6850202 (2)

NONCAPITAL PROJECT PAPER (PROP) PD-AAC-152-B1 PAGE 1 of ___ PAGES

I. PROJECT IDENTIFICATION

1. PROJECT TITLE: Senegal Range and Livestock Development

APPENDIX ATTACHED 195p ☐ YES ☐ NO

2. PROJECT NO. (A.O. 1055.3): 685-11-120-202

3. RECIPIENT (specify): ☒ COUNTRY Senegal ☐ REGIONAL ☐ INTERREGIONAL

4. LIFE OF PROJECT: BEGINS FY 1975 ENDS FY 1975

5. SUBMISSION: ☒ ORIGINAL Oct 10, 1974 DATE ☐ REV. NO. ___ DATE

CONTR./PASA NO.

II. FUNDING ($000) AND MAN MONTHS (MM) REQUIREMENTS *

A. FUNDING BY FISCAL YEAR	B. TOTAL $	C. PERSONNEL (1) $	C. PERSONNEL (2) MM	D. PARTICIPANTS (1) $	D. PARTICIPANTS (2) MM	E. COMMODITIES $	F. OTHER COSTS $	G. PASA/CONTR. (1) $	G. PASA/CONTR. (2) MM	H. LOCAL EXCHANGE CURRENCY RATE: $ US ___ (U.S. OWNED) (1) U.S. GRANT LOAN	(2) COOP COUNTRY (A) JOINT	(2) COOP COUNTRY (B) BUDGET
1. PRIOR THRU ACTUAL FY	-	-	-	-	-	-	-	-	-	-	-	-
2. OPRN FY 1975	2225	890	122	74	53	625	636	1539	122			
3. BUDGET FY												
4. BUDGET +1 FY												
5. BUDGET +2 FY												
6. BUDGET +3 FY												
7. ALL SUBQ. FY												
8. GRAND TOTAL	2225	890	122	74	53	625	636	1539	122			$240,000

9. OTHER DONOR CONTRIBUTIONS

(A) NAME OF DONOR	(B) KIND OF GOODS/SERVICES	(C) AMOUNT
IBRD (Eastern Senegal)	Range Management including marketing	$9,000,000
FED (Ferlo Area)	4 pilot projects: boreholes for forage	$1,600,000

III. ORIGINATING OFFICE CLEARANCE

1. DRAFTER: Robert W. Shoemaker for FAC — TITLE: Project Design Officer, AFR/DS — DATE: 10/2/74

2. CLEARANCE OFFICER: David Shear — TITLE: Director, AFR/CWR — DATE: 10/11/74

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL Based on Section 639A(b) of the Foreign Assistance Act of 1961 as amended by the Foreign Disaster Assistance Act of 1974:

1) Code 935 procurement is authorized for the purchase of project vehicles and equipment.

*Note: Deviations in the funding between this face sheet and the body of the PROP are due to up-dated costing.

2. CLEARANCES

BUR/OFF.	SIGNATURE	DATE	BUR/OFF.	SIGNATURE	DATE
AFR/CWR	J. Patterson	10/9/74	PPC/DPRE/PRB. PPC/DPR	Odell A. Handly	10/11/74
AFR/CWR	L. Clyburn (draft)	10/9/74	AFR/DP	R. Huesman	10/11/74
AFR/CWR	H. Johnson (draft)	9/27/74	AFR/DS	P. Lyman (draft)	10/2/74

3. APPROVAL AAs OR OFFICE DIRECTORS — SIGNATURE: Samuel C. Adams, Jr. — DATE: 12/4/74 — TITLE: Ass't Adm., Bureau for Africa

4. APPROVAL A/AID (See M.O. 1025.1 VI C) — SIGNATURE: John C. Dean — DATE: 12/12/74 — TITLE: DEPUTY ADMINISTRATOR, AGENCY FOR INTERNATIONAL DEVELOPMENT

CONTINUATION SHEET

EASTERN SENEGAL LIVESTOCK PROJECT

Conditions of approval cont.

The Administrator approves this project and the projected funding estimates for FY 1975 thru FY 1977 consistent with the project and budget reviews and evaluation procedures contained in this PROP. Continuation of this project activity beyond FY 1977 requires the Administrator's approval.

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I. Summary and Recommendations

A. Grantee: The Government of Senegal

B. Executing Agency: The Ministry of Rural Development

C. Amount of Grant: US $2,068,100

D. Estimated Life of Project Cost:

	Foreign Exchange	Local Cost	Total
AID Contribution	$1,313,700	$754,400	$2,068,100
GOS Contribution	-	240,000	240,000
TOTAL	$1,313,700	$994,400	$2,308,100

E. Funding Requirements:

	FY 75	FY 76	FY 77	Total
Foreign Exchange	$703,700	$450,000	$160,000	$1,313,700
Local Cost	327,000	490,000	177,400	994,400
TOTAL	1,030,700	940,000	337,400	2,308,100

F. Other Donor Contributions: Although other donors are involved in the livestock subsector, indeed in other similar projects, no other donor funds will be made directly available for this project.

G. Project Description: The project involves the establishment of a managed grazing reserve of approximately 110,000 hectares throught the development of water resources, the establishment of a comprehensive health control program, the construction of firebreaks, and the provision of limited technical assistance and participant training.

The project provides for year-round grazing on a controlled rotational basis for approximately 16,000 animal units through: (a) the establishment of active and passive fire prevention measures; (b) the strategic location of watering facilities within the project area; and (c) the establishment of an improved animal health program within the project area.

A major economic benefit of the project will be a substantial increase in livestock production as a result of higher fertility rates, decreased mortality rates and improved growth rates. The increased livestock production will in turn allow an increase in the off-take rate within the project area from the currrent estimated rate of 8% to 14% within five to seven years. A second major economic benefit will be a substantial increase in milk production, which is expected to double within 2 to 3 years. The project will result in other substantial benefits which are not quantifiable, such as range maintenance, improved nutrition and health, and increased income.

H. Project Justification:

The livestock sub-sector has traditionally played a very important stabilizing role in the Senegalese economy. However, the worst drought in Senegalese history has resulted in a severe decline in the livestock industry. Considerable losses have been suffered by the small Senegalese herds, especially in the North Eastern section where the project is located. We believe that an integrated approach to range management represents a viable approach to solving this problem.

Goal: To assist in the rapid recovery of the livestock sector as a source of food while taking steps to prevent further loss and degradation of animal pasturage and water resources through the implementation of an integrated range development program.

Purpose: To finance the cost of equipment, materials, construction, technical assistance, education, training and research aimed at improving livestock production in the Toulekedi/Sarre Zones near Bakel, Senegal. The project will provide a model for an integrated approach to livestock development which may be expanded to other parts of Senegal and the Sahel Zone. adopted

Target Population: The primary target group of this project is the small herder in the Bakel area of Eastern Senegal, where the average number of cattle per herder is estimated at between 15 to 25.

I. Major Issues: None.

J. Recommendation: That a grant be authorized to the Government of Senegal for an amount not to exceed $2,068,100 to finance the foreign exchange and most of the local costs of executing this livestock project, subject to the passage of the required special legislation establishing the grazing perimeter and other terms and conditions set forth in the grant authorization (see Page 53).

K. Project Identification Team:

Mr. F. Moore	AID/W
Mr. J. Patterson	AID/W
Mr. R. Henry	RDO/Dakar

L. Project Design Team:

Chairman and Coordinator	R. Shoemaker	AID/W
Range Management Advisor	L. Fallon	USAID/Morocco
Animal Husbandry Advisor	H. Van Blake	AID/W
Veterinary Advisor	Dr. D. Detray	Contract
Economist	G. Nelson	AID/W
Sociologist/Anthropologist	Dr. W. Derman	Contract
Administrative Assistant	K. Salter	Contract

PART II - SECTION I

A. Background of the Project

1. History of the Project

In early 1973, the Regional Livestock Project Officer of the Area Development Office in Dakar toured the areas near the junction of the Mauritanian, Malian and Senegalese borders to reconnoitre the possibilities for the development of complementary livestock projects in the area of Selibaby, Bakel and Kayes. The area was chosen in part because it was thought that the complementarity of the projects would provide a regional character to the program which could involve, and perhaps strengthen, the OMVS (Senegal River Basin Organization). Linkage to OMVS was later found to be impractical and this aspect has been dropped.

During his several visits to the area in 1973, the Regional Livestock Project Officer visited with sedentary farmers, nomadic herdsmen, veterinary and forest service technicians and local government officials. He visited 29 villages in Mauritania, 6 in Senegal and 29 in Mali. He further consulted with the Directors of the Livestock Services in each country where he found a positive response to the project concepts. These concepts included (a) creation of grazing reserves, (b) reforestation, (c) firebreaks, (d) cattle feeding, (e) animal health and nutrition.

In October 1973 the project sites were visited briefly by a team of livestock and range management specialists who presented a description and recommendations on the proposed project.

In February/March 1974, Messrs Moore and Patterson, comprising the AID/W Sahel Task Force for identifying medium-term projects for Mali, Mauritania and Senegal, visited Senegal and Mali and met with representatives of Mauritania in Senegal. As a result of their discussions, they concluded that the proposed projects clearly conformed to the guidelines for AID's medium-term program related to the drought, and recommended that they be considered for design and funding.

On March 15 an Intensive Review Request was prepared by ADO/Dakar and REDSO/WA describing and evaluating the proposed five activities in the three countries and recommending AID consideration of a program of $30 million to finance these activities.

During the week of March 18-23 a "Sahel Program Planning Seminar" was held to discuss the substantive problems of food crop and livestock production in Sahelian Africa and to review the project recommendations of the two Task Forces. At the conclusion of the seminar the Executive Committee selected the three projects recommended by the Task Force and the IRR within an approximate funding level of $3 million for each project. In addition, during the review of the design team's terms of reference to prepare PROPs on the projects, it was concluded that cattle feeding, credit and reforestation activities should be postponed until further economic technical feasibility studies could be carried out.

Based on the recommendation of the Executive Committee, design teams were recruited, organized and dispatched to the field to prepare detailed project proposals for projects in Mali, Mauritania and Senegal. The teams spent several days at the proposed project sites with counterparts provided by the respective host governments. Interviews were conducted with the herders, and relevant technical and economic data was collected.

Based on the results of these efforts, detailed recommendations for the proposed projects were prepared in full collaboration with the respective counterparts. The detailed proposals of the Senegalese Design team are presented herein.

2. GOS Program and Strategy in the Livestock Sub-Sector

Discussions over the past month with GOS officials and other donors make it clear that the GOS is acutely aware of the need to place higher priority on the livestock sub-sector. It is also clear that the GOS realizes the need to emphasize quality over quantity in order to avoid further range degredation.

In this context, Ministry of Rural Development officials in Dakar outlined the following medium-term and long-range strategy. The northern geographical zone, north of the railroad and including the Bakel area, is to serve as a breeding zone for a cow-calf operation. This northern area would provide yearlings for growing-out areas located in the cash crop and farming regions in the peanut growing area (Sine Saloum). There the GOS is presently organizing a new system of irrigated farming of peanuts, sorghum and other forage crops. The forage would be used for the growing out process.

At a later stage, these animals would be transferred to the Cape Verde area for finishing using ag industrial by-products. (see page 62).

However, the GOS is aware that this long-term strategy aimed at geographic specialization must be supported by appropriate medium-term policies.

Thus under the 4th plan (1972/73 - 1976/77) the GOS strategy will be directed toward achieving the following objectives:

1. The improvement of feeding and watering of the cattle by multiplying watering holes (bored-wells, shallow wells), by protecting grazing lands against bush fires and increasing forage crop growing ahd haymaking.

2. An increase an individual animal output by an improvement in livestock practices, notably by progressive <u>sedentarization</u> of the herds and by fattening.

3. The real integration of livestock into agriculture so as to lead to profitable livestock raising, which will in turn lead to an increase in the peasants' income.

4. The transformation within the country of products of animal origin, so as to favor the creation of new jobs, and also to increase the value of these products by moving from the "semifinished" to "finished" products.

5. The organization of commercialization circuits by setting up adequate infrastructures both at production and market levels, which besides having definite economic effects will also improve communications and the degree of "openness" within these circuits.

6. The access to bank credits by different socio-professional groups working in the animal production fields (herders, fatteners and butchers).

7. Finally, the training of personnel necessary for the establishment of development projects in the livestock sector.

Thus there does not appear to be conflict between the GOS strategy and the Africa Bureau's medium-term strategy.

3. AID Strategy, Objectives and Relationship of Project to Host Country Strategy and Drought

The primary focus of the Africa Bureau's medium-term Sahel livestock strategy is on facilitating the rapid recovery of the livestock sector within the drought stricken countries while also avoiding further range loss and degredation. This will be accomplished through the implementation of appropriate range management practices. This strategy is to be supported inthe Sahelo-Sudano Zones through the development of viable range management schemes which can be replicated and which therefore facilitate the development of workable national livestock policies. A further aspect of the strategy is to encourage sedentarization in the intermediate rainfall areas.

Great care was taken in designing the proposed project to ensure that this strategy, which has the full support of the design team, is reflected to the maximum extent feasible in the proposed design of the project. We believe we have accomplished this with the full collaboration of the GOS.

Most importantly, a special effort was made in the design process to ensure that the substantial increase in the number of cattle, sheep and goats which we are confident will result from the proposed project does not in turn simply result in an increase in the total number of animals in Senegal. Thus, although the number of animal units allowed within the grazing zones at a given point in time will be limited to the number which the grazing range will support on a year-round basis, measures will also be taken to ensure that an appropriate off-take rate is achieved. These will include educational activities, establishing markets within the perimeter as well as tying these markets to the Dakar market through an appropriate intermediary. The GOS is fully supportive of this approach.

On several occasions, GOS officials indicated their deep interest in the proposed project as one of the several pilot efforts involving different approaches to range management. Further, GOS officials emphasized their intentions to repeat it on a large scale throughout Eastern Senegal to the extent that it proves successful. GOS officials showed particular interest in those aspects of the project which might lead to sedentarization of the transhumants in the area.

To ensure that the GOS will gain from the project maximum benefits in developing its livestock policy, a baseline data study is being proposed which will permit a more accurate determination of the project's impact over time. At the same time GOS officials have emphasized that Eastern Senegal, which it was openly admitted has been largely ignored in the past, is to receive high priority under the plan.

The income effects of the project are also completely in accord with AID's policy with respect to improving income distribution in the LDC. The chief beneficiaries of the project will be the small sedentary herders in the Bakel area of Eastern Senegal. The substantial direct benefits of the project, real (milk and meat) and financial (increased income), will accrue to the herders themselves. At the same time, because the project involves heavy use of human labor during both the implementation and operational phases, the indirect benefits will also largely accrue to the herders. The demonstration of the feasibility of labor intensive methodology will encourage GOS to use labor intensive methods, either as self help or income generation in other areas of Senegal.

B. The Project Area

The project is located entirely within the administrative department of Bakel in Northern Senegal.

The project area consists of two adjacent perimeters (Sarre and Toulekedi) totalling approximately 110,000 hectares lying 12 kms. northwest of Kidira and 23 kms. south of Bakel. (See attached map - Appendix A)

Nearly forty percent of the 50,000 hectares of the Sarre zone lies northeast of the Kidira-Bakel highway. It slopes gently into the Faloume and Senegal rivers and is bisected by six major drainage systems. The remaining sixty percent of the perimeter contains the drainage heads and, in general, steeper slopes marked with a few boulder-strewn hills. The Sarre perimeter, the southern edge of which runs approximately parallel to the continental terminal, is representative of the drainage areas paralleling the Faloume and Senegal Rivers in the Bakel-Kidira regions. The soils are predominantly heavy clay with sandy loam in the depressions.

The Toulekedi perimeter of 60,000 hectares slopes largely southwest towards Goudiry and represents a very large, sparsely inhabited dry zone characterized by lateritic soils varying in depth from shallow to medium deep. The slope of this perimeter, which is located on the southern eige of the continental terminal, is mostly very gently giving the appearance of being almost flat and is bisected by a few shallow drainages.1/

The vegetation cover in both perimeters is characterized by scattered trees, clumps of low growing bush and open grass areas. However, due primarily to soil conditions, etc. the two zones differ ecologically.

Acacias, combretuns, ficus, and pterocarpus luscans are prominent among the trees and bush in the laterite areas. Baobab trees are common in the Sarre perimeter. At present, annual grasses are reported to predominate. There appear to be a wide variety of these grasses, ranging from perennials such as hyparrhinia rufa, cymbopogon giganteous and andropogon gayanus, to annuals such as aristeda stipoids, eragrostis tremula, cenchrus biflorus, chloris pilosa and pennisetum pedicellatum.

Uncontrolled fires burn 50 to 70% of the perimeters each year, stripping the grass from large areas.

1/ The boundary between the Sarre and Toulekedi perimeters should be adjusted at the time of survey to follow as nearly as practical the continental divide, so that the Sarre perimeter will include the watershed draining into the Faloume and Senegal Rivers while Toulekedi will contain drainages sloping mainly southwestward.

The perimeters are located between the 600mm and 700mm isophytes; however, since 1964 the rainfall at Bakel has varied from a high of 900mm in 1967 to a low of 391.7mm in 1972. (Appendix B) The average for the past ten years has been 567.3mm falling over an average period of 40.4 days. The rainfall occurs mostly between late May through early October, with most of it falling during July through September. It may fluctuate 15 days to a month at the beginning and end of the rainy season, but can normally be expected to last 4 to 5 months, with a dry season of 7 to 8 months.

C. Present System of Range Management

The present livestock population of the villages in the project area is roughly estimated from vaccination records and experienced observation to be approximately 11,200 cattle and 17,000 sheep and goats. It should be noted, however, that although these statistics, especially for sheep and goats (which are not vaccinated) may be somewhat inaccurate, they are the present best estimate.

In the Sarre perimeter there are ten permanent villages supporting an estimated sedentary human population of 2000, who reportedly own approximately 6500 cattle and 9700 sheep and goats.

The Toulekedi perimeter is sparsely settled primarily because of insufficient water, and contains only 5 permanent villages with a total estimated population of 1190 persons, who reportedly own 4500 cattle and 7350 sheep and goats.

The cattle herd is composed of mostly (50%) Zebu + N'Dama crosses, which carry some resistance to trypanosomiasis. An estimated 30% of the herd is pure N'Dama and 20% pure Zebu. The emphasis on crossbred animals is due to the presence of the tsetse fly, which favors a herder's having N'Dama cattle, and the demand for milk which favors his owning the Zebu cattle. In general the crosses are not as large as the Puel zebu, but are of good quality for traditional herds.

The herd composition shows a large percentage (60%) of females, probably due to the emphasis on milk production and involvement in a market system. Only 3% of the herd are breeding bulls and 9% are steers. The remaining 28% (which is low due to high mortality) are immatures.

1. The Herding of Cattle

With the exception of the animals being milked, the cattle are herded out from the villages during the rainy season when water and green forage are available. At the end of the rainy season the animals move back towards the village, utilizing water from temporary ponds as long as it is available. As the temporary water supplies dry up the animals are brought to the villages or to the river for water and to graze on the cropland and forage available on the areas within walking distance. (The village cattle are herded by hired herders, Peuls, who care for herds of

100 or 150 animals, including some animals of their own). All the cattle are kept in one 2/ herd including bulls, steers, young and females (those no longer milking). There is not a conscious effort to identify cattle by distinguishing marks because each herder knows his own cattle well. Markings visible on the animals are due to traditional "cures" for worms or injuries and not for identification.

The animals producing sufficient milk for human consumption are kept near the village year around and are milked each morning, after which the calves are allowed to nurse. The nursing calves are kept in the village all day and are cared for by the women and children. In the evening the animals are returned to the village, the cows are again milked and then the calves are again allowed to nurse. It should be emphasized that the milk flow is reduced substantially during the dry season. Further, the combination of removal of milk for human consumption and undernourished cows results in undernourished calves, which in turn contributes substantially to the very high calf mortality rate.

The sheep and goats in general remain closer to the villages than do the cattle and provide much of the milk and most of the meat consumed by the villagers and livestock owners.

The Sarre perimeter, being better watered, closer to the river and containing a larger number of villages, is more heavily used than Toulekedi. In both perimeters the areas within grazing distance from the villages are heavily overgrazed. This is due not only to too many animals but also to poor management practices, including concentration of the animals around the villages and excessive trailing to and from the villages. This results in trampling and erosion (this is partially due to the lack of water and partially to the traditional practice of having the animals close to home for milking etc.)

The livestock being grazed in both perimeters are owned mostly by the following groups:

(1) Villagers inside the perimeter

(2) Villagers from nearby villages

(3) Transhumants from Senegal and Mauritania who traditionally graze their animals in the area for certain periods of time.

2/ Note, with the bulls running with the herds, breeding continues the year round.

(4) Transhumants who traditionally graze their animals elsewhere but due to drought or other reasons bring their animals to the area.

(5) Persons en route to other areas, including the market.

The extent of the use of the range resources by each of the above groups is not known; however, numbers of animals will vary greatly with the season, undoubtedly reaching a peak during the rainy season.

2. Present Stocking Rate.

The present stocking rate is unknown and undoubtedly fluctuates from year to year. At the time of observation (April 19-23, 1974), the cattle in general appeared to be in good condition indeed. Some of the bulls and dry cows could be considered almost range fat, which would indicate that they are receiving sufficient nutrients from the unburned grass to meet their needs during this late portion of the dry season when the nutritive value of the forage should be nearly at its lowest point. Both the local G.O.S. authorities and the few villagers questioned reported that cattle were not receiving supplemental feeds. The fruit or pock from the acacias and other trees which might add protein to their diets appeared to have been gone months before. In general, therefore, one must conclude that the present overall stocking rate is within the carrying capacity of the range and there does not now appear to be a heavy population pressure on the land for either grazing or cultivation.

Nevertheless, due to inadequate water supplies and poor management practices, the areas within dry season grazing distance are being seriously depleted with loss of vegetative cover and top soil. In addition, with uncontrolled burning (either by accident or design) each year of 50 to 70% of the total area, concentrations of animals cannot be avoided. Further, cultivation around thevillages is on a traditional slash/burn basis, which results in further degradation of the land resources. Land to be cultivated is allocated by the village chief and elders. Based on the population of the two areas (approximately 3,100), it is estimated that about 3,500 hectares are under cultivation at any one time within the perimeter, 3/ primarily for the production of millet, grain sorghum and pulses during the rainy season.

3/ Assuming approximately 500 families each cultivating seven hectares.

The Tukoleur have a relatively intensive agricultural system. They combine rotational cultivation, annual fields, annual valley bottom fields, inundated areas, and small scale irrigation on sides of creeks and rivers during the dry deason. They grow large and small millet in the rotational fields. These fields are planted for 2-4 years in succession, depending upon the yield, and then left fallow for 4-10 years depending upon the kind of soil, amount of land pressure and time needed to restore fertility. Around their villages the Tukoleur also have smaller gardens of corn. They are annually cultivated and fertilized with manure. Women plant pulses or rice in flooded zones. Other than the rice fields, agriculture is primarily men's work. Crops may be planted in bottoms of streams following the end of rainy season. Small cash crops for family consumption or vegetable gardens may also be planted during dry season along streams and rivers irrigated by simple use of watering cans. The basic implements for cultivation are the short handled hoe and the axe, both of local manufacture.

The pattern of Soninke villages is not much different. Soninke (Sarakolle) villages tend to be large, with their agriculture also based on millet production in slash and burn fields, and corn in annually cultivated fields around the village. They also use valley bottoms and inundated areas. There is some evidence that Soninke women participate more in farming than do Tukoleur women. Some Sarakolle own plows but use them only in sandy areas, where they are not impeded by tree roots.

D. Description of Project

1. Summary Description

The project consists of the development of an integrated range management system within two grazing zones totalling 110,000 hectares. This integrated system is to be achieved through the construction of firebreaks, development of water resources establishment of a comprehensive animal health program and the provision of technical assistance and participant training. The project would be implemented over a three year period under the responsibility of the Ministry of Rural Development and Hydraulics.

The project would comprise the following inputs:

a. Fire Prevention

(1) Firebreaks - This would involve the provision of equipment for the construction and annual maintenance of approximately 500 km of firebreaks within the project area. Construction would be carried out with a combination of capital and labor intensive technology. Maintenance would be carried out almost entirely with labor intensive methods.

(2) Fire Suppression - This would involve (a) the construction of lookout towers and (b) the provision of miscellaneous equipment (e.g. walkie-talkie radios, backpack water pumps, portable high pressure pump units, hand tools, etc.) for volunteer fire-fighting units.

b. Livestock Water Development - This would involve constructing and maintaining up to:

(1) 12 earth reservoirs

(2) 5 sand reservoirs;

(3) 30 deep pits;

(4) 40 shallow-dug wells;

(5) 4 deep wells; and

(6) 4 water spreading dikes

c. Animal Health - This would involve strengthening the Livestock Service of the Ministry of Rural Development and Hydraulics to enable it to carry on a sustained campaign to vaccinate project area animals against important endemic diseases and to provide regular treatment of sheep, goats and cattle against parasitic diseases. The following construction items and equipment will be provided.

(1) 3 veterinary posts

(2) 10 vaccination corrals (8 cattle/2 sheep-goats)

(3) 2 quarantine posts

(4) Equipment and medicine for 16,000 animal units (e.g. vaccines, lab equipment, transportation equipment, identification and handling equipment, etc.)

d. Technical Assistance - This would involve financing advisory services of long-term and short-term consultants as follows:

(1) Long-term Consultants - (two to three year tours)

(a) Range Management Specialist

(b) Livestock Specialist

(c) Stock Water Development Specialist

(d) Mechanic (Peace Corps)

(e) Ag. Extension Specialist (Peace Corps)

(2) Short-term Consultants

(a) Geologist/Hydrologist

(b) Well drilling Specialist

(c) Water spreading Specialist

e. Participant Training - This would involve the provision of non-degree academic/practical, observational and in-country training for the following positions:

(1) Academic/Practical Training will be provided for the following Senegalese personnel associated with the project:

(a) Project Director (1 year)

(b) Interim Project Director - following return of Project Director (1 year)

(c) Chiefs of the Sarre and Toulekedi zones (six months).

(d) Two Senegalese counterparts to the livestock specialist (six months)

(2) Observation Training of 4-6 weeks will be provided for the following central government personnel from the Ministry of Rural Development and Hydraulics

(a) Director of Livestock Service

(b) Director of Hydraulic Service

(c) Director of Water and Forest Service

(d) Director of Rural Extension Service

(e) Director of the Office of the Minister of Rural Development (Permanent Secretary).

(3) In-Country Training should be provided as necessary for operational personnel under the project (e.g. grazing association chiefs, perimeter council members, topographic and dam layout survey crews, etc.)

2. Detailed Discussion of Project Components.

a. Range Management

(1) Organization

(a) Legislation

Under the project, two grazing zones totaling approximately 110,000 hectares will be established by a decree providing the necessary legal base for management and development of the land and the livestock resources therein. See page 53 for detailed discussion of legislation required for the implementation of the project.

(b) Administration

The project will be administrated by the Ministry of Rural Development and Hydraulics. The (livestock service) will bear primary responsibility. It will be assisted by the Water and Forest service and the Energy and Hydraulics Service.

In addition, an internal organization of cooperating herders and cultivators will work with the GOS administrative staff in managing the project. See(page 56) for complete discussion of the organizational structure.

(2) Functional Considerations

(a) Stocking Rates

Because little data is available on which to base estimates, the carrying capacity of the grazing lands in the perimeters is difficult to estimate. From the Abercrombie and Moeller Report of 1/21/74 one could conclude that the present year-long carrying capacity would vary from approximately 8 hectares in the Sarre perimeter to about 12 hectares per animal unit (1 cow or 8 sheet) in Toulekedi. It also states that grazing management could bring about rapid improvement. Other estimates have varied from 5 to 17 hectares.

One GOS official thought that carrying capacity in both perimeters was about the same. Total forage production should increase substantially if the project grazing management and fire suppression programs are effectively implemented. Reducing the burned area from the present 50-70% range to 10 to 20% should increase forage availability by perhaps 30 to 50%. The benefits from improved management practices should substantially increase the total production as well. As the range is to be grazed by sheep and goats as well as cattle, the carrying capacity requirements per animal unit will be less than if the range were grazed solely by cattle. The sheep and goats will graze on many of the shrubs and forbs not normally eaten by cattle (they will also help keep shrubs and forbs in check).

Probably an overall stocking rate of 5 hectares per animal unit, when developed, may not be overly optimistic.

However, in view of the very limited data available, a more conservative year-long stocking rate of seven hectares per animal unit (1 cow or 8 sheep) has been set, subject to adjustment as project implementation proceeds. During the first year of operation grazing in general will be limited to the animals owned by the villagers in or immediately adjacent to the perimeters and should be well below the estimated carrying capacity of approximately 16,000 animal units.

(b) Rotational Grazing

The following proposed rotational grazing scheme is based on (among other considerations) discussions with GOS officials, an evaluation of the current range conditions and the desire to minimize the disruption to the people and at the same time meet their needs in terms of improved management and development of range and livestock resources.

Under the proposed program the grazing system will, to the extent feasible, be based on a 4-block rotation, on a year-around basis. The boundaries of each block will be defined by a fire-break and where feasible shrubs can be planted to form a natural living fence.

It is recommended that between June 15 and and October 15 of each year the rotation system have a one-month rotational interval. This will ensure that each pasture is grazed for one month during the rainy season. Following October 15 a three month-rotation interval could be followed until the next rainy season. Under the proposed system, the Sarre zone would be sub-divided geographically into 5 grazing areas and the Toulekede zone into 4 areas, with each area having 4 grazing blocks. Although it is recommended that systems based on year-long grazing should be stressed, in the Toulekede perimeter, in particular, some blocks may be set aside for seasonal grazing in order to make the best use of the forage and water supplies and, to the extent possible, to best meet the needs of the Transhumants and others in the Ololdou region.

The animals grazing in each block should be divided into several herds and flocks rather than one large herd of cattle and one flock of sheep and goats. (To facilitate this approach, watering points will be strategically placed within each grazing block to the extent feasible.)

The milking herd will be handled basically in the same way as at the present time. It will be kept in the villages at night and graze near by during the day. The milking animals will be kept near the village only while they are producing milk for human consumption. As soon as production drops they will be moved out to graze with the main herd. It is estimated that 10% of the cattle and 20% of the small ruminants will be near the village and milking at any one time. The remainder will be with the main herd out on the grazing land.

Therefore, based on the needs of each village, an area adjacent to each village will be set aside for the animals to be milked. The milk animal area should also be subdivided into a four pasture rotation system to ensure adequate forage and to minimize overgrazing.

The main herd including rams, bulls, steers, stags, immatures and non-milking cows, ewes and nannies will be kept out on the grazing land. During the rainy season the cattle still stay out on the grazing lands at all times, not returning to the village at night. They will be kept in thorn corrals out in the bush. In the dry season the cattle will likewise be kept out in the bush but will also graze some of the croplands to utilize the crop residues and also to fertilize the croplands.

Initially all animals in the project area will be marked and numbered. Cattle will be branded by letters signifying the owner, and numbers to identify the individual animals. Sheep will be eartagged. Only this process will give permanent identification to every animal and also provide a good animal census. Each animal will also have a permanent paint dye placed conspiciously on its right ear for rapid differentiation between project animals and those from outside the project. Each year the young animals will be branded, tagged and dyed for identification purposes.

After each animal has been identified it will not be difficult to institute a system of basic record keeping to record sales, vaccinations, deaths, births, illnesses, etc., using the identification numbers. These statistics will be invaluable in evaluating the project.

Control of oestrus per se will not be a component of this project. However, basic means of controlling the breeding cycle will be demonstrated and encouraged. These practices range from the crude but effective traditional method of tying a string around the testicle and then tying it up to the sheath to more sophisticated methods such as breeding harnesses, etc.

Eventually a segregation of males and females and other more complex systems may be feasible, but simplicity is the present guideline.

Several new practices will be introduced under improved livestock management. These include castration of unneeded males, dehorning of cattle, improved veterinary facilities and regularized veterinary service as well as the large animal health program.

The land to be cultivated in each block should be specifically designated. This includes areas around each village as well as other traditionally tilled areas. However, if the rotational grazing system is to be accepted, the needs of both the herders and the cultivators must be adequately considered.

Based on considerable discussion with GOS officials in Bakel, Tambacounda and Dakar, it is believed that adequate accommodation can be made regarding the needs of both. This statement is based on the following assumptions: (1) the estimated number of hectares cultivated in the area is only 3,500, or less than 3½% of the total number of hectares in the perimeter; (2) most families in the project area own cattle as well as cultivate the field and thus are familiar with the potential for conflict and complementarily between the two systems; and (3) perhaps most important, that both groups are appropriately involved in the design of any rational grazing/cultivating system which is established within the perimeter.

It is highly probable that the villagers have a set crop rotation pattern which they have been following for years. Thus with their help, it should be possible to specifically identify the crop rotation plan inside the perimeter for the next 3 to 5 years. This would permit close coordination between the grazing and cultivating rotation patterns, thus facilitating the complementary aspects of the relationship.

The traditional system of slash/burn agriculture should be discouraged where appropriate. At the same time the use of crop rotation systems which include legumes and the application of natural fertilizer should be encouraged.

Controlled burning should be incorporated in the grazing plan to allow burning once every three to four years of those areas requiring such treatment.

b. Firebreaks.

As in most other Senegalese range areas, each dry season approximately 50-70% of the land in the project area is burned by accident or by design. The fires begin around December and end with the advent of the rainy season. In the project area, almost 100% of the fires are caused by man. Many originate from the slash/burning fallow cultivation operations. Some are set to burn the accumulation of coarse grass.

While properly controlled fire is considered an important range management tool, the present uncontrolled burning results in considerable loss of forage as well as damage to the vegetation and soil resources.

In order to ensure that adequate forage is available to for the livestock to permit the development of a rational management plan, it is imperative that unauthorized and uncontrolled burning be minimized. Only authorized burning can be permitted.

The following fire control program is envisaged;

(1) Fire prevention.

As most of the fires areman caused, strong publicity and educational programs are to be carried out in the Bakel-Kidira area by the forestry officers. Enforcement of the fire regulations will also be necessary; however, it is recognized that changes in traditional ways do not occur rapidly.

(2) Fire Breaks.

Fire breaks are important in stopping the spread of wild fires.

They will be constructed originally to serve the dual purposes of marking the boundaries of each grazing block and of serving as important access roads in the project area.

If it is later found that it is unnecessary to maintain all the grazing block boundaries as fire breaks, the firebreak system can be modified accordingly, thereby reducing the annual maintenance requirements.

Approximately 500 kms of firebreaks are planned for construction, of which 180 kms will form the exterior boundaries of the two grazing perimeters. The remaining 320 kms will form an interior cross network. The exterior firebreaks are to be approximately ten meters wide, and the interior eight meters. The brush chopped in the clearing operation will be used to form perimter boundary fences.

Firebreaks are to be constructed by a combination of hand clearing supplemented by mechanical means (project purchased D-4 bulldozers equipped with angle dozers and a wheel tractor equipped with a disc harrow) and fire. Mechanical clearing will be minimized in order to employ many unemployed and under-employed persons in the region. Approximately half of the fire breaks will be constructed by ten crews of twenty-five or more men with hand tools, and the remainder by tractor. Construction of the fire trails should commence early in November and be completed by December 31.

Annual maintenance should be accomplished largely by hand labor, supplemented by tractors and fire to the extent necessary to make efficient use of the hand labor and to minimize the clearing costs.

(3) Fire suppression.

For fire detection, two lookout towers will be constructed of local materials on high points in the Sarre. The lookouts, which will be manned during the fire season, will be equipped with radios for communication with the perimeter headquarters and with sirens to notify villagers to the extent possible.

Six walkie-talkie radios are proposed for the radio network.

Twenty fire brigades consisting of ten men each will be organized in villages. Each brigade will be equipped with water back-pumps, other hand tools and clothing necessary for effective fire fighting. They will be trained by the project forester and will serve without pay.

To provide additional support for the fire brigades, three portable high-pressure pump tank units of approximately 800 to 1,000 gallons capacity will be procured to be stationed in each perimeter and the Bakel office. The tank units will be fabricated to slip on a Landrover or other truck. (If desired, it can also be mounted at Bakel on a two-wheel trailer for towing to the fire). The project forester will train several operators for each unit.

Used fifty gallon oil drums are to be procurred for additional water supplies in support of the fire fighting units and brigades. Two portable submersible pumps may be necessary for the quick refilling of the tank units and barrels from shallow wells (up to 45 meters deep).

It is anticipated that local villagers will aid the fire brigade in the fire suppression activities.

c. Livestock water development

During the dry season water for both humans and livestock becomes acute. The Senegal and Faleme rivers provide the most reliable sources of water, either from water flowing in the channels or from shallow wells in the river beds where there is no surface flow.

A few shallow (up to 45 meters deep) hand-dug wells in villages provide the remaining dry deason water points. Temporary water is also available during the first part of the dry season in a few natural depressions and in the deeper borrow pits made during the construction of the Bakel-Kidira highway.

Both man and beast inhabiting the area suffer from the lack of adequate water during the dry season. Therefore when villagers living away from the rivers are asked what development they need most, they invariably reply "water". To make proper use of the range resources, substantial supplies of water must be developed for both livestock and humans.

For this reason the development of the water resources has been given priority in the project.

All water sources are to be explored in order to meet the requirements at the lowest possible cost. Both temporary (provides water during the wet season and part of the dry season) and permanent (year-long) water points will be developed.

(1) Surface water-points.

The rainfall reportedly comes mostly in relatively high intensity storms, resulting in considerable run-off in spite of the sandy loam nature of the soil. The channels observed in the Sarre perimeter indicate substantial flows during the past rainy season. The yield from the burned and bare areas is undoubtedly particularly high before a new ground cover is established. It is understood, however, that in the Sarre perimeter the high intensity and volume of the storms also cause substantial run off from the water sheds with good ground covers. (This should be verified by observing yield from portions of the drainage presently with good ground cover during the next rainy season, because good ground cover should be the prevailing condition after the project is implemented.)

While time did not permit a detailed examination of the water sheds, observations indicate possibilities for impounding surface run off by constructing earth dams, sand reservoirs or pits, depending on the condition of the sites.

(a) Earth Dams.

The construction of up to twelve reservoirs with earth fill dams varying from an estimated 3,000 cubic meters to 7,000 c.m. has been provided for in the two perimeters, subject to suitable sites being found. Part of the reservoirs can be designed for temporary storage and the remainder for permanent water points.

The sites must be carefully selected to avoid those with sandy bottoms.

Because the annual evaporation rate is estimated at 370 cm., depths of 8 to 10 meters will be necessary for permanent water points. Where feasible the material for the dam can be taken from the basins in front

of the dam, thus forming a deep pit which can, if necessary, be lined with polyethylene plastic sheeting to form an impervious barrier against seepage.

The ponds should be fenced, with controlled access for livestock and the necessary silt traps installed. If the ponds are to be used for human consumption as well as livestock, the water should be piped by siphon or pumps to troughs below the dam.

To provide employment, the dam should be constructed largely with hand labor supplemented by the D-4 tractors, with bulldozers and scrapers used to the extent necessary. (The tractors will also be used to construct fire trails and other facilities). Provision has been made to employ approximately 3 crews of 50 men each equipped with barrels and other tools.

(b) Sand Reservoirs.

Up to 5 sand reservoirs have been included for construction if suitable sites are found in the two perimeters. The sand reservoirs (similar to those constructed in Kenya)consist of a concrete or other impervious barrier being constructed at a point where the bedrock lies near the bottom of a sandy drainage channel. After the first few flows the basin behind the concrete barrier fills with sand and water.

The amount of water storage depends on the height of the barrier and the volume of the sand basin. Since the water is stored in sand, evaporation loss is minimized, and the water is filtered and clean.

A simple collection system with a pipe to an outlet below the barrier completes the installation. Should there be an underground flow, as may be in the case of some of the large drainages, the yieldfrom the reservoir is greatly increased.

The sand reservoirs can be constructed entirely with hand labor. One crew with up to 25 men equipped with hand tools and hand operated equipment for mixing cement has been included.

(c) Pits.

Deep pits (8-10 meters) appear to offer good sources of water. Some of the shallow pits (about 2 meters deep) created along the Bakel-Kidira highway during construction of the road appeared to have had water until around March. They also appeared to have been used extensively for watering livestock.

The construction of up to 30 pits is included in the water development plans, subject to the identification of suitable needs and sites.

Due to the high evaporation rate, the permanent pits should be eight to ten meters deep with sides approaching slopes of 1:1, and with a capacity of approximately two to four millions liters. Polyethylene liners with an overcover of soil will probably be necessary to prevent excessive seepage.

In some cases there may also be the possibility of fabricating a simple shade made from local materials (grass + poles) which, it is estimated, would cut down the rate of evaporation from 40 to 50%.

It is recommended that a hand pump system be installed for removing the water from the permanent pits rather than providing an excess slope for livestock. The area around the pits should be fenced to exclude animals. Small diversion dams and dikes equipped with silt traps would collect and channel the water into the pits.

As in the case of the earth dams, the pits could be constructed largely with hand labor equipped with wheel barrows and small tools supplemented by the tractors to the extent necessary for efficient construction.

Provision has been made for 5 crews of up to 50 men each for construction of the pits.

(d) Maintenance of Earth Dams, Reservoirs and Pits.

If the dams and pits are properly designed and constructed, maintenance should not be a major item of expense over the life of the installations.

A certain number of repairs and improvements will be necessary, however, particularly after the first time the installations are subjected to flood water and use. It should be possible to perform the annual maintenance requirements over a period of two to three months, with hand labor involving crews of 5 to 10 men.

(2) Ground water points

(a) Shallow wells

Away from the rivers the only source of permanent water in the perimeters is hand dug wells. The present wells vary in width from 1.5 meters to 2 meters or more and in depth from a few meters up to 45 meters.

The wells may be divided into two basic types.

(1) Wells dug in dry sandy stream beds. They are uncased and usually under 8 meters in depth and tap either an underground flow or water trapped in the sand. Each dry season the wells must be redug, as they fill with sand during the rainy season.

(2) The second type is permanently dug wells, cased with cement and going down 45 meters or more to bedrock. These wells have been constructed mostly by the Government and have a cross-beam/pully arrangement for hand extraction with a bucket. The water yield of the wells varies considerably but is generally relatively low.

At Toulekedi, the water in the well is now exhausted by mid-day according to the villagers. They then wait until the late afternoon for the well to recharge before drawing out more. The capacity

of the well could possibly be increased if it were deepened (now approximately 40 meters deep). However, the yield would probably do little more than meet the needs of the village and their several hundred animals.

The depth (usually 30 meters or more) makes extraction difficult and slow whether by hand or by animal power. Also, the relatively low yield of the wells makes the installation of pumping systems uneconomic as well as difficult to maintain.

Therefore, if water is found at a reasonable depth, drilled wells equipped with pipe distribution systems may be more economic.

Assuming, however, that hand dug wells will continue as the main source of permanent water, it is estimated that up to 40 wells may have to be dug or improved under the project. It is further estimated that each serviceable well will provide sufficient water for 200 to 500 cattle.

It is planned that initially the wells will be dug through contracts with experienced well diggers living in the area. The materials required for construction will be furnished under the project. The location of the wells and the supervision of the contractors will be directed by the Well Digging Brigade Chiefs attached to the Bakel Office. (The six Well Digging Brigades being organized in the Hydraulic Service with IRDB and UNICEF Assistance are already fully committed and may not be available for 18 months or more to assist in the well digging operations).

A portable drill for drilling small exploration holes up to 60 meters deep prior to starting the hand digging could help avoid hand digging dry holes or wells with inadequate yields. The procurement of such a drill is included subject to later feasibility determination.

Hand extraction of water from the wells to provide water for several hundred animals is a difficult chore. However, the use of windmills and motorized pumps has definite limitations, and maintenance problems usually rule out their use under project site conditions.

Although it is contemplated that the current system of hand extraction will be installed on the wells, a better method should be explored.

(b) Deep wells.

Current information indicates that in order to provide sufficient permanent water points in the perimeters, it may be necessary to bore up to four deep wells with plastic pipe line extensions. The nearest deep well is at Tambacounda. It is a large volume well (45,000 lts per hour) 553 meters deep used for the city water supply. Water rises in the well to a pumping level of approximately 40 meters.

Discussion with members of the Hydraulic Service indicate that sufficient water may be found between 100 and 400 meters in the project area. The wells may be costly to drill and to operate; therefore, maximum use should be made of plastic pipe distribution systems to minimize the number of wells required.

It is proposed that an U.S. geologist/ hydrologist experienced in locating stock water wells be recruited from the U.S. Geological Survey or by contract to make a reconnaissance of the project area and, in collaboration with experts in the GOS Hydraulic Service, to advise on possible sites and the feasibility of drilling wells in the area.

It is also recommended that an experienced U.S. well driller be contracted to advise on the best method of getting the wells drilled considering the availability of equipment that may be contracted in Senegal or neighbouring countries. It may be found advisable to equip the GOS Hydraulic Service with an air rotary drill to give the Service the capability to drill deep wells which will be needed not only for the project, but the development of stock water and irrigation wells elsewhere in the country.

(c) Maintenance of Shallow and Drilled Wells.

If equipped with a simple hand extraction system, the shallow wells should require negligible maintenance. However if pumps or complicated systems for drawing the water from the wells are installed, the maintenance costs will be higher. In any event a crew of one or two men should be organized to periodically inspect the wells and with the assistance of the users of the wells, perform any maintenance required.

In general, maintenance of the deep wells pump units will be carried out by the operators of the units with the assistance of expert mechanics when needed. Maintenance and eventual replacement costs should be provided for along with the operation costs. The well itself should not require any maintenance for a number of years.

The distribution systems will require periodic checking to ensure proper operation and for the performance of any maintenance required. A small crew of one or two men (possibly the same crew for shallow well maintenance) equipped with a few tools and materials will be required to keep the systems in good operating condition. Of course, the extent of the work will depend upon the magnitude and complexity of the distribution system.

(3) Rationale for Water Developments

An inventory of the present water supply in the two perimeters is not available. Nor are the present and future needs of the villagers and other inhabitants inside the perimeters known. It is certain, however, that very little permanent water exists compared to the needs.

The yield from many water developments to be constructed may be relatively low, thereby requiring more points than in areas of abundant yields. Also, if the water is to be extracted largely by hand, the number of animals that can be satisfactorily watered from one well is further limited. The necessity of establishing separate pastures around each village for the milk herds increases the number of water points over that of a project based on a straight beef herd.

Also the sites available for the shallow wells, reservoirs, pits, etc. are often so situated that not more than one grazing block can be served. Therefore, the number of small water points required will be far greater than if the entire supply system were based on deep wells and pipe distribution systems.

The yield of the deep wells and the extent of the distribution system that will be feasible from each well also remain unknown quantities until the first wells are drilled.

It may be found more practical and economical to serve the perimeters largely from drilled wells. If so, the number of hand dug wells would be accordingly reduced. Therefore, it is not possible to be precise as to the number and capacity of the water sources until there is more information, particularly as to the practicability of drilled wells.

Due to the unknown human requirement for water as well as the other factors mentioned above, water needs can only be estimated in the most general terms.

Some authorities on this area reportedly use a daily consumption rate of 30 liters per animal unit to cover the comprehensive needs of human, cattle, sheep and goats. On this basis the total daily consumption would approximate 500,000 liters a day or around 135 million liters over a 9 month period. The water development program proposed should fully meet these requirements. If it has been over estimated, the excess funds could be used for other project components or for developing water in extensions to the project area, thereby extending the benefits to other needy livestock producers in the area.

d. Animal Health

Comprehensive veterinary support is essential to the success of any livestock project. This is particularly true in Africa where almost every known infectious and parasitic disease exists. In recent years added stress from the drought has caused greater deterioration in animal health in the Sahel.

All concerned parties have recognized the importance of animal health as an integral part of this project. Thus, the U.S. and Senegalese teams spent considerable time addressing this problem.

(1) The Major Animal Health Problems in and Around the Project Areas

(a) Trypanosomiasis

The Senegalese reported that trypanosomiasis is widespread in both project areas. About 20% of the cattle currently present in the project areas are of the N'dama breed, which are trypanotolerant Another 25% to 50% are N'dama-Zebu crosses, which probably are partly tolerant to trypanosomiasis. Zebus make up about 30% of the total cattle population in the project area and are highly susceptible to trypanosomiasis. It was estimated that 50% of these Zebu cattle are infected with trypanosomiasis.

The role of the tsetse fly in relation to trypanosomiasis in the project area is not clear. Dr. McClennon, a British veterinarian and world authority on tsetse flies and trypanosomiasis told

us that according to data recently released by Dakar Hann, the project area is a tsetse habitat. However, it is likely that much of the infection takes place when cattle migrate south into other tsetse areas. In order to determine the role of the tsetse fly in the area, the following actions should be taken early in the project period:

(1) Blood smears should be taken from all suspected cases of trypanosomiasis in and around the project area. Often this can be most readily accomplished when cattle are brought in for treatment. The blood smears should be examined microscopically to determine the presence and species of trypanosomes. If t. congolense predominates, tsetse are probably involved in transmission. If T. vivax predominates, the infection was probably brought in by nomadic cattle, and tsetse are not involved in the project area.

(2) Survey teams should make an exhaustive investigation for the presence of tsetse flies in the project area. If tsetse flies are located, their distribution should be noted on a map, for interpretation by specialists in the field.

We were told that 6,000 to 7,000 cattle were treated for trypanosomiasis in the Department of Bakel this past year. If sufficient drugs had been available they would have treated about 75,000, or about half the total cattle population.

Dr. McClennon recommended that cattle be treated on their return from migration to the south. Sick animals showing trypanosomiasis in blood smears should also be treated. At present only Berynil and Homidian should be used. Both these curative drugs should be kept on hand in case the trypanosomiasis develops resistance to one or the other. Prophylactic drugs such as trypamidium should not be used at present but should be kept in reserve for later use in case tsetse flies are found to be prevalent in the area.

The presence of trypanosomiasis presents a serious problem but should not prevent the project from going forward if proper measures are taken.

(b) Rinderpest

As a result of the JP 15 rinderpest campaign, this disease did not appear in Senegal from 1968 until April 1974. Just prior to the team's arrival in Bakel, a herd of 53 cattle crossed into Senegal from Mauritania. Four of these cattle were ill with rinderpest. These four cattle were killed and the remaining 49 were returned to Mauritania. As of this date (April 26, 1974), there has been no reported spread of the disease in Senegal to Senegalse cattle. Dr. Henri Lipissier, formerly the international coodinator for JP 15, informed me in Dakar that the rinderpest vaccination program in Senegal had been very well maintained since the end of JP 15 here in 1969. Thus, it should only be necessary to vaccinate herd increases and any cattle not previously vaccinated. All calves vaccinated under one year of age should be revaccinated as two year olds. This is because colostral antibodies in the milk of rinderpest immune cows may block the immune response in calves. The colostral immunity persists until the calf is 10 months old.

(c) Contagious Bovine Pleuropneumonia (CBPP)

All cattle should be vaccinated once a year between November and February with the T. strain of vaccine. This vaccine provides immunity for about a year. Cattle should be observed closely after CBPP vaccination. With T. vaccine, observation cannot be maintained. The milder KH_3J CBPP vaccine should probably be used in N'dama cattle. The duration of immunity with KH_3J is about six months. The Dakar-Hann laboratory should make the decision as to which vaccine is most appropriate.

(d) Blackleg (Charbon Symptomatique)

This disease infects mainly calves from birth to cattle of three years of age. All cattle in this age group (which represents about 1/3 of the total cattle population) should be vaccinated each year.

(e) Anthrax (Charbon Bacteridien)

This is not a problem in the areas at this time. A vaccine is available for cattle, sheep and goats in case the disease should occur.

(f) Pasteurellosis

This disease occurs in swampy areas. Cattle in these areas should be vaccinated each year. They currently vaccinate about 10,000 cattle each year in the Department.

(g) Botulism

This is an important disease during the dry season and is associated with a calcium-phosphorus imbalance or deficiencies. The botulism toxin forms in the carcasses of cattle that die as a result of the drought or from other causes. Live cattle try to eat the bones of these dead cattle, apparently in an attempt to satisfy their craving for the deficient minerals. Botulism toxin is one of the most concentrated and lethal poisons known. Nearly 98% of the affected cattle die.

The provision of mineral mixtures in a salt lick helps to prevent botulism. In areas of high infection an anatoxin is used to prevent the disease. Two doses one month apart should be given. Immunity does not reach its maximum level until 15 days following the second innoculation. The anatoxin has no curative power once an animal is sick. Vaccination should be given at the end of the rainy season well before the dry season begins. Dr. Doutre of Dakar-Hann laboratory is a recognized authority on this disease, and he should be consulted if botulism presents a serious problem in the project area.

(h) Ticks and Tick-Transmitted Diseases

Ticks are prevalent during the rainy season. They transmit piroplasmosis, which is prevalent, and heatwater, which is apparently quite rare in the project areas. Ticks are also said to be associated with the skin condition known as streptococus, which may be a problem in Zebu cattle during the wet weather. N'dama cattle are resistant to streptorthricosis. Ticks are apparently not a major problem, but they should be controlled before they become one.

Dipping is the preferred method of tick control provided that the dipping vats are properly supervised and the chemicals are maintained at the proper concentration. Later, if the situation warrants, dipping vats might be constructed.

(i) Internal Parasites

Internal parasites present a serious problem in cattle, sheep and goats, particularly in the young. These parasites consist of stomach and intestinal worms and liver flukes.

Coccidiosis, an intestinal protozoan, is also important, especially in calves and lambs. Internal parasites are generally insidious and gradually debilitating but may cause losses equal to all other diseases combined. The Dakar-Hann laboratory should be requested to carry out a survey of the incidence and species of parasites involved. Treatment and management should be carried out according to laboratory findings and the advice of laboratory parasitologists.

(j) Other Disease Entities Considered

Sheep pox has recently made an appearance. This should be watched carefully since this disease can cause high mortality in lambs. A vaccine is available.

Brucillosis exists, but the extent is not know. As the project develops a survey of this disease should be made.

T.B. is said not to be a problem.

Foot and mouth disease is said not to exist.

(2) Proposed Organization of Veterinary Services for the Two Project Areas

Two veterinary posts will be provided in Zone A; one each where the main road enters and exits the zone. One veterinary post will be provided in the center of zone B. Each post will be staffed with one technical agent, two nurses and two laborers. These people will be directly responsible to the Engineer d'Elevage for the Department, who is in turn responsible to the Regional Veterinarian at Tambacounda. In other words, project personnel will be an integral part of the Service d'Elevage, but their sole responsibility will be in connection with the two project areas.

The reason for veterinarian posts at the entrance and exit of the main road is to insure that transient livestock do not transmit diseases to animals in the project areas.

Vaccination parks will be built at each post. Vaccinations, parasite treatment, trypanosomiasis examinations and treatments and other clinical procedures will be carried out at the vaccination park.

The following general procedures are recommended with respect to implementing an animal health project area:

(a) In general it will be the responsibility of the herdsmen to get the ill or injured animal to the veterinarian or the veterinarian to the animal.

(b) A regular vaccination, deworming, branding, spraying, castracion, and dehorning routine will be established, after the experimental work at Hann determines what parasites are present.

(c) It will be the responsibility of the herdsmen to get the herds to the work points at the appointed day and time. The livestock officer will notify them through their association.

(d) To record these events, the livestock officer will prepare a chart of the markings of all the animals he expects to treat that day. These charts will be mimeographed for the whole project. As each animal is treated, his marking or number will be crossed off. At the end of each treatment day the officer will have a record of what animals were treated and those missed. In the case of deworming, knowing what animals were missed in the routine will be very helpful in future diagnosis.

e. Discussion of Technical Assistance Component

The following U.S. technical support will be provided:

Two to three year tours

- Range Management Specialist (3 years)
- Livestock Specialist (2 years)
- Stock Water Development Specialist (2 years)
- Mechanic (Peace Corps) (2 years)
- Extension Agent (Peace Corps) (2 years)

Short Term Consultants

- Geologist/hydrologist
- Well drilling Specialist
- Water Spreading Specialist

(1) Long-Term Consultants

(a) Range Management Specialist (PASA or contract)

The range management specialist will have a key role, since the main project activities are centered around the development and management of the range resources. He will be responsible for assisting the GOS project director and staff in:

- Collecting and analyzing data necessary for planning the grazing system to be implemented, including division of the range into grazing blocks, and including but not limited to,

- Animal ownership patterns in project area,
- Land ownership patterns, current grazing patterns, carrying capacity of the range, human population of the project area and attitudes of the herders/cultivators,
- Determining the requirements for livestock watering points and other improvements,
- Coordinating grazing and cultivating patterns,
- Implementing the grazing program, including the control of trespassing,
- Evaluating range conditions and benefits of the management program

The range management specialist should make a short (approximately two weeks) observational visit to the project area during the 1974 rainy season and arrive in country o/a January 1, 1975, to begin his tour.

He should be well experienced in the administration of public range lands in the U.S. (e.g., someone from Bureau of Land Management of U.S. Forest Service).

(b) Livestock Production Specialist (PASA, contract or Peace Corps)

The livestock production specialist will work closely with two zone chiefs and the veterinary assistants. He will be responsible for assisting in:

- Carrying out a livestock census to determine herd numbers, composition, etc.,
- Collecting and analyzing data necessary for determining mortality rates, fertility and fecundity rates, growth rates, milk production rates, etc.,
- Establishing an animal identification system
- Establishing an animal health program,
- Advising on herd management

(c) Stock Water Development Specialist (PASA or contract)

The water development specialist will assist the GOS hydraulic technician in surveying, planning, designing, constructing and maintaining the sand reservoirs, earth dams, and pits. He should be experienced in constructing stock water developments such as those constructed by the U.S. Bureau of Land Management, Forest Service or Soil Conservation Service.

To observe run-off conditions during the rainy season, the specialist should make one or two short trips (2 weeks) to the project site during the 1974 rainy season (July-October). He should arrive in country o/a January 1, 1974 to begin his tour.

(d) General Remarks on Long-Term Personnel

To the extent that qualified Peace Corps volunteers are available for stationing at Bakel, they will be substituted for the AID-funded livestock and stock water development specialist. These experienced AID specialists will then serve as consultants to advise and assist the Peace Corps volunteers in planning and implementating the programs. As consultants, it is estimated that each must make up to five trips to the project area during the term of the project, for a total of 6 months.

If it is not possible to obtain Peace Corps volunteers, it will probably be necessary to headquarter the U.S. technicians and their families in Dakar, unless they are willing to stay in Bakel. If stationed in Dakar, it must be understood that they will each spend approximately three weeks each month at the project site. Two U.S. air-conditioned trailers approximately 25 feet long should be provided at Bakel for the USAID staff and consultants while on the project site. Living conditions and the remoteness at Bakel are such that it is not believed possible to obtain experienced U.S. technicians (PASA or contract) who would be willing to

live at Bakel. Stationing at Tambacounda is not considered advisable because of the distance to Bakel and also because of its remoteness and lack of facilities.

(2) Short-Term Consultants

(a) Geologist/Hydrologists (PASA or Contract)

The geologist/hydrologist is needed to advise, in collaboration with GOS technicians, on the feasibility of drilling deep wells in the project area. If drilling is feasible, the first site should be located. He should visit the area as necessary during the actual drilling operation. Based on the results of the first well, sites for the other wells should be located or further drilling be discontinued if found unfeasible. The geologist/hydrologist should be experienced in locating stock water wells in the U.S.

It is estimated that up to 4 trips to the project area will be required during the duration of the project, for a total of six months.

(b) Well Drilling Specialist (PASA or contract)

The well drilling specialist is needed to evaluate, in collaboration with GOS, contract drilling costs, and the equipment to drill deep wells available in Senegal and neighboring countries. He will then advise on the best method of drilling the wells considering the availability of equipment, including the possibility of procuring an air rotary drill for the Hydraulic Service. (This would include training a crew in its use to give the Service the capability of drilling deep wells. There is a great need for deep drilled wells to develop the country's ground water resources for irrigation and stock water).

The well drilling specialist should have at least 10 years practical experience in water well drilling operations. He also should have experience using air rotary drill rigs.

It is estimated that the deep well specialist must take approximately four trips to the project area during the duration of the project, for a total of eight months.

If it is necessary to purchase the drilling equipment and train a crew, his services would be required for a full two-years tour.

(c) Water Spreading Specialist (PASA or Contract)

The water spreading specialist is required to carry out the flood irrigation experiment. He will be responsible for assisting the project director and the Senegalese in determining the best location for the experiment, the design of the water spreading system and the implementation of the design.

The water spreading specialist should have at least two years experience in flood irrigation techniques. It is estimated that only one trip (of six months) will be necessary to complete this aspect of the project.

f. Discussion of Participant Training Component

(1) Training in the U.S.

The training program will be designed to provide academic, practical and observational training in the U.S. for selected GOS administrators and project technicians, primarily in the fields of range management, livestock production, stock water development, waterspreading, and range fire prevention and suppression activities.

(a) Academic and Practical Training

Project Director

The project director should be sent to the U.S. in the fall of 1974 to commence a nine months special academic program in the science of range management at a western university, such as the Univ. of California. Following this program, he will spend two months with the Bureau of Land Management and the U.S. Forest Service participating in western range management, development and administration programs and one month in Texas or Florida observing cattle management

and production techniques. Upon his return to Senegal, he will assume the position of project director.

- Interim Project Director

The interim project director will be in charge of the initial phases of project implementation until the return from the U.S. of the project director. The interim director will then go to the U.S. for the same type of one-year program.

Upon his return from the U.S., the interim director will assist the project director in implementing the project if necessary and also will initiate the planning and implementation process for new project areas.

- Chiefs of the Sarré and Toulekedi Perimeters.

The two chiefs of the perimeters should go together to the U.S. as soon as they obtain the necessary English language capability (not later than October 1974) to commence a six-months special academic and practical program in range management. Approximately one-half of this program should be spent at a western land grant university. Of the remaining time, approximately two months should be spent participating in actual range management programs being conducted by the Bureau of Land Management and U.S. Forest Service in the western states and the remainder in Texas or Florida observing cattle management and production techniques.

(b) Observational Training

A group of national level administrators should go by November 1974 to the U.S. for a 4-6 week observational training program. The group will visit one or two far western states and Texas (or Florida) observing primarily range management and water development practices, livestock production including feed lot operations, and fire prevention and suppression activities. Upon their return to Senegal they will use the

benefits from the tour in formulating policies and directing the activities of their services as related to the project.

It is recommended that the group consist of the following Directors; Director of Livestock Service, Director of the Hydraulic Service, Director of the Water and Forest Service, Director of Rural Extension Service. If possible an observational tour should be arranged for the director of the Office of the Minister for Rural Development, either with the above group or separately. If it is not possible for the four directors to go in one group, arrangements should be made for them to go in two groups.

A group of four regional level technicians representing the same services as listed above should to to the U.S. around the same time as the national level administrators for the same type of observation program.

Ideally they would accompany their national office directors, but if this is not practical they could go as a separate group or with a group with the same interests from other nearby countries.

(2) <u>In-Country training</u>

Special in-country training programs must be conducted as needed for the following groups:

(a) Grazing Association chiefs

(b) Perimeter council members

(c) Topographic and dam layout survey crews

(d) Crews constructing fire breaks

(e) Dam and water spreading crew foremen

(f) Fire pump unit operators + Fire suppression leaders

(g) Village firebrigades

(h) Village cultivators in improved forage cropping, harvesting and storage practices.

(i) Perimeter livestock owners in improved animal production, health and nutrition practices.

(j) Villagers who will plant forage crops in the water spreading systems.

(k) Other in-country training programs will be conducted as necessary to ensure proper implementation of the project and increased return to the livestock owners and village participants.

(3) English Language Training

In addition to the four medium-term U.S. participants, approximately 10 members of the project director's staff will receive English language training so that they can readily communicate with their U.S. associates and read important scientific and technical books and publications related to their specialities.

g. Other Associated Activities

Two activities which are related, but not essential, to the major project components will be included under the project: (1) a water spreading (flood, irrigation) scheme; (2) forage and revegetation trails.

(1) Waterspreading

The construction of simple water spreading systems to spread run off water over relatively level lands appears to be well adapted to the Sarre perimeter and other areas on which there is substantial run-off. The additional water available for infiltration into the soil should provide substantially more soil moisture. The growing period should be extended farther into the dry season. The production of forage and other crops should therefore be increased far beyond the present production. Reportedly the best crops are currently being produced on lands adjacent to the rivers, which are flooded when the rivers overflow their banks.

The same principle is involved in the installation of water spreading systems. Flood water is diverted from a channel and spread by a system of dikes over a relatively flat area, enabling the water to penetrate into the soil. The diversion structure can be a weir constructed from gabions providing

a controlled flow into a contour dike waterspreading system. A similar system was designed in 1963 by USAID range management advisor LELAND E. FALLON for installation in the Turkana region of Kenya (See "Waterspreading in Turkana - A Hope for an Improverished People", by Fallon). The dikes are constructed of compacted earth and vary from approximately 60 cm to 130 cm in height, depending on site conditions.

The diversion weir and dikes can be constructed entirely by hand. The land to be flooded should then be seeded to food, forage and other crops. The water spreading area can be planted and harvested on a communal basis or allocated to specific families or groups, whichever is in the best interests of the people and meets GOS policy.

Four small pilot systems totalling 100 hectares are planned for construction in the grazing perimeters. A construction crew of up to 100 men is envisage to build the pilot systems.

If successful, water spreading systems can be extended to cover possibly 3,000 hectares or more.

Although the stock water development specialist may be experienced in the design and construction of simple waterspreading systems, he should be fully occupied in assisting with the planning and construction of the earth dams, reservoirs and pits.

Therefore, a water spreading specialist is considered essential to assist the GOS technicians in making necessary topographic surveys, and in designing and constructing the systems. He should be experienced in the construction of simple water spreading systems such as would be an engineer of the U.S. Bureau of Land Management and Soil Conservation Service.

(2) Forage and revegetation trails

Two sites (one in each perimeter) of approximately 25 hectares each are to be established for conducting limited forage and range seeding trails including sprigging of indigenous and exotic species.

The trails would also include planting of shrubs and trees.

While a major revegetation program is not envisioned, the trails could materially benefit the villagers and further development programs.

The trails would be under the direction of the perimeter chiefs, with technical guidance from the project director's staff.

h. Discussion of Educational Component

During the design team's short study in Senegal it was not possible to develop the specific elements of the educational component of the project. However, considerable discussion took place with people from all levels of the Senegalese government, from the local representatives of Service de l'Elevage to the Minister de la Promotion Humaine (development of human resources). As a result of these discussions there appears to exist at all levels a clear understanding of the need for extension education if the project is to succeed.

It is accepted that the most important aspect of the project is the attitude of those most affected by the project (both inside and outside the project area). Indeed, the Ministeur de la Promotion Humaine (MPH) strongly emphasized that care must be taken not to let the technicians and administrators work alone, because they would, in the colonialist tradition, neglect the sociological aspects of the project, and it would fail.

In this context the Minister promised the full support of his Ministry in the implementation of the project. He emphasized that his Ministry involvement will begin with the initiation of phase I (detailed design of the project) and will continue as long as is required.

The Ministry's primary activity will be providing the project with experts with skills in teaching, sociology and village organization. These experts will have only limited knowledge of cattle raising, land

management and other matters related to the project. Thus, to effectively carry out their project responsibilities, the people assigned to the project would require training in these areas.

In addition to training, these experts would need limited housing and transportation. However, since the Ministry of Rural Development had not contracted the MPH prior to the design team's discussions with the latter, these requirements could not be quantified in the time available.

However, the Minister of MPH indicated that the specific involvement of his ministry would be developed in coordination with the Ministry of Rural Development and Hydraulics, and that information regarding this involvement would be made available by the end of May. The Minister also pointed out that it would be useful, in terms of ensuring the positive participation of the people in the project area, if health nutrition and practical education elements were included under the project, such as medical and maternity centres with emphasis on preventative aspects of health and nutrition through education.

Thus, in view of the brief but positive discussions with the Ministre de la Promotion Humaine, and the critical importance of an adequate education component, up to $100,000 additional funding may be required under this component of the project.

PART II - SECTION II Project Analysis

A. Management and Organizational Analysis

1. Legal Consideration

After U.S. and Senegalese officials sign the official agreement, it will be necessary that the Senegalese authorities issue certain legal documents.

An existing Senegalese law, called the Law of National Domain, states that all land belongs to the government, with individuals having only useage rights. To define and limit the useage of the land, an administrative decree will be required setting aside the land in the project as a "pioneer zone" and describing in detail the land useage under the project.

The first draft of the decree will be prepared by the detailed design team sent out under the project in close collaboration with local GOS officials and inhabitants of the project area. To be sure that the cultivated areas, grazing areas and local administrative structure are clearly defined, the final draft will be prepared by the Ministry of Rural Development and Hydraulics.

The final draft will be forwarded to the Ministry of Justice in the GOS to assure that it is in concert with the Law of the National Domain and any other existing decrees of a similar nature.

Once approved by the Ministry of Justice the draft will be presented to the Ministries of Finance and Plan for their approval before being forwarded to the Prime Minister for his approval.

The final step is presentation to the President, whose signature makes the decree final and effective.

2. Staffing

a. Government of Senegal

The Ministry of Rural Development will be responsible for implementation of the project through the following agencies:

(1) The Service de l'Elevage et des Industries Animales (Livestock and Animal Industry Service) will be responsible for the overall direction of the project and for the range management and animal

(2) The Service des Eaux et Forets (Water and Forest Service) will be responsible for constructing and maintaining the firebreaks and for fire control activities.

(3) Service de l'Energie et de l'Hydraulique (Energy and Hydraulic Service) will supervise the construction, operation and maintainance of stock watering structures.

(4) Ministry of Promotion Humaine (Human Development) will be responsible for the education of herders, organizing the herder association and after the project is underway introducing the "Animation Rural" program in the project areas.

b. Bakel Staff

A project office will be established at Bakel. It will be headed by a project director, who will be responsible for the overall execution of the project. The project director will be an animal husbandry/veterinarian and will serve as counterpart to the USAID or Peace Corps range management advisor. It is proposed that the project director receive range management training in the U.S. as outlined in the training section.

The Bakel office will also include one accounting officer and a secretary to handle the logistic details.

The staff at Bakel will also include (1) a forester who will be responsible for directing the construction and maintenance of firebreaks, fire prevention and control activities, including training the village fire fighting units and for planting any trees or shrubs required. The forester will receive technical guidance and assistance from the regional forester at Tambacounda. (2) Two engineers from the Hydraulic Service, one of whom will direct the planning and construction of the surface water developments, i.e., stock water dams,sand reservoirs and pits. He will serve as counterpart to the USAID stock water development specialist. The other engineer will be on a short-term basis and will

direct the planning and construction of the pilot water spreading systems, with the assistance of a U.S. expert. (3) Two well digging chiefs from the Hydraulic Service will direct the digging of shallow wells.

A garage will be established at Bakel for the maintenance of the vehicles and tractors. Two GOS mechanics will be advised by a U.S. Peace Corps mechanic, if available.

c. Perimeter Staff

In addition to the Headquarters Office in Bakel, there will be a limited staff stationed on each perimeter.

The perimeter staff will be headed by a chief of the perimeter (technician deputy level from the Livestock Service) who has received three to six months training in range management in the U.S. The chief will be responsible for the implementation of all project activities within his perimeter. It is estimated that approximately 70 percent of his time will be spent on the planning and implementation of the grazing management program. The chief of the Sarre perimeter will be assisted by two livestock agents and one laborer to carry out the animal health activities. The chief of the Toulekedi perimeter will have the same staff plus three additional laborers.

There will also be an operator/maintenance person for each deep well and up to eight guardians to patrol the boundaries of the perimeters if found necessary to prevent trespass.

d. Organization of Perimeter Herders/Cultivators

The following general management program is envisaged. Each owner authorized to graze animals in the perimeters will be issued a permit, which will specify the location and number of cattle, sheep and goats he can graze. The project director will issue the permits annually or at such other times as necessary

The cooperation of the herders is essential for the projects success. They must participate in the management of the two zones, especially with regard to questions directly effecting them.

In this context Senegal is in the process of implementing an administrative reform aimed at developing regional planning and greater decentralization than presently exists. "Communates rurales" (rural communities) are being established. At present this is a pilot project but it will be extended to other areas of the nation, including Eastern Senegal, sometime after 1976.

Under this program each rural community will have a great deal of financial autonomy, which should provide the impetus for its own development. A management budget will be included for supplies and equipment to finance local projects. This information is included in the Fourth Development Plan for Senegal.

The Senegalese authorities feel that eventually the Bakel project could be integrated into such an infrastructure, as a rural community.

In this spirit, and because it is considered that the project will function at maximum efficiency only if the members are associated in the management of their own affairs, an internal organization of the herders and cultivators in the project area has been foreseen.

As discussed, there will be a cattle rotation plan based on management within a four-block area. Each of these four block areas will choose a "committee". This committee will enable the herders to participate in the planning, development, and management of their grazing area. Each committee will appoint from among its members a chief and an assistant, who will be responsible in association with the technical staff to see that the grazing and livestock management plans are adhered to and that trespassing by members and outsiders does not take place. There will be five such committees in Sarre zone and four in Toulekede zone.

These committees thus stand as the base unit of what may be termed an "internal cooperative association".

At the zone level, there will be established a "conseil" (council) made up of the chief and assistant of each committee. Thus, for the Sarre zone the council would have approximately ten members, and for the Toulekede zone approximately eight members. A council president and secretary will be chosen from among the members.

This council will advise on matters relating to policy, overall zone management and development plans, disputes, enforcement and such other matters as deemed appropriate.

The committee and councils will work closely with the chief administrative officer of each zone and will thus have an important role in the enforcement of the management programs.

A coordinating body, an "assemblee" (assembly), will exist at the higher level to deal with matters of common interest to both zones. It will be composed of members appointed from the two zone councils.

This internal structure is in line with that foreseen for the rural community system under the Senegalese local government reform plan.

3. Evaluation of Institutional Capabilities

a. Government of Senegal

The GOS has a very well-trained cadre of experienced officials at all levels in the Ministry of Rural Development and Hydraulics. They appear technically capable but lack experience in range management. Their capabilities in this new field will be strengthened through the participant training component of this project. Further, it is planned that the lower level technicians directly involved with the project will have detailed expertise in the range management field before U.S. technical assistance is withdrawn and that ministerial level officials will have been introduced to U.S. range management concepts and will have a basic understanding of project goals and objectives.

We are confident that the GOS is completely capable of implementing this project.

b. Local Organization

The organization of the herders and cultivators into a management association for the project area is a practice which in a formal sense is new but which in an informal sense, on a smaller scale, is a part of their culture; i.e. allocation of cultivation lands, etc.

The organization of inter-village groups is now a major emphasis of the GOS, and the projects internal management plan meshes very well with this new GOS program. The people are interested in having a voice in their own destiny and thus are receptive to this kind of an organization.

Thus, it is felt that these local associations can and will be organised and will play an active part in the management of the project area.

B. Technical Feasibility of the Project

1. Appropriateness of the Technology

The proposed integrated range management and animal health programs are in accordance with sound practices related to animal manipulation, and the improvement of vegetation, soil and water resources and animal health, which are prerequisites to the sustained recovery of Senegal's livestock industry.

The Governmental decree which will be issued to establish the two grazing perimeters will provide the necessary legal base and regulations for implementation of the management and development programs.

A concerted information program is to be conducted to ensure that the people are fully aware of the program and its objectives and restrictions.

Through their associations and councils, the livestock owners and cultivators will participate in the planning and implementation processes of the project. They will have an active part in the prevention of unauthorized use.

The GOS veterinarians, technicians and officers responsible for the project are to be given training and U.S. technical support in the implementation of the administrative and technical aspects. The above legal, administrative and local user inputs should prevent a breakdown in the management system which could happen if the important aspects do not have a sound base.

The water developments proposed are designed to meet the water needs of the project. They are based on the sound principle of utilizing all available sources of water to the extent necessary to meet the needs for livestock distribution and management at a minimum cost.

The fire prevention, fire breaks and suppression activities are designed to provide maximum protection from fire at a minimum cost.

The medicines and equipment provided under the proposed animal health program are designed to provide added protection for the animals in the project area.

These physical inputs in combination with the proposed management improvements are believed sufficient to ensure the technical feasibility of the project.

2. Environmental Impact

The management program, which is designed to halt vegetation and soil depletion, and the fire program, designed to minimize the destructive effects of fires, can have only a beneficial effect on the environment. Presently large areas (50 to 70%) are laid bare to erosion and degradation each year from fire and abusive grazing practices. The project is designed to stop this.

Construction and maintenance of the firebreaks is to be done largely by hand to minimize soil disturbances. It will not be necessary to remove the trees - only the bush material. Most of the land is relatively flat. The firebreaks should avoid slopes.

The dams and water spreading systems will contribute to halting erosion and damage from wild floods. The dam embankments will be planted to grass to provide a good ground cover against erosion.

The overall effect of the project on the environment will be positive.

- Economic Feasibility

1. The Economy

The political independence of Senegal was accompanied by three principal events which had a momentous impact on the country's economic development during the past decade. First, the disintegration of former French West Africa, of which Dakar was the capital, deprived Senegal of most of its traditional export markets for manufactured products, with a consequent decline of activity and under-utilization of capacity in many establishments. Secondly, the departure of most of the French military and civilian personnel, who had been concentrated in Dakar in colonial times, resulted in a fall in demand for locally-manufactured goods and a stagnation in construction activity. Thirdly, the gradual phasing out of the guaranteed price for groundnuts on the French market started in 1964 and led to a 20 percent fall in average export prices. As groundnuts (including processing) account for almost 20 percent of GDP and 75 percent of exports, this sharp fall had a substantial impact on the overall economic situation of Senegal. The price decline was only partially offset by EEC price subsidies obtained from 1964 to 1968. The difficulties created by these events and the lack of vigor in Government policies to overcome them, combined with the country's meagre natural resources, help account for the performance of Senegal's economy during the decade after its independence.

In the early years after independence, the Government's responses to the adjustment difficulties were insufficient and often ill conceived. The marked depression in the modern sector of the economy and the knowledge that groundnut prices would soon have to be reduced should have induced the government to rapidly implement a sizable program of public investments, concentrating on quick yielding projects in directly productive sectors, particularly agriculture. However, the inherited ponderous administrative apparatus was not geared to respond quickly to the new situation, and government policies remainded strongly administrative and very slightly development oriented. In line with pre-independence policies, the First Development Plan (1961-1964) concentrated on investment for social and transport infrastructure, including housing, urban water supply and administrative building. Investments in rural sectors accounted for less than 20 percent of total development outlays. Furthermore, they concentrated on an expensive and technically premature irrigation project along the Senegal River, which did not yield satisfactory results for almost a decade.

Since 1968, the sharp increase in groundnut export prices together with the partial recovery of the volume of groundnut production has led to a sizable growth of GDP (at current prices) after four years of virtual stagnation. Over the 1968-1971 period GDP increased by over eight percent per annum. A substantial amount of the increase in resources was channelled into investments; the incremental savings ratio increased to a high 18 percent, raising the average savings rate from 12 percent to 13.5 percent in 1971. Nevertheless national savings have not kept pace with the almost 14 percent annual growth in investments since 1968, spurred by increased absorptive capacity in the public sector and a generally more optimistic business outlook in the private sector. Higher foreign aid and a dramatic reversal in capital flows (from a net outflow reaching six percent of GDP in 1968 to a net inflow of over two percent of GDP in 1971) have reduced the widening resource gap. Moreover the recent rise in the Central Bank rediscount rate from three to five percent and the accompanying increases in commercial bank rates on deposits and savings are expected to increase the availability of local resources for investments by stimulating local savings, and more importantly be reducing the outflow of liquid assets by foreign companies. Furthermore, they may stimulate foreign borrowing by local banks as well as by foreign companies operating in Senegal. However, the magnitude of this change will be limited because of the recent rise in interest rates in foreign money markets.

Improvements since 1968 in the overall economic situation were interrupted in 1972 by the severe drought Senegal has been experiencing during the last several years. It caused a sharp fall in rural production, not only of groundnuts but of virtually all crops, and seriously decimated livestock herds. Preliminary estimates suggest that GDP stagnated in current terms and declined in real terms. Substantial emergency food aid has been necessary to prevent widespread malnutrition. This has demonstrated how strongly Senegal's economy remains dependent on weather conditions despite increasing diversification over the last few years into regions less affected by drought and into activities (manufacturing, tourism) not dependent on weather.

2. Livestock Sub-Sector

In spite of favorable conditions (Sahelian climate, unused agricultural areas estimated at 30 percent of the country, and large local demand for meat), Senegal has not used its comparative advantage in livestock. Between 1959 and 1971, the cattle herd increased at about two percent a year to an estimated level of 2.65 million head, with an estimated off-take of eight percent. During the same period, the population of sheep and goats increased at about three percent a year with an estimated 25 percent off-take rate. Several factors explain the poor livestock performance.

First, neither the agricultural nor the livestock sector has been given high priority by the Government. Between 1965/66 and 1970/71 the livestock sector accounted for only (one) percent of the Central Government's current budget, while allocations to the rural sector as a whole amounted to only 5-7 percent of the total. It is estimated that the increase in current budget outlays has not kept pace with the increase in livestock herds, although the latter is low considering Senegal's potential. Insufficient current outlays have hindered extension services in their task of improving livestock raising techniques. Lack of extension service field personnel and equipment have been major reasons for the lack of progress in the methods used and, therefore, the low off-take and growth rates of cattle, goats, and sheep. While substantial foreign aid has helped maintain health standards, and while a successful vaccination program has been implemented as a result, a mass epidemic is still possible.

A second major constraint has been the insufficient infrastructure for livestock raising, i.e. a lack of veterinary outposts, wells and firebreaks, etc. From 1965/66 - 1970/71, only one to three percent of Central Government capital expenditures were for livestock development; foreign aid financed more than 70 percent of these. The Third Plan (1969/70 - 1972/73) originally included 28 projects in the livestock sector, for a total of CFAF 2.5 billion. This program was reduced to CFAF 1.6 billion in the Readjusted Plan, a decrease from two to 1.4 percent of total plan outlays. This was particularly regrettable in view of the already low allocation made to this sector in the original plan and the potential of this sector, which could substantially reduce the disparity between urban and rural standards of living. Of equal concern is the fact that by November, 1972, more than three-quarters through the Third Plan, less than one-third of the Readjusted Plan projects in this sector have been implemented.

A third factor is the inadequate level of commercialization. According to the World Bank Report this problem is largely the result of inadequate communications within the existing market mechanism, which in turn allows a monopsonistic advantage to certain intermediaries. This situation has resulted in low prices to producers (CFA 35 to 40/kg on the hoof). However, the drought has changed this situation substantially. The design team learned that the price has doubled, to 70 - 80/kg on the hoof.

No doubt the closed nature of the market system is an important constraint to increased commercialization. However, while the system appears overly complex and restrictive, evidence indicates that it is highly efficient and the efforts to change it must be undertaken with caution. (e.g., the FED experience at Dole ranch.)

Based on information obtained by the design team, an equally important constraint to commercialization may be the fact that cattle have served traditionally as a storehouse of capital as well as a symbol of status, rather than as a commercial enterprise. Although this concept is slowly breaking down, the transition could be substantially accelerated if proper incentives were applied under suitable risk circumstances and supplemented by appropriate education. This would require a comprehensive approach to the development of livestock resources.

However, several reasons make it doubtful whether such a program can be immediately implemented. First, the drought has seriously affected the livestock sector, particularly in the north and center of the country, where the highest concentration of livestock can be found. Despite the absence of reliable estimates, heavy losses have undoubtedly occurred, which may hamper development for many years. In addition, experience shows that livestock projects are difficult to implement. This is particularly so since there is still no fully tested satisfactory solution to the problem of developing livestock on a large scale that could be implemented rapidly. Thus, over the next few years Senegal will have to implement a series of pilot projects that will hopefully provide some answers on how best to exploit this very important potential. In consequence, developments in the livestock sector will necessarily remain limited over the next years, but can be expected to speed up substantially toward the end of the 1970's.

In this context the G.O.S. has entered into negotiations with the F.E.D., I.B.R.D. and A.I.D. to obtain financing for projects involving varying approaches to range management on a pilot basis. The objective of this effort is to establish a model (or models) for a large-scale, medium-term approach to livestock development.

3. Microeconomic Description of Project Area

The present system of livestock production in the project area appears to be influenced as much by sociological considerations as by economic considerations. Traditionally the cattle have served as a storehouse of capital and as a status indicator rather than as a productive enterprise for either their meat or milk. The herder's primary objective was to maximize his asset accumulation and not to gain maximum economic returns. As was indicated above, this traditional concept is slowly breaking down, and with proper incentives under suitable risk situations the change to a market economy could be accelerated. While this project is not directed at encouraging commercialization per se, increasing involvement in the cash economy will be one of the results.

The project area will serve two basic markets on a commercial level. One is the local Bakel market and the other an "export" market consisting of the deficit areas of Senegal (Dakar and the Casamance).

The local market is presently utilizing approximately 2000 cattle per year and a large number of sheep and goats for the 6000 Bakel inhabitants. A significant portion of the cattle slaughtered in Bakel are brought from Mauritania. This apparently results from a combination of factors. First, the increased demand for CFA by Mauritanians following Mauritania's departure from the Frank zone. Second, the higher price available in Bakel (although the price [150 CFA/kilo] established by the Prefect in Bakel Dept. lower than the minimum established by National Government [175 CFA/kilo]). Notwithstanding the above, it is likely that Mauritanian cattle sold in Bakel are older ones which would have difficulty making the trip to Tambacumda or Dakar. However, nearly all the Senegalese cattle sold in the Bakel market come from near Bakel, and the project area is a prime producer of these cattle.

The "export" market (meaning sent to other areas of Senegal) is far more important because, given the scale of our project, the market is of limitless capacity.

Senegal is a net beef importing country and its urban areas exert a high demand for meat. Assuming a normal

growth of the economy and a continuation of the present high rate of population growth, over the next five to ten years this demand is expected to continue to grow more rapidly than national supplies, thus providing a constant market for project animals.

The cattle are moved from the range to the market by a group of traders, 20 of whom operate in the Bakel area. These traders collect cattle, buying a few animals from several different herders, to make up a herd to be moved to a market area. Transport at the present time is largely by walking because it is much cheaper than by rail (180 CFA/head vs 2000 CFA/head by rail). Unless this price differential is reduced, the railroad is not likely to become an attractive alternative in the near future. In addition to a decrease in cost, an increase in the speed of movement and the development of proper facilities at the railheads and in transit are necessary to make the rail system a feasible alternative.

The project will include two formal markets to provide additional organization to the commercial system. Weigh scales, which have been quickly adapted in other projects, will be available, and sales on a per kilogramm basis will be encouraged. The present trade system will be utilized, and the most of the animals will probably be walked to market.

4. Summary of Benefits

The benefits of this project fall into three categories: real, cash and asset maintenance. The first two are measurable and quantifiable for normal economic analysis. However, the maintenance of an essential national asset, rangeland, is difficult to measure and impossible to quantify.

We have made a distinction between real and cash benefits because much of the increased production, especially milk, will be consumed by the herder and his family. Their improved nutrition constitutes a real benefit possibly even greater than the cash value of the milk. For our analysis we valued the auto consumption of milk at its lowest market price of 50 CFA per liter and the auto consumption of meat at its lowest market price of 10,000 CFA per head. In analyzing cash returns, marketed milk was also valued at 50 CFA per liter.

Commercialized beef, however, is valued at present prices to the herdsmen in the Bakel area for different types and grades of cattle. Although there is no absolute grading system for the cattle, the larger and better animals are usually assembled for the walk to large markets, while lower-grade animals are sold in the local market and used for auto consumption.

Sheep and goats provide a substantial benefit in the area. First, they are an important source of meat production. Second, they are especially important for auto constumption (even more important than cattle). Third, they produce much milk. Fourth, their reproductive rate is high, permitting a high off-take rate. Mutton and goat meat enjoy a premium price in the markets, selling about 15% above beef. Goat and sheep milk is price the same as cows milk.

Methodology and Assumptions.

The methodology used to determine meat off-take and sales, and milk production and sales was taken from J. Dirck Stryker's "Livestock Production and Distribution in the Malian Economy; AID; August 20, 1973." Using this methodology, an independent analysis was made based on discussions with the Senegalese (government and non government), in the Bakel area data from the "Ankony Angus Corporation report; Feasibility Study for Industrial Meat Production in Senegal, Aug. 1971;" and data from the SEDES Report, "Meat Supplies in West Africa, March 1973."

GOS statistics and estimates of cattle herd composition in the project area indicate a very high percentage (60%)of females, probably because the herders of this area are mostly sedentary and thus maintain producing animals. This may also indicate that they are already in the market economy, since the older males are sold. The value placed on females is illustrated by the fact that females command a very high price in market (30,000 CFA of more). The fecundity rate of the cattle herd is presently estimated at 60%, but calfhood mortality is very high (50%) and adult mortality (one year +) is about 12%. This allows an offtake of about 8% (national average) and a growth rate of 3%.

The sheep and goat herd also has a large percentage of adult females (70%). Fecundity is high (110%) with many twins and some triplets noticed. The offtake rate is 25%

and the growth rate 1%. The sheep and goat herds have generally been neglected by both the GOS and outside donors and therefore statistics of any kind are nonexistent. The assumptions made are our best estimate after limited discussions with some herders and GOS livestock service officials.

The primary impact of the project will be an increase in fecundity to 65% in cattle and 125% in sheep and goats, a decrease in calfhood mortality to 40% in all livestock and a decrease in adult mortality to 8%. Over the life of the project the growth rate is expected to decrease to an average rate of 1% and the offtake rate is projected to increase to 14% for cattle and to 40-45% for sheep and goats. (See table in economic Annex). Present production of milk for human consumption is estimated to be 150 lt. per milking cow and 75 lt. per milking sheep and goat per annum. This is projected to increase to 300 lt. per annum for cattle and 150 lt. per annum for sheep and goats. These assumptions were based on GOS estimates which were confirmed by World Bank consultants in Dakar.

The estimated benefits from both milk and meat have been divided into cash benefits and real benefits for the purpose of analysis. Such a division not only provides an estimate of the actual cash benefits which will accrue to the herders as a result of the project but also an estimate of the real benefits which will accure to them.

This division provides greater flexibility for example, in terms of relating cash benefits to recurrent costs. It also provides the basis for a calculation of the internal rate of return.

The cash benefits resulting from the project are estimated at $151,000. Assuming 16,000 animal units in the grazing perimeter, this represents a net incremental return of $9.44 per animal unit per year. Against this, the recurrent costs of the project are estimated at $134,000 per year, or $8.37 per animal unit. Thus the annual cash returns to the project are nearly double the recurrent costs.

In this context it was agreed with the GOS representatives that (a) in order to minimize the financial burden of the project to the government, and (b) to maximize the herders'

participation in both the administration and the financing of the project, a fee should be charged the herders.

Given the above estimates, it would be theoretically possible to charge a fee sufficient to cover some recurrent costs. However, in discussions with GOS officials it was agreed that while the herders in the perimeter would be advised in the beginning that a fee would be charged, the actual collections would not begin in the first year. At the same time it was agreed that the money collected should remain under the project to defray actual expenses rather than go through the Ministry of Finance.

Further, although it is agreed that, in principal, recurrent costs should be covered to the maximum extent, neither the precise amount of the fee nor the date at which it should begin was established. These questions will be further analyzed during the study phase. A more detailed discussion of the fee is presented in Annex J.

The project's real benefits, which basically include auto-consumption of meat and milk plus additional milk sold, are estimated at $520,000 annually. On an animal basis this amounts to $32.50 per animal unit.

Based on these estimates, the internal rate of return is calculated to be just under 12% (see Annex I).

In view of the importance of rainfall (and the unpredictability of its level) with respect to the carry capacity of the grazing land, a sensitivity analysis was carried out to determine the effects of various rainfall levels on project benefits. This analysis shows that a return to pre-drought levels of rainfall will add to the benefits, particularly the cash benefits. A continued decline in rainfall to a lower level (33 mm) decreases the benefits, but not below the breakdown point. (See chart Annex I). The return on investment would then, of course, be considerably lower.

The third type of benefit, maintenance of the rangeland, has not been quantified or included in the calculations. This is because although it is measurable and observable, it is not quantifiable in dollar terms, since in this area land presently has only an intrinsic value and no cash value. Nevertheless, this real benefit will result from the project and therefore deserves mention. It has been

observed that for may years the rangeland has been decreasing in productivity due to over grazing, burning and poor management. It is the expressed purpose of this project to halt this deterioration and possibly even to begin a regeneration. Halting degeneration is a benefit because it maintains the productivity and thus the intrinsic value of the land, while without the project the land would continue to deteriorate. This becomes particularly important if rainfall declines further over the next several years. In that case the maintenance of the present productivity and value of the land would be the major benefit, as without the project the deterioration would accelerate.

For similar reasons (difficulty of measurement) the indirect benefits of the project have not been quantified either. Nevertheless, during the construction phase the use of labor intensive methods will generate a great deal of employmnet; this, too, is an economic benefit. Also, during the operation of the project laborers will be employed for maintenance, and thus there will be a continued employment benefit. Furthermore, the over $50,000 spent in administrative salaries will be at least partly spent in Bakel, further stimulating the economy of the area.

D. Financial Soundness

1. Estimated Project Cost

The grand total project cost is estimated to be $2,308,100. This includes an estimiated foreign exchange requirement of $1,313,700 and a local cost requirement of $994,400 equivalent. Of this latter amount, AID will fund $754,400 and the GOS $240,000 equivalent. Tables A and B provide a summary breakdown of project costs. For a detailed breakdown of project costs see Annex K.

It should be emphasized that the above figures represent the total financial outlay required to implement the proposed project. However, if one charges to the project only the cost of the capital equipment actually used in carrying out the project (assuming the equipment is productively used for other purposes during the remainder of its life), ignoring other costs associated with research trials (i.e., water spreading, forage and vegetable trials) and recurrent costs (e.g., vaccines/drugs, mineral/salt mix, and POL related to operations), one can derive the real cost of establishing the grazing perimeter and developing G.O.S. capacity to operate a managed grazing perimeter.

With the above objective in mind, the following assumptions were made:

(1) That work on a second grazing perimeter of approximately 100,000 ha. will begin with the completion of that proposed in the project.

(2) That the second grazing reserve would be located close enough to the proposed perimeter that it could also be administered out of the Bakel Office

(3) That the infrastructure (e.g., water resources, firebreaks, etc.) established in the second perimeter would be approximately the same as under the pilot project.

(4) That the appropriate equipment purchased for the Sarre/Touloukede perimeters would be immediately transferred to the replication perimeter once they are completed.

Based on the above assumptions, the real cost of implementing the proposed project was estimated to be approximately $1.6 million. See Annex L for a detailed breakdown of these costs.

Notwithstanding the substantially lower estimated costs of the project, the higher financial costs are used throughout for purposes of economic analysis. Thus the returns projected are based on conservative assumptions regarding cost.

TABLE A

Senegal Livestock Project
Funding Requirements for First Three Years
(in thousands of US Dollars)

US Financed

		FX	LC	TOTAL
I.	Infrastructure	200.0	414.4	614.4
II.	Equipment	529.7	14.0	543.7
III.	Animal Health	25.0	140.0	165.0
IV.	Studies/Evaluation	90.0	41.0	131.0
V.	Education	25.0	75.0	100.0
VI.	Technical Assistance	380.0	60.0	440.0
VII.	Participant Training	64.0	10.0	74.0
	Sub-Total U.S. Financed	1313.7	754.4	2,068.1
	GOS Financed		240.0	240.0
	GRAND TOTAL PROJECT COST			2,308.1

TABLE B

SENEGAL SAHEL LIVESTOCK PROJECT

THREE YEAR FUND REQUIREMENTS

YEAR

	1	2	3	TOTAL
U.S. Foreign Exchange	703.7	450	160.0	$1,313.7
Local currency	296	415	43.4	754.4
Total U.S.	999.7	865	203.4	2,068.1
Senegal Local currency	31.0	75.0	134.0	240.0
Project total	1,030.7	940.0	337.4	$2,308.1

2. Financial Plan

The proposed financial plan of the project calls for AID to fund all foreign exchange and some local cost. Initially, the GOS will cover only administrative salaries associated with the project. However, beginning with the third year of the project the GOS will begin financing all recurrent local costs.

TABLE C

	Foreign Exchange	Local Cost	Total Cost
AID Contribution	1313.7(100%)	754.4(75.9%)	2,068.1
GOS Contribution		240.0(24.1%)	240.0
	1313.7(56.9%)	994.4(43.1%)	2,308.1(100%)

E. Social/Anthropological Feasibility

Sociology/Anthropology of the Area

It should be emphasized that the team spent less than one full week in the project area. Thus, it was not possible to adequately assess the potential sociological and anthropological effects of the proposed project. What follows, therefore, are basic impressions gained during the all to brief stay in the area. The methodology followed during the site visits was to visit a different village each day and to visit each of the different ethnic groups involved.

Ethnic Composition of the Area

The Department of Bakel is composed of members of the Sarakolle, Tukoleur, Peul, Bambara, Wolof and Maure ethnic groups. Of these the principle groups located in the project area are the Tukoleur, Peul, Sarakolle and Maure.

The Tukoleur, the largest group in the area, speak a language known as Pular. They have been a sedentary people for hundreds of years, always blending agriculture with the keeping of animals. They are a highly stratified society -- the most accurate comparison is a caste society. The old ruling caste, which apparently still has substantial influence in the area, is known as the toorobbe. Its members continue to hold positions of leadership in the villages and dominate the religious hierarchies of the mosques.

The next caste is called the rimbe, which means "free". This group includes those who do not owe service to the toorobbe, but who cannot become religious leaders or chiefs. The artisanal caste, the nyeenybe, continues to provide the rural areas with weavers, blacksmiths, potters, musicians, etc.

The Peul speak the same language as the Tukoleur. Although there are both sedentary and nomadic Peul, it was not possible to obtain an accurate breakdown of the number of each in the project area.

The Sarakolle (also known as Soninke) also speak Pular and are living in permanent sedentary villages. They, too, have a highly stratified social system. The Horo are free men who are led politically by one family and religiously by another. The Nyamakala caste includes the artisans and certain other unidentified groups. The Komo are apparently the slave and/or serf class. In the Sarakolle villages

there is apparently a high continuity between the present chiefs of villages and the old ruling families.

Little was learned about the Maures, many of whom are apparently come from Mauritania to spend the dry season near the Senegal river and some of the wells around Gabon. There are also a relatively large number of Maure merchants in the town of Bakel.

Transhumance Because of the short time frame and the fact that the visit to the site coincided with the height of the dry season, it was not possible to determine the importance of this phenomonen in the project area. The team was advised by our Senegalese counterparts that the practice of transhumance was not significant.

There were indications, however, that many of the Tukoleur in the area move their cattle toward Ferlo and Gabon (see map) to find pasture and water for their animals. There were also indications that some transhumants and nomads come into the area from Mali and Mauritania, although their numbers and significance could not be learned.

Some recent studies indicate that the practice of transhumance is seen as a necessary, not desired, way of life. For example, a sociological study for a livestock program in the Fleuve and Ferlo regions of Senegal considered this aspect in detail ("Projet du Developpement de l'Elevage dans les Regions du Fleuve et du Ferlo, Societe d'Etudes pour le Developpement Economique et Social," Paris, 1972). It was concluded that increased sedentarization would be a welcome means of taking on a lifestyle closer to that of the other population groups in Senegal. Transhumance in search of water and forage was not seen as a traditionally desired pattern so much as a necessity without any aspect of choice. It is the young who usually follow the herds, and they will welcome the change.

Land Tenure Although under Senegalese law all land is "owned" by the state, there are apparently well defined and understood rights regarding the "use" of land at the village level. However, the differentiation between "ownership" and "use" were not readily apparent. Among most of the groups in the project area, land is held by kin groups and is handed down from the kin group to the newborn.

The nature of the claim on land and just how it would effect the project are not known. Thus a more intensive study of this critically important factor must be undertaken prior to the implementation of the project.

Herding vs. Cultivation. Nomads and transhumants have been losing ground in the face of the expanding number of cultivators, (this appears to be the continuing case in Bakel), especially since the beginning of French colonialism. Thus there has been, and to a lesser extent still is, some conflict between herders and sedentary cultivators (see article by Jean Gallois "Les Societes Pastorales Ouest-Africaines Face au Developpement" in Cahiers d'Etudes Africaines, 1972).

The system appears to be moving inexorably toward an integration of cattle-keeping and cultivation. The movement of animals is being adapted to cultivating patterns, and the cultivating patterns are being adapted to the presence of animals. The basic problem is how to facilitate this transition at the least cost to those affected by it.

Restricting the Use of Grazing Lands in the Project Area. The question of restricting the use of grazing land under the project must be evaluated from two levels; (a) not allowing herders from outside the project area to enter the perimeter; and (b) restricting the herders inside the project area to a predetermined grazing pattern. Because of the very little time available it was not possible to determine specifically who is using the land and when, or what, if any, restrictions there are on the use of the land.

Apparently there are few if any restrictions placed on the use of "bush" areas (i.e., non-village and non-cultivated areas) for grazing. Further, to the extent that any restrictions have existed in the past, it is probable that the drought has nullified them.

In what ways will the project affect this system? How can these affects be minimized?

Water rights appear to be more specific. In villages with cemented wells, the well becomes the domain of the village. Although village wells are open to use by other humans, they are not used by the herds of other villages or groups unless specific permission is granted. Thus, having already linked access to water to a system of control, this aspect of the project may be more easily understood and accepted by the villagers.

In addition to analyzing existing rights to pasture and water, it is also important to consider links and ties which are not limited to villages. For example, people have kinfolk not only in neighboring villages but also in Mali, Mauritania and other parts of Senegal. With these relationships also go certain rights and responsibilities. To what extent will the proposed project interfere with these?

It is clear from the above discussion that a more detailed analysis of the area is required in order to minimize the social change.

Commercialization. Livestock raising can be said to have sociologically limiting factors only if one takes into account the potential capital represented by a herd of cattle. The key point to remember is that the traditional management of a herd, as widely carried out, may not appear coherent according to Western economic criteria. However, it must be understood and taken into consideration before any new type of management plan is implemented, especially one based on a Western model.

The herd is often the property of a family group whose members may also be engaged in other activities. This is particularly true for that part of the herd which is the property of groups of cultivators. The herd is certainly seen as a means of production, but it also is a socio-economic "capital," whose acquisition is intimately related to social relations and ties existing between and among individuals and groups.

This capital is almost always considered a kind of insurance. In case of financial difficulty, it will be converted into cash only when the problem cannot be resolved by other means of production - harvest or salary. This capital permits the fulfilling of social obligations or the increasing and intensifying of these social relations. The herd is thus considered as one of the tangible manifestations of a family's power. Seen in this light, the quantity of animals in a family herd appears more important than their quality or the manner in which the herd is economically managed. The herders are often reproached for this. Seen in isolation, the preference for quantity over quality may appear to be very uneconomic behavior. But in this socio-economic system, the "credit" which an individual or a family has at its disposal is measured in part by the

number of intermediate elements permitting it to make new marriage ties or to reinforce bonds of kinship. Moreover, the possibility of being able to handle large or unforeseen expenses by the sale of a few animals, without seriously compromising the family "insurance capital," is a kind of security.

One of the principal motivations of the cattle raiser is this a search for security, which is often represented by the quantity of cattle he possesses. In fact among both the Tukoleur and Peul the word for cattle is "dyaudi". This is also the word for "wealth".

Any improvement in grazing land and water resources will be accepted by the herders. However, the desire for quality over quantity will perhaps take longer to bring about. To accomplish this it will be necessary to show that the socio-economic "benefits" that a cattle raiser can obtain from fewer cattle of a higher quality will largely compensate for the advantages that he presently receives from a large herd of perhaps mediocre quality, subject to periodic losses.

The provision of an improved water and food supply for the animals will in itself lessen the dependence on quantity as a safeguard against loss of the herder's capital.

In general, the sociological factors limiting what we might term a rational exploitation of the herd stem partly from the insecurity caused by physical factors (lack of an assured supply of food and water) and partly from a global economic conception which cannot be analyzed merely in terms of "classical economics".

A change in the "behavior" or "attitude" of the herders should result, therefore, from technical changes in the physical conditions of livestock raising and from better marketing and commercialization conditions. The resulting regular and greater monetary revenue should certainly be an incentive to change.

It is clear from the above discussion that the sociological implications are numerous and complex. Therefore, prior to implementation, a more detailed sociological study will be undertaken as soon as possible following the signing of the capital Agreement. The terms of reference for this study are presented in Annex D. The study will take approximately three months to complete and will play a major role in the detailed design of the range management system implemented under the project.

In further recognition of the complexity of the issues involved under the proposed project it will be implemented in phases. The first phase will include a pilot effort in a one block area to develop guidelines for the implementation of the project throughout the perimeter.

F. Other Donors AID to Senegal

Historically the largest donors to Senegal have been the European Economic Community and France, but recent world developments (political changes, the oil price rise, etc...) have changed this picture as new donors rush to assist Senegal recover from the disastrous drought. In the past year Saudi Arabia with a nine million dollar contribution for water development, Canada with an eight million dollar contribution for water resource development, and the Peoples Republic of China with a 44 million dollar contribution for dams and water supplies have overshadowed the contributions of France and the EEC, so that these latter sources are presently providing only five percent of the total $82,780,000 aid to Senegal. See table for summary of aid by country.

The other donor assistance which is of the most interest to us in this project is the World Bank livestock program in Eastern Senegal, which is very complementary to our project. They are attacking the same problem that our project is, but they are taking a slightly different approach. They are treating an extensive area, all of the Eastern Region except Bakel, with a much wider scope project than ours, including marketing. There will be small controlled areas within their project area, but most of it will be open grazing with additional water provided. This open grazing area will give an improved area to those transhumants who previously used our project area to graze their stock. In addition, their market system, in which an auction sale on a per kilo basis will be attempted, will provide additional outlets for the offtake from our project and will encourage quality animals in terms of higher weights. They will be setting up one of their markets in Bakel and therefore will be very convenient.

The FED is also planning an integrated livestock project in the Northern region, near Ferlo. This project envisages a 1.6 million dollar grant for four pilot projects based on obtaining water from boreholes to grow irrigated forage

crops and to provide stock water for a controlled grazing area. In addition they will provide many other boreholes 25 kilometers apart to provide additional stock water. Close cooperation between the FED technicians and the technicians on our project will allow a free interchange of ideas and assistance on mutual problems.

The FAO projects in Senegal are concerned largely with research on improved exotic forage. Open discussions with the FAO could provide a basis for our minor adaptive research.

AID TO SENEGAL CALENDAR YEAR 1973 - MAJOR DONORS

Source	Sum	Purpose
F E D	3,108,000	cash grant
FRANCE	1,060,000	cash grant
SAUDI ARABIA	9,200,000	water resources
IRAN	2,550,000	water resources
African Development Bank	4,000,000	undefined
UNITED NATIONS	452,000	wolldigging teams
CANADA	8,000,000	water resources
FEDERAL REPUBLIC OF GERMANY	5,600,000	water resources
I B R D	3,000,000	water and livestock
PEOPLES REPUBLIC OF CHINA	49,000,000	dams and water supply
U S A I D	1,500,000	misc.
CATHOLIC RELIEF	150,000	misc.
OTHER	160.000	
TOTAL COMMITTED	$87,780,000	

Proposed		
IBRD	9,000,000	Livestock Eastern Region
U S A I D	3,000,000	Livestock - Bakel
TOTAL IN FARM PROPOSAL	12,000,000	

A. Project Execution

1. Implementation Plan

In view of the complex nature of the proposed integrated range management project, the fact that it will involve a modification of certain traditional practices of the people in the project area, and the lack of range management experience within the responsible Ministry, the project will be implemented on a phased basis as follows:

Phase I - Project Study Phase. This phase will involve carrying out a detailed design study, including the following major tasks:

(1) Review available material relating to the proposed integrated range management scheme (e.g. AID program documentation, especially the CAP) as well as materials relating to the project area, (e.g. sociological, anthropological, economic, vegetation studies, etc.). Based on this review, the consultant will identify major information gaps as well as major items requiring verification in the field.

(2) Also based on this review, design a baseline data collection and analysis system to serve the following two basic functions:

(a) To provide the basis for the collection and analysis of data required to properly evaluate and modify the proposals contained in the CAP;

(b) To provide appropriate baseline data to permit the evaluation/measurement of the socio-economic impact of the project over time,

(3) Collect and analyze the data.

(4) Prepare a detailed recommendation for implementing the project and prepare draft of required decree and

(5) Design an impact analysis system which will permit an evaluation/measurement of the socio-economic impact of the project over time.

Prior to the initiation of the study, the GOS will name the technical staff members of the project administration. The director, the forestry technician, the hydraulic technician and the chiefs of the zones will work with the study team in developing detailed recommendations for design of the grazing scheme as well as assisting in writing the draft decree.

During this phase also, initial steps will be taken toward developing the herder organization. At a minimum, representatives will be selected from each village in the project area to work with the study team and their Senegalese counterparts. As one of its tasks, the study team, working closely with its Senegalese counterparts, will develop recommendations regarding the appropriate organizational structure for the herder association as well as the responsibilities and authority to be granted to the association.

Phase II - Accelerated Development of Single Block. The second phase will involve the accelerated development of a single block within the project area.

However, before the beginning of any construction, indeed before the delivery of any equipment to the project area, the decree must be finalized, i.e., signed by the President. Thus by the end of November a final draft of the decree will have been completed. By the end of December the decree should be finalized.

This schedule coincides with the arrival of the equipment, which should occur sometime in January 1975. Thus by the end of January, 1975, construction should begin in the accelerated development block.

This area will serve as a testing ground for the hypotheses, concepts and techniques outlined in this paper. Having the benefit of a large technical staff, the area will get off to a fast start and will serve as a demonstration area. The pilot area will be completed with facilities in place, water development completed and the organizational structure, both GOS and local committee, in place before June, 1975, so that the range and livestock management can begin in full following the rainy season.

After three or four months of the 1975 - 76 dry season have passed, a detailed evaluation of this accelerated development area will be done using, to the extent feasible, the same staff that developed the evaluation criteria under phase I. This evaluation will show how the concept has worked and will form a basis for modifications needed before developing the rest of the project.

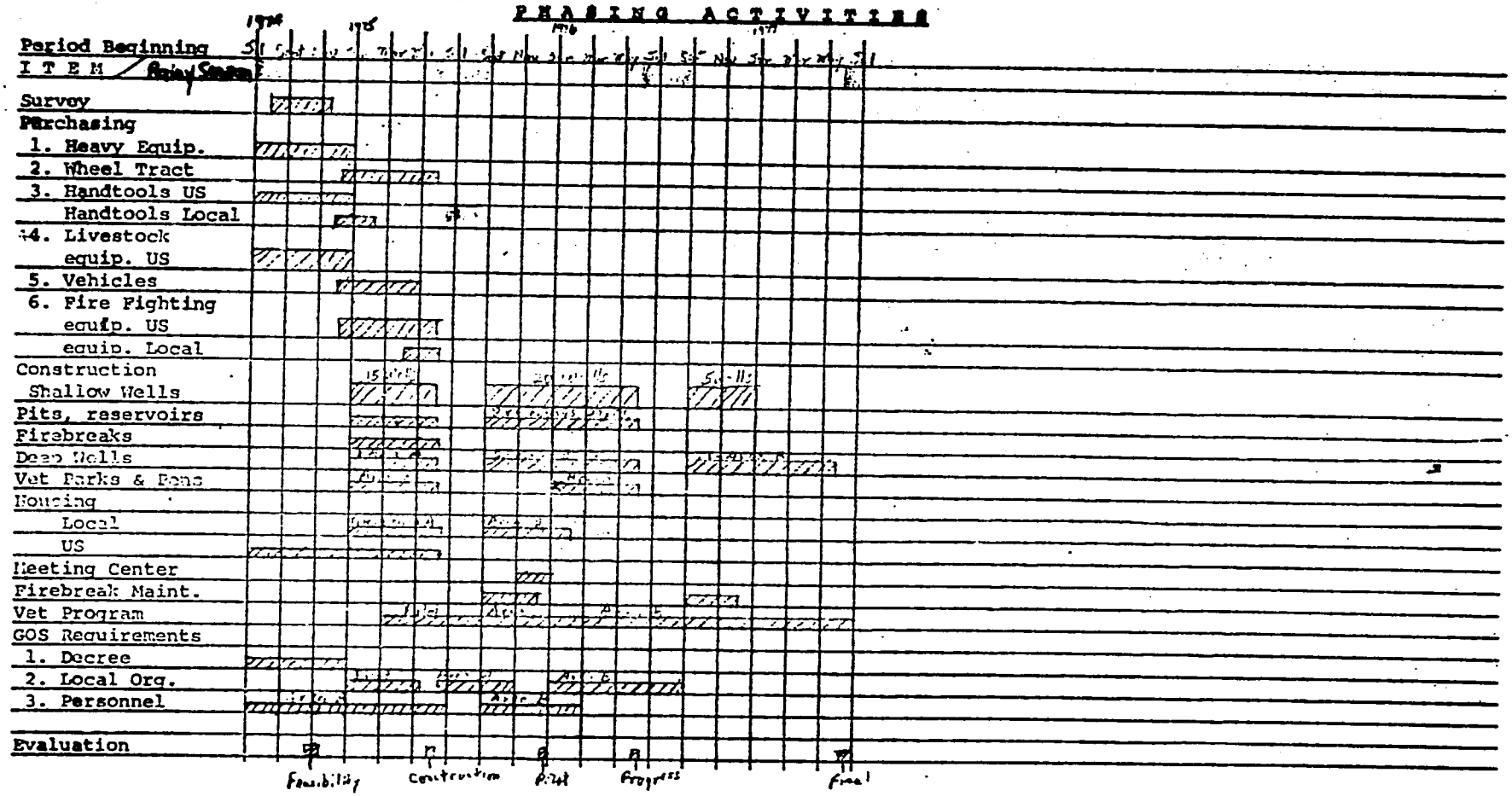
Phase III - Development of the Sarre and Toulekedi Zones. This work will begin in the 1975 dry season but will not be completed until the 1976 dry season. Lessons learned in the implementation of the accelerated development area will be utilized on an on-going basis in developing these zones.

The development of the Toulekedi zone will begin as soon as the pilot zone evaluation is completed. This zone will develop more quickly because the watering points are bore holes which, although they require more time than digging wells, are substantially fewer in number and can be completed more quickly. The population, both animal and human, is less dense than that in the other zone, and thus fewer sociological problems are foreseen.

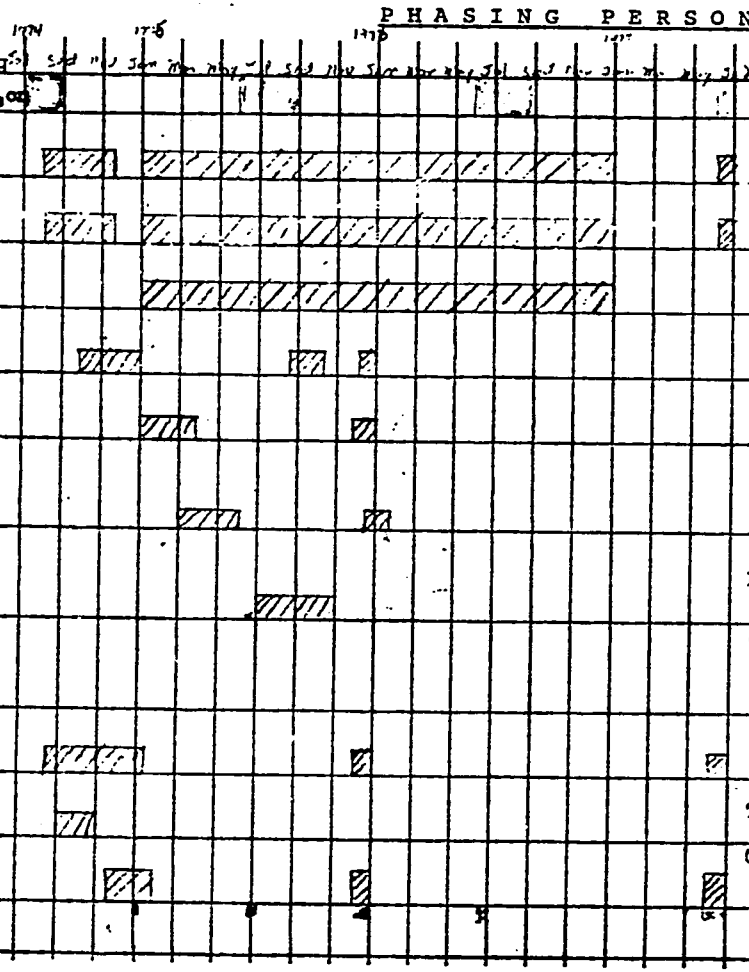
The final step in the project will be a detailed evaluation of the whole project so that the problems encountered, solutions found and lessons learned can be enumerated and the overall real impact, both social and economic, evaluated. This is essential for the project to fulfill its function as a pilot zone for arid land development in Senegal.

The very tight time frame of three years for an integrated range development scheme to be implemented and the fact that all work must be planned around the rainy season requires very close timing of inputs. For example, if the study effort were to be delayed just two months it would cause the project to slip a whole year because the studies must take place partially during the rainy season. Therefore, we recommend that the project manager develop a detailed PERT giving the complete details of each activity in the project. The simple bar graph chart we have prepared is only an indicator of phasing; the subtleties of implementation are yet to be addressed.

PHASING ACTIVITIES



PHASING PERSONNEL



ITEM	NOTES
Range Specialist	Three month Baseline Study plus two years plus one month final evaluation
Livestock Specialist	Three month Baseline Study plus two years plus one month final evaluation
Agricultural Engineer	Two years
Hydro - Geologist	One month Baseline Study plus one and half month ID plus one and half month ID plus final evaluation
Well Driller	Two and a half months plus one and one half months
Water Distribution Expert	Three months plus one month
Minor Irrigation Expert	Four months
Agricultural Extension Expert	One and one half months
Head Sociologist	Baseline Study plus one and one half months plus one month evaluation plus two months evaluation
Assistant Sociologist	Two months Baseline
Economist	Two months Baseline plus one month evaluation plus one month evaluation
Evaluations	

IMPLEMENTATION SCHEDULE FOR MAJOR COMPONENTS

Completion of Capital Grant Paper	May 15, 1974
Authorization of Funds	June 7, 1974
Signing of Capital Grant Agreement	June 30, 1974
Heavy equipment procured	July,15, 1974
Begining of Study phase	Aug. 15, 1974
Completion of Study phase	Nov.15, 1974
Completion of Decree (GOS)	Dec. 31, 1974
Establishment of initial GOS technical/administrative Structure	Jan. 1, 1975
AID funded technicians in place	Jan. 1, 1975
Establishment of local level organizational structure	Jan. 1, 1975
Heavy equipment arrives	Jan., 1975
Local contracting for construction	Jan.1, 1975
Construction begins	Feb. 1, 1975
Accelerated Development Block completed	May 31, 1975
Evaluation of initial construction	June 15, 1975
Construction begins again	Sept. 1, 1975
Evaluation of Accelerated Development Block	Dec. 1975
Sarre Zone Complete	May 31, 1976
Annual evaluation	Sept. 1976
Construction begins again	Sept.1976
US technical Assistance Departs.	Dec. 1976
Construction complete	Dec 1976
Final Evaluation	May 1977

2. Contracting

In view of past difficulties in recruiting American technicians for Francophone Africa and the rather tight timeframe within which the implementation of the proposed project must proceed, it is essential that appropriate steps be taken to facilitate the timely location of capable technicians. The two components of the project which require American technical expertise are the detailed design/impact analysis phase and the implementation phase. It is recommended that the range management, livestock, and stockwater development specialists who are selected for the study phase also fill the positions of long-term advisors during the implementation phase. This recommendation holds particularly for the range management specialist, since range management is a relatively new concept in Senegal. In view of the above discussion the question of the method of recruitment to be used requires immediate attention. In this context, the following alternatives are presented in order of priority.

As a first alternative, the Peace Corps should be requested to fill all four of these technical positions with suitably qualified persons. It should be re-emphasized however, that range management is a new concept in Senegal. Thus, the specialist in this area must be a highly qualified, French-speaking person with experience in West Africa. Should it not prove possible for Peace Corps to recruit someone with appropriate qualifications for this position, it is recommended as a second alternative that the Bureau of Land Management be requested to locate a qualified specialist to fill this position full-time. If a full-time specialist cannot be located, it is possible that a short term specialist could be located who would be supplemented by a Peace Corps Volunteer. A similar approach might be followed with respect to the livestock and stock water development specialists. If Peace Corps cannot fill these positions, then the Department of Agriculture should be requested to do so. If the Peace Corps is unable to recruit a mechanic, it is recommended that a qualified person be recruited by AID under a personal services contract.

The short-term consultants, (i.e. the geologist/hydrologist well drilling specialist, water pipe line specialist and water spreading specialist) present a somewhat different case for two reasons. First, it is not necessary that they speak French, although ideally they should. Secondly, it is not essential that they be American, although again, ideally this should be the case. In this context, and considering the type of expertise involved, it is believed that these people can be recruited by AID under personal services contracts. It may also be possible that Peace Corps could provide some of these people.

As a third alternative it is recommended that a contract be let with a qualified U.S. firm to provide the technical expertise required for both the study phase and the implementation phase.

3. Disbursements

It is anticipated that there will be a variety of disbursements under this project, including PSAS, U.S. Contract, U.S. procurement, U.S. personnel service contract, local labor hired by the GOS, local contracts, local procurements, free world procurement, and contracts with third country firms or individuals. The objectives of the project might best be facilitated with disbursements procedures similar to those of the AID Sahel R & R Program.

These procedures call for AID to advance funds to a government disbursing agent, such as the National Development Bank. The disbursing agent makes payment for goods and services received under the program and periodically submits to AID/W financial reports and requests for reimbursements. The reports and reimbursement requests go through the local AID representative and are forwarded to the comptroller's office in AID/W. The AID/W comptroller's office reviews the requests and cables the regional disbursing office in Paris. The funds are then forwarded to the government disbursing agent.

The disbursing procedures of this project will be affected by the authorization and appropriation legislation, and a review of the requirements of the overall AID mid-term Sahel program. The servicing of West Africa is presently under study by the comptroller's office in AID/W. The results of this study could also affect the disbursement procedures of this project.

B. Special Conditions Precedent to Disbursement.

Prior to opening an A.I.D. letter of commitment for initial disbursement, the Government of Senegal will be required by the Grant Agreement to present the following items to A.I.D. to satisfy the conditions precedent to disbursement:

(1) An appropriate contract for the services of U.S. and/or Senegalese experts to undertake the Phase 1 detailed design/impact study outlined in Annex D of the CAP;

(2) The names of the Senegalese government technical personnel who will be made available for the project to fill the positions specified in appendix B of the Grant Agreement and their availability to work with the consultant responsible for carrying out the detailed design/impact study.

Prior to opening an AID letter of Commitment for additional disbursement, the Government of Senegal will be required by the Grant Agreement to present the following items to AID to satisfy the second-tier conditions precedent to disbursement.

(a) A decree signed by the President, based on the Law of the National Domain (n· 64-46 of 7 June 1964) enumerating the specific terms and conditions under which the grazing area will be set aside under the proposed project.

C. Evaluation and Monitoring Plan

Since the project is designed to serve as a replicable activity, close monitoring and evaluation of its progress is essential. Before the project area can be developed, the first step in this evaluation process must take place -- the baseline survey and feasibility study, which will be done by a specialized team consisting of an economist, a sociologist, a livestock specialist, a range management specialist and a hydrogeologist. Among other things, this study will evaluate the proposals presented in this paper, analyze the assumptions made, establish baseline economic, social and technical data, and develop criteria for the on-going monitoring and evaluating of the project, as well as designing a system for measuring the social and economic impact of the project over time.

In addition the project team will make a regular annual evaluation to judge progress and enumerate problems encountered. This annual evaluation will be held at the end of each dry season. Further, a detailed evaluation by an outside evaluation team consisting of an economist, sociologist and hydrogeologist in addition to the project team, will be held during December, 1975, to evaluate the accelerated development area and to modify the project as suggested by the initial experience.

In addition, there will be a final evaluation by a complete evaluation team composed of an economist, sociologist, livestock expert, range expert, and the project manager to list problems, solutions and lessons learned as well as to judge the success of the project in meeting its stated goals and purposes.

The accelerated development area is a crucial component of the evaluation so that the concepts and the hypotheses of the project and the implementation procedures can be tested and evaluated before getting too far along in the other areas. The evaluation of the accelerated development area will point out any areas of weakness and offer solutions. In case of major problems in the project it could serve as a point of major restructuring and redesign of the project.

ANNEX A

DRAFT TRANSLATION/PRM/ab April 30, 1974

Letter received fromthe Minister of Plan and Cooperation and dated April 13, 1974

Mr. David McAdams
Regional Development Officer

American Embassy
Dakar

Dear Sir:

Subject: Financing for Development Projects proposed by USAID

In a letter dated March 21, 1974, Mr. J. Moore, Chief of the Analysis and Planning Service for the programs of the Development Office for Africa, has confirmed the projects for which the Government of Senegal would appreciate a financing assistance from USAID.

Such assistance concerns the two following projects:

1. The first one is for the integrated development of pasture activities within an area of about 100,000 hectars in the Bakel District;

2. And the second one to intensify theSODEVA activities passing from the semi intensive to the intensive cultural techniques within the groundnut basin

Therefore, I wish to confirm my agreement on these two projects.

Sincerely,
By authority of the Minister of Plan and Cooperation

Madiong Diakhaté

Director of Cabinet

GLOSSARY FOR MAP

3 Veterinarian Posts - These will be sub-stations, similar to the one at Bakel. A veterinarian technician will be in charge. He will be trained in animal husbandry skills and will work with the livestock specialist in programming and executing the routine jobs.

8 Cattle Vaccination Parks - These include an assembly area and a restraining chute. The vaccinations, spraying, deworming, dehorning, etc., will be done here.

2 Sheep and Goat Vaccination Parks - These will be in the same style as the cattle vaccination parks but scaled to the size of sheep and goats. They will be used for handling and treating the sheep and goats.

2 Quarantine Parks - They are holding area for cattle that will be moving through the zones. They will have a small restraining chute to hold the animals that will need to be examined.

2 Market - A small holding area with scales where cattle, sheep, and goats can be purchased and sold.

4 House - Dwellings and offices for the zone chiefs and others.

AID 1020-25 (1-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

Life of Project: From FY 75 to FY 77
Total U.S. Funding
Date Prepared:

Project Title & Number: Senegal Sahel Livestock Program

PAGE 1

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Assumptions for achieving goal targets: (A-4)
To assist in the rapid recovery of the livestock subsector as a source of food and income while taking steps to insure the maintenance and development of the range resources.	1. Increased availability of animal products in both urban and rural areas. 2. Improve range productivity.	1. (a) National slaughter records (sales, urban food) (b) Rural consumption survey (rural food) 2. Trained observation (a) return of improved perennial grass species (b) greater percentage of vegetation good species.	GOS will continue to encourage livestock production GOS will continue to financially support the livestock subsector National Political Stability. Imports of cattle will not overwhelm the Senegal market.

AID 1020-20 (1-72)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 75 to FY 77
Total U.S. Funding
Date Prepared:

Project Title & Number: Senegal Sahel Livestock Program

NARRATIVE SUMMARY Project Purpose: (B-1)	OBJECTIVELY VERIFIABLE INDICATORS Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)	MEANS OF VERIFICATION (B-3)	IMPORTANT ASSUMPTIONS Assumptions for achieving purpose: (B-4)
To develop a replicable system of integrated range and livestock management which is socially acceptable, economically viable.	The existence of a managed grazing reserve of approximately 110,000 he., which utilizes given resources, water, grass and livestock to the optimum to produce meat and milk for use or sale by the local people while maintaining the conditions of the range resources. Small herders utilizing proven methods with resulting increased incomes. GOS capability to manage integrated range management system for small herders.	Results of final project evaluation including update of baseline data. Direct observation of range: (a) Water points well used but not over grazed. (b) Improved grass varieties present in larger percent inside area (c) Milk production maintained at 7 liters per milking cow. (d) Cattle number maintained under ceilings set by management boards. (e) Offtake at 14 percent or high enough to maintain 1% or less herd growth.	GOS will provide adequate financial support and qualified technicians to permit testing of system. There will be no major constraints to project implementation due to unusual climatic conditions, outbreak of animal disease, undue livestock price fluctuation or substantial lack of acceptance by small stockholders. The area of Bakel is not unique in Senegal in terms of soil, vegetation, water etc.

B-2

ANNEX-B

AID 1020-25 (11-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: From FY 75 to FY 77
Total U.S. Funding
Date Prepared:

Project Title & Number: Senegal Sahel Livestock Program

PAGE 3

NARRATIVE SUMMARY Project Outputs: (C-1)	OBJECTIVELY VERIFIABLE INDICATORS Magnitude of Outputs: (C-2)	MEANS OF VERIFICATION (C-3)	IMPORTANT ASSUMPTIONS Assumptions for achieving outputs: (C-4)
A. Range Management (Institutional) GOS officials and herders introduced two concepts of range and livestock management and have capability to implement these concepts.	1. At least 4 GOS officials with more than 1 year experience at project site. 2. Herders voluntarily following recommended rotation and livestock system.	Personnel records Observation	Appropriate GOS officials will be assigned to the project area. GOS will fund their portion of the project.
B. Livestock Management practices in force to accurately census the cattle, allow increased rate of growth, allow increased number of calves at weaning, increased fertility and decreased mortality of the herd.	1. Cattle being sold at weight 10% above present weight at sale. 2. 40% of cows have calves at weaning. 3. Adult mortailty decreased to 8%.	Cattle census Cattle census Cattle census	Adequate water resources exist to allow development.
C. Demonstrated feasibility of carrying out integrated range management program to improve or maintain range.	1. Fees levied by management board being paid regularly	Accounting Records	Rainfall will not fall below a level sufficient to sustain plant life.
D. Training-Overseas and local training provided for GOS project management staff, local training provided for cooperating farmers, and national level officials introduced to US range management practices.	1. 2-Management staff completed training and observation tour in the U.S. 2. 6-Ministry level officials completed observation tour in the U.S. 3. Management staff completed observation tour in US. 4. Management staff completed counterpart training	MORD Records MORD Records MORD Records MORD Records	
E. Research: Continual small scale adaptive research on possibilities for improved forage and expanded flood irrigation program.			

(continued)

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

ect Title & Number: _____

PAGE 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
ect Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)
	(continuation)		
	5. Cooperating farmers participating in local training courses.	Management Group Records	
	- Small trial and demonstration plots maintained in the reserve to try new practices such as a seeding reforestation, water spreading etc.	Observations	

AID 1020-25 (1-73)
SUPPLEMENT 1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: _____

Life of Project:
From FY ____ to FY ____
Total U.S. Funding ____
Date Prepared: ____

NARRATIVE SUMMARY Project Inputs: (D-1)	OBJECTIVELY VERIFIABLE INDICATORS Implementation Target (Type and Quantity) (D-2)	MEANS OF VERIFICATION (D-3)	IMPORTANT ASSUMPTIONS Assumptions for providing inputs: (D-4)
U.S. Inputs - Initial Studies - Baseline and Feasibility - Evaluation - Technical Assistance (see pp 53-69-text) - Full time 3 persons - TDY 14 man months - Commodities Equipment Supplies - Construction 1.vet. facilities 2.firebreaks 3.water points 4.housing 5.labor -Training US Local	3 month duration (21 man months) See Implementation Schedule in body of PROP.	Budget support Observation and evaluation.	Recruitment and timely arrival of properly qualified and well-motivated specialists will be accomplished. Equipment to be provided will arrive on schedule. Local labor of the required magnitude is available as indicated by GOS Bakel officials for labor intensive systems. Proper GOS officials can receive sufficient English language training to participate in US Training Program.

ORGANIZATIONAL STRUCTURE

Animal Husbandry

In the Republic of Senegal, the "Service de l'Elevage" is in the Livestock Division of the Ministry of Rural Development and Hydrolics. The National Director is Dr. Diallo, D.V.M., stationed at Dakar. At the Regional level, the Inspector is Dr. Dieme, DVM, who is stationed at Tambacounda.

The project is located in the department of Bakel, one of the five Departments of the Tambacounda Region. The Chief of Livestock Services, Mr. Dia, who is a livestock engineer, is responsible to the Inspector at Tambacounda.

A. Administrative Infrastructure

The livestock and animal industries service is under the jurisdiction of the Ministry of Rural Development and Hydrolics and covers the entire country. It has the following structure:

1. A head office in Dakar with six technical divisions, each headed by a veterinarian, and backed up, when needed, by experts and specialized sections.

2. A regional inspection office for each region. The regional inspector has two assistants, one of whom is in charge of development problems.

3. In each department of the country there is a livestock officer whose chief also has an assistant in charge of development.

4. There are veterinarian posts in major livestock points. There are 40 such posts at present.

5. Special institutions are in charge of specific operations. An example would be the Dahra Zoo Technical Research Center which has a 6,000 ha. ranch and a 3,5000 cow herd.

6. The National Livestock Laboratory in Hann is in charge of research, diagnostic work and vaccine production. It manages the Sangalkam farm where grass and feedlot experiments are conducted.

The service is staffed as follows:

14 French veterinarians (Tech.A)

35 African veterinarians

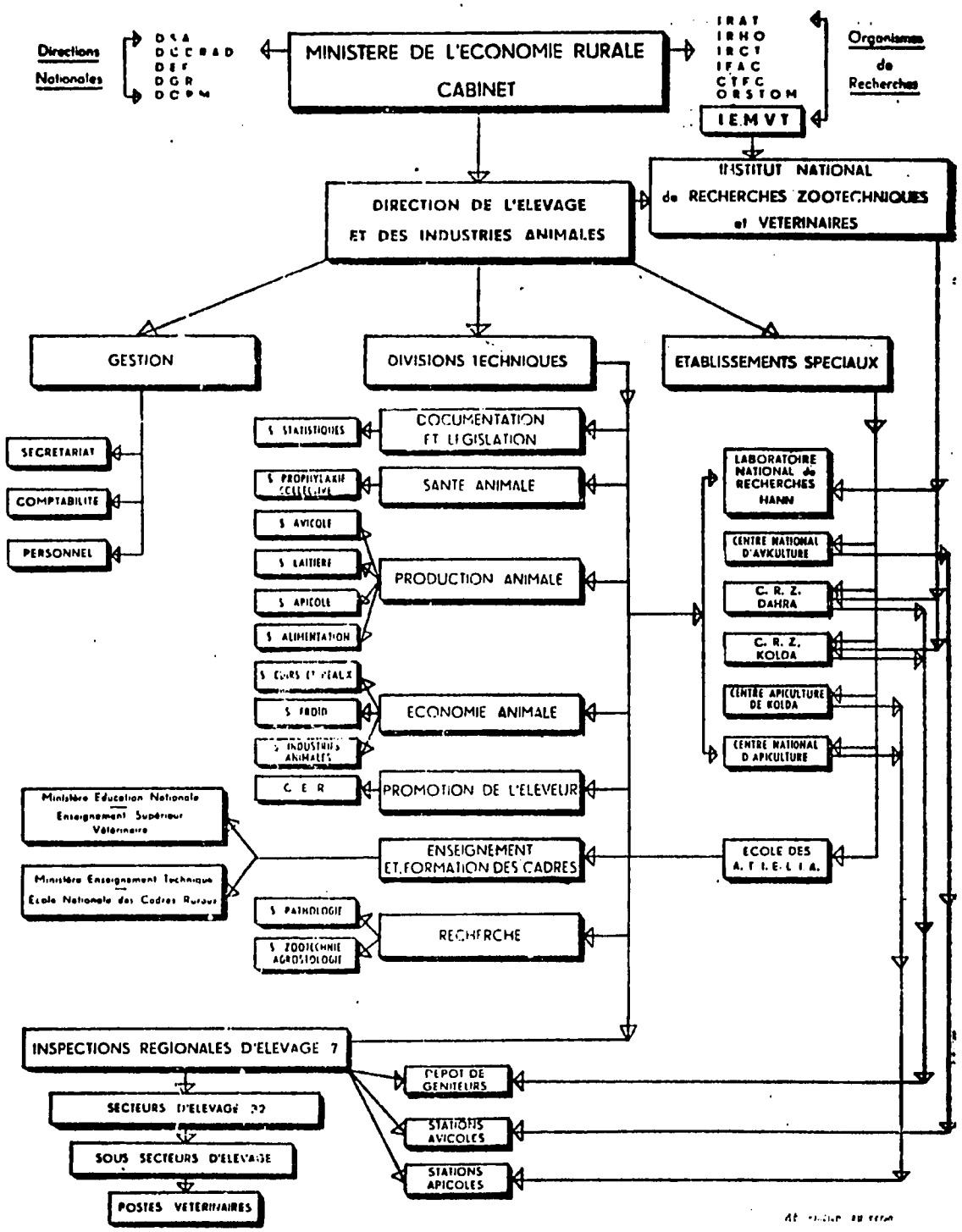
4 Engineers of works (Ingunieur des Travaux)

418 Technical agents (Agents Techniques)

The service is training more personnel in all categories except the lowest cadre to upgrade their service.

RÉPUBLIQUE DU SÉNÉGAL

ORGANIGRAMME DE LA DIRECTION DE L'ELEVAGE ET DES INDUSTRIES ANIMALES



ABREVIATIONS

DIRECTIONS NATIONALES

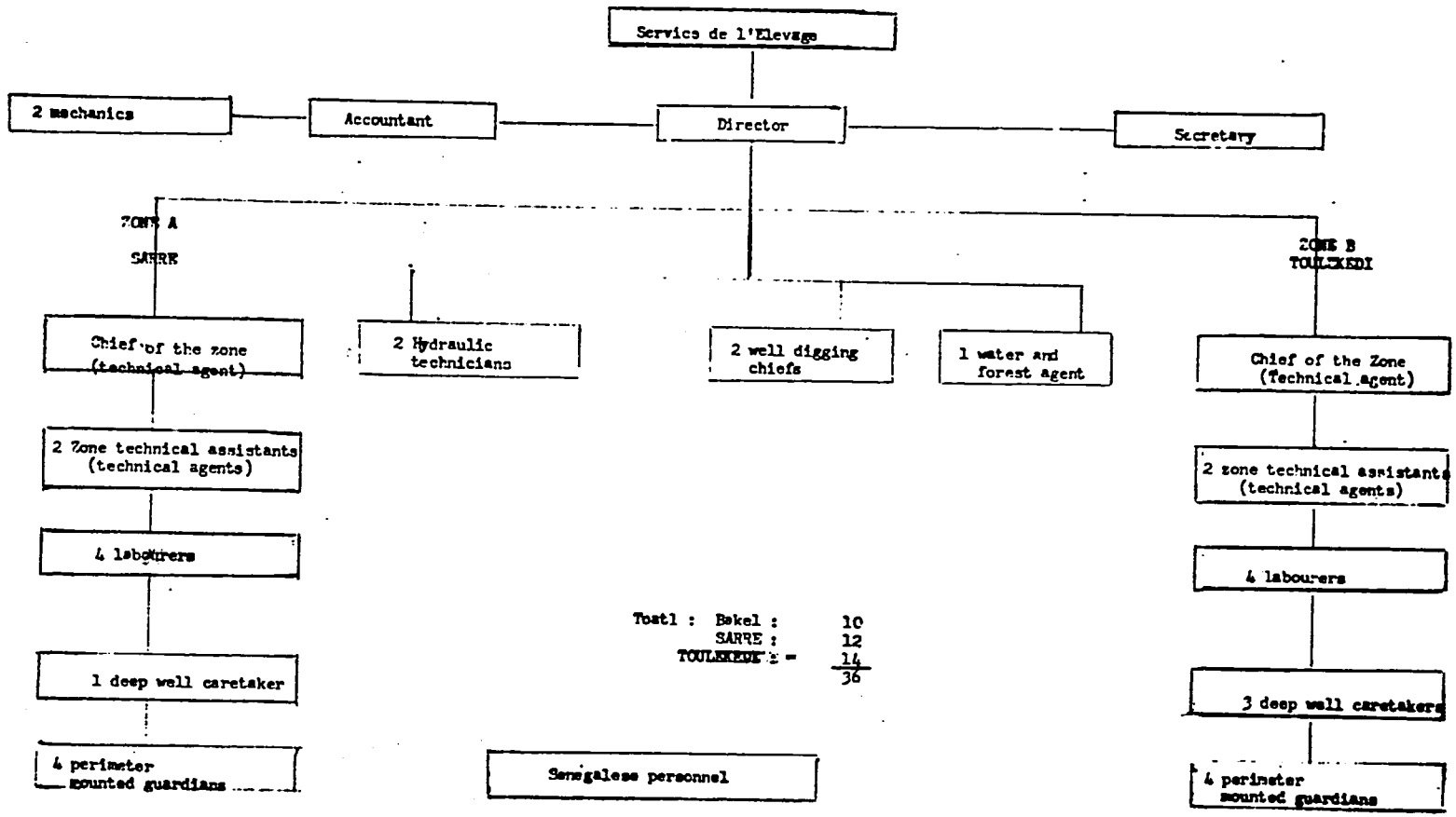
- D. S. A. : Direction des Services Agricoles.
- D. C. C. R. A. D. : Direction de la Coopération et des Centres Régionaux d'Assistance pour le Développement.
- D. E. F. : Direction des Eaux et Forêts.
- D. G. R. : Direction du Génie Rural.
- D. O. P. M. : Direction de l'Océanographie et des Pêches Maritimes.

ORGANISMES DE RECHERCHES

- I. R. A. T. : Institut de Recherches Agronomiques Tropicales
- I. R. H. O. : Institut de Recherches Huiles et Oléagineux.
- I. R. C. T. : Institut de Recherches Coton et Textiles Tropicaux.
- I. F. A. C. : Institut Français de Recherches fruitières.
- C. T. F. T. : Centre Technique Forestier Tropical.
- O. R. S. T. O. M. : Office de la Recherche Scientifique et Technique Outre-Mer.
- I. E. M. V. T. : Institut d'Elevage et de Médecine Vétérinaire des Pays Tropicaux.

DIRECTION DE L'ELEVAGE ET DES INDUSTRIES ANIMALES

- C. R. Z. : Centre de Recherches Zootechniques.
- C. E. R. : Centres d'Expansion Rurale.
- A. T. I. E. I. I. A. : Ecole des Agents Techniques et Infirmiers de l'Elevage et des Industies Animales.


Services de l'Elevage
2 mechanics
Accountant
Director
Secretary
ZONE A
SARRE
ZONE B
TOULEKEDI
Chief of the zone (technical agent)
2 Hydraulic technicians
2 well digging chiefs
1 water and forest agent
Chief of the Zone (Technical agent)
2 Zone technical assistants (technical agents)
2 zone technical assistants (technical agents)
4 labourers
4 labourers
Total : Bakel : 10
SARRE : 12
TOULEKEDI : 14
36
1 deep well caretaker
3 deep well caretakers
4 perimeter mounted guardians
Senegalese personnel
4 perimeter mounted guardians

ANNEX D

Scope of Work for Detailed Design Study Senegal-Integrated Range Manage-Management Project

I. Background

Traditional livestock producers in Senegal have proven unable to meet the rising demand for animal products generated by current rates of population growth, rapid urbanization and general economic advances. Traditional livestock production is subsistence oriented, more social than economic with respect to production inputs, and is indulged in as a by-product of a way of life, increasingly subsidiary to some other occupation (especially agriculture). In Senegal this situation has been exacerbated in recent years by the prolonged drought which has taken a heavy toll of the cattle population.

Improving such an industry implies the need for significant change in order to develop an industry which is more productive and/or commercial in nature. This can be accomplished through the introduction of new technological inputs which have specific demonstrable economic value. However, prior to the introduction of new techmology into Senegal the following special problems must be given proper consideration.

1. The fragile nature of the land resource base.
2. The uncontrolled use of grazing land.
3. The difficult social, political and economic problems which are basic yet exogenous to development projects directed at technological adaptation.

Thus the requirements for rapid and sustained technological change in livestock production practices from traditional to a more commercial system of livestock management are extremely complex.

The Government of Senegal (GOS) is acutely aware of these problems and all their economic, technical and social implications. Thus, under the Fourth Plan (1972/73--1976/77), high priority will be placed on efforts designed to facilitate the recovery of the livestock industry. At the same time, however, the GOS is also aware of the need to emphasize quality over quantity in order to avoid further degradation of the range.

Thus, it is essential that the GOS develop appropriate criteria for the selection, design, and implementation of future investments in the livestock subsector. A major objective of this pilot project is to contribute to the development of such criteria.

In this context, based on a financing request from the government of Senegal, a project design team was sent to Dakar in mid-April 1974, to consider a livestock development project in the Bakel department in Eastern Senegal. The team, accompanied by Senegalese counterpart technicians from the Ministry of Rural Development's Service de l'Elevage et des Industries Animales; Service des Eaux et Forets; and Service de l'Energie et de l'Hydraulique Division, spent one week of intensive research and analysis. In addition, the Ministry of Promotion Humane agreed to play a major role in educating and organizing the local herders in order to facilitate their full participation in the design and implementation processes.

This cooperative effort provided the basic components for an integrated range management proposal (PROP) which was approved by AID in June 1974. The proposed project involves the establishment of a managed grazing reserve of approximately 110,000 hectares through the

development of water resources, the establishment of comprehensive animal health control program, the construction of firebreaks, and the provision of limited technical assistance and participant training. In view of the complexity of the proposed range management project every effort will be made to ensure the broad professional as well as constituent involvement in the design process. In this context, a multidiscipline team of specialists will be sent to Senegal to work with national and local government representatives and with representatives of the herders in preparing design details for the proposed range management project.

The multidiscipline approach to project design demands a high degree of cooperation and compromise between members of the consultant team as well as between the various groups involved in the design process. The scope of work to be undertaken is comprehensive and innovative, involving objective analysis, interpretation and both qualitative and quantitative evaluations.

II. Purpose and General Directive

The purpose of the proposed study is three fold:

A. Collect and analyze pertinent baseline data from within and without proposed project area according to manifest need and availability.

B. Based upon an analysis of assembled data, prepare a detailed design of the proposed integrated range management project.

C. Identify key indicators, develop systematic surveillance procedures and devise a system for measuring impact of proposed integrated range management scheme over time.

III. Detailed Scope of Work

The major components in the scope of work can be broadly codified as human constituents, land resource base, livestock element, administrative control concepts, economic considerations and project impact measurement.

A. Human Constituents

The most complex component of this design effort involves the identification and appropriate treatment of the major behavioral constraints to project implementation. Its complexity results from the fact that more than any other component of the study, the sociological component is at the same time influenced by and substantially influences other components of the design. This component is also extremely important because unless the project receives the full support of those at whom it is directed, the human constituents, it will fail. Thus, the primary purpose in considering the human constituents is to achieve their maximum feasible participation in order to enhance the relevance of project planning, design and implementation. In this context, the design team will to the extent feasible undertake to gather relevant socio-economic data as required to complete the project design. As part of this effort, the team will also gather a portion of the data required for ongoing evaluation and long-term impact analysis. It should be noted, however, that the data required into for long-term impact analysis are substantial. Therefore, this effort is expected to extend beyond the design period.

The people common to project area will be the chief beneficaries of project implementation. Not only will they benefit and be influenced by the project, but more importantly they will in turn directly influence the project itself. Indicators required in project monitoring, evaluation and impact analysis are all natural correlatives of these considerations.

1. Socioeconomic Baseline Survey

The design team will review and analyze all pertinent existing sociological information and in addition undertake a survey of the inhabitants and seasonal users of project area, keeping in mind the multi-purpose role the data is expected to plan as regards project planning, design, implementation, evaluation and impact analysis. An important element of this component of the study is the required socio-economic baseline survey which is to the extent feasible, to be taken at the height of inhabitation. This survey and analysis should focus on the following key elements as a minimum:

a. Demographic characteristics including:

1.) Vital statistics

a.) Population size

b.) Age Distribution

c.) Sex

d.) Death rates

e.) Health

f.) Fertility

g.) Marriage Patterns

h.) Family size

i.) etc.

2.) Relationship between population increase and land utilization patterns as well as the effects of seasonality on residence patterns.

b. Economic System

1.) Labor

(a.) Distribution

(b.) Seasonality

(c.) Unemployment

(d.) Herding responsibility

2.) Production of goods and services

3.) Marketing system for goods and services

4.) Incomes

i.) Level

ii.) Distribution

c. Social and Special Groupings

1.) Villages

2.) Ethnic

3.) Non-conformists

4.) Religious

5.) Lineages

6.) Linguistic

7.) Socio-political

d. Patterns of Leadership

1.) Authority (government, village, religions)

2.) Local perceptions of government contact with government (national district, local) what were results (positive negative) concept of governments responsibilities

3.) Opinion leaders

(a) Village
(b) Ethnic religions

e. Linkages Between Project-Area Residents and:

1.) Non-project area nomads

2.) Other - ethnic groups in area

3.) With GOS and Dakar

4.) Outside World

5.) Non-traditional claimants of project area grazing

f. Communications Systems

1.) How does news travel?

2.) What kinds of media have greatest impact (e.g. radio newspaper etc.

3.) Creditable sources of information

4.) Who do they trust and who is competent?

5.) What would be recommended by way of extension measures?

g. Key values and beliefs

1.) Religions

2.) Political

3.) Social

4.) Economic

h. Aspirations and Status Symbols

1.) Animal Wealth

2.) Housing

3.) Consumer Goods

4.) Personal Adornments

5.) Etc.

i. Decision making process of owners and herders

1.) Who makes what decisions?

2.) Timing of major decisions (e.g. period of year length of time required to reach certain decisions etc.)

j. Reaction to Change

1.) Kinds of innovations introduced in past

2.) Which have been adapted

3.) Why and by whom were they adopted

4.) Who introduced innovation (e.g. agency of govt, local resident, etc.)

2. Rational of the Livestock Production System

The traditional or subsistence system of livestock production and management followed in project area is often seen both as a "capital" and as an "insurance", and management practices reflect this fact as well as the requirements relating to family consumption needs and obligations, tribal affinities, etc. Thus, some traditional practices may have to be modified in the process of adhering to rational land use and associated livestock management plans. In this context and in view of these required changes, the design team will as a minimum and to the extent possible, analyze the commercialization problem in terms of the following:

a. Livestock producer concepts of animal ownership

b. Patterns of animal ownership

1.) Individual

2.) Dual

3.) Communal

4.) Kinship

5.) Inheritance

6.) Absentee

c. Owner Concept of Animal Value

1.) Asset Value Vs. Commercial Value

2.) Social

3.) Religious

4.) Aesthetic

d. Relationship between risk and commercialization

3. The Concept of Land Tenure and Usufruct

Land will be incorporated into the management plan which may at present be considered the "property" of specific individuals or groups in spite of state laws dealing with the public ownership of the national domain. The resolution of any conflict in the area of land tenure as the project is established will depend in large part on a full understanding of the existing patterns of "ownership". Thus the team will at a minimum determine:

a. Present Patterns of Tenure and/or Ownership

I.) Individual

2.) Family

3.) Communal

b. Methods of Land Transfer

1.) Inheritance

2.) Sale

3.) Barter

4.) Cermonial

5.) Marriage

c. Degree of Permanence of Villages

d. Internal Allocations of Water Access

e. Conflict between Local Farmers and Graziers

f. Cooperation Between Local Farmers and Graziers

g. Patterns of Cultivation

1.) Use of Aftermath and Fallow for Grazing

4. Attitudes Toward Nomadism and Nomads

a. Extent of such practices in project area and effect of the drought thereon

b. Degree of local ethnicity involved

c. Origin and destination of major nomadic groups, including season and duration of stay and relationship with local inhabitants

1.) Kinship relationship

2.) Economic relationship

3.) Nature and degree of conflict

d. Rights and privilages extended or tolerated as regards water and range access.

e. Extent of commercial intercourse with nomads

5. Herding Management Systems Indicated

The design team will, in the process of studying project inhabitants and land resource base users, make suggestions relative to the systems of production required in project area under project implemenations. For example:

a. Sedentary Systems

1.) Village Communal Gazing

2.) Groups

3.) Cooperative

4.) Individual

5.) Commercial

6.) Parastatal or Government

b. Semi-Nomadic System

1.) Communal

2.) Group

c. Nomadic System

1.) Communal Grazing only

6. Major Human Constraints to Implementation

The design team will undertake to identify any overriding implementation obstacles as perceived by the inhabitants and users of project area, and suggest remedial or alternate courses of action. The team will indicate which forms of behavior can be changed and those which cannot. Show the relationship between potential behavior changes and income, education, etc.

7. Key Indicators for Monitoring Sociological Change

Key indicators for assessing sociological changes over time resulting from the project will be identified. Suggestive are:

a. Demographic

1.) Age of population

2.) Life expectancy

3.) Population mobility (Level of Migration)

4.) Morbidity and mortality rates

5.) Population growth rates

6.) Population location - (rotation to water reservoirs)

b. Social/Organization

1.) Family/community cohesiveness

2.) Traditional customs

3.) Pattern of utilization of land and water

4.) Patterns of ownership

c. Administrative/Political Organization

1.) Patterns of local leadership (non project related)

2.) Pattern and effectives of project administration

3.) Relationship between herders and government in project area

4.) Herder attitudes toward government

B. Land Resource Base

The scope of work concerning this component ill involve appropriate survey and analysis leading to a detailed plan providing for maximum beneficial use which project area is capable of supporting, without further deterioration, within the context of an integrated range livestock management scheme.

1. Survey and Baseline Data

Using available data, such as aerial photographs, and ground reconnaissance, the contractor will assemble baseline data sufficient for formulating a land resource development and management plan. The required survey will include but not be limited to the following items:

a. General description of project area.

(1) Soil description and mapping

(2) Productivity and limitations for cropping and rangeland.

b. Hydrological Data from existing stations and/or additional installations as required.

(1) Precipitation as to time and amount of fall

(2) Evaporation

(3) Runoff

(4) Soil moisture relationships

c. Present land use patterns

(1) Area of cropland

(a) by types

(b) estimated yields

(c) residues

(d) factors limiting use and development

(e) special practices required for sustained yield

(f) fallow and go-back land

(g) Abandoned farmland and special treatment suggested (e.g., reseeding, tree planting)

(h) degree of erosian (e.g., wind, water, etc.)

(2) Area of rangeland

(a) season and duration of use

(b) water sources, permanent and temporary

(c) limiting factors of use

(d) estimated carrying capacity (A.U./ha.)

(e) estimated stocking rate (A.U./ha.)

(3) Area of non-usable land by types

(a) desert

(b) eroded beyond recovery

(c) rivers, lakes, etc.

(d) mountains and rock outcrops

(e) villages, roads, etc.

(4) Potentially usable land not now in use

(a) cropland, including limiting use factors, adoptive crops and special practices required.

(b) rangeland, including limiting use factors and special management practices suggested.

(c) forest and woodland, suggest alternative uses and required practices and/or treatments to convert to more productive use.

2. Land Resource Management and Development Plan

An analysis of data collected in connection with the baseline survey will be used to formulate a detailed land management and development plan with emphasis on a controlled grazing scheme. However, attention

will also be given to designating land for the cultivation of subsistence and cash crops. both at the outset and in the future.

a. Cropland

Apart from demarcating land specifically for crops, a plan will be prepared with the view of promoting improved production practices and crops of higher nutritive value. Suggestive practices are:

(1) crop rotation

(2) improved and/or new varieties

(3) seed bed preparation

(4) tillage practices

(5) harvest and storage

(6) use of manure as a fertilizer

(7) use of farm aftermath in special animal feeding

(8) reseeding of backland for grazing and soil improvement.

(9) etc.

b. Rangeland

Using conventional procedures as applicable, a detailed survey will be made of all lands who's best use has been determined as grazing under the earlier baseline study. This data will then serve in developing a detailed range management plan.

(1) Detailed Range Survey

(a) range site description and mapping

(i) soils

(ii) precipitation

(iii) vegetation

(iv) erosion

(v) water availability, present and potential

(vi) limiting factors such as tsetse flies, soils and water availability

(b) Range condition and trend survey

(i) plant composition

(ii) plant density

(iii) percent of expected dominant species present

(iv) plant vigor and reproduction

(v) estimated kilos of available forage per hectare

(vi) tree and bush canopy present

(vii) soil erosion

(viii) invasion of undesirable species

(ix) low vigor due to overgrazing, drought, burning, etc.

(2) Detailed range management plan

Results of the detailed range survey will provide the basic data for establishing the range management plan which will include stocking rates, seasonal or year-long use plan, controlled burning schedule, annual range use checks and livestock adjustments to remaining available forage. Suggestive outline:

(a) proper stocking rates (A.U./ha.)

(b) seasonal grazing plan

(i) deferred use

(ii) seasonal use

(iii) rotational use

(c) control of burning

(i) non-burning

(ii) burning for bush control

(iii) burning for tick control

(d) mechanical treatment

(i) water spreading

(ii) range pitting

(iii) etc.

(e) annual forage use checks and livestock adjustments to remaining forage available.

(3) Range development plan

An overall plan for developing the range resource base will flow from dictates specified in the range management plan. The development plan will consider present water inventories as to quantity and time of availability and the development of new supplies to balance available water with forage for livestock at the planned season of use. The development plan will also consider establishing physical facilities and other issues relating to land reclamation and improvement, and adaptive experimentation.

(a) inventory of existing water supplies

(b) development of additional water supplies

(i) temporary

(ii) permanent

(c) establishment of firebreaks, access roads, etc.

(d) livestock handling facilities, including working pens, squeeze chutes, scales, camps, etc.

(e) animal health control facilities, including veterinary posts, vaccination and quarantine parks, etc.

(f) headquarters buildings, such as housing, storage facilities, etc.

(g) special considerations

(i) establishment of permanent line transects

(ii) experimental nursery

(iii) tsetsefly control measures

(iv) multiple use of larger permanent water storage sites for fish production.

(v) reseeding abandoned land

3. Key indicators for monitoring land resource base change

Necessary surveillance, including key indicators, will be identified at the outset to measure change over time resulting from technological application to the land resource base as concerns:

a. cropland

(1) area farmed and crops grown

(2) crop yields

(3) improved practices employed

(4) diversification

b. rangeland

(1) permanent line transects with photogrid plots

(2) rangesite and condition determinations

(3) carrying capacity and stocking rates

(4) five control and suppression

(5) erosion control

(6) reclamation of deteriorated land

C. Livestock Resource Base

The livestock component is intimately linked to both the human element and the land resource base, in that it is the conversion instrument transforming range forage into other products more directly usable in support of human life. The necessity of maintaining a reasonable balance between the subsistence requirements of the livestock owners and the optimum use of the land resource base as regards stocking rates, lies at the heart of the integrated range management scheme. Suggestive outline includes:

1. Baseline data

An assessment of the livestock resource component common to project area will be made at the outset that includes species involved, their performance and relative importance, and the chief limiting factors in production. This data is fundamental to the establishment of a land resource management plan and in making herd projections.

a. description of breed-types by species

(1) physical characteristics

(2) functional characteristics

b. estimated census by species and breed-types

(1) cattle

(2) sheep

(3) goats

c. systems of herd management and size

(1) nomadic

(2) semi-nomadic

2. Livestock Production and Development Plan

A combination of owner demands for animal products, especially milk, and dictates of the land resource management plan will have an important bearing on the livestock production program. Within these limits a detailed plan will be developed to assure a balance in the five phases of production. That is management, nutrition, breeding, disease control and marketing. Suggestive outline includes:

a. livestock management

Management as used in the present instance is taken in the broadest sense of the word. It refers to the daily care or husbandry of project livestock, and their regular movement and distribution as required by the range management plan. Management decisions as regards the mass movement, handling and treatment of project animals will be as jointly agreed upon between Grazier Association leadership and project technicians and include:

(1) animal identifications--All animals at the time of assignment to a given grazing unit must be permanently identified by a method that is economical and acceptable to the Graziers.

(a) hot iron brand and ear notching on cattle

(b) Ear notching on sheep and goats

(2) Herd make up and management

(a) milking animals--kept in village herds and flocks

(b) range herds

(i) size

(ii) composition

(iii) herding management

(iv) watering interval

(v) night camps

(3) special considerations

(a) seasonal breeding

(b) castration

(c) dehorning

(4) simplified record of herd performance to permit surveillance, and for use in conforming to established stocking rates.

b. Animal nutrition

(1) natural grazing

The level of nutrition enjoyed by project herds and flocks will be largely determined by the availability of water and the condition of the ranges provided under the grazing management plan.

(2) salt/mineral supplementation

It is suggested that such supplementation, to include trace minerals, be undertaken in night camps and on a herd basis.

(3) subsistence milking herds

The taking of milk for human consumption poses a special problem of undernutrition for associated nursing young, and some means of alleviating the problem should be considered.

c. Animal breeding plans

This phase of production refers to the genetic make-up of project animals, their suitability to environmental conditions, and the extent to which it is desirable and readily possible to improve them in keeping with changing project conditions. Under the detailed range management plan, which will tend to keep animals away from the river and the

challenge of the tsetse fly, it is probable that a higher percentage of Zebo blood could to good advantage be added to the cattle herd. An appropriate plan should be developed.

(1) identify demonstration breeding herd in each grazing unit

(a) establish breeding goals

(b) exert selection pressure toward established goals

(2) extend breeding concept to other project herds

(a) castration of poor males

(b) culling of poor females

(c) intensive selection of breeding males

(3) introduction of new germplasm

(a) Zebu bulls from Sahelien herds

(b) maure stud rams

d. Animal health protection program

Animal disease control under the project will be an extension of the established veterinary service of Senegal. This service will be further strengthened in project area by the erection of strategically located animal health facilities, including three veterinary posts, 10 vaccination corrals and two quarantine parks. Special equipment and medical supplies will also be provided under project financing. Major diseases common to project area are already reasonably well known. Plans will be formulated to provide an assured animal health protection service. Suggestions include:

(1) operational procedures for veterinary posts

(2) schedules for en masse treatment against major diseases

(a) routine vaccinations

(b) drenching

(c) dipping or spraying

(3) limited diagnostic service

(4) surveys respecting less well known diseases

(5) clinic for individual animal treatment

(6) recording system respecting disease incidence and treatment statistics.

3. Key Indicators for Monitoring Animal Resource Base Change

Key indicators to assess changes in the livestock resource base over time, resulting from environmental and/or genetical improvement, will be identified. Suggestive are:

a. numerical relationship between species.

b. residual breeding herd composition and merit

c. productive and reproductive coefficients

d. offtake levels and composition by class, grade, age and weight.

e. mortality rates and etiology.

f. management practices

(1) castration

(2) dehorning

(3) seasonal breeding

D. Economic Analysis

Improving livestock production in the Sahel/Sudano zones implies the need for significant modification of traditional herding practices in order to develop an industry which is more commercial in nature. This can be accomplished through the introduction of new technological inputs which have specific and demonstrable value. Thus the team must ensure that the range management program which is to be implemented under the proposed project is economically viable. A major requirement of economic viability will be that the benefits to be derived from the project by the herders involved are sufficient to induce them to appropriately change their behavior with respect to livestock production. In this context the economic component of this design study will include the following:

(1) The collection and analysis of adequate economic baseline data relevant to all elements of the project (including economic sociological, technical, legal and administrative).

(2) Identify important economic constraints.

(3) Ensure that appropriate consideration is given to efficiency, equity and security issues in the design of the project.

(4) Identify and define those economic phenomena which may need to be restructured to facilitate project implementation.

1. Economic Baseline Survey

It is imperative that the team develop the best possible economic data reflecting current conditions in the project area. In this context the team will define, collect and analyze relevant economic data needed at the producer, village regional and national level. Such data will include:

(1) The cost of production inputs both variable and

fixed for each production activity.

2.) Prices received for products at various seasons by producers and intermediates as well as those paid by consumers etc.

3.) Annual productive returns (in cash and kind)

a.) Livestock (cattle, sheep and goats)

b.) Crops

c.) Other (specify)

4.) Economic incentives and disincentives i.e.; subsidies, taxes, user fees, etc.

5.) Economic trade-offs between existing cropping and grazing enterprises and systems as well as between milk for human consumption and that allowed for the nursing young.

6.) Economic distribution of assets and income (ethnic groups, villages, families and/or per capita)

Based on an understanding of the existing economic environment, and available data the team will consider the economic consequences of alternative enterprise combinations in the project area will be evaluated in view of the constraints defined by the baseline analysis with emphasis on their profitability and distributive effects (i.e. who benefits and who loses).

2. Feasibility Analysis

A major purpose of the project is to develop a replicable approach to increasing livestock production in the Sudano zone. A key measurement of replicability is whether the capital and recurrent cost of the project are adequately exceeded by the economic benefits which are generated. Therefore, the team will prepare an internal rate of return analysis of the project over an appropriate time period

(20 years is suggested). Such an analysis will include but not be limited to the following elements:

a. Project Costs

1.) Development costs by years

a.) Land resource base

b.) Livestock component

c.) Other as appropriate

2.) Operational (annual or recurrent) Expense projection for at least 10 years.

a.) Cash costs including maintenance

b.) Non-cash costs including depreciation

b. Annual Project Productive Returns Projection (in cash and kind)

1.) Livestock (sales and home consumption

a.) Cattle

b.) Sheep

c.) Goats

c. Proforma Cash Flow Projection

It is to be noted that while AID is providing grant funds for project development and operational expenses over five years, it is expedient to determine the economic feasibility of the undertaking and the extent to which the project can be made self-sustaining by charging service fees. An analysis based on standard financial procedures is required in this connection.

1.) Cash Inflow

a.) Income from sales and value used in kind

b.) Development Loan

c.) Operational cost (excluding debt service)

2.) Cash Outflow

a.) Loan Investment

b.) Operational expense

3.) Cash balance (before debt service)

4.) Debt service

a.) Interest payment

b.) Amortization

c.) Cash balance after debt service

5.) Cumulative cash balance

6.) Indicated service fee per animal unit required for project viability.

d. Credits and/or subsidity indicated to repay development cost and recurrent expenses

1.) Short-term loan to cover operations

2.) Long-term loan to defray development cost

e. Repayment Schedule of Credits and Services

1.) Short-term

2.) Long-term

3.) Service fees - Project participants understand that a service fee will eventually be imposed. This fee could be used as a tool in adjusting stocking rates by raising or lowering for a given species or market class in keeping with immediate and projected range condition.

a.) Suggested grace period and repayment schedule.

b.) Amount of service fee per grazing animal unit.

f. Project Residual and Equity Values

a.) Equipment and supplies

b.) Physical Facilities

g. Appreciation Values

a.) Land Resource base

b.) Water installations

c.) Infrastructure

d.) Merit of breeding herds and flocks

3. Key Indicators for Monitoring Economic Change

An important task of the team will be the integration of economic phenomena relevant at the level of the individual producer as well as at the village regional and national level with sociological and physical production considerations into a system for analyzing the impact of the project over time. In this context, the team will develop and define key indicators of economic change and will develop an appropriate monitoring and analysis procedure for measuring such change. These indicators will include but not be limited to the following:

a. Level of individual wealth as demonstrated by

1.) Level of cash income

2.) Level of wealth in terms of

a.) Food, clothing and household goods

b.) Transportation improvements (e.g. bicycles, horses, etc.)

c.) Improved housing (e.g. more permanant construction, more facilities, increased cost, etc.

b. Level of Commercialization

1.) Local economy more cash oriented

2.) Marketing system more formalized

3.) Extent to which food, clothing and household items are bought instead of being made at home.

4.) Commercialization of livestock production

c. Labor force

1.) Level of specialization

2.) Degree of mobility

3.) Number of salaried workers

4.) Presence of skilled labor

d. Distribution of income (cash and kind)

1.) Equity changes

2.) Individual, family, village level

3.) Male/female

4.) Herders/cultivators/other

E. Administrative and Legal Considerations

Attempts at administering grazing reserves in Africa in the absence of substantial herder involvement in the decision making process have proved largely unsuccessful. This has been largely due to herder resentment to outside enforcement. At the same time, however, the structure of the social system (including outlinkages with other group, particularily other ethnic groups) along with traditional land use codes, impose difficult problems regarding internal control of grazing reserves.

a.) Equipment and supplies

b.) Physical Facilities

g. Appreciation Values

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This situation suggests several very important requirements with respect to the successful implementation of range management project. First, without legal standing as a corporate body grazing associations or cooperatives cannot maintain adequate control over a given grazing reserve in the Sahel/Sudano zone. Second, appropriate land use legislation must exist to ensure that the association has adequate control over the use of the grazing reserve. Third, the government involved must possess adequate technical/institutional capability to appropriately plan, design and implement range management programs. Thus, the government must be able to provide appropriate technical and administrative guidance to grazing associations. Fourth, especially in the early phase of a range management project the government must be able to provide adequate operation and maintenance funds to ensure the viability of a project.

In this context, the PROP discusses in detail, the need for appropriate legislation establishing the perimeter and develop a detailed administrative system beginning with the headquarters of the GOS Ministry of Rural Development in Dakar thorough the Ministries Departmental headquarters in Bakel and down to the project level. In addition, the PROP provides detailed suggestions regarding the organization of a herder association. The design team will review and modify these recommendations as necessary in order to ensure the viability of the project design. In undertaking this effort,

the following specific elements will ge given careful consideration:

1. Project Requirements

a. Herder organization with legal authority, in coordination with Ministry of Rural Development to:

1.) Develop project by-law

2.) Register members

3.) Issue rights of occupancy

4.) Establish committees who represent herders

5.) Borrow capital and dispense monies

6.) Assess fees for repayment of borrowed money

7.) Generally manage project grazing reserve as prescribed in the range management plan

8.) Impose penalties for breach of established rules

b. Land tenure legislation and adjudication requirements including the possibility of:

1.) Recognition of existing grazing rights

2.) Land title

3.) Short-term lease or specified rights

4.) Long-term lease or right to use

c. GOS institutional budgetary capability

1.) Availability of qualified counterparts and other required manpower.

2.) Propects for GOS providing operational and maintenance funds to assure an on-going and viable project.

d. Payment of fee by herders including following suggestions

1.) Grazing fee-recorded project animals, migratory animals with legal rights, or transits.

2.) Water use fee - recorded project animals, migratory animals with legal rights or transits.

3.) Service fees - user fee for all services provided, both mandatory and optional (including health, mineral suppliments, marketing, etc.)

2. Long-Term Administrative Requirements for Replicability

Within the context of the goal of replicability, the team will develop recommendations with respect to institutional and infrastructure requirements which the GOS must address. These will include but not be limited to the following areas:

a. Range and livestock planning

b. Range and livestock development

c. Range and livestock extension service

d. Range and livestock administration

1.) Land tenure legislation and adjudication

2.) Meeting future financial requirements with respect to capital and recurrent costs.

a.) Development operations by GOS (grant)

b.) Supporting services to be provided by GOS

c.) Long term development loans to herder coops

3.) Possible revenue generation mechanism to be used by GOS.

a.) Taxes (land, livestock, pole tax)

b.) Land lease or rental (long-term and short term)

c.) Fee charge

IV. Detailed Design Study Team Qualifications

The multi-discipline approach to project design and evaluation demands a high degree of cooperation and compromise between members of the consultant team.

A. Personnel

4. Economist
1. Range Ecologist-Planner
2. Livestock Advisor
3. Rural Sociologist
8. Demographer
5. Agricultural Engineer
6. Agricultural Extension Specialist
7. Veterinarian

B. Professional Qualifications

1. Agricultural Economist

The economist must have met Phd requirement in agricultural economics with at least 5 years experience in livestock production and marketing systems in developing countries. Experience in Africa is highly desirable but not limiting. Familiarity with base line studies and designing evaluation criteria on a micro-level is required.

2. Range Ecologist-Planner

The range ecologist-planner will have at least a M.S. degree in range management and 5 years experience in his fielf of specialization. At least two years of experience should have been in tropical areas, preferably in Africa. The specialist must have experience in interpreting aerial photos, and agrostological maps, and be able to evaluate vegetation and soil conditions in the field. He must also have experience in determining stock water requirements,

availability and locating water points. In particular he must have the expertise required in designing detailed range management plans and grazing systems to balance and maximize the use of water, forage, and grazing animals.

3. Livestock Advisor

The livestock specialist must have an advanced degree in animal science with emphasis in beef cattle production field with a minimum of five years experience in planning and/or implementing animal resource development projects, preferably overseas and in semi-arid areas involving large scale livestock surveys, estimating production coefficients, herd dynamics and projections, and in calculating the requirements and costs of livestock production facilities.

4. Rural Sociologist

The rural sociologist technician in this position must be a French speaking Phd in the fielf of rural sociology or social anthropology with practical experience in rural social systems study. He must have at least five years experience, preferably in Africa. He must also be capable to preparing and administering a detailed questionaire which can be used by local assistants to survey the peoples of project area.

5. Survey Statistician

The survey statistician must have at least a B.S. degree in statistics or a related field with a minimum of five years experience in collating and evaluating statistical data, preferably in or from developing countries. He should have some experience in quantifying survey results. He should also be experienced in all facets of survey design including sampling, survey planning and procedures, specification writing for field work and data processing, questionnaire design, output design, and in the management and control of ongoing surveys.

6. Agricultural Engineer

The technician in this position should hold at least a B.S. degree in agricultural engineering with some emphasis or experience in civil engineering. He should have a minimum of five years experience overseas, preferably in tropical and/or semi-arid areas. This experience should have included stock water development, and the construction of agricultural installations and livestock handling facilities.

7. Agricultural Extension Specialist

The extension specialist will have a basic degree in agriculture with advanced training in education and/or extension methods. He must have a minimum of 10 years of field experience, including the promotion of new programs in developing countries. In addition he should have experience and demonstrated aptitude in organizing rural people's associations, and in making imaginative use of limited resources.

8. Veterinarian

Apart from a regular academic degree in veterinary science, the technician in this position should have at least five years of field service in undeveloped countries, preferably in Africa. In particular he should have capability in surveying disease incidence and organizing an animal health protection service, especially involving en masse treatment of large numbers of animals.

V. Methodology

A. Coordination of Discipines and Involved Groups

The proposed integrated range management project basically involves an effort to modify significantly traditional methods of livestock production through the introduction of new technologies. Since traditional production methods are a by-product of a way of life, such modifications necessarily involve complex sociological, economic and technical and legal question. Thus a closely coordinated multi-disciplinary approach to designing such a program is essential for success.

In addition to the involvement of a multidisciplined design team, considerable emphasis has been placed on maximizing the involvement of the people in the project area as well as the GOS Ministries which will be responsible for implementing the project in the design phase.

With so many entities involved in the design phase, it is critically important that maximum coordination is achieved in the design process between these various groups.

In view of the importance and complexity of the sociological element of the project design process, the limited time frame for completing the study and the substantial amount of sociological/anthropological data available, appropriate arrangements will be made to involve local individuals and/or institutions having substantial professional capability in the field of sociology.

B. Project Implementation Recommendations

Upon completion of project design activities and/or as a part of team responsibility, detailed recommendations will be made for implementing the project. These recommendations will broadly cover as a minimum:

1. Criteria for implementation
2. Priorities
3. Phasing of Project Inputs
4. Work Plans

DAKAR-HANN STUDIES

The Dakar-Hann laboratory, which is a section of the Livestock service, can provide several important studies to the project. The laboratory has indicated that it will be available to do four major studies (animal nutrition, internal parasites, trypanosomiasis, and agrostological) in the project area on a contract basis.

Nutrition, Parasitological and Trypanosomiasis - Senegal, Mauritania

The animal nutrition study would involve an investigation into nutrient deficiencies, especially mineral deficiencies, and would involve one man for two weeks a year, for all three years. This would assist the project management to determine what nutrients are needed in addition to what the animals can get from forages.

Using fecal studies, the internal parasite study would first identify the parasites of both large and small ruminants present in the project area and then would recommend treatments which will be effective against those specific parasites.

The trypanosomiasis study would first all indicate whether the infection is due to flies in the local area or due to contract with transhumance herds in areas further to the south and, secondly, would indicate the magnitude of the infection in the project area.

The technicians of the study team will also train the veterinarians. After this basic determination, recommendation will be made as to method of treatment.

ANNEX D

The following are cost estimates for the three medical surveys for both Mauritania and Senegal.

Nutrition Study

A. Bi Calcium phosphate from Morocco

200,000 cattle require 20 grams a day each for 180 days. This amounts to 720 tons at 90 CFA per Kg or a total of 64,000,000 CFA per year (about $260,000). This does not include transport from Dakar.

B. Salt/Mineral Blocks

200,000 cattle require 50 grams a day each for 180 days. This amounts to 1,800 tons at 60 CFA per Kg. or a total of 168,000,000 CFA per year (about $432,000).

Note: These prices are almost prohibitive. It might be less expensive to import mineral supplements from the U.S.

C. Laboratory support in the area of nutrition physiology would be as follow:

a/ One senior expert for 15 days a year for 45 days (3 years)		1,800,000 CFA
b/ Transport for 3 years		420,000 CFA
	Total	2,220,000 CFA
	about	$ 8,880

ANNEX D

Internal Parasites and Trypanosomiasis

One senior parasitologist - 3 months	3,600,000
One laboratory assistant 3 months	300,000
Three fly boys - local hire	270,000
Transport	840,000
Lab equipment and supplies	321,000
Lab analyses of blood smears and fecal samples	
1,200 exams at 100 CFA each	120,000
Total	5,451,000
(about	$ 21,800)

This figure does not include the cost of treatment nor the cost of surveillance and evaluation.

Agrostological Survey - Senegal Only

It is proposed that a detailed agrostological survey be done to determine the precise vegetation present in the area and to determine more precisely the carrying capacity of the land.

The Dakar-Hann laboratory has the capability to do this survey and in fact is presently conducting a survey of the remainder of the Eastern Region under contract to the IBDR.

The proposal study will be done in detail according to the following plan. There will be a total of one month in the office and one month in the field. The first stage will be interpreting the aerial photos and drafting a working map on which to base the ground studies. This operation will take approximately two weeks. Following this the technician will go to the field to do the ground study of the area. He will spend two to three weeks in this initial rainy season survey doing the vegetation identification and collecting samples for chemical analysis. Upon his return to the laboratory, work will begin on the final map of the area based on his observations. The technician will make a return trip to the field for approximately one week during the middle of the dry season to collect samples of the dry season forage for laboratory analysis. The final stage will be a final report collation which will take approximately two weeks.

The end result will be a detailed mapping of the vegetation cover in the project area on a map scale of 1 : 50,000 and a detailed evaluation of the existing forage species including food value and mineral content. The projected costs are are follows.

ANNEX D

Personnel	
1 Expert - 2 months at $ 4,800/month	$ 9,600
- per diem	$ 600
Field labor	$ 200
Laboratory costs (plant composition) 75 samples	$ 3,000
Mapping and reports	$ 600
Transport costs (4000 km at 70 CFA/Km)	$ 1,200
Contingency	$ 1,800
TOTAL	$ 17,000

RAINFALL REDORDS - BAKEL, SENEGAL

Year \ Month	April mm	April days	May mm	May days	June mm	June days	July mm	July days	August mm	August days	September mm	September days	October mm	October days	TOTAL mm	TOTAL days
1964															480.6	32
65															760.5	42
66															698.7	46
67			6.9	3	.92	7	168.7	13	384.8	13	227.7	16	19.9	3	900.0	55
68	3.3	1			36.7	6	250.6	7	96	3	79.6	3	5.3	2	471.5	34
69					41.4	4	156.9	12	166.9	14	84.8	10	131.6	9	582.4	50
70			0.2	1	82.8	4	96.1	9	188	14	88.9	7	0.5	1	456.5	36
71					47.4	3	133.4	10	196.7	16	151.4	13	5.7 * 6.0	2 * 1	540.6	45
72			33.8	2	43.7	5	45.4	5	130	8	123.7	8	15.1	4	391.7	32
73			1.2	1	37.0	5	147.9	10	146.2	11	56.0	4	7.5	1	395.8	32
Total 1964-73	3.3	1	42.1	7	381.0	34	999.0	66	1308.6	79	812.1	61	235.3 *6.0	22 *1.	5678.3	404
Average 1964-68	0.47	0.14	6.01	1.0	54.4	4.89	142.7	9.43	186.9	11.3	116.0	8.71	*0.86 33.6	*0.14 3.14	567 567.8	40.4
Average 1969 -73													* November '71		662.7	41.8
Average															473.4	37.0

SOILS AND VEGETATION

Area A - Basically alluvial types

80% Alluvial Planisol soils

Vertic soil

Poor structured heavy clay

Dry and slightly permeable

Vegetation group

Schoenfeldia	Gracilis
Aristida	Adscensionis
Acacia	Senjal

Escarpments - 10%

Deep brown lithosols

Steep terrain

Vegetation

Andropogon ssp	
Oxytenantheia	abyssinium
Pterocarpus	arinacens

10% Continental Terminal

Reddened ferrous soil

Windy sand cover

Scanty water reserve

Vegetation

Andropogon	pseudapricuo
Dikitropcgon	hagenipie
Ctenium	elegans
Combritum	glutinosum
Giriera	senegalencis

Area B- Dry laterites

75% Pebbly lithosols

Thin

No water reserve

Sandstone base

Ferrigeneous crust - Latesito

Vegetation

Loudetta	togonesis
Elionurus	elegams
Pterocarpus	ssp
comberatum	nigricans

15% Continental terminal (see Zone A desc.)

10% Indurated Ferrugineous

Thin

Little water

Vegetation

Dihetropo	hagerupii
Andropogon	pseudopricus
Boireria	stachydea
Combretum	nigrican
Bombax	Costatum

		CATTLE / SURFACE AREA		CATTLE / POPULATION		
	Cattle	Surface area	no. of cattle/Km2	Human population	population density inhabitants/Km2	no of cattle/ inhabitants
Goudiry *	48,000	8,054	5,96	17,000	2,11	2,82
Ololdou *	46,000	1,343	34,25	22,000	16,4	2,1
Belé	11,000	4,099	2,68	7,000	1,70	1,57
Bale	35,000	8,882	3,94	15,000	1,69	2,33
Total for Dept of Bakel	140,000	22,378	6,25	66,000	2,9	2,12

* project area included Ololdou and Goudiry

SARRE ZONE

VILLAGE NAME	TOTAL # Human	TOTAL CATTLE	TOTAL GOATS & SHEEP	Around Village Cattle	Around Village Goats and sheep	Grazing blocks Cattle	Grazing blocks Goats and Sheep
I - SARRE	141						
DIBICOULE	189	500	196	50	39	450	157
Mama N'DAO	69	400	800	40	160	360	640
DIABEL	200	700	960	70	192	630	768
AMADJI	332	400	992	40	198	360	794
DEDJI	216	700	1280	70	256	630	1024
KIDLEI	214	500	720	50	144	450	576
SARRE		400	496	40	99	360	397
SAUREL MARDI	131	400	576	40	115	360	461
MARSA	392	1000	1200	100	240	900	960
SAMBA KONTAYE	79	1500	2480	150	496	1350	1984
TOTAL	2044	6500	9700	650	1940	5850	7760

TOULEKEDI ZONE

	Human	Total		Around Village		Grazing Blocks	
		Cattle	Goats and Sheep	Cattle	Goats and Sheep	Cattle	Goats and Sheep
Toulekedi	100	600	1,360	60	272	540	1088
Boulel	120	500	896	50	179	450	717
Taurel Niaye	400	2,000	3,488	200	698	1,800	2790
Dura Soule	335	800	700	80	140	720	560
Fete Golombi	105	600	900	60	180	540	720
TOTAL	1,060	4,500	7,344	450	1,468	4,050	5,875

HERD COMPOSITION

	Bulls	Steers	Cows	Calves	TOTAL
Ololdou	433	3,009	21,091	10,593	35,126
Bélé	166	442	5,277	2,960	8,845
Goudiry	1,698	4,293	22,567	12,636	41,194
Bala	784	1,770	8,913	9,213	20,680
Total for Dept. of Bakel	3,081	9,504	57,848	25,402	105,845

JANV/73 - VACCINATION FIGURES (Dia)

TABLE 21

NATURAL CALVING DISTRIBUTION

Month	Number of births	Distribution in %
January	153	5.56
February	228	8.29
March	232	8.43
April	183	6.65
May	321	11.67
June	473	17.20
July	464	16.87
August	243	8.83
September	159	5.78
October	91	3.30
November	92	3.34
December	111	4.03
TOTAL	2,750	100.00

Under natural conditions, the months of May, June, July, August represent 54.57 % of the calvings for the year; hence, the most auspicious months for mating are the months of August, September, October, and November.

The average interval between calvings is 473 days, or about 15½ months.

2.4.4.2. Weight Performance Depending Upon Time of Birth

The animals' feeding is planned as follows:

a/ from birth till weaning the young animals received in addition to mother's milk a concentrate containing 125 to 130 g digestible nitrogen matter per kg.--13%;

b/ from weaning and until the age of 2 years, the animals were placed in lots where in addition to grass they received the same concentrate at will, and whenever possible, hay harvested at the Station. The concentrate, given in pellet form, is analyzed in Table 22.

At 6 months, the average weight is higher for the animals born during the 2nd quarter, since they benefit from the best feeding conditions from birth until weaning.

At 12 months, the maximum average weight is observed for births in the 1st quarter, since the animals benefit until they reach this weight, from the entire rainy season, and the period that follows it.

Weight performance after weaning has been studied on animals born from 1965 to 1967, until the age of 30 months, and the findings are assembled in Table 23.

TABLE 23

ANIMALS' AVERAGE WEIGHT DEPENDING UPON THE QUARTER OF BIRTH

Age	1st quarter		2nd quarter		3rd quarter		4th quarter	
	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.
Birth	23	51	22	48	22	48	24	53
10 weeks	48	106	52	114	58	128	53	117
6 months	85	187	100	220	92	202	86	189
7 "	101	222	109	240	98	216	89	196
8 "	111	244	117	257	105	231	93	205
9 "	124	273	119	262	110	242	100	220
10 "	130	286	120	264	108	238	110	242
11 "	137	301	123	271	114	251	123	271
12 "	142	312	127	280	116	255	138	304
13 "	141	310	128	282	124	273	149	328
14 "	142	312	132	290	132	290	159	350
15 "	149	328	139	306	149	328	169	372
16 "	150	330	155	341	159	350	173	381
17 "	155	341	171	376	158	348	175	385
18 "	160	352	184	405	179	394	184	405
19 "	174	383	194	427	186	409	182	400
20 "	192	422	197	433	195	429	179	394
21 "	209	460	205	451	196	431	189	416
22 "	202	444	207	455	189	416	211	464
23 "	230	506	209	460	194	427	229	[illegible]
24 "	235	517	223	491	197	433	[illegible]	[illegible]
27 "	237	521	241	530	270	594	272	598
30 "	246	541	296	651	297	653	-	-

2.4.4.3. Natural Distribution of Mortality

For the past ten years the CRZ in Dahra has statistics on natural livestock analyzed.

TABLE 24

MONTHLY DISTRIBUTION OF MORTALITY FOR THE WHOLE HERD OF THE DAHRA RANCH

Month	% of mortality
January	7.3
February	6.0
March	7.0
April	10.0
May	11.6
June	12.5
July	14.7
August	7.1
September	5.5
October	6.0
November	5.0
December	7.3
TOTAL	100.0

These statistics were compiled on the basis of the data for the 1960 to 1969 period.

The highest mortality was in July; close to one-half of the deaths occur between April and July, i.e. during the second half of the dry season.

With the animals receiving nutritional supplements until the age of 2 years according to the program defined in paragraph 2.4.4.2., 3.25 % of the calves died before reaching the age of 1 year, and 5 % before they were 2 years old.

TABLE 25

ANALYSIS OF MORTALITY PER AGE GROUP FOR THE WHOLE HERD OF DAHRA

Age	% of mortality
0 to 6 months	1.90
6 to 12 months	1.35
During the first year	3.25
12 to 24 months	1.75
During the first 2 years	5.00
24 to 36 months	0.29
36 to 48 months	0.16
During the first 4 years	5.45

2.4.4.4. Mortality Depending Upon Time of Birth

Statistics in Table 26 show the incidence of deaths in relation to the dry season, to which the animals are particularly vulnerable, even in a ranch manager under modern techniques.

They also show that the most favorable period for weaning in a project aimed at selling cattle at an age that does not exceed 20 months is the 3rd quarter--July, August, and September.

TABLE 26

MORTALITY PER AGE GROUP BASED ON TRIMESTER OF BIRTH
FOR THE WHOLE HERD OF DAHRA

Age	1st quarter	2nd quarter	3rd quarter	4th quarter
0 to 6 months	30.4	27.9	31.5	33.6
6 to 12 months	30.4	25.6	10.5	20.9
During the 1st year	60.8	53.5	42.0	54.5
12 to 24 months	16.4	27.9	35.0	30.9
During the first 2 years	77.2	81.4	77.0	85.4
24 to 36 months	6.2	1.8	7.6	4.5
36 to 48 months	2.3	2.2	3.5	2.7
During the first 4 years	85.7	85.4	88.1	92.6
4 years and over	14.3	14.6	11.9	7.4
TOTAL	100.0	100.0	100.0	100.0

The following additional remarks may be made regarding Table 26 :

a/ from birth to weaning the mortality distribution is relatively identical for the 4 quarters;

b/ from weaning to 12 months, the mortality is the highest for the 1st quarter and the lowest for the 3rd quarter;

the month of birth seems to exert little influence on mortality before the age of 2 years. It appears nevertheless that the mortality rate is much higher for the animals born in the 4th quarter. There is no explanation to account for this fact for the time being. This higher rate for the 4th quarter might be due to a greater development of parasitic diseases in the young animals in the season after the rains, despite the better feeding conditions of the mothers during the rainy season. This hypothesis remains to be verified.

TABLE 27

MONTHLY DISTRIBUTION OF DEATHS FROM BIRTH TO 24 MONTHS AT DAHRA

Month	Distribution of deaths in %
January	5.7
February	8.2
March	8.2
April	6.7
May	13.1
June	16.4
July	15.6
August	8.8
September	5.5
October	3.5
November	2.6
December	5.7
TOTAL	100.0

There again, June and July account for 32 % of the deaths, and May, June and July for 45 %.

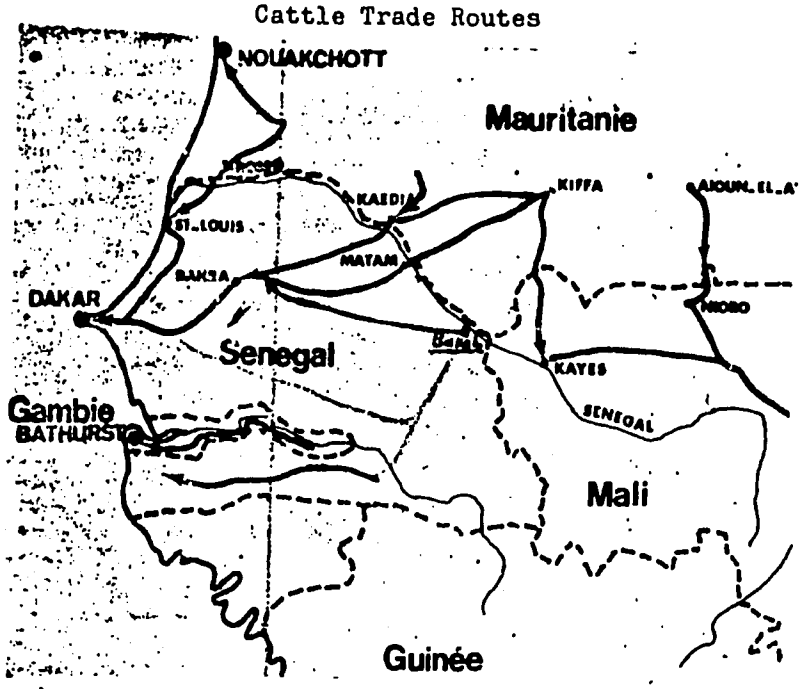
Table 1.2

Henry E Kambeke - May 1974 -

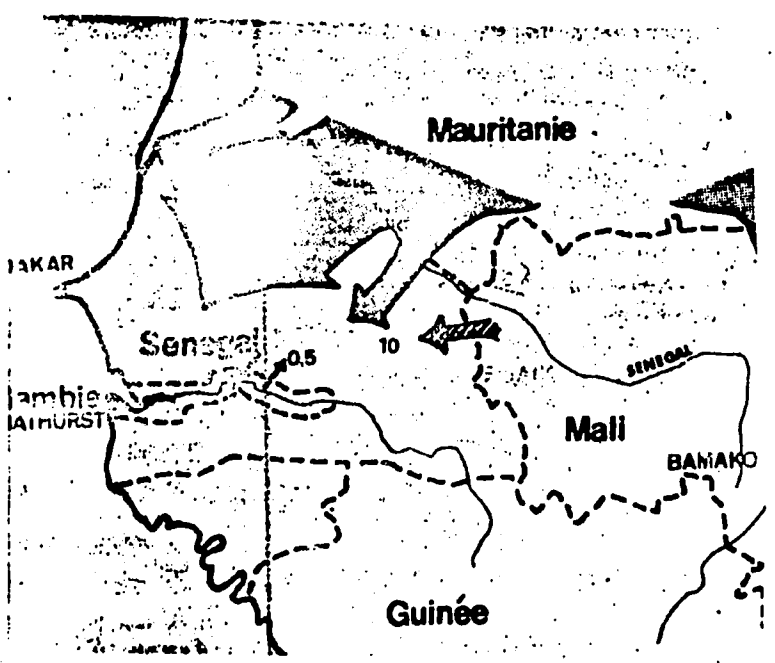
SMALL RUMINANT OUTPUT IN 1970

Sheep - goats	OMVS countries				Other countries			General total
	Mali	Mauritania	Senegal	Total	Gambia	Sierra Leone	Liberia	
Size of herd (thousands of head)	11,250	7,000	2,700	20,950	205	206	269	21,650
Number of animals per inhabitant	2.2	6.0	0.7	2.1	0.5	0.08	0.2	1.5
Off-take rate (%)	30	30	30	30	30	30	30	30
No. of animals available (thousands of head)	3,375	2,100	810	6,285	61.5	61.8	86.7	6,495
Average carcass weight (kg.)	12.4	13	12.5	12.6	10	10	10	12.5
Tonnage of meat	41,940	27,300	10,125	79,365	615	618	867	81,465
% of weight composed of offal	15	15	15	15	15	15	15	15
Tonnage of offal	6,291	4,095	1,519	11,905	92	93	130	12,220
Tonnage of meat and offal	48,231	31,395	11,644	91,270	707	711	997	93,685
Producer price per kg net (CFA francs)	133.5	100	150	124.1	300	300	330	129
Value of output (millions of CFA francs)	5,600	2,730	1,520	9,850	184.5	185	286	10,505.5

Cattle Trade Routes



Small Ruminant Trade Routes



Summary Tables for Economic Analysis

Summary of Assumptions For Economic Analysis.

CATTLE

with project.		without project.
13,500	-Number of cattle-	11,000
57%	-% Female-	52%
65%	-Fecundity rate.	60%
40%	-Calfhood mortality.	50%
8%	-Adult mortality.	12%
14%	-Offtake.	8%
1%	-Growth	3%
3001.	-Annual milk production.	1501.

SHEEP AND GOATS

20,000	-Numbers	17,000
70%	-% Females	70%
125%	-Fecundity.	110%
40%	-Kid and lamb mortality.	50%
8%	-Adult mortality.	12%
43%	-Offtake	25%
1%	-Growth.	1%
150 1	-Annual milk production	[illegible]

ANNUAL BENEFITS - COST SUMMARY in $ US.

Benefits	FY 75	FY 76	FY 77	FY 78	FY 79 Onward
REAL					
MEAT		10,000	20,000	80,000	135,000
MILK		45,000	118.000	315,000	385,000
Total	———	55,000	138,000	395,000	520 000
CASH					
MEAT		6,000	14,000	65.000	115,000
MILK		21,000	24,000	32,000	36,000
Total	———	27,000	38,000	97,000	151,000
COSTS					
Capital	842,400	425,000	215,000	---	---
Recurrent					
Admin	29,200	56,200	55,200	52,000	52,000
Labor		17,500	22,500	24,000	24,000
Supplies	15,000	36,000	31,000	19,000	19,000
Drugs, Vaccines & Minerals	35,000	35,000	35,000	35,000	35,000
Miscellaneous	10,000	10,000	10,000	10,000	10,000
Total Cash	89,200	154,700	153,700	140,000	140,000
Depreciation		80,000	80,000	80,000	80,000
Total Operating	89,200	162,700	233,700	220,000	220,000

CATTLE BENEFIT SUMMARY

US $	With Project	Without Project	Incremental Benefits
Real Income			
Meat	135,000	57,000	78,000
Milk	315,000	129,000	186.000
Total/per Animal	450,000/33.44	186,000/16.90	264,000/19.50
CASH Income			
Meat	87,000	21,400	65,600
Milk	79,000	64,000	15,000
Total/per Animal	166,000/12,30	85,400/7.75	80,600/5.95

SHEEP & GOATS BENEFITS SUMMARY

US $	With Project	Without Project	Incremental Benefits
Real Income			
Meat	105,400	48,000	57,400
Milk	315,000	116.000	199,000
Total/per Animal	420,400/21.02	164,000/9.64	256,400/12.82
CASH Income			
Meat	67,400	18,000	49,400
Milk	79,000	58,000	21,000
Total/per Animal	146,400/7.32	76,000/4.47	70,400/3.52

TOTAL ANIMAL BENEFITS

Real Income	870,400	350,000	520,400
Cash Income	312,400	161,400	151,000

VALUE OF BEEF PRODUCTION REAL BENEFITS

Using STRYKER's Method

	Present Number	Price	Value Benefit
Cattle for Export	120	20,000 CFA	2,400,000*
For local consp.	200	15,000 CFA	3,000,000*
Auto Consumption	560	10,000 CFA	5,600,000
Herd growth	330	10,000 CFA	3,300,000
			14,300,000 CFA
			$57,000

Future WITH Project

	Number	PRICE	Value
Cattle for Export	900	25,000 CFA	22,500,000*
For Local consp,	250	15,000 CFA	3,700,000*
Auto Consumption	750	10,000 CFA	7,500,000
Herd Growth	100	10,000 CFA	1,000,000
			34,800,000
			$135,000

Annual Increment - $78,000 - meat

* Cash benefits.

MILK PRODUCTION CATTLE

PRESENT

Milk Production

# Cows	60% of 11,000 = 6,600	
# Prod	60% of. 6,600 = 4,350	
Average milk production		150 l.
For Human Consumption		
Total produced -	650,000.1.	
50% sold	325,000 l.	
50% consumed	325,000 l.	
@ 50 CFA per litre	32,200,000 CFA	
sold	16,100,000 CFA*	
auto consp.	16,100,100 CFA	

WITH PROJECT

# Cows	60% of 13,500 = 8,100
# Prod	65% of 8,100 = 5,250
For Human Consumption	300 l.
Total prod 300.5250 -	1,575,000 l.
25% sold	394,000 l.
75% auto consp.	1,181,000 l.
@ 50 CFA/litre	78,700,000 CFA
sold	19,700,000* CFA
auto consp.	59,000,000 CFA

* Cash Benefit

VALUE OF SHEEP AND GOAT PRODUCTION

REAL AND CASH

WITHOUT PROJECT

SALES	NUMBER		PRICE	VALUE
Export				
Local	1500	@	3000	4,500,000*
Auto Consumption	2800	@	2500	7,000,000
Herd Growth	200	@	2500	500,000
				12,000,000 CFA

WITH PROJECT

SALES	NUMBER		PRICE	VALUE
Export	3100	@	3500	10,850,000*
Local	2000	@	3000	6.000,000*
Auto Consumption	3500	@	2500	8,750,000
Herd Growth	300	@	2500	750,000
				26,350,000 CFA

*CASH BENEFIT

MILK PRODUCTION - SHEEP AND GOATS

WITH PROJECT

70% of total	=	14,000 Female
75% milking	=	10,500 milking
150 l/ milker	=	1,575,000 litres
50 CFA/litre	=	78,750,000 CFA
sold	=	19,750,000 CFA*
auto consp	=	59,000,000 CFA

WITHOUT PROJECT

70% of total	=	11,900 Female
65% milking	=	7,735 Milking
75 l/milker	=	580,125 litres
50 CFA/litre	=	29,000,000 CFA
sold	=	14,500,000 CFA*
auto consp	=	14,500,000 CFA

* Cash Benefits

Calculation of Internal Rate of Return

	Capital	Costs - Recurrent	T. A.	Total	Gross Benefits	Net Benefits	Discount Factor @ 12	Present Worth @
1.	842,400	89,200	200,000	1,131,000	--	-1,131,600	.893	-1,010,518
2.	425,000	157,700	250,000	832,700	55,000	-777,700	.797	- 619,826
3.	215,000	153,400	130,000	498,400	138,000	-360,400	.712	- 256,604
4.	---	140,000	---	140,000	395,000	255,000	.636	162,180
5.	---	140,000	---	140,000	520,000	380,000	.567	215,460
6.	---	140,000	---	140,000	520,000	380,000	.507	192,660
7.	---	140,000	---	140,000	520,000	380,000	.452	171,760
8.	---	140,000	---	140,000	520,000	380,000	.404	153,520
9.	---	140,000	---	140,000	520,000	380,000	.361	137,180
10.	---	140,000	---	140,000	520,000	380,000	.322	122,360
11.	---	140,000	---	140,000	520,000	380,000	.287	109,060
12.	---	140,000	---	140,000	520,000	380,000	.257	98,660
13.	---	140,000	---	140,000	520,000	380,000	.229	87,020
14.	---	140,000	---	140,000	520,000	380,000	.205	77,900
15.	---	140,000	---	140,000	520,000	380,000	.183	69,540
16.	---	140,000	---	140,000	520,000	380,000	.163	61,940
17.	---	140,000	---	140,000	520,000	380,000	.146	55,480
18.	---	140,000	---	140,000	520,000	380,000	.130	49,400
19.	---	140,000	---	140,000	520,000	380,000	.116	44,080
20.	---	140,000	---	140,000	520,000	380,000	.104	39,520
Salvage	---	---	---	---	150,000	150,000	.104	15,600
Total								-24,628

SENSITIVITY ANALYSIS ON BENEFITS WITH VARYING RAINFALL

Rainfall Possibilities PROJECT	Continued Present Level		Return to Predrought Levels	% Change	Continued Decline	% Change
Projected Animal Population - Cattle, Sheep and Goats	16,000 Au 13,500/20,000		20,000 All 17,000/25,000	+25%	12,000 All 10,000/15,000	-25%
Real Benefit Dollars						
Meat						
Cattle	78,000		120,000		44,000	
Sheep/goats	57,000		75,000		48,000	
Milk						
Cattle	186,000		250,000		96,000	
Sheep/goats	199,000		260,000		108,000	
TOTAL	520,000		705,000	+36%	296,000	-43%
Cash Benefit Dollars						
Meat						
Cattle	65,600		123,000		44,000	
Sheep/goats	49,400		71,000		43,000	
Milk						
Cattle	15,000		32,000		7,000	
Sheep/goats	21,000		36,000		8,000	
TOTAL	151,000		262,000	+73.5%	102,000	-32%

Proposed Fee for Use of Improved Grazing Facilities

A major aspect of the medium-term livestock strategy developed by the by the Sahel Program Planning Seminar was that the programs designed for the medium-term should provide replicable demonstrations of livestock development schemes in the Sahel-Sudano zones. Thus, a major implication of the strategy is that to be replicable the programs developed must not impose unreasonable financial burden on the governments involved. This principle was completely concurred with by the Senegalese. design team.

Thus every effort was made to minimize the recurrent cost of the proposed integrated range management scheme, to ensure that it is economically viable and to maximize the benefits accruing to the herders. We believe that reasonable success was achieved in the design process on all three counts.

A further objective of the design team was to maximize the participation of the herders in the planning and implementation of the project. In the above context and in view of the substantial economic returns which are projected to accrue to the herders as a result of the project (see pp. 84 - 89 of CAP) both the design team and its Senegalese counterparts fully agreed that a fee should be paid by the herders. This discussion was subsequently strongly supported by GOS officials in Dakar and by World Bank and FED representatives engaged in similar projects. Thus, it was tentatively agreed that the following approach should be followed with respect to the charging of a fee: First, that the direct objective in charging a fee should be to cover the recurrent costs of the project to the maximum extent feasible, consis-

tent with the broader objectives of the project. Second, that the fee should not be initiated (beyond some token amount to get the herders into the habit of paying) until (a) the project had proven viable (i.e., until advantages are realized by the herders) and (b) until an appropriate education program has been carried out by the Ministry de la Promotion Humaine explaining the entire project and its purpcse (including the fee). Third, that the fee should be collected by the herders association (see pp. 69-71 of the CAP) and should remain within the project area.

However, in view of the substantial changes in herder's traditional patterns which may be required under the project, it was agreed that further details regarding the actual amount of the fee, the timing of its imposition and the role of the herders regarding its imposition and use should be thoroughly addressed during the detailed design study phase in coordination with representatives of the herders and the GOS.

ANNEX K

DETAILED BUDGET

I. INFRASTRUCTURE		
Water Points 1/		
44 Reservoirs		356,400,00
Water Spreading		
100 Ha Four sites of 25 Ha each		10,000.00
Fire Breaks		
500 Kilometers of firebreaks at $140.00 per km		35,000.00
Forage and Revegataion Trails		
50 Ha Two sites of 25 Ha each		2,000.00
Vaccination Parks		
2 Goats and sheep (corral and squeezes)	2,000.00	
8 Cattle (corral and squeezes)	40,000.00	
2 Quarantine pens	4,000.00	
Total Vaccination Parks		46,000.00
Garage in Bakel (plus tools)		25,000.00
Housing and Offices for Senegalese Personnel		
11 Permanent houses and office units		125,000.00
Training Installation		
2 Buildings plus training materials		15,000.00
TOTAL INFRASTRUCTURE		614,400.00

1/ We have tentatively assumed that total water requirements can be met with the construction of reservoirs. However other alternatives will be used as necessary.

II. EQUIPMENT

Vehicles

Bakel

2	Landrovers - Gas - Long wheel base with metal cab and canvas back	14,000.00	
2	R - 4s Renault - Breaks - with side windows	4,000.00	
2	Five ton trucks - diesel with stake body	16,000.00	
1	Four-wheel 5 ton trailer without springs with side boards 1 meter high-all steel	4,000.00	
4	1,000 gallon tanks for water and fuel	8,000.00	

Sarre and Toulekedi Perimeters

1	Road Grader	35,000.00	
1	D-4 Caterpillar tractors, with angle dozer approx. 10' wide and D-4 tractor, tool bar equipped with ripper teeth	56,500.00	
2	D-7 power shifts with cable control	130,000.00	
2	Scaper attachment for D-7s	55,000.00	
2	Landrovers - Diesel - long w/b with metal cab and canvas back	14,000.00	
10	Moblyettes	2,000.00	
1	Wheel tractor equivalent to Massey Ferguesen 165 equipped with hydraulic system, 3 disc plow and cover crop disc harrow approx. 10' wide	10,000.00	
	Miscellaneous vehicle accessories and equipment	5,000.00	
	Total Vehicles		353,500.00

Reservoirs and Pits		
200 Wheel barrels (heavy duty contractor type)	3,500.00	
200 Shovels	500.00	
25 Mattocks - Local	200.00	
25 Axes	300.00	
2 Saws	100.00	
Miscellaneous	500.00	
Total Reservoirs and Pits		5,100.00
Water Spreading		
20 Wheel barrels	1,500.00	
200 Shovels	200,00	
100 Mattocks - local	1,000.00	
Miscellaneous	1,000.00	
Total Water Spreading		3,700.00
Wells		
1 Mobile Rotory Auger	31,000.00	
2 Fire fighting filling drums portable pumps for pumping water from wells 120 feet deep, possibly electric operated from vehicles for filling pump units and barrels and fire fighting and construction ($1,000.00)	2,000.00	
Miscellaneous	2,000.00	
Total Wells		35,000.00

Surveying and Drafting Equipment		
Transit, levels, plain tables, rods studies, etc., for two crews	3,000.00	
Drafting table and equipment for Bakel office	1,000.00	
Total Surveying and Drafting Equipment		4,000.00
Livestock Equipment		
All weather livestock markers (dye)	195.84	
All weather point sticks (marking pencils)	273,60	
Heavy Duty Irons (letters) Branding)	1,944.00	
Heavy Duty Irons (numbers) Branding	520.00	
Jumbo size tags for sheep and goats	1,322.00	
Jumbo Roto Tag Pliers	90.00	
Ewe Marking Harness	113.75	
Crayons for marking	156.00	
Medium Rum and Buck Jacket	120.00	
Large Buck Jacket	120.00	
Sisal Rope	240.00	
Easy Hold Chute Gate	800.00	
Portable scale	1,832.00	
Dehorning Irons (sets of 3)	45.00	
Miscellaneous	747.81	
Hand Sprays (Hudson)	1,480.00	
Total Livestock Equipment		10,000.00
Patrol Equipment		
8 Horses with saddles		3,000.00

Fire Fighting Equipment

20	Portable back tanks (water) 5 gals. metal or heavy plastic	200.00	
50	Machetes	500.00	
100	Boots (pairs)	1,000.00	
10	Binoculars	500.00	
10	First Aid Kits	200.00	
100	Sets of clothes	1,000.00	
6	Radio Sets $700 complete with battery chargers and transformer	4,200.00	
16	Sirens (hand)	1,500.00	
3	Portable fire fighting Units with high pressure pump, fog nozzle, 100 ft of high pressure hose, 200 gal tank, metal and 50 intake hose (2,000 x 3)	6,000.00	
40	Back packs, pump units with metal or plastic tank (approx. 5 gals)	2,000.00	
1000	Sacs, burlap, used	1,000.00	
	Miscellaneous equipment	2,500.00	
	Total Fire Fighting Equipment		20,600.00
	SUBTOTAL EQUIPMENT		434,900.00
	Shipping and Insurance (25%)		108,800.00
	TOTAL EQUIPMENT		543,700.00

III. ANIMAL HEALTH

Vaccines and Drugs

Rinderpest	720	
CBPP	1,800	
Blackleg	300	
Pasturellosis	180	
Botulism	2,160	
Trypanocide	6,300	
Dipping or spray concentrate for tick control	1,800	
Parasite treatment - cattle:	40,000	
Parasite treatment - sheep & goat:	55,000	
Antibiotics (Penicillin, streptomycin, aureomycin and miscellaneous drugs)	4,000	
Total Drugs and Vaccines		112,260
Mineral Salt Mix - Obtain actual price from Dakar-Hann Laboratory, but rough estimates ($)		20,000

Veterinary Equipment

1.	1 Microscope @ $500.00	500
2.	Microscope glass slides - 5,000 @ .02	100
3.	Microscope stains	100
4.	Syringes, Champion Luer Lock (U.S. source)	
	300 - 30cc @ 4.00	1,200
	400 - 20cc @ 3.00	1,200
	200 - 10cc @ 3.45	690
5.	Needles - Champion Luer Lock	
	16 gauge - ½ in. - 300 dz @ 2.00	600
	20 gauge - 3/2 in. - 320 dz. @ 2.00	640
6.	Surgical Instruments	
	3 complete sets - estimated @ 200.00	600
7.	Burdizzo Emasculation Castrators	
	30 medium @$32.00	960
	30 small @ $29.00	870
	30 large @ $32.00	960

8. Electrolux Kerosine Deep Freezers 4 @ $650.00	2,600	
9. Portable Ice-Boxes 9 @ $30.00	270	
10. Automatic dose Syringes for parasite treatment		
50 - 100cc @	500	
25 - 50cc @	250	
25 - 30cc @	250	
Total Veterinary Equipment		12,300.00
Vehicles (2 landrovers with 4-wheel drive)		12,000.00
Operating Costs		
Fuel for 2 Land Rovers for 3 years	6,000.00	
Kerosene for Deep Freezers (4 units x 360 litres x .25 x 3 years)	1,080.00	
Total Operating Expenses		7,080.00
Miscellaneous Health		1,350.00
TOTAL ANIMAL HEALTH		165,000.00

IV. STUDIES/EVALUATION

Design Study		
Range Specialist (3 man months) 2/	15,000.00	
Livestock Specialist (3man months) 2/	15,000.00	
Hydro Geologist (1 man months) 2/	5,000.00	
Agriculture Extension Expert (1½ man month)	8,000.00	
Head Sociologist (3 man months)	15,000.00	
Assistant Sociologist (2man months)	8,000.00	
Economist (2 man months)	10,000.00	
Dakar Hahn tse-tse, trypanosomiasis and parasite survey	30,000.00	
Total Studies Costs		106,000.00
End of Project Evaluation		
Economist (1 man month)	5,000.00	
Sociologist (2 man months)	10,000.00	
Livestock Specialist (1 man month)	5,000.00	

2/ These specialists will also be members of the advisory team assisting the MERD with the implementation of the project.

Range Management Specialist (1 man month)	5,000.00	
Total Evaluation Costs		25,000.00
TOTAL STUDIES/EVALUATION		131,000.00
V. EDUCATION ("ANIMATION RURAL")		100,000.00
VI. TECHNICAL ASSISTANCE		
1 Range Management Specialist 2.75 year tour 3/	110,000.00	
1 Livestock Specialist 1.75 year tour 3/	70,000.00	
1 Stock Water Development Specialist 2 year tour	80,000.00	
TDY Assistance		
1 Geologist/Hydrogenologist 3/ Several TDY trips total of 4 months	20,000.00	
1 Well Drilling Specialists Several TDY trips total of 8 months	40,000.00	
1 Water Spreading Specialist Several TDY trips total of 4 months	20,000.00	
Housing and other support	100,000.00	
TOTAL TECHNICAL ASSISTANCE		440,000.00
VII. PARTICIPANT TRAINING - U.S.		
Project Personnel		
1 Director of Project - 1 year Academic and Practical training in U.S. in Range Management	12,000.00	
1 Interim Director - 1 year Academic and practical training in the U.S. in Range Management	12,000.00	
2 Chiefs of Sarre and Toulekedi Perimeters 6 months in U.S. for practical training in Range Management 2 x 6,000=	12,000.00	
Materials, supplies, training aids, and other miscellaneous training expenses	10,000.00	
Total Project Personnel Training		46,000.00

3/ These specialists will also be key members of the project design team.

Observational Training - one month in the U.S.

1 Director of the Office of the Minister for Rural Development	2,000.00	
2 Director and Tambacounda Regional Chief of Livestock Service	4,000.00	
2 Director and Tambacound Regional Chief of Hydraulic Service	4,000.00	
2 Director and Tambacounda Regional Chief Water and Forest Service	4,000.00	
2 Director and Tambacound Regional Chief of the Rural Development Service	4,000.00	
Interpreter for observational training tour	10,000.00	
Total Observational Training		28,000.00
TOTAL PARTICIPANT TRAINING - U.S.		74,000.00

TOTAL U.S. PROJECT COSTS	2,068,100.00

U.S. PROJECT COST SUMMARY

I. Infrastructure	$614,400.00
II. Equipment	543,700.00
III. Animal Health	165,000.00
IV. Studies/Evaluation	131,000.00
V. Education	100,000.00
VI. Technical Assistance	440,000.00
VII. Participant Training - U.S.	74,000.00
TOTAL COST	2,068,100.00

EASTERN SENEGAL LIVESTOCK I

Real Investment Costs

Items	Number Units	Unit Cost	Total Cost	Working Life (years)	% Charge to Project	Total Charge to Project
I. Equipment Costs						
A. Bakel						
Landrovers	2	$ 7,000	$ 14,000	5	70%	$ 9,800
R-4 Renault	2	$ 2,000	$ 4,000	5	70%	$ 2,800
5-Ton Truck	2	$ 8,000	$ 16,000	5	70%	$ 11,200
5-Ton(four wheel) trailer	1	$ 4,000	$ 4,000	10	100%	$ 4,000
1,000 gal water fuel tanks	4	$ 2,000	$ 8,000	15	100%	$ 8,000
B. S&T Perimeters						
1. Construction Unit						
Road Grader	1	$ 35,000	$ 35,000	7	100%	$ 35,000
D-4 Caterpiller	1	$ 56,000	$ 56,000	7	100%	$ 56,500
D-7 with ripper and angle blade	2	$ 65,000	$ 130,000	7	30%	$ 39,000
Scaper attachments	2	$ 27,500	$ 55,000	10	20%	$ 11,000
Landrovers	4	$ 7,000	$ 28,000	5	100%	$ 28,000
Moblyettes	10	$ 200	$ 2,000	5	100%	$ 2,000
Wheel Tractor	1	$ 10,000	$ 10,000	5	100%	$ 10,000
Miscellaneous accessories		$ 5,000	$ 5,000		100%	$ 5,000
Mobile Rotory Auger	1	$ 31,000	$ 31,000	7	30%	$ 9,300
Small Equipment--shovels axes, saws, etc.		$ 5,100	$ 5,100	5	100%	$ 5,100
2. Surveying Unit						
Transits levels rods etc		$ 3,000	$ 3,000	10	20%	$ 600
Drafting Equipment		$ 1,000	$ 1,000	10	20%	$ 200
3. Fire Fighting Unit						
Portable fire fighting units with high pressure pump, tank, etc.	3	$ 2,000	$ 6,000	10	100%	$ 6,000
Radio sets	6	$ 700	$ 4,200	10	100%	$ 4,200
4. Livestock Unit			$ 10,000			$ 10,000
5. Veterinary Unit						
Microscopes, Needles, Syringes, "Refers," etc			$ 13,300		100%	$ 13,300
SUB-TOTAL EQUIPMENT						$ 284,900

EASTERN SENEGAL LIVESTOCK I

Items	Number Units	Unit Cost	Total Cost	Working Life (years)	% Charge to Project	Total Charge to Project
II. Development Costs						
A. Water Development						
11 Permanent Facilities cu.m.	330,000	$ .60				$ 198,000
11 Temporary Facilities (D. J.E.) cu. m.	176,000	$ .60				$ 105,600
22 Temporary Facilities (S. O.N.) cu. m.	88,000	$ .60				$ 52,800
B. Fire Breaks km	500					$ 35,000
C. Permanent Housing and Office Units	11					$ 125,000
D. Mobile Homes for Expatriate Technicians	6	$ 16,500				$ 100,000
E. Training Center	2					$ 19,000
F. Vaccination Parks (cattle/sheep/goats)	8					$ 26,000
G. Garage in Bakel	1					$ 25,000
SUB-TOTAL DEVELOPMENT COSTS						$ 682,400
III. Technical Assistance Cost						
A. Full-Time		Per Year				
Range Management Specialist (3 year tour)		$ 40,000	$ 120,000			$ 120,000
Livestock Specialist (2 yr tour)		$ 40,000	$ 80,000			$ 80,000
Stock Water Development (2 year tour)		$ 40,000	$ 80,000			$ 80,000
Mechanic (Peace Corps 3 yr tour)						
Ag Extension Specialist (P.C.V. 2 yr tour)						
B. Part-Time		Per Man-Month				
Geologist/Hydrologist (5m/m)		$ 5,000	$ 25,000			$ 25,000
Well Drilling Specialist (8m/m)		$ 5,000	$ 40,000			$ 40,000
SUB-TOTAL TECHNICAL ASSISTANCE						$ 345,000

EASTERN SENEGAL LIVESTOCK I

Items	Number Costs	Unit Cost	Total Cost	Working Life (years)	% Charge to Project	Total Charge to Project
IV. Participant Training (US)						
Practical/Academic						$ 36,000
Observational Training (plus interpreter)						$ 28,000
In-country Training						$ 10,000
SUB-TOTAL PARTICIPANT TRAINING						$ 74,000
V. Studies						
Hann Lab tse-tse, trypanosomiasis and parasite survey (Agrostological Survey)						$ 30,000
Detailed Design Study (3 months)						$ 93,000
SUB-TOTAL STUDIES						$ 123,000
VI. Education Component						$ 100,000
GRAND TOTAL COSTS TO BE CHARGED TO PROJECT						$1,604,300

Proj. No. 6850.202

DEC 18 1974

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU: EXSEC

FROM: AA/PPC, Philip Birnbaum

SUBJECT: Eastern Senegal Livestock Project
695-11-120-202

Problem: Being greater than $2.0 million, the proposed grant requires your authorization.

Discussion: As part of the mid-term Sahelian drought response, AID has been requested by the Government of Senegal to assist in the financing of a livestock production project in the eastern part of Senegal. This project is of high priority to the GOS in several respects. Major among these are the following: (a) largely in response to severe losses caused by the drought, the GOS places high priority on activities in the livestock sector, (b) acutely aware of the damage which has been done to the range as a result of overgrazing, the GOS is searching for viable approaches to controlling grazing, (c) openly admitting that the eastern part of Senegal has been neglected in the past, the GOS indicated that rural development efforts in this area would receive high priority attention in the future, and (d) the proposed project is an integral part of the GOS's preliminary long range strategy in the livestock sector. Further, the project is located in one of the poorest regions of Senegal, and represents an important test of the potential for effective range management in eastern Senegal.

The proposed grant will provide financing for the establishment of a pilot managed grazing reserve of approximately 110,000 hectares through the development of water resources, the establishment of a comprehensive health control program, the construction of firebreaks, and the provision of technical assistance and participant training. The AID grant will finance $2,225,000 of project costs, while the Government of Senegal will finance $240,000 equivalent in local currency. As a Special Sahel project the total AID grant for the three year project will be obligated in FY 1975. The Peace Corps has agreed to recruit up to three special volunteers for the project.

This livestock production project is in line with the Agency's new initiatives in that assistance is being directed toward the poorest Senegalese. Further, in view of the substantial and growing deficit in the supply of meat in West Africa, this pilot project also involves an important test of a technically superior alternative to traditional methods of livestock production under conditions prevailing in the Sudano zone.

In addition to the above considerations, the following criteria were used in appraising the project.

A. Involvement of Cattle Herders

The project calls for maximum herder involvement in the implementation of its various components. This is to be facilitated initially through substantial herder participation in the development of details regarding herder organization, the system of herd management to be used, use of water resources, fire suppression, animal health, etc. Later, through the herder organization, herders will participate in the administration of the project. (See PROP, Page 55-57).

B. Technical Feasibility

The range and livestock management and animal health components of the project are in accordance with proven practices related to range improvement and livestock development. At the same time, the methodologies to be used are of minimum sophistication and clearly within the technical capability of the GOS. (See PROP, pages 59-60).

C. Economic Feasibility

The economic soundness of the project has been studied and found acceptable for a project of this type. (See PROP, Pages 60-70).

D. Sociological/Anthropological Feasibility

In view of (a) the considerable flexibility designed into the project, (b) the substantial herder involvement in the development of project components as well as their implementation, and (c) the herder education programs designed to help herders inside and outside the project area understand the project purposes and objectives, the project was found sociologically and anthropologically feasible.

This project has been reviewed and cleared by all AID offices concerned and was concurred in by the Executive Project Review Committee (EPRC) on June 3, 1974.

E. Commodity Procurement

Strict compliance with normal A.I.D. procurement policies, i.e., restriction of procurement to U.S. sources, would, in the circumstances of this project, constitute a serious restriction against providing timely and beneficial assistance. Section 639A(b) of the Foreign Assistance Act of 1961, as amended (which specifically authorized the funds with which this project will be carried out), expressly provides that assistance to the drought-stricken nations of Africa may be provided "notwithstanding any ... restrictions contained in this or any other Act."

The situation in Senegal parallels that in the other Sahel states in that commodity imports emanate almost entirely from France and the other EEC countries. U.S. equipment and commodities cannot be serviced or

repaired in the event of breakdown. Spare parts are not available, and Africans are not trained in the maintenance of U.S. equipment. In the past, audits and inspections of A.I.D. projects in the area have been sharply critical of the difficulties of host governments in maintaining U.S. equipment after project phase-out. An additional factor to be considered if procurement were to be restricted to the U.S. is the lead-time of at least one year and often longer for the delivery of commodity orders. (In the case of the procurement of Caterpillar equipment, for example, demand far exceeds production rates, and up to 18 months is required before the equipment on order is manufactured. The order then must be delivered by surface which can require an additional 6-8 months).

The following are the commodity requirements over the life of the project: $286,000 for heavy equipment; $71,000 for vehicles and spare parts; $40,000 for well drilling equipment; $4,000 for surveying equipment; $25,000 for firefighting equipment; $8,000 for storage tanks; $10,000 livestock handling equipment; $162,000 vaccines and drugs; and $19,000 for veterinary laboratory equipment. European-made vehicles and equipment are available in the capital city of Dakar. Shipment to the Bakel region will be facilitated by Senegal's relatively good road network. Spare parts and service for locally available equipment and vehicles are available through local dealers.

On the basis of the above circumstances, commodity procurement from Geographic Code 935 (Free World) is requested for this project.

The attached PROP was submitted approximately six months ago. Because of the coordination and discussion that surrounds a project proposal of this magnitude, a limited amount of cost up-dating and revision has taken place. Therefore the cost figures noted on the face sheet are not the same as those found within the body of the PROP itself. You will also note because dates have slipped that disbursements of funds will occur in FY 78. The project now spans four fiscal years instead of three because the implementation slippage effects the synchronization of project elements. This will cause portions of the activity to be undertaken at different times than originally planned but will not affect the total project. Neither costing or time discrepancies reflect any substantive changes in the project.

This project has been reviewed and cleared by all of the concerned A.I.D. offices and has the approval of the Executive Project Review Committee (EPRC). Lastly, Section 114 of the Foreign Assistance and Related Programs Appropriations Act of 1974 does not require Congressional notification prior to Agency authorization of the use of FAA Section 639A(b) funds.

<u>Recommendation</u>: It is recommended that you approve the attached Non-capital Project Paper (PROP).

Attachment
Non-capital Project Paper

Approved:* John E. Murphy

Disapproved: _____

Date: 12/20/74

Clearances:
AA/AFR:SCAdams, Jr. [illegible]
GC:AZGardiner, Jr. [illegible]

Other Clearances:
AFR/CWR:DShear (Draft)
AFR/DPL:RHuesmann (Draft)
AFR/DS:PLyman (Draft)
RJB PPC/DPR:AHandly [illegible]
AFR/CWR:JPatterson (Draft)
AFR/GC:EDragon (Draft)

AFR/DS:RSchoemaker:baw 12/3/74

*Subject to the conditions of approval contained on the face sheet of the PROP.