclusion, credit should be given to GOS for setting ambitious goals for agricultural development and trying hard to reach them. However, one must bear in mind the enormous difficulties and obstacles (lack of rainfall, lack of financing, lack of qualified technicians). GOS is facing.

With persistent drought situation GOS should rather focus on irrigated crops which seems to be a safe remedy for food crop deficit especially rice and horticulture production. The development agencies should get enough funding to carry ^{out} irrigated agriculture for a greater production. Marketing agencies for cereals as well as for other crops such as fruit, vegetable, cotton, should be efficient so as to enable goods to be easily marketable. Some products such as tomatoes and sugar cane are locally processed and such chance should be given to other basic food crops. Intensive training programs along with the big productive projects should be carried out to ensure success for any agricultural program. Prices to producers should be increased so as to induce farmers to grow more food crops.

There is a great need to resolve the problem of water supply, as is evident by the recent drought. The focus will be on water resource development in order to make up for crop deficiencies, reduce imports, upgrade ag. and livestock and in general, satisfy all rural needs, leading to an integrated ag. development policy.

VILLAGE HYDRAULICS

I. The situation and Evolution of the Sector

Defined as the provisioning of water in quality and quantity to people and their herds, though exempting the large herds. It differs from urban hydraulics in that there are no pipes or drainage systems involved. It is necessary to use underground water supplies which are generally pure.

A. Hydraulics Works

1. Wells: tens of thousands of hand-dug wells have been executed in all regions, through use of very little means. Initial and maintenance costs are little, however they tend to be technically unsound and to dry up rather quickly. A general survey of these wells has been done to determine their state of repair, as well as their geographic density to create a more rational distribution.

2. Deep-Bore Wells: in 1973, there were some 207 of these wells, though due to the drought, their supplies were overused and degraded. There is at present, a need for general rehabilitation. The use of these wells is due to the fact that ground water resources are not adequate in view of the need, and that exploitable water is too deep to exploit by hand.

3. The Piping of Water: these works are still rather superficial and include a few street fountains and watering trough in important rural locations. They serve both village and pastoral needs.

B. New Pumping Techniques

Experiments have been done which include solar pumping, aeolian pumps and manual pumps - all at various locations around the country.

C. Wells Teams

Teams needed to construct and maintain wells. Activity has existed for a long time, but has always lacked means. During the IV Plan, teams were reconstituted in all regions.

II. Balance Sheet for IV Plan

The rate of execution of projects in this sector is particularly high thanks to exceptional exterior financing. There will be 330 new hand-dug and deep-bore wells, while the well team project has already been executed. During the IV Plan, the accent was on the creation of well points, however, the labor difficulties involved in hand-drawing water from more than 25 meters have not been properly addressed. In smaller rural areas, the existing wells are not enough to meet the need.

III. Orientations and Strategy of Development

In terms of a directive plan, these are the general guidelines:

- better well placement geographically, taking into account those areas which are lacking
- manual pumps in least populous villages to conserve time, effort and have a rationing of production

- equipping of deep-bore wells with motor pumps and improvement of surface installations.

V Plan geared to fulfilling the equipment needs for the building and maintenance of well points as well as the piping of water in rural areas.

A. The Equipment

- wells constructed with little delay thanks to outside financing, while well teams will need financing from local budgets.

- in general, wells need water-drawing equipment to increase productivity and decrease contamination, while protecting the access to the well

B. Equip villages of more than 2000 people with a piping system

C. Well Point Construction

during the V Plan, the construction of 615 wells is foreseen: 10 deep-bore; 55 deep-bore/hand dug and 550 hand dug wells, all over the country. Also, a plan for the rehabilitation of the well casing will be undertaken.

IV. Program of Action

A. The Equipment

1. reinforcement of 7 well teams
2. creation of new, supplementary well teams at regional level
3. reinforcement of well teams in Cap Vert. The need is urgent since this region was the only one which did not benefit from drought relief and many wells are dry.

4. Renovation of the auto and material park at Louga for hydraulic equipment subdivision (SOMH)

5. logistical support for well teams

6. development of existing logistical and equipment infrastructure for regional well teams.

7. water drawing equipment for wells

goal is to expand mechanized water drawing equipment, put stout fountains + troughs for animals - for 800 wells in all regions

B. Piping of water to rural areas

creation of new piping systems as well as extension of old ones.

C. Well Point development

1. construction of 15 combination deep bore/hand dug wells + 30 hand dug wells

work to be done in Casamance, Sine Saloum, Diourbel Fleuve + Senegal Oriental

2. construction of 10 deep bore points and 10 combination deep bore/hand dug wells all equipped

goal is to integrate ag. + livestock

3. construction of 520 hand dug wells by well teams in regions not yet touched by administrative reform

4. construction of combination deep bore/hand dug wells in certain areas of Sine Saloum, Thiès + Diourbel, when salt is a problem

5. rehabilitation of well casings in the Fleuve + Diourbel

AGRICULTURE HYDRAULICS

Numerous programs in this area both along national lines and large international projects OMVS + OMVG

I. NATIONAL PROGRAM

A. Underground water + irrigation

- concerns development of irrigated ag. 100-200 ha. per deep-bore well in semi-arid zone of the Niayes
- also rice production on left bank of Fleuve by SAED
- other activities include hydraulic development by SODEFITEX
- feasibility studies of small tributaries
- hydraulics in semi-arid zone by SODAGRI

B. Secondary Valleys + National Dams

- Casamance maritime + Sine Saloum
 1. Casamance Maritime + goal is to construct a series of salt water intrusion dams to reclaim land + stock fresh water as well.
 2. Sine Saloum
 - build a series of dikes to store rain water for irrigation. Pumping of water will also be used as water level recedes.

II. River Basin Development

- Fleuve by OMVS
 - a. Diama Dam for irrigation / anti salt
 - b. Manantali Dam - to regulate water flow, have irrigation and navigation all year round between St. Louis and Kayes.

- Gambia River Basin - OMVG
- studies on the development of this basin will be done during the Vth Plan in accordance with Gambia

PASTURE LAND HYDRAULICS

Goal is well point development for water / forage for livestock geared toward the sedentarisation of the herds + ecological balance. Need is to integrate ag. + livestock in Fleuve Valley + Delta - reduce the sphere of influence of well points 20-10 km + have 5000 cattle max at each point.

PLAN OF ACTION

1. well point development in SPZ - 17 well points
 - 1st phase
 - 2nd phase. The introduction and training of program is made complete by the construction of 36 deep bore/hand dug wells, 1 deep bore well + 9 hand dug wells
2. Livestock improvement in Senegal Oriental
 - construction of 100 wells of 45-75 meters in depth spaced 12 km apart .

Project will also include rehabilitation of 30 existing well points.
3. Livestock improvement in Bakel
 - same sort of program as in Senegal Oriental
4. Equipping of wells in SPZ.

Soil Conservation for Central Senegal - appendix 24

If the GOS accepts the interim team's recommendation for an integrated approach to soil conservation in Central Senegal, these comments are pertinent.

Power

Since most agricultural operations are labor-intensive, labor during peak periods is critical. Utilization of basic tools (plows) and draft animals (oxen) can double or triple the area one man can cultivate. Efficiency could be increased further by mechanized power, but graduation to animal power seems the appropriate step at this time.

In addition to increased efficiency, animal power allows deeper tillage and incorporation of more organic material into the soil. This results in greater porosity, increased water intake, less erosion than from hand tillage, reduced weed problems, and better crop yields.

Crop Rotation

Present farming is nearly continuous. Fallow periods are too infrequent and too brief in duration to have a pronounced positive effect on soil. As presently practiced, the major impact of fallow is reseeding of weedy species. Therefore, instituting a system of rotation farming without fallow is advisable. Design of the specific cropping system should address:

- (1) farmers income;
- (2) adequate area for subsistence crops;
- (3) wind erosion control;

- (4) replenishment of soil - both physical and chemical;
- (5) animal forage;
- (6) crop sequence that takes advantage of nutrients or residue from the preceeding crop and is not detrimental to the succeeding crop.
- (7) evaluation of SODEVA's present recommendations indicate a need for more concern in the area of erosion control.

A crop rotation of peanuts, millet, peanuts, millet, and cowpeas for green manure is suggested. This rotation will improve soil physical condition, provided animal manure and most millet residue is returned to the soil. Mineral fertilizer will still be needed for optimum yields, but annual applications may be less than at present.

Erosion Control

Erosion control has not been adequately addressed. The size of farms should make wind erosion control a simple matter. Apparently erosive winds are from the East-Northeast. Strips' alternated with peanuts will help reduce dessicating surface winds in the area devoted to peanuts.

Permanent wind barriers also reduce wind speed at ground surface. Properly spaced tree or shrub rows offer excellent protection to erosion susceptible area. More research may be needed to determine species best suited for this purpose.

Water

It may be desirable, or even necessary, to develop additional water facilities in the pilot project community rurales.

First priority will be given to developing water supplies to satisfy human and domestic animal needs. Second priority is water for growing subsistence vegetable gardens. Third priority is water in a quantity which would enable irrigation of cereal crops for family and village use. Fourth and final priority would be water for irrigating cereal and vegetable crops for local sales.

Good water is readily found within the confines of a line from Louga to Kebemer, Mekhe, Baba Garage, Sagata, and back to Louga. South and East of that area water is apt to be brackish.

There are four water bearing strata in the Louga area: one at 20-30 meters, one at 60-80 meters, one at 110-120 meters, and one at 250-300 meters. Wells in the shallow aquifer are poor and usually go dry with 3 to 4 hours of hand drawing or pumping.

The second water-bearing strata is very good. Generally, water is hand-drawn and is adequate for domestic use and livestock. Pumps and motors are required to extract water from the two deepest aquifers.

Currently, there are about 5 deep wells and at least 10 wells in the 60-80 meter aquifer within a 50 km radius of Louga.

A modification of the deep well has been used with good success. A deep well is drilled to the 250-300 meter aquifer. Then an auxiliary well about 1.8 meters in diameter is hand dug adjacent to it to a depth of 65-70 meters. The two are

connected by a pipe channel. Water rises in the deep well to about 60 meters and flows into the hand-dug well. Water is hand-drawn by villagers using ropes and buckets.

Mr. Diop, Chief of Hydraulique studies, feels there is a possibility of developing wells in the 110-120 meter water-bearing strata near Louga which will yield about 200 cubic meters per hour (840 gpm). This amount is certainly adequate for irrigation, assuming that other factors are equally favorable.

Management of Natural Grasslands

In the Louga area, as is true for many areas of Mediterranean-type climate, the original native perennial vegetation has, for the most part, been replaced by communities of annual plants. The annual plants produce useful forage and effective soil cover when properly managed. The objective of scientists and farmers with whom we talked is to maintain or improve the present cover of annuals, rather than to encourage secondary plant succession toward climax perennial plants.

The primary requisite of range management on annual grasslands is balance of grazing animals with forage production to leave sufficient plant cover to protect the soil from erosion and maintain or improve soil fertility. The desirable degree of use has been suggested as no more than 60%. The numbers and distribution of grazing animals must be controlled so as to achieve this objective.

Grazing Systems

In the Louga area much of the animal forage will consist of crop residues or forage crops grown on cultivated land. The responsible conservationist or extension agent will work with farmers and village officials to develop grazing plans involving forage and feedstuffs from all sources, including natural grasslands. Cropping systems and animal husbandry programs should be complimentary to proper use of natural grasslands used by village herds .

ACACIA ALBIDA

Assuming that the returns to be gained by planting Acacia Albida will be as great as research results indicate, this activity could serve as the hub of a valuable integrated resource management program. It can be designed to rebuild degraded soils by allowing 50-75% of the leaves and pods to be incorporated into the soil during cultivation. Further erosion can be minimized by appropriate cultural techniques as well as by the protection from wind and rain which the trees will provide after 5 to 10 years.

~~FF.~~ At the same time some cattle can be raised on the area, by feeding them 25-50% of the foliage from the trees, tops from the groundnut plants and ground forage from non-cultivated areas in the vicinity.

Probable needs

The need for items listed below should be evaluated by component and included in the project, if appropriate, after close consultation with SODEVA.

I. Inventory

Certain resource inventories are needed to enhance replicability in non-contiguous areas. This inventory should be broad enough in scope to provide base data for future monitoring.

Agricultural

Inventory of selected site (s) could include: a more detailed soil survey than is presently available; aerial photos; number of farms and farmers size of farms-hectares tended

per family; kind, classes, and number of livestock; area available for grazing outside the perimeter of the site; contemporary vegetation, land use, and cropping pattern; inputs in crop farming and livestock production; availability and location of water.

Sociological

Inventory household economics, consumption, time budgeting, decision models, energy needs, diets, sanitation facilities, etc. SODEVA may not have expertise available to them at this time to conduct this inventory.

II. Personnel

First priority should be a soil conservation - agronomist with broad experience in wind erosion control. SODEVA indicates they lack in-country expertise in this field. Depending on degree of intensification desired, a soil scientist and a rural sociologist may be needed. SODEVA has other disciplines at their disposal.

III. Training

Senegalese nationals should have additional training in soil conservation and total resource management.

Training for identified leaders should be provided in the United States.

IV. Loans

Loan guarantees should be available for capital investments such as draft animals, plows, and hay-making equipment.

V. Subsidies

Subsidies should be considered as a means of encouraging conservation measures such as tree planting, green manure crops, and stripcropping. Payment could be made in cooperation with food for peace.

References:

- Dommergues, Y.R. The effect of Edaphic Factors on N₂ Formation
With Special Emphasis on Organic Matter in Soils
- National Investment Strategy for Increasing
Food Production in Senegal
- Gifford, P.L. Les Essences de Reboisement au Senegal

SOIL CONSERVATION IN CENTRAL SENEGAL

Dalton J. Comeaux - Livestock Specialist - Project No. 685-0219

A Rural Community in the Louga Area

In a rural community there are 1000 to 2000 families with an average of 10 members per family.

The area in a community will vary from 10,000 to 15,000 hectares of land. The Louga region is located in the northern part of the peanut basin. It is an intensive agricultural area with peanuts being the main crop, followed by millet, sorghum, and horticulture crops. There is also a small acreage of cowpeas which are used for human consumption and the plant remains for fodder for livestock.

Millet is the main staple grain for the people in this country.

A small percentage of the land is owned by individuals and the rest by the Government. In densely populated areas the land is controlled by a village council and allocated to families, both crop land and grazing land.

In most areas the land area/population ratio is 1.2 ha per person.

Approximately 93% of the tillable soil is in cultivation and 7% is fallow.

Livestock - Beef Cattle

The livestock enterprise is a minor one but very important to the small farmer. The average size farmer has two to four cows and larger farmers may own 10 to 25 animals. Those animals serve an important function in the family living as they produce milk for the family's use. Any excess milk, if not sold in the nearby village, is used to make cheese and butter. That may also be sold if there is a surplus.

Livestock also serves as their bank account. If they are not in need of money the animals are not sold. The larger the number of animals owned by a farmer the greater his prestige is in the community. Many areas are overgrazed due to the excessive number of animals and the drought for the past two years. Some herders group their cattle and migrate to other areas looking for forage and a good water supply. They return at the beginning of the rainy season. Herders do not plant any forage crops nor do they produce hay. They graze their cattle on whatever native grasses grow and feed peanut hay during the dry period.

The family milk cow or cows are usually kept at the house during the lactation period and tied to a tree or stake. If there is some fallow land nearby they are staked out to graze, otherwise grasses and fodder are cut and hauled to the animals. The remaining livestock is driven to grazing land daily, and controlled by a herder.

Sheep and Goats

Most farmers also own four or five sheep and goats that are slaughtered on special occasions such as feast days. The surplus animals are sold to buy family needs such as clothing, tea and sugar.

There are 3,600,000 sheep and goats in the country and approximately 1,000,000 will be slaughtered in one day for their big feast day at the end of November. There are no special programs in the country that devote any attention to the small ruminant animals.

Animal Nutrition

During the rainy season the native grasses grow very fast. They are of excellent quality, fine-stemmed, succulent and high in protein. The number of days of rainfall and its distribution are the main factors in determining the richness of the natural grazing land. Animal health improves rapidly, stimulating weight gain and increased productivity of the females. About two months after the rainy season ends the quality of the forage declines rapidly, causing a corresponding decrease in herd productivity, i.e., weight, growth, fertility and calving interval.

Hay should be made and stored at, or just before, the beginning of the dry season, when it is still high in nutritive value. Native grass hay along with peanut fodder can be fed to the stock during the most critical part of the dry season.

Supplementary feeds such as bran, peanut meal, peanut cake, minerals and coarse salt can be purchased and fed to the animals. That will help maintain animal health and prevent them from losing excessive weight.

Animal Health

The amount of veterinary service available to stock farmers is very limited. The Livestock Service has a yearly campaign every fall to vaccinate animals against contagious diseases.

According to the Animal Breeding Research Center of Dakar-Djolofoff, Study and Breeding of Senegalese Fulani Zebu Cattle, the yearly overall mortality rate of cattle under the traditional system is 20% of the herd. Most of the mortality is among young animals. Under good management and adequate nutrition, the death rate in 1972-73 was reduced to 2% to 4%.

The following table is extracted from the work cited above:

Weight performance of selected Gobra, comparison with traditionally reared, ungraded animals:

	<u>Traditional Stockfarming</u>	<u>Controlled Animals C.R.Z. 1972-73</u>
Weight, adult males	300-400 kg	700-750 kg
Weight, adult females	200-300 kg	350-400 kg
Weight at birth	17- 18 kg	26- 28 kg
Weight at weaning	65- 70 kg (6 mos)	110-120 kg
Age at first calving	4 - 5 years	36 months
Calving interval	18 - 22 months	14 months
Overall mortality rate	20%	2 - 4%
Birth rate	50 - 55%	86%
Distribution of birth (June to Aug)	58%	83%

Four of the most important indexes used in determining good management are birth rate, mortality, calving interval and weaning weight. If those four indexes are high it is safe to say that the herder can receive a good income from his cattle. Those are the objectives that this project must strive to achieve.

Proper health measures must be taken to protect the herd against four major diseases: botulism, rinderpest, bovine pleuripneumonia and parasitosis in young animals.

Herd Management

The traditional system of herders and small farmers is to keep as many animals in the herd as possible, regardless of their age, health or reproductive ability. The number of animals they own gives them prestige in the community but certainly does not return very much annual income, nor does it help control overgrazing and degradation of the soil. To overcome a shortage of grazing on a given area the offtake rate has to be increased, old cows, slow producers, sterile bulls, and steers that have reached maturity (3 to 4 year) must be culled and sold. Only young and productive animals should be kept in the herds.

The carrying capacity of the fallow land should be determined and only that number of animals be allowed to graze. The Extension Service should organize a committee among the elders in the community to allocate the grazing rights. The excessive number of cattle could be sold or placed with a herder and sent to other grazing areas.

The improvement of breeding herds should have a high priority on the list of goals set by the Livestock Extension agents. A program of genetic improvement of local stock through the introduction of selected sires was started at the animal breeding research center in 1965. The distribution of breeding bulls among herders for upgrading their herds proved to be very successful in spite of the many problems encountered. Problems noted were, lack of health care for the herd bulls, lack of supplemental feed and minerals, drought resulting in limited grazing, sterility and death of the animals. There was also a lack of supervision. Stockfarmers who were successful in their breeding program are proud of the improvements in their young animals. They are keenly interested, and demand far exceeds the supply of breeding bulls available at the research station. In 1974, the demand for breeder bulls was 67 and the supply was 10, which represent only 14.77% of the needs. This type of demand for breeder animals can be duplicated throughout the country once the success of such programs is demonstrated to herders and farmers.

Herders who receive improved bulls should be closely supervised by the extension agents. Those who wish to buy improved sires should be assisted in the purchasing of the animal in the form of a subsidy. Short and long term credit should also be made available for the purchase of the animal feed, medical supplies, and hay making equipment.

5

A large scale agro-pastoral enterprise should no longer be provided free of charge since methods used in disease prevention, supplementary feeding and hay making, etc. have now proven their worth through such organizations as the animal breeding research center, SODESP and SODEVA. Subsidies can act as incentives for early adopters.

Extension Service

SODEVA (Société de Développement et de Vulgarisation Agricole) the National Extension Service is in charge of rural development in the groundnuts basin. The basin covers four administrative regions, Thies, Diourbel, Sine Saloum and Louga. There are 180,000 farms in the basin.

In 1976, the acreage of various crops was as follows:

groundnuts	1,033,000	ha
millet	493,500	ha
sorghum	164,500	ha
cowpeas	45,000	ha
corn	12,900	ha

The Extension agents work with as many farmers as possible to improve production through better soil preparation, use of commercial fertilizer, and the addition of organic matter to the soil. They also have programs in reforestation, firewood lots for communities, wind breaks, and livestock production.

The national Extension Service needs to be strengthened by the addition of personnel, in-service training, transportation and financial aid in carrying out their activities. It is a well known fact that the peasants are very slow to accept new ideas and make changes. The best method of inducing farmers to accept new ideas is through organization, and method and result demonstrations.

There should be at least one Extension agent in each community to be involved in this pilot project.

Demonstrations

Examples of demonstrations that could be established are as follows:

- (a) Reforestation - Acacia Albida
- (b) Soil Conservation
 - (1) Crop rotation
 - (2) Wind strip cropping
 - (3) wind breaks
- (c) Production
 - (1) Fertilization - organic matter
 - (2) Fertilization - commercial fertilizers
 - (3) Insect and bird control
 - (4) Soil preparation
- (d) Irrigation - if water is available
 - (1) increase production through irrigation
 - (a) furrow irrigation
 - (b) planchet (plots) irrigation
 - (c) sprinkler irrigation
 - (2) Insure the production of their staple crop-millet, through irrigation. A community plot of land made possible by a joint effort of the families in the Community.
 - (3) Introduction of vegetable production
- (e) Livestock

- (1) increase milk production through supplementary feeding of concentrates and minerals.
- (2) improved methods of raising young animals. Creep feeding, parasites, control, and minerals. Example of such a program is enclosed as annex 2.
- (3) introduction of bullocks for traction power
 - (a) proper feeding and health care for maximum use.
- (4) improve reproduction ability of the females, increase birth rate, and weight, increase weaning weight of calves and shorter calving interval. These can all be done through demonstrations at proper health care and supplementary feeding, particularly during the dry season.
- (5) introduction of improved herd sires. Principally with the larger herders.
- (6) year round planned grazing program. Through the Cooperation and organization of farmer, herders and village elders.
- (7) fattening program (beef and sheep) - small feedlots of 1 to 5 animals. Example as in annex 3.

Extension Agents should organize committees composed of village leaders, farmers and herders. Women should be included, as they often are leaders in the families. All activities or demonstrations should be conducted through a Committee so that they become integrated as a part of the demonstration process and become early adopters themselves.

In order for the GOS to succeed in reversing the deterioration of its soil and vegetation resources, it will be necessary to develop relevant programs promoting farmer/herder participation. This can be done by reinforcing existing non-institutional structure and by providing in service training for the up-grading of Agriculture, Forestry and Livestock personnel in natural resource management.

Information field days are an important tool to use in teaching farmers/herders when there is a comparison, and they can see the results of improved practices.

Until such time as the, "Institut Agronomique", for the education of degree-level agricultural engineers is complete, it will be necessary for limited numbers of Senegalese Agronomists to receive training abroad.

It is also necessary to provide short-term U.S. training in specialized resource conservation technique and extension methods.

Credit

12

Long and short term credit must be made available to the farmers and herders.

Long term credit (4-5 years) should be made for the purchase of equipment, such as, plows, carts, hay making equipments etc. and the purchase of oxen as draft animals and breeding stock.

Short term credit (1 year) can be extended for items such as; minerals, supplement feeds, fertilizer and medication for livestock.

As an incentive for farmers and herders to adopt new practices as listed above, a subsidy of 25 to 50% is proposed. The exact amount should be decided upon by SODEVA and the American Technicians.

BIBLIOGRAPHIE

1. CHARREAU, C. & P. VIDAL. 1965. Influence de l'Acacia Albida Del. sur le sol, la nutrition minérale et les rendements des mils Pennisetum au Sénégal. L'Agron. Trop. XX, 6-7 (600-25)
2. CHARREAU, C & R. NICOU. 1970. L'amélioration en profil culturel dans les sols sablo-argileux de la zone tropicale Ouest-Africaine et ses incidences agronomiques. IRAT, Bambey-CNRA.
3. CHARREAU, P.L. & R. NICOU. 1971. Les facteurs biologiques: Faune et végétation and their influence on the cultural profile of the agricultural productivity agron. Bull. no 23. (Extraits de l'Agronomie Trop. 1971).
4. DANCETTE, C. & J.F. POULAIN. 1968. Influence de l'Acacia Albida sur les facteurs pédoclimatiques et les rendements des cultures - nouvelle contribution- IRAT - Bambey-CNRA:45.
5. DANCETTE, C. 1968; Note sur les avantages d'une utilisation rationnelle de l'Acacia Albida au Sénégal. IRAT - Bambey-CNRA
6. DUGAIN, F. 1960. Rapport de mission au Niger. ORSTOM - Dakar

7. GIFFARD, P.L. 1964. Les possibilités de reboisement en Acacia Albida au Sénégal. Bois et Forêts des Tropiques 95:21-23
8. GIFFARD, P.L. 1974. L'arbre dans le Paysage Sénégalais. CTFT - Dakar:452 PP.
9. GIFFARD, P.L. 1969. Recherches effectuées au Sénégal sur Acacia Albida. CTFT Dakar
10. POUPON, H. 1976. La biomasse et l'évolution de sa répartition au cours de la croissance d'Acacia Senegal dans une savane Sahélienne (Senegal). Bois et Forêts Trop. 166(3-4):23-38,
11. RADWANSKI, S.A. & G. WICKENS. 1976. The ecology of Acacia Albida on mantle soils in Salinger, jebel mara, Sudan, J. Appl. Ecology 4:569-79
12. ROSS, J.H. 196-. Distribution of Acacia Albida in Africa (Bewa Botan. Labs., Univ. of Natal, Pietermasitzburg, S.A.)
13. WICKENS, GE. 1969. A study of Acacia Albida Del. Kew Bulletin 23:181-202

BIBLIOGRAPHY

- Van Voorthuizen, E.G. 1977. Grass Burning Practices in Africa
- Schoonover, Norman. 1976. Project Review Paper for Land Conservation and Revegetation (685-0219)
- Schoonover, Norman, 1977. Project Identification Documentation for SODESP - Livestock Production (685-0224)
- U.S. Soil Conservation Service. 1976. National Range Handbook
- Webster, C.C. and P.N. Wilson. 1966. Agriculture in the Tropics
- Clyburn, Loyd, Donald Ferguson & Dillard Gates. 1/7/77. Report: The Senegal Land Conservation and Revegetation PRP
- Clyburn, Loyd, 3/31/77. Terms of Reference for the Design of a National Integrated Resource Management Program in Senegal
- Gates, Dillard. 9/3/77. Trip Report re/field review & evaluation of project proposals in Senegal
- Thiongane, Papa I. and Gueye, El Hadj. 1974. Study and Breeding of Senegalese Fulani Zebu Cattle (Gobra)