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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT  
INTERNATIONAL DEVELOPMENT ASSOCIATION

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THE CURRENT ECONOMIC SITUATION  
AND PROSPECTS  
OF  
MAURITANIA  
(in four volumes)  
VOLUME II  
LIVESTOCK

August 5, 1971

Western Africa Department

CURRENCY EQUIVALENTS

Currency Unit: CFA Franc (CFAF)

Before August 11, 1969:

US \$ 1.00 = CFAF 246.85  
CFAF 1,000 = US \$ 4.05

After August 11, 1969:

US \$ 1.00 = CFAF 277.71  
CFAF 1,000 = US \$ 3.60

WEIGHTS AND MEASURES

1 Metric Ton (t) = 2,205 lbs  
1 Kilogram (kg) = 2.2 lbs  
1 Kilometer (km) = 0.62 mile  
1 Meter (m) = 3.28 feet

### COMPOSITION OF MISSION

This report is based on the findings of a mission which visited Mauritania in March-April 1970. The mission comprised the following members:

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## A. PRESENT STATUS OF STOCKRAISING IN MAURITANIA

### I. General Observations on Stockraising

1. Stockbreeding is the mainstay of most of the population of Mauritania. All rural dwellers look to cattle to improve their production. Although the quality of basic statistics can be faulted, they all point to the predominant position occupied by stockraising in the economy of the country.

2. The GDP estimates of the Islamic Republic of Mauritania give the following value added for local production;

- Minerals	14.2 billion CFA francs
- Animal Production	10.6 billion CFA francs
- Vegetable Production	3.2 billion CFA francs
- Fisheries	1.0 billion CFA francs

3. Out of the population of 1,140,000, 820,000 are nomads who derive almost their entire income from stockbreeding; 160,000 are rural dwellers or farmers in the River Senegal Basin, who should substantially increase their livestock in the future; and 160,000 are city dwellers of whom many still own animals.

4. Stock farming clearly holds a privileged place in this country, and its production must be increased if the level of living of most of the inhabitants is to be improved.

### II. The National Herd

#### 1. Estimation of total livestock population

5. In all African countries it is extremely difficult to ascertain the number of stock animals and the actual turnover in numbers since livestock is subject to a head tax.

6. The following table summarizes the estimates made by the livestock service derived from visits made by the members of the service for the purpose of vaccination.

Table No. 1: ESTIMATED LIVESTOCK NUMBERS (IN THOUSANDS OF HEAD)

	1964	1966	1967	1968	1969
Steers	2,000	2,000	2,275	2,500	2,000
Sheep - Goats	4,600	5,900	6,550	6,700	7,000
Camels	500	700	710	720	720
Horses - donkeys	250	270	280	300	300

This table calls for the following comments:

- a. The figure of two and a half million steers, in 1968, is given in the general technical report on the conduct of the joint rinderpest control campaign. The persons in charge of that campaign base this figure on 2,343,000 vaccinations administered in 1968, the probable coverage being 80%.
- b. The decline in the cattle population in 1969 (in the order of 20%) is the consequence of the very low rainfall in 1968. The outcome in the 1969 dry season was a hecatomb due first to famine (lack of pasture), then to consequential diseases (botulism, for example) and finally to abortions (physiological exhaustion) and increased mortality in young animals, because their mothers were dry. There were also losses of sheep and goats due to the drought (approximately 15% of the total population according to the estimates of the livestock service).

7. Nevertheless a reduction in the total population to 5,700,000 head in 1969 cannot be taken as a working hypothesis:

1. First because for the last ten years the estimates have been low, undoubtedly well below actual numbers. As early as 1960 the total number of sheep and goats was estimated at 7 million head.
2. Secondly, because fluctuations in the total number of small ruminants are common and occur every year, especially in the wet season, as a result of parasitic disease. But the reproduction rate of these animals is very high, and they develop very early so that the herds make up the losses in one season of production.

3. Another point is that, although the dry season caused losses due to malnutrition, the usual mortality due to parasitic diseases was avoided because of lack of water. In conclusion we shall take, as the Nouakchott livestock service does, the figure of 7 million head of small ruminants in 1969. On balance, other animal species (camels, horses, donkeys) suffered less in the difficult 1969 period.
4. The distribution of animals in the country was determined in 1967. By chance the total estimates made on that occasion coincide very closely with those we have used. It is therefore to be assumed that they rather accurately reflect the present situation.

Table No. 2: DISTRIBUTION OF ANIMALS BY REGION

Unit: number of head

	CATTLE	GOATS SHEEP	CAMELS
1st Region NEMA	450,000	2,000,000	120,000
2nd Region AIOUN	280,000	1,400,000	70,000
3rd Region KIFFA	320,000	900,000	50,000
4th Region SELIBABY	130,000	150,000	
5th Region KAEDI	200,000	360,000	50,000
6th Region BOGHE	370,000	700,000	20,000
7th Region TIDJIKJA	110,000	550,000	70,000
8th Region ROSSO	220,000	650,000	
9th Region NORD	<u>20,000</u>	<u>350,000</u>	<u>250,000</u>
TOTAL	2,100,000	7,060,000	720,000

8. The 1st region has the most cattle and small ruminants and the 9th region has the most camels. It should be mentioned that the River Senegal area (Selibaby, Boghe, Kaedi, Rosso) has 44% of the total cattle population and only 26% of the sheep and goats.

9. Statistical data are very incomplete when it comes to livestock numbers. The same holds true of the structure of the herds and the utilization of livestock products. In the following chapters we shall be obliged to proceed by successive hypotheses which obviously allows us to reach only rather dubious results. It is therefore essential to take steps to obtain good quality data either by sampling, by systematic censuses on the occasion of health examinations, or by inspections on cattle routes. This should be done not only to obtain reliable statistical information but also to ascertain the economic facts with respect to livestock, its composition, the evolution of its structure, the importance of stock farming and its commercial implications.

2. Animal Breeds encountered

10. CATTLE: In Mauritania there are two distinct breeds: The Zebu Maure, of medium stature, with a brown or pie-bald coat, and short horned. Its conformation is good and when in good condition it butchers well. The live weight of male, mature slaughter animals is from 330 to 380 kilograms. The national herd largely consists of this breed. Troquereau <sup>1/</sup> estimates that about 85% of the Maure breed, which today would mean about 1,700,000 head.

The Zebu Peul is larger, heavier, and often rather loose-limbed. It usually has a light coat and large horns. Slaughter animals are larger than the foregoing, the males weighing from 400 to 420 kilograms. According to the percentage given by Troquereau, there would be about 300,000 head in the country.

SHEEP: These are fleece animals and are divided into: Peul sheep which are large, smooth-haired animals with a bicolored coat, long-legged, stoutly built with a hooked snout, and good walkers; they butcher well. Carcass weight is about 13 to 15 kilograms.

The Moorish sheep has a long-haired black coat. It is smaller than the foregoing, well-shaped, remarkably adapted to the Sahel. It is a good meat animal; its carcass is slightly lighter than that of the Peul sheep.

GOATS: Goat breeding is very well developed in Mauritania. The only breed found is the Sahel goat which is large, long-legged and rather heavy (25 to 35 kilograms when mature). It has a small, well-shaped head and its coat is of several colors (black, white, reddish-brown, and grey); the hair is fine and smooth. The female has well developed teats and is an excellent milk animal.

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<sup>1/</sup> Les Ressources animales de la R. I. M. (FAC. 1959).

3. Composition of the national herd - Production

11. We did not find in the reports of the livestock service many examples of the structure of herds ascertained on the spot and unfortunately certain structures given cannot possibly be true. On the other hand a study by the Yugoslav firm "Energoprojekt" reports the composition of a herd undoubtedly supplied by the persons in charge of the livestock service, which enables us to propose a theoretical scheme of an acceptable herd. The proposed composition is as follows:

Males - over 4 years of age .....	8.1%
Females - over 4 years of age .....	38.5%
Males - from 1 to 3 years .....	18%
Heifers from 1 to 3 years .....	20.6%
Calves .....	15%

12. Among the calves there are as many males as females or 7.5% of the total number, and the number of young females not yet bred amounts to 28.1%. Cows account for 38.5% of the total cattle population. Thus in such a structure the females "coming on" to replace breeding animals will represent  $28.1/38.5 = 72.9\%$  of adult cows. Such a percentage undoubtedly allows the herd to increase in number. The number of males appears to be proportionally rather large; however, most of them are young bull calves, which is in line with observations made in neighboring countries where stockbreeding is carried on under similar conditions.

13. In our study of Mali we assumed rather a similar composition, as is shown in the following comparative table:

	MALI	MAURITANIA
Adult Females	38%	38.5%
Heifers	32%	28.1%
Adult Males	7%	8.1%
Young Males	23%	25.5%

14. Thus we finally come back to the same exploitation rate as the one we applied in Mali, namely 12%, broken down as follows: 1/

1/ We are simply applying the results of an analysis of the cattle population in Mali where stockbreeding conditions are similar. Annex 6 contains studies on theoretical herd structures. Structure No. 1 is rather similar, without being comparable, to that assumed here. This example shows how the percentages of different types of animals marketed is ascertained.

Over-age cows	4.2% of the total population
Sterile cows	0.8% of the total population
Adult males	4.2% of the total population
Bull calves	2.9% of the total population.

15. To obtain a more exact figure for the actual yield of Mauritanian livestock, a detailed study would be necessary. It would undoubtedly show slightly fewer bull calves marketed and slightly more male adults if the percentages we have given were correct. As a first approximation, however, this scheme may be considered more realistic than the 8% exploitation rate used so far. In the study of Mali the structure of the herd in which heifers represented 84% of the adult females the annual growth rate is estimated at 3%. In this case there are 73% heifers as opposed to cows so that the potential growth is therefore theoretically less. However, until we have more accurate statistics we will apply the same hypothesis as in our study of livestock in Mali and assume only a 2% growth rate.

### III. Stockbreeding in Mauritania

16. It would be more accurate to speak of stockbreeding in the Sahel. In order to exist, men must adapt their way of life to the demands of the cattle. In Mauritania, sedentary stockbreeding has not taken the place it should have in agricultural development and stockbreeding at the present time is characterized by transhumant movements. Because of environmental conditions (pasturage and water) the animals can only survive if they are made to regularly undertake rather long transhumances according to the season. Timing and itinerary are always the same.

17. During the rainy season (July to September) the herds are in the northern regions where the rainfall is sufficient to ensure sufficient green herbage and to fill the pools. This is the fat season in which without any help from the herders the animals have more than enough to eat and drink. In October-November the dry season sets in and the meres in the area where the animals are gradually dry up. The move south begins, divided into as many stages as there are temporary water points along the way. Towards December all the graziers are grouped around permanent water points (wells or streams). They will stay there until the first rains, thus spending the height of the dry season on grazing lands composed of graminaceous stubble, a few leguminous plants, and some trees which are very useful in supplementing the food supply. When the rains are sufficiently heavy to allow grass to grow again (in the months of June-July), the march northwards is resumed to the rich range of the rainy season.

18. The length of these transhumances varies according to the region; some of the herds move into Mali or to Senegal; and the movements are extremely regular if nothing interferes with them. Indeed the graziers always find their way to the same grazing lands, following the same transhumance routes, and the wells are often considered to belong to certain families or groups.

19. Exterior factors that may change the course of things are lack of water (water holes along the route that have dried up) or lack of pasture because of low precipitation (as in 1969) or because of brush fires. Indeed uncontrolled fires each year destroy large areas of range, sometimes the best range. If they are overgrazed in the dry season around a well for example, the well is deserted and is no longer of any benefit.

20. A knowledge of the transhumant movements is essential to the work of the livestock service. Activities can rarely be undertaken during the rainy season, since then the roads are impassable and the graziers are widely scattered in the northern region. On the other hand, during the treks, activities can sometimes be undertaken on the cattle routes at points of "compulsory passage" and especially in the dry season, for the animals are collected together and remain stationary for five or six months and are much more accessible. However, it must be realized that, under such stockbreeding conditions, it is often difficult to apply or to maintain rigid sanitary policy measures. During the movements, for example, it is almost impossible to isolate sick animals and to prevent contacts between the herds.

#### IV. Marketing Systems

21. The bulk of the production is disposed of through traditional market channels. However, very different arrangements are to be set up in Kaedi and we shall examine them separately.

##### 1. Traditional Marketing

22. Although inaccurate, the estimates we give in the following chapter indicate that 130,000 steers, 900,000 sheep and goats, and 30,000 camels are marketed both for export and domestic meat needs.

23. The marketing arrangements have been described in a number of reports and have not varied, most of the trade passing through the hands of traditional cattle merchants and butchers. The farm price of cattle, according to figures given by official market price lists, seemed to have increased since 1964 by 5 to 10% depending on the animals and regions concerned. It must be borne in mind that the findings of the market surveys used to establish these price lists are necessarily rather approximate. However, they do indicate trends which, over rather a long period of time, are acceptable.

24. Foreign demand is steadily increasing. This phenomenon is common to all the African cattle and meat markets. Since no reliable statistical data are available, we have taken the figure of only 100,000 cattle for export. However, we are certain that this figure has already been exceeded today. The price on intermediate markets for export cattle is, for good animals, in the order of 70 to 80 CFA francs per net kilogram live weight at Aioun el Atrousse and from 80 to 100 CFA francs at Kaedi. This phenomenon is extremely important, since it represents confirmation that the efforts made to develop production will not be in vain and that graziers will always be able to sell the animals they put on the market.

25. The domestic needs of the country are very considerable; our calculations indicate a very high individual consumption level, a fact regarded as obvious by all Mauritians. But the demand can only increase because of the increase in population and the very high rate of urbanization in the country for the last few years. The problem of supplying Nouakchott with cattle has been improved by increasing the price of meat. Indeed, in 1961, the price of beef with bone was 80 CFA francs per kilogram and that of mutton 200 CFA francs; in 1970 the price of beef had risen to 125 CFA francs per kilogram while that of mutton had not changed.

26. Thanks to a 56% increase in the price of meat a certain number of steers have been drained off to the capital despite the difficulties involved in conducting cattle in that area and their survival. Nevertheless, we still find today that at the most difficult period (from May to July) beef is in short supply and then, as an offset, many more camels are slaughtered since that animal can easily come to Nouakchott at any season of the year.

27. In this connection mention should be made of a very interesting measure which has been adopted in Selibaby, where the price of meat is fixed according to the period of the year; a kilogram of beef with bone costs 80 CFA francs from August 1 to September 31 and 90 CFA francs from January 1 to July 31. Mutton with bone costs 90 CFA francs per kilogram from August 1 to September 31 and 100 CFA francs from January 1 to July 31. This example should be followed by all the large towns. The most difficult semester should be identified and a slightly higher retail price (in the order of 10%) should be allowed. We have proposed the same solution for Dakar.

## 2. The problems involved in meat marketing in Kaedi

28. A well-equipped and well-managed slaughterhouse, which is also a meat packing plant, has been planned to serve the exacting clientele of the country (Nouakchott, Nouadhibou, the iron and copper mines) and the Canary Islands. This plant was put into operation about a year ago. It has opened several domestic markets (MIFERMA at Nouadhibou, the Nouakchott Secondary School, the Nouakchott Teachers' Training College, the Agricultural Training and Extension Center in Kaedi, the Governor's office of the

4th region, the Kaedi Secondary School, the Boucherie Barbosa, SIGP of Nouadhibon, etc.) but has not yet been able to serve the Canaries market. A cursory examination of the present situation shows that there are still administrative and commercial problems.

a. Management of the Plant Proper

29. A public establishment with financial autonomy and legal status has been carefully established; the meat packing plant is well managed. However, one basic difficulty remains: the cost of the service. For despatch, the meat must pay 15 CFA francs per kilogram of carcass weight for slaughtering and 15 CFA francs for refrigeration; these sums do not represent taxes but only the actual costs of the services rendered.

30. This charge is very high and is due to the fact that the amount of meat handled is low, that the personnel at present employed work very few hours a day yet are enough to operate the establishment at full capacity. But the heaviest constraint comes from the fact that, during construction, a radical change was made in the original project. FAC experts and technicians had emphasized that the necessary water supply and electricity investments be included in the establishment. Now the electricity generating plant and the water and pumping station have been separated (by deducting, it must be added, credits from those for the meat packing plant) and today the company operating the slaughterhouse is required to buy water and electricity at exorbitant rates, which makes economical management impossible. This problem must be reconsidered today if a reasonable service price is to be obtained.

b. Commercial Problems:

31. The COVINA Company (Company for the Marketing of Mauritanian Meat) has been established to sell meat brought in to Kaedi. The volume of business in the first year of operation was small, which is not serious in itself since at this level of activity it is possible under favorable conditions to "run in" all the mechanisms of the company and of the meat packing plants. It is now a matter of increasing the domestic markets by rigorously applying the regulatory decisions about the priority of local meats, and every effort must also be made to export to the Canary Islands and perhaps to Morocco.

32. To sell meat to the Canaries three problems must be resolved:

- The agreement of the Spanish authorities for the introduction of meat from Mauritania. This has been obtained, thanks to an agreement made in 1969.
- The establishment of a quarantine station, which will be financed by French assistance.
- Favorable economic conditions. For that it is necessary to have accurate knowledge of the cost of livestock in Kaedi, of services, of transport and of selling prices acceptable to the Canary Islands.

33. At the present time COVIMA is not in a position to solve any of these problems. An expert from the French Office of the Secretary of State of Foreign Affairs will provide the necessary economic data. He will then endeavor to set up an effective and dynamic marketing system in the Canary Islands if the market is possible.

34. At this point we must emphasize that the very high taxes levied on the slaughterhouse in Kaedi and on meat marketing undoubtedly make success impossible. For the slaughterhouse, in addition to settling a matter of excessive water and electricity prices 4 or 5 "start up" years should be allowed before repayment begins. It would also be wise to exempt COVIMA from taxes and fees, even the licensing fee, until the break-even point is reached. Finally, there is the so-called meat circulation tax of 15 CFA francs per kilogram which in principle, is not levied on meat for export; however, the manager of the slaughterhouse would like meat for the domestic market to be exempted as well. Finally for meat export the regulations provide for a 6.90% ad valorem customs charge as well as 1% fiscal duties; 0.5% conditioning tax; and 5.4% purchase tax. In order to open up the Canary Islands market it is essential to suppress these duties and taxes as soon as possible.

35. The profit and loss statement of COVIMA for the first three months of 1970, all charges included, was as follows:

Operating expenses	7,906,569 CFA francs
Turnover tax	+ <u>870,784</u> CFA francs
	8,777,353 CFA francs
Total receipts	- <u>8,459,076</u> CFA francs
Debit balance	318,277 CFA francs

As it will be seen if income tax is excluded COVIMA made a profit of 552,507 CFA francs.

36. Finally, it is important to emphasize the importance for the development of stockbreeding of a modern meat distribution channel. We shall see later that the possibilities of fattening cattle in Mauritania are extremely limited. They can only be recommended for an improved quality market. Thus if it were impossible to send consignments from Kaedi, the whole future of the improvement of stockbreeding in the area would be jeopardized.

V. Macro-Economic Data on Stockbreeding

1. Meat Production

a. Cattle production

37. In the second paragraph of this report we stated that we would assume a 12% exploitation rate for livestock broken down as follows:

over-age cows	4.2%
Sterile cows	0.8%
Adult males	4.1%
Bull calves	2.9%

38. The average farm prices of animals are estimated at 6,000 CFA francs for over-age cows, 15,000 CFA francs for adult males and sterile females, and 8,000 CFA francs for bull calves. In the light of these theoretical data we can draw up the following table:

Table No. 3: PROBABLE PRODUCTION OF THE NATIONAL HERD IN MAURITANIA

Type of animal marketed	Number marketed as percentage of total numbers	Theoretical number marketed. Number of head	Unit farm price CFA francs per head	Value of national production millions of CFA francs
Over-age cows	4.2%	84,000	6,000	504
Sterile cows	0.8%	16,000	15,000	470
Adult males	4.1%	82,000		
Bull calves	2.9%	58,000	8,000	464
TOTAL	12 %	240,000		2,438

b. Production of national sheep and goat herds

39. Assuming an exploitation rate of 25% and an average farm price for a meat animal of 1,400 CFA francs, the national sheep and goat herds would each year supply: 1,750,000 meat animals with a value of 2,450 million CFA francs.

c. Production of the camel herds

40. Bearing in mind the lack of the early development of these animals, the exploitation rate for this herd can hardly exceed 9% per year and if the average farm price of a meat animal is 15,000 CFA francs, the herd would produce each year 65,000 animals worth 975 million CFA francs.

2. Uses of Meat Production

a. Cattle production

41. Export: In our study on Senegal, we estimated that, in 1966, 65,000 steers came from Mauritania. In 1967 our collaborators in an analysis of the meat supply of Central West Africa <sup>1/</sup> stated that 20,000 beasts left Mauritania for Mali and 8,000 for the Ivory Coast. Around 1967, at least 93,000 head were therefore exported. The demand is growing and it is therefore certain that a figure of 100,000 head for export in 1969 would not be over-estimated.

42. Domestic Consumption: For domestic consumption we shall distinguish between urban dwellers, nomads and rural dwellers. This is undoubtedly an arbitrary breakdown especially since in some areas the transient population is by no means negligible (Aioun, Kiffa, for example). However, that breakdown enables us to roughly define the importance of the various rates of consumption.

43. The nomadic population is estimated at 820,000 inhabitants; that of rural dwellers, who are almost all located in the River Senegal Valley at 170,000; and urban dwellers at 150,000. Supervised slaughterings account for almost all the consumption in the towns or about 20,000 head in 1969; according to the slaughterhouse records, production is about 30% male adults, 35% over-age cows, and 35% bull calves. Among rural dwellers and nomads, it is mostly over-age cows and bull calves that are consumed. On important markets and on the occasion of certain holidays or religious ceremonies, steers and even bulls are slaughtered.

44. Text table 4 summarizes, by number and tonnage, the various uses of meat animals. The following average weights have been used:

Over-age cow and bull calf	80 kilos carcass weight
bull, steer or sterile cow	160 kilos carcass weight
offal weight	25% of carcass weight

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<sup>1/</sup> Approvisionnement en viande de l'Afrique Centre Ouest. Tyc, Sarniguet, Peyredieu du Charlat. Secretariat d'Etat aux Affaires Etrangeres.

Table No.4: UTILIZATION OF CATTLE PRODUCTION

(UNITS = HEAD OF CATTLE: TONS)

	HEAD OF CATTLE				TONS CARCASS WEIGHT				Offal tons	Total carcass + offal tons
	Cows	Steers + sterile cows	Bull calves	Total	cows	Steers + Sterile cows	Bull calves	Total		
Exports	9,000	80,000	11,000	100,000	720	12,800	880	14,400	3,300	18,000
Consumption										
- towns	7,000	6,000	7,000	20,000	560	960	560	2,080	520	2,600
Consumption										
nomads	60,000	10,000	35,000	105,000	4,800	1,600	2,800	9,200	2,300	11,500
Consumption										
rural dwellers	8,000	2,000	5,000	15,000	640	320	400	1,360	340	1,700
Total	84,000	98,000	58,000	240,000	720	15,680	4,640	27,040	6,760	33,800

b. Production of small ruminants

45. Export is estimated at 700,000 head per annum. Domestic consumption is difficult to break down, because most of the slaughterings are for family consumption, both in towns and in the bush. We propose the following table which has been established assuming an average carcass weight of 12 kilos, an offal weight equal to 12 kilos and an offal weight equal to 25% of the carcass weight. (Table 4)

c. Production of camels

46. Export is estimated at 20,000 head per annum. Domestic consumption is limited to urban and nomadic population. Carcass weight equals 130 kilos, and offal weight equals 25% of the carcass weight.

3. Domestic consumption of meat in Mauritania

47. Text table 8 gives the detail of the domestic consumption of meat and offal.

4. Value added by the commercial meat channel

48. The main commercial item is animals on the hoof, both for export and for domestic consumption (with the exception of self-consumption), followed by meat for towns, villages, and the Mauritanian markets.

a. Trade in animals on the hoof

49. The estimated value added by the domestic trade is 1,000 CFA francs per head of cattle and camels, and 200 CFA francs per head of sheep and goats. For the export trade 1,000 CFA francs per small ruminant, 2,000 francs per camel, and 4,000 CFA francs per steer. It must be stressed that all this trade is in the hands of Mauritanian nationals and therefore the money it brings in must be included in the revenue of Mauritania. Text tables 9 and 10 give the total added value in this respect.

b. Domestic meat trade

50. We have found almost everywhere in Africa that the margin between the retail price of meat and the net price of a kilogram live weight is 25%. <sup>1/</sup> Thus by assigning to the tonnage of carcasses marketed a quarter of the retail price of meat, we will obtain the value added by the meat trade. We also give a rough estimate of the amount of meat consumed in the bush through sales in small centers and regular markets. Text table 10 shows the total value added by the domestic meat trade.

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<sup>1/</sup> The net price per kilogram live weight is obtained by dividing the price of the live animal by its carcass weight.

Table No. 5 UTILIZATION OF SHEEP AND GOATS PRODUCTION  
(Units = Head of sheep and goats, and ton)

	Number of Head	Carcass Weight (ton)	Slaughtering Weight (ton)	Total Weight (ton)
Export	700,000	8,400	2,100	10,500
Urban consumption	150,000	1,800	450	2,250
Nomadic consumption	800,000	9,600	2,400	12,000
Rural consumption	<u>100,000</u>	<u>1,200</u>	<u>300</u>	<u>1,500</u>
Total	1,750,000	21,000	5,250	26,250

Table No. 6 UTILIZATION OF CAMELS PRODUCTION  
(Units = Head of camels, and ton)

	Number of Head	Carcass Weight (ton)	Slaughtering Weight (ton)	Total Weight (ton)
Export	20,000	2,600	650	3,250
Urban consumption	10,000	1,300	320	1,620
Nomadic consumption	<u>35,000</u>	<u>4,550</u>	<u>1,330</u>	<u>5,880</u>
Total	65,000	8,450	2,300	10,750

Table No. 7 : LIVESTOCK RESOURCES AND UTILIZATION

(UNITS = NUMBER OF HEAD AND TONS)

	RESOURCES			UTILIZATION					
	No. of head	Carcass weight tons	Carcass + offal weight tons	No. of head	EXPORTS		DOMESTIC CONSUMPTION		
					Carcass weight tons	Carcass + offal weight tons	No. of head	Carcass weight tons	Carcass after weight tons
Over-age cows	84,000	6,720	8,400	9,000	720	900	75,000	6,000	7,500
Adult males	82,000	15,000	19,000	80,000	12,800	16,000	18,000	2,880	3,600
Sterile cows	16,000								
Bull calves	58,000	4,640	5,800	11,000	880	1,100	47,000	3,760	4,700
Subtotal	240,000	27,040	33,800	100,000	14,000	18,000	140,000	12,640	15,800
Sheep-Goats									
Subtotal	1,750,000	21,000	26,250	700,000	8,400	10,000	1,050,000	12,600	15,750
Camels									
Subtotal	65,000	8,450	10,750	20,000	2,600	3,250	45,000	5,850	7,500
Grand Total		56,490	70,800		25,400	31,750		31,090	39,050

Table No 8 : DOMESTIC CONSUMPTION OF MEAT

(UNITS = TONS AND KILOGRAMS)

	Consumption towns 150,000 pop.		Consumption nomads 820,000 pop.		Consumption rural dwellers 170,000 pop.		Consumption entire country 1,140,000 pop.	
	Total tons	Kg per capita	Total tons	Kg per capita	Total tons	Kg per capita	Total tons	Kg per capita
Beef	2,600	17.3	11,500	14	1,700	10	15,800	13.8
Mutton and goats meat	2,250	15	12,000	14.6	1,500	8.8	15,750	13.8
Camel meat	1,620	10.8	5,800	7.8			7,500	6.4
Total	6,470	43.1	29,380	36.4	3,200	18.8	39,050	34

Table No. 9 : VALUE ADDED BY TRADE IN LIVESTOCK

		Number of head	Value added per head	Total value added
Steers	<u>Export</u>	100,000	4,000 CFA francs	400 million
	Domestic market	30,000	1,000 CFA francs	30 million
Sheep	<u>Export</u>	700,000	1,000 CFA francs	700 million
	Domestic market	200,000	200 CFA francs	40 million
Goats	<u>Export</u>	20,000	2,000 CFA francs	40 million
	Domestic market	10,000		10 million
				1,220 million

Table No. 10 : VALUE ADDED BY THE MEAT TRADE

		Retail price of meat	25 % margin	Meat marketed tons	Total value by meat trade
Beef	Town	100 CFA francs	25 CFA francs	2,080 T	52 millions
	Bush	70 CFA francs	17 CFA francs	800 T	14 millions
Mutton/goat meat	Town	150 CFA francs	35 CFA francs	1,800 T	63 millions
	Bush	100 CFA francs	25 CFA francs	600 T	21 millions
Camel meat	Town	150 CFA francs	35 CFA francs	1,300 T	45 millions
	Bush	100 CFA francs	25 CFA francs	1,000 T	25 millions
					220 millions

c. Milk production

51. Text table 11 summarizes the data used as a basis for estimating the milk production of different animal species.

Table No. 11: MILK PRODUCTION

	Cow's milk	Ewe's milk	Goat's milk	Camel's milk
Size of national herd	2,000,000	2,600,000	4,400,000	720,000
% females	38%	50%	50%	40%
Number of females	760,000	1,300,000	2,200,000	288,000
% pregnant	66%	90%	90%	50%
Number in milk	502,000	1,170,000	1,980,000	144,000
Individual production (litres)	400	40	70	400
Total production (litres)	200,800,000	46,800,000	138,600,000	57,600,000

Grand Total: 443,800,000 litres.

These 4,438,000 hectolitres are worth at the farm price 4,438 million CFA francs if we estimate the value of the litre of milk at 10 CFA francs. A small part of this production is marketed. The remainder is consumed by the graziers.

52. The farm price we have given to a litre of milk may seem low. It is impossible for us to put a higher price on a foodstuff which cannot be marketed; first, because the stockbreeders give themselves first priority and then because of the remoteness of possible clients in most cases. Trade in milk properly speaking would bring in 700 million CFA francs to the producer according to the estimates of the livestock service, which would be equivalent to 70,000 hectolitres at 100 CFA francs a liter.

5. Revenue contributed by stockbreeding

53. Recapitulating the data in the foregoing table and bearing in mind that the milk trade brings in additional revenue to the producer, for it is usually his family that sells the product, we can deduce that the total revenue brought in to stockbreeders is as follows:

	<u>In millions of CFA francs</u>
Cattle production	2,438
Sheep and goat production	2,450
Camel production	975
Milk production	4,438
Milk trade	<u>630</u> /1
Total	10,931

54. We estimate that the cash revenue to the producer is in the order of 4 thousand million CFA francs, distributed as follows:

	<u>In millions of CFA francs</u>
Steers	1,624
Sheep - goats	1,260
Camels	450
Milk	<u>700</u>
Total	4,034

In addition, the value added achieved in the marketing of cattle and meat reaches about 1,440 million CFA francs.

55. Despite the approximate nature of our estimates it will be seen that:

- a. the revenues contributed by stockbreeding exceed 12 billion CFA francs, of which at least 11 directly benefit stockbreeders, essentially in the form of self-consumption, since out of this total only 4 billion comes to them in cash. A very approximate estimate of resources may be made if a fifth of the revenue benefits 34 thousand families of sedentary stockbreeders and the remaining four-fifths, the 160,000 nomadic families; we can then construct the following table in which incomes are expressed in round figures:

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/1	Value of marketed product	700
	Less price to producer	<u>- 70</u>
		630

	Total income per family self-consumption included	Cash income per family
Nomads	55,000 CFA francs	22,000 CFA francs
Sedentary Stockbreeders	6,500 CFA francs	2,300 CFA francs

56. Milk production has the highest value even if we assign a rather low price to milk. There is therefore no "under exploitation of milk" as has sometimes been said; on the contrary, we must bear in mind that this considerable food contribution ensures the bulk of the subsistence of graziers.

57. The production of small meat ruminants has approximately the same value of that of cattle. This fact must be taken into account in drawing up development programs.

## VI. Stockbreeding and the Public Sector

### 1. Budgetary resources derived from stockbreeding

58. The resources which the state derives from pastoralism come from the taxes on cattle for export and on meat intended for local consumption. The following table summarizes the receipts.

Table 12: ACTUAL RECEIPT FROM TAXES  
ON CATTLE AND MEAT

	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>
Taxes on cattle	26.0	25.0	33.2	25.3	17.0	15.0
Taxes on meat	24.5	20.4	21.8	22.9	23.2	32.1
Total	50.5	45.4	55.0	48.2	40.2	47.1

59. The export tax on cattle is collected before the health permit is established but it has been increased since April 1, 1965. That gave rise to good receipts in 1966 after which the franc became increasingly common and the amounts collected declined. On the other hand, the tax on meat is "paying off," for, both for steers and camels, butchers are obliged to go to the slaughterhouse and to pay the tax.

60. These receipts do not include the cattle market taxes or slaughtering or retail sales taxes which are all collected by local authorities (municipalities). A tax is also charged on each herd of livestock and paid in to the regional budget. We have not yet been able to obtain a figure for the amount of revenue derived from this tax, since it would have been necessary to make a tour of all the regions to collect the necessary information. It would appear that in 1970 it produced 260 million CFA francs.

61. In 1969 the total receipts of the regional budgets amounted to 599,887,191 CFA francs. The cattle tax amounted to 273,161,321 CFA francs. The surcharge (centimes additional) to 130,190,262 CFA francs. Miscellaneous receipts produced 196,535,608 CFA francs. Most of the regional budgetary funds are derived from stockbreeding. The approximately 82 million entered under surcharge are derived from pastoral activities. In start, pastoralism contributes about 345 million CFA francs to the regional budget.

2. Funds available to the Livestock Service

62. The funds assigned to the Livestock Service by the local authorities in recent years are shown in the following tables:

Table 13: ACTUAL EXPENDITURE OF THE LIVESTOCK SERVICE  
AFTER SETTLEMENT OF ACCOUNTS

(Unit = Million of CFA francs)

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
Personnel	54	53	55	56	58	53	60	68
Supplies and equipment	<u>62</u>	<u>25</u>	<u>32</u>	<u>26</u>	<u>27</u>	<u>26</u>	<u>20</u>	<u>20</u>
Total	116	78	87	82	85	79	80	88

Table 14: BUDGETARY APPROPRIATIONS FOR THE LIVESTOCK SERVICE

(Unit = Million of CFA francs - Round Figures)

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
Personnel	57.4	58.8	56.0	60.7	60.5	61.0	64.5	73.8	72.2	74.9	80.3
Supplies and equipment	<u>69.2</u>	<u>34.5</u>	<u>32.8</u>	<u>33.0</u>	<u>29.5</u>	<u>29.0</u>	<u>25.5</u>	<u>20.8</u>	<u>21.4</u>	<u>25.3</u>	<u>32.8</u>
Total	126.6	93.3	88.8	93.7	90.0	90.0	90.0	94.6	93.6	100.2	113.1

63. These figures demonstrate the poverty of the Livestock Service. Whereas livestock is the mainstay of most of the inhabitants of the country, the funds allocated for its protection are paltry. Furthermore, when the European Development Fund and U.S. AID made a considerable contribution (rinderpest campaign) in high-level personnel and technical assistance funds, Mauritania reduced its own effort.

64. Material resources have never been at such a low level as they are today: only 20 million was spent in 1966 and 1967. (Cf. Table 13). These tables also show that personnel expenses have been considerably increased but that those for the purpose of supplies and equipment remain unchanged: the allotment in 1970 is the same as it was in 1962.

65. For 1970 the funds (personnel, and supplies and equipment) made available to the Livestock Service account for only 1.35% of the total state budget. However, we must also add that fortunately the regional budgets purchase the necessary vaccines at a cost of about 40 million CFA francs. Now the revenue derived from stockbreeding undoubtedly exceeds 400 million CFA francs if the licensing fees paid by the merchants and also the taxes levied by the local authorities are added to state taxes and the cattle tax. With respect to this tax which we estimate brings in 355 million CFA francs, we must emphasize that, in relation to the 4 billion cash revenue, it represents a burden of 8.9%.1/

66. Because of the lack of funds to stockbreeding we have very serious reservations about the wisdom of undertaking a program and for the following three reasons:

- a. The present Livestock Service has no resources, especially high-level personnel, to take on the work proposed: campaign based on mobile teams, application of preventive measures, reconnaissance of grazing lands, surveillance of the use of water points, of transhumances, supervision of marketing, etc.
- b. The state has so far not released sufficient funds to safeguard the vital investments already made. Annex 4 contains a list of the grants made to Mauritania from external assistance sources between 1960 and 1969. They total approximately 1,100 million CFA francs. The results of the programs vary. Studies of grazing lands, hydrogeology and marketing provide extremely valuable basic data which have not perhaps been fully exploited. The immunization centers and the vaccination points do a good job. Unfortunately they have not been maintained and, during our visit to the various sectors in the bush, the persons responsible complained about the impossibility of keeping this infrastructure in good condition because of lack of money. The firebreaks have disappeared

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1/ For a white collared worker such a tax would equal more than one month's salary per year.

as has the equipment belonging to the maintenance centers. Wells exist but some need a complete overhaul and some need rebuilding. Lack of funds is also the cause of this situation. The rinderpest campaign was a success but it is necessary to continue the effort in order to ensure even greater success. The Kaedi slaughter house has begun operations under favorable conditions. So far no action has been taken on the Kaedi quarantine station.

c. An assistance program may perhaps temporarily remedy the present situation, but it must at once be stated that provision must be made for recurrent charges in order to permit:

- the Livestock Service to maintain the level of activity that external assistance will have made possible (and not to reduce the funds granted as was done in the PC 15 campaign);
- the persons responsible for public works to repair forthwith all damage to wells;
- the Water and Forestry Service to maintain the firebreaks.

The work the stockbreeders cannot do themselves must be done by the regional authorities or the state. A formal pledge by the authorities with respect to these problems would appear to be necessary if the program is not to be discontinued and to have lasting results. Indeed, in these fields, what matters most is steadfast action.

## B. MAIN DIFFICULTIES FACING LIVESTOCK DEVELOPMENT

### I. Productivity of the National Herd

67. In earlier studies, we tried to give some idea of the productivity of African herds by calculating the production of meat per head of cattle grazed. Table 4 shows that the production of beef, expressed in carcass weight tons, is estimated at 27,040 tons for a total of 2 million head of cattle. Production per head of cattle grazed is therefore approximately 13.5 kilograms carcass weight, which is low compared with that of improved herds. As a matter of fact, the same calculation gives 44 kg in Greece, 45 kg in Yugoslavia, 51 kg in Spain, 51 kg in Japan, 68 kg in Sweden, 79 kg in the United States, 80 kg in France, 85 kg in Germany, and 93 kg in Belgium.

68. The possibilities of increasing production are therefore very great. To identify the most effective ways of increasing production, we must first ascertain the reasons for the present low productivity. If livestock development is allowed to proceed without interference, the probable increase will

be at the rate of 2 or 3% annually, provided that new pasturelands are opened up in accordance with a soundly conceived water policy. In 10 years, there would be between 2,450,000 (assuming a 2% increase rate) or 2,700,000 head (assuming a 3% increase rate), without any change in productivity. In the following paragraphs, we shall examine the causes of this low productivity and which of them may be influenced.

a. Lack of early breeding

69. The Sahelian Zebus have a rather late breeding age. The cows do not drop their first calves until they are four years old and the males do not reach slaughter weight until they are five years old. These characteristics cannot be changed in a medium-term program, for to do so it would be necessary:

- to make a selection of breeds, which would require 20 to 25 years' work;
- to change the environment so that the inbred qualities of improved stock can emerge.

70. These programs should not be passed over, but they can in no way form part of activities under a Bank loan. However, it must be borne in mind that early breeding has a considerable effect on productivity. In studying a Baoule herd in which the animals are adult by age 2, we found that the exploitation rate could easily reach 20% instead of the 12% envisaged here, despite poor environmental conditions.

b. Low fertility rate

71. As a rule, adult females produce only two calves every three years during the fertile period of their life. This represents a 66% reproduction rate and is directly related to the rainy season cycle: the only periods of the year in which the animals find in the green pasture the nutrients that determine their fertility. This is another factor which it is virtually impossible to influence. The impact of this fertility rate is also very considerable. If the birth rate was comparable to that of improved herds (90% fertile cows) it would be possible, all other things being equal, to increase the number of head culled from 12 to 17% of the total.

c. Mortality rate of young animals

72. This is only a special aspect of animal diseases, but it is undoubtedly the most dramatic and undoubtedly has the most telling economic effects. The mortality rate of young animals under one year of age is always high; in some cases it exceeds 60% of the births; it is almost always 40% and rarely falls below 30%. Losses of young animals were probably very considerable in 1969, after the exceptionally dry season in which the cows did not have very much milk.

73. Any action that will reduce mortality in young animals will make it possible to increase productivity by:

- regularly increasing the number of breeders and raising the rate of increase of the livestock;
- producing more male animals each year which will form part of the batches that can be marketed.

74. The impact of the reduction of mortality in calves on production can be seen in the following very simple table. If we assume that, in a group of 100 cattle, the fertility rate is 66% and that in one case the survival rate at age 4 years is 60% and in the other 80% then:

	Assumed mortality at 1 year: 40%	Assumed mortality at 1 year: 20%
Total number of cattle in the herd	100 head	100 head
Number of breeding cattle	38 cows	38 cows
Fertility rate	66%	66%
Number of births	25 head	25 head
Percentage of calves surviving at 1 year	60%	80%
Number of calves surviving at 1 year	15	20

75. It can be seen that the production of young animals (male and female) of one year of age rises from 15% in the first case to 20% in the second, merely by reducing mortality in calves by half. The 15% of survivors corresponds roughly to a possible production equal to 12% of the total number of cattle in the herd, and of a growth in the number of animals of 2% per year (for mortality in adults must also be taken into account). In the second case, a 15% production, for example, and an increase of 4% in the total number of livestock, could easily be achieved. It is therefore clear that reduction in the mortality of young animals should be given precedence, especially in the years following seasons that are particularly lethal for cattle.

d. Mortality in adult cattle, bull calves and heifer calves

76. The mortality rate decreases with age. Adults are the least affected, but mortality increases as old age is reached. For the Sahel, a mortality rate of from 5 to 10% for bull and heifer calves and from 2 to 5%

for adult cattle is generally accepted. Obviously, control of the major endemic diseases should lower the over-all mortality rate and increase production by at least 2 to 3% annually if a sufficient period of action is allowed for: 5 years for example. The cumulative effect of such activities is considerable, which explains the importance of the control of major endemic diseases, in particular rinderpest which "in times of yore" killed off more than 80% of young calves, bull calves and heifer calves.

77. It is important to bear in mind that the economic impact of infections and contagious diseases must not be expressed merely by taking into consideration the numerical losses or losses in weight recorded. The very sharp fall in production they entail must especially be taken into account:

- Abortions which are sequelae of these diseases are frequent when they cause physiological exhaustion;
- The decline in milk production often results in the loss of a calf;
- The death of a cow means a reduction in the rate of growth of the herd. Indeed, the calves it would have had during its "reproductive life" will not be born and it will not be replaced itself. As a matter of fact, its disappearance intrinsically causes a "gap" of several units in the herd.

Finally, in the case of pleuropneumonia, certain apparently healthy animals are carriers and spread the disease in the herd. Therefore the use of a drug such as Novarsenobenzol, which covers up the symptoms of sick animals and makes healthy carriers out of them, must be abandoned.

78. These technical considerations show that it is extremely difficult to put a figure on the economic losses due to endemic diseases and that they are far higher than one is led to believe judging by mortality alone. In the past, when there was no such thing as animal health activities, the size of the herds fluctuated violently as a result of aggressions of all kinds. For the past twenty-five years effective vaccines<sup>1/</sup> have been produced, and sufficient funds made available to apply maximum preventive measures and thus to minimize the incidence of the major contagious diseases. As a result of these activities, the herd numbers have been able to increase and the present exploitation rates achieved. But efforts must on no account be relaxed in any technical assistance field, since then a return to the former situation would be inevitable.

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<sup>1/</sup> In the case of pleuropneumonia they are recent and at present only confer a rather short-lived immunity.

e. Low average carcass weight

79. The low weight of slaughter animals results from the breeds that make up the herds and to improve it is the work of animal geneticists, which we mentioned at the beginning of the chapter. But we also noted that out of 240,000 beef cattle there were 58,000 bull calves or nearly a quarter of the production. These young male slaughter animals often give less than 80 kilograms of carcass meat: theoretically if they were brought to maturity or fattened, the gain in carcass weight would be in the order of 4,600 tons or a 17% increase in beef production.

II. The Environment

80. The basic environmental factors that directly affect stock-breeding are the availability of pasturelands and water.

1. Pasturelands<sup>1/</sup>

81. The Sahel, which consists of steppe land in which annuals predominate, has two main characteristics:

- The period of active vegetation is short, and plants which are often adapted to drought, complete their annual cycle in a very short period of time;
- Burning off is not systematic, and the dry aerial part of the herbaceous cover remains on the soil after the rain.

82. Most of the crop species are annual gramineous plants. There may therefore be considerable quantitative variations from one year to another. This was shown by the especially dry season of 1968, whose catastrophic results demonstrate the extent of the risks, for the annual stock of vegetable material depends directly on rainfall. There is no way of changing this random production. The seeds fall to the ground and escape all forms of destruction (brush fires, consumption) but steps must be taken to prevent animals from completely consuming the young shoots at the beginning of their vegetative cycle. There is thus a risk of pastureland being very seriously damaged especially by sedentarization. That has happened in Senegal (Ferlo province) and in Nigeria (in the vicinity of artesian borings). Leguminous plants exist but do not represent any considerable part of the vegetation. On the other hand, aerial forage (leaves and fruits of trees) is very much sought after and makes a considerable contribution during the height of the dry season.

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1/ Many of the statements in this section are from "Manuel sur les Pasturages tropicaux et les cultures fourrageres". Institut d' Elevage et de medecine veterinaire des pays tropicaux.

83. The ideal theoretical carrying capacity of this type of pastureland is 1 head of adult cattle per 4 hectares; however, in practice that ratio cannot be achieved because of:

- a. a very unequal distribution of the grass, the area around wells being non-productive;
- b. variations in the quality of the gramineous plants concerned;
- c. presence or absence of trees that can be used as forage by animals.

84. The livestock owners have stated that the present number of livestock is the maximum number of cattle, sheep and goats the territory can carry, without overloading the range.<sup>1/</sup> The estimate is for an area of 300,000 km<sup>2</sup> to the south of the 18th parallel (corresponding to 200 mm rainfall belt) with the following utilization:

- 2,300,000 cattle at 8 hectares per head	184,000 km <sup>2</sup>
- 6,700,000 sheep and goats at 1.6 hectares per head	107,000 km <sup>2</sup>
- 300,000 donkeys at 6 hectares per head	<u>18,000 km<sup>2</sup></u>
	310,000 km <sup>2</sup>

85. This estimate is obviously very theoretical. No account is taken:

- of the fact that a not inconsiderable part of the cattle in Mauritania move into Senegal and especially into Mali during the dry season;
- that the acceptable carrying capacity in the transhumance areas along the river Senegal is certainly greater than that usually envisaged;
- that, on the spot, one comes to realize that, at the height of the dry season, very considerable tracts are not used. In the Aioun el Atrouss, Kiffa, and Selibaby regions, local notables told us that 40 to 60% of the pasturelands were not used by the herds.

86. A choice has to be made between these two views: on the one hand, maximum utilization; and, on the other, possibility of practically doubling the number of animals. In our opinion there is a very real possibility of maintaining more livestock, since so far there are no signs of overloading

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<sup>1/</sup> Comptes économiques de la RIM-Mademoiselle Etienne

in Mauritania. Nevertheless, the aftermath of the 1968/69 hecatomb shows that under present watering conditions the pasturelands now being exploited are carrying their maximum load when because of a particularly severe year forage production is very low.

## 2. Water

87. Throughout the Sahel, the availability of water in the dry season determines the possibilities of life both of livestock and of men. Mauritania must solve the difficult problem of developing its water resources as quickly as possible. That calls for an awareness on the part of the authorities and a determination to find rational solutions that take precedence over the political aspect of things.

88. Indeed it seems that theoretically there must be enough wells in the country: if a circle representing the area accessible to cattle is drawn around each water point, the whole area of usable pasturelands is covered. On the spot, however, you learn that sometimes 60% of the tracts are deserted because of lack of water. It is the same dilemma as in the case of pasturelands, where theoretical estimates and on-the-spot findings are completely contradictory.

89. The problems of pasturelands and water in the dry season cannot be considered separately. Bremaud and Pagot\* rightly point out: "For optimum returns from a water development scheme it should never be forgotten that a well should only be sunk if the grazing land around it will feed the amount of livestock that can be watered from it. Otherwise there is the risk of simply converting waterless pasturage into fodderless wells."

90. In Mauritania there are about 3,000 permanent wells (without counting those of palm groves which number approximately 2,000) but many of them are damaged, if not unusable, as a result of lack of maintenance. Many wells built with external assistance funds have been very badly sited, not the slightest attention having been paid to grazing possibilities although the desires or demands of private individuals and local notables have been taken into account. The sinking of certain wells has probably led to the abandonment of water holes or modest water structures. We also noted that in certain areas regarded as "rich in water" no programs have been undertaken. Further knowledge of the actual conditions on the spot would make it possible to considerably improve stock-raising conditions by developing all suitable areas none of which should be rejected before a very thorough survey has been made. The overriding criterion for defining the priorities of the water development program must be the number of animals occupying the region. Wells must no longer be sunk for the benefit of local notables but for the largest possible number of users.

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\* Grazing lands, nomadism, and transhumance in the Sahel in "The Problems of the Arid Zone", Proceedings of the Paris Symposium, UNESCO, 1960.

3. Conclusions concerning pasturelands and water development

91. The possibilities of increasing the number of livestock are clearly directly dependent on increasing the extent of the dry season grazing lands well provided with water and well protected against fire. Now any activity whose purpose is to increase production will inevitably result in an increase in the number of animals. It is therefore essential to provide the largest usable area of good grazing land with water. The entire plant cover must be used as a result of more or less large-scale transhumance movements which alone make it possible to achieve a realistic and rational utilization of grazing lands. Bearing in mind the state of many of the wells, the first priority of such a program will be the maintenance of existing wells, the overhaul of those that can be repaired, and, finally, the sinking of new wells.

92. Such a program is possible because, despite appearances, Mauritania has considerable water resources and, from the hydrological standpoint, the country is well explored (prospecting for ground water will shortly be undertaken under a UNDP project).

III. Animal Diseases

93. We referred to the economic aspect of cattle diseases in the first paragraph of this chapter dealing with the difficulties facing the stock breeders. We must now go into the detail of these problems. Although range improvement based on a consistent water development policy will increase the carrying capacity of the land, it must be borne in mind that the most efficient way of increasing the number of cattle is to control the diseases that decimate them.

94. A distinction must be made in animal diseases between the major endemic diseases and diseases of young animals; and it should be borne in mind that the steps to be taken to motivate stockmen are the same in both cases, using mobile teams of technical advisors. A joint rinderpest control program (Program P.C. 15) was undertaken with dramatic results. The table below shows the evolution of the number of outbreaks. In 1969 three foci reappeared (in Aioun at the end of the year).

Table 15: OUTBREAKS OF RINDERPEST, 1964-1969

Year	Number of Outbreaks	Morbidity	Mortality
1964	52	922	594
1965	57	572	242
1966	86	706	347
1967	43	451	357
1968	3	5	5
1969	3	66	63

95. It is now necessary to take protective measures both because the disease is a "social disease"\* connected with stock-breeding conditions and because it is impossible to rigorously enforce animal health preventive measures. In view of the susceptibility of young cattle to this disease, it is essential to ensure complete coverage of the country each year by means of regular vaccination campaigns. Modern vaccines are very efficacious and confer long-term immunity.

96. In the case of pleuropneumonia the problem is much more difficult, since the vaccines available only provide immunity for up to six months. Provision must therefore be made for two inoculations a year. To control this disease, nationwide coverage is also essential since only vaccination can give definitive results; in addition, rigorous controls must be instituted over the movement of animals and markets in the regions in which outbreaks occur. Provision should also be made for the early and effective tagging of diseased animals and then for their slaughter, and credits for that purpose should be released by the local authorities (this expense will in large part be recovered since the slaughter animals can become part of local meat supply).

97. It must also be borne in mind that other contagious diseases cause heavier losses than rinderpest and pleuropneumonia. Botulism, for example, is alone responsible for the greatest number of deaths according to the research work in the IEMVT laboratory who investigated the cause of this mortality. Finally, the disappearance in the first year of a very large number of bull and heifer calves results in a marked decline in productivity. We have seen that an attack on this problem would be the most effective way of increasing livestock production. Gastro-intestinal parasitic diseases and malnutrition, especially during weaning, are the main causes of death in young animals. To remedy this situation it will be up to livestock owners to take over the necessary treatments; but initially it is essential to undertake control campaigns demonstrating the methods to be used and the results that can be obtained with them.

98. Mention must also be made of diseases of small ruminants. Sheep and goats for slaughter bring in for the stock-raiser as much as his cattle. The diseases of these animals vary, but they have one common characteristic: their exceptional seriousness. Gastro-intestinal parasitic diseases can, during certain especially wet seasons, cause considerable losses (up to one-quarter of the herds). To deal with this problem the same measures must be adopted as in the case of parasitic diseases in calves.

99. In conclusion, it may be said that the only way of increasing livestock production (which can only be considered if the area of grazing land is increased) is to control all cattle diseases throughout the territory. After a particularly harsh period, which has led to the disappearance of a great number of animals of which, unfortunately, the majority consists of young and very young female breeding animals, it is absolutely essential to adopt a policy of replacing as soon as possible the "female breeding cattle" that determine animal production.

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\* as is pleuropneumonia

IV. Herding (social aspect of stockraising)

100. Stockraising is virtually the only means of livelihood for the 820,000 inhabitants of Mauritania (Moors or Peuls). They adapt their mode of living to the needs of their animals and undertake long and harsh transhumances in order to safeguard their livestock. Cattle therefore occupies an essential place for these nomads and if some of them feel the need for sedentarization, a need which is felt throughout the country after this catastrophic year, they nevertheless do everything necessary to ensure that these age-old transhumances may continue. By reason of their milk production, the herds enable stockraisers to live; indeed, milk is the basic foodstuff and is often even a means of exchange for obtaining millet. The self-consumption of meat, especially of small ruminants, provides an important part of proteins in the diet.

101. In the first part of this report, we estimated that stockraising brought in to each nomadic family about 69,000 CFA francs a year, of which 25,000 in cash. This is a modest income but it is the only one possible in this region and it can be stated that in the pastoral area of Mauritania (that is the whole country, except the Senegal river valley) there would not be any population if there were no stockraising. Any program whose aim is to improve the living conditions of these graziers must therefore be designed to increase the livestock (at least at the same rate as the population increases) and to increase its productivity.

102. The individual herds are very small. The average, not significant, calculated on the basis of over-all statistics, is as follows:

$$\frac{2,000,000}{160,000} = 12 \text{ oxen per family}$$

and

$$\frac{7,000,000}{160,000} = 44 \text{ sheep per family}$$

These figures cannot be taken as accurate, since there are families of servants that do not have any livestock; however, they do show that large herds can only be the exception. Now the stock breeders do not interfere with the livestock except to take milk and culls (a true cropping), do not provide them with feed, and therefore do not take any productive action. Under these conditions, we find that a very unusual number of animals that have not reached slaughter weight are sold; in particular, a large number of bull calves that are slaughtered when they weigh only half of what they could.

103. These practices directly influence:

- the structure of the herd, in which there are very few adult males (bulls or steers);
- productivity, which is obviously low;
- the farm price of the animals, which cannot be defined on the basis of the cost of food or of work, but which is established by what the consumers' markets can pay.

It is obviously difficult to influence these factors; only the modernization of certain channels of trade and a fundamental change in the behavior of stock breeders can modify this situation.

104. It therefore follows that at the crux of the problems raised by livestock development is the stock breeder himself. In the event, graziers have remarkable qualities since they have made it possible to maintain and increase a large national herd in a particularly unfavorable environment. But at the present stage in the development of the country, nothing can be done to increase production without the active participation of the stock-breeder and without a gradual change in his behavior towards his herd. He must progress from "cropping" to a more developed stage in which more care will be given to young animals, and more attention paid to the diseases of adult animals. At a more advanced stage, the grazier should endeavor to produce heavier animals and to feed working animals and milch cows.

### C. COMPONENTS OF A DEVELOPMENT PROGRAM

#### I. General

105. An examination of current production and of its value bring out three basic facts:

1. There is considerable dairy farming, considering the poor qualities of the dairy cattle. Relatively speaking, goats and camels are better producers;
2. Small ruminants account for a preponderant part of the pastoral resources;
3. Almost the entire cash income of graziers comes from slaughter animals.

It should be borne in mind that there is a heavy demand for meat in all the neighboring countries and that it is bound to increase in years to come.

106. In the case of cattle, all efforts should therefore be centered on meat; milk production will at the same time increase proportionately to the number of cows. For the time being, there is no other way of improving milk production because the introduction of highly productive animals, requiring the abundant distribution both of water and of food, is not realistic under present conditions. On the other hand, the Sahelian environment is particularly suited for producing cattle. In a rational program the young male animals should subsequently be fattened in an area where there is considerable agricultural production and meat consumption is high.

107. At present, there is no such ecological region in Mauritania. On the other hand, if the programs for the development of the Gorgol are carried out, the production of fat stock must be undertaken. Indeed, rice and sugar cane by-products will enable the fat stock to supply a meat distribution channel. There can be no question of fattening stock to supply the present traditional markets, since animals moving on the hoof would lose the weight they had gained at great cost.

108. In the case of cattle, then, attention must be focused on improving the breeding potential; the same applies to small ruminants. The program therefore consists, as far as these animals are concerned, in controlling the various diseases that decimate the herds. This program will increase productivity and will make possible a considerable increase in numbers, in particular of female breeding animals. In order to maintain the increasing number of livestock, new grazing lands must be opened up in accordance with a rational water development policy. The two aspects of a livestock development policy are therefore:

-control of animal diseases, and

-improvement of the water and grazing resources available.

## II. Control of Animal Diseases

109. In Africa animal diseases are a serious problem. However, the living conditions of cattle are not as bad as all that in the Sahel, for animals can subsist throughout the year without any food supplements, without particular care, and without shelter. Because of this natural equilibrium with the environment survival is possible, as is a modest operation and even a slight increase in the number of cattle when rinderpest can be brought under control.

110. To achieve a substantial increase in production, animal diseases must be really brought under control as a whole and throughout the territory. We have always found that when resources are limited or when action is limited to only one aspect of the problems, the efforts made are in vain and the results are short lived. On the other hand, if coordinated programs are set up and provided with sufficient technical advisory resources, then when a certain threshold has been reached, every undertaking becomes profitable and

every disease control operation becomes a paying proposition. We believe that this concept of a threshold of resources to be exceeded in order to institute an effective program is essential.

111. It is only by pooling resources and incorporating them into well-coordinated operations that success will be achieved, not by working piecemeal and with insufficient resources. To undertake such activities among pastoralists, support must necessarily be obtained from the local livestock service whose present situation is so precarious that the development program proposed to the IBRD has sometimes been called the "Livestock Service Rescue Operation".

1. Situation of the Livestock Service

112. Everybody recognizes the gradual deterioration of the Livestock Service, which, as is well-known, can no longer meet all its obligations. The present status of the service is as follows:

a. Personnel

113. The greatest shortage is in high level personnel. In Mauritania there are only five Veterinarians. Three are at Nouakchott, but:

the first is no longer working,

the second is to take charge of the laboratory, but unfortunately he has been on leave for more than a year with a long illness,

the third is the present Director of the Livestock Service and the only one really working at Nouakchott.

The others are serving outside the capital: one, a fisheries expert is the Governor of the Nouadhibou province, the second is the Manager of the Kaedi slaughterhouse, which assignment is fully justifiable. In a nutshell, there are only two veterinarians practising in Mauritania and they are helped by a colleague from the French Technical Assistance Mission.

114. It is a matter of regret that several young men who in recent years have qualified as veterinarians are at present practising in France. At present there are two students in the first year of the new veterinary school in Dakar; they will qualify in 1975.

115. The situation as regards higher administrative personnel capable of undertaking activities is therefore catastrophic and cannot be quickly improved. As a matter of fact, twelve veterinarians would be needed: one for each region, one at the Kaedi slaughterhouse, and three to administer the Livestock Service of which one for the laboratory.<sup>1/</sup> The Nouadhibou veterinarian must be a fisheries specialist.

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<sup>1/</sup> Without taking into account the teaching needs (Kaedi, Regional Veterinary School: - Dakar; etc.)

116. Middle level staff consists of persons holding the elementary certificate. They include:

5 engineers for livestock projects graduating from the Bombay School (Senegal), and

21 livestock assistants trained at the Bamako (Mali) inter-state school.

117. They are posted as sector chiefs and regional inspectors in the provinces of the country, with the exception of the seventh (Nouadhibou-Adrar) and the eighth (Tiris-Zemmour) provinces. The livestock administration intends to continue to have staff trained by the Bamako school at the rate of one assistant a year,<sup>1/</sup> until the strength is brought up to 35 and then to make provision for replacements.

118. Executive personnel consists of veterinary orderlies holding the certificat d'etudes. They number 76 and are assisted by 10 vaccinators. This number is sufficient. There is no point in increasing it until higher level personnel are available to direct them. The orderlies are at present trained at Kaedi, in the Agricultural Training and Extension Center. Future plans provide for graduating classes of ten every two or three years, which calls for the recruitment of four or five agents each year merely to ensure replacements in a group of 90 persons. Finally, the Livestock Service employs one secretary and 30 drivers.

b. The Infrastructure

119. In all the regions there are more or less recently established immunization centers. They all suffer from a lack of maintenance. The same applies to the building of the Livestock Service in Nouakchott. Under these circumstances it is a foregone conclusion that, if buildings are increased, the resources cannot be released locally to maintain them in a good state of repair. In our opinion, it is essential at the present time to increase resources and not to overload the infrastructure. Bearing in mind their functional aspect, about a dozen immunization yards could be established provided they are strategically sited.

120. The investment program of the livestock administration provides for:

at Nouakchott, the construction of offices for the administration, drug depository, lodgings;	16.5 million CFA
the construction of 10 immunization centers;	90 " "
the fitting out of the Nouakchott laboratory;	25 " "
the construction of 20 vaccination yards.	35 " "
TOTAL	<u>166.5 " "</u>

1/ Graduation of 2 students every 2 or 3 years, according to need.

With exception of the Nouakchott laboratory, which will be the responsibility of FAC, no source of financing for these projects appears to have been found.

c. Supplies - medicaments

121. In this respect the poverty of the Livestock Service is alarming.

The vehicles are almost all in a pitiful condition, most of them being "survivals" of the joint rinderpest control program. The mobile teams cannot use these vehicles for transportation. More serious still is the need for essential supplies: there is sometimes a lack of syringes, needles, and basic medicaments in the bush, and they are only very charily replaced. With the funds provided for in the budget, it is impossible to meet the basic needs of a service with such responsibilities. In conclusion, to attempt to institute a disease control program, it is essential to increase the resources of the Livestock Service beyond the minimum necessary for success.

2. Control of endemic diseases

122. The only possible measure to be used against major contagious diseases is mass control based on regular vaccination campaigns and measures for the prevention of outbreaks. The bulk of the work is carried out by mobile teams that have the means for storing unstable vaccines and for motivating graziers to vaccinate the herds.

123. If we bear in mind that the aim is to reduce mortality as much as possible regardless of the cause of death, there is no point in undertaking activities confined to one or two diseases. On the contrary, it is more realistic to use the resources available to carry out as many activities as possible. Several activities can be undertaken during the same visit: i.e., vaccinations or treatments. In the case of vaccination, provision must be made for inoculations against rinderpest, pleuropneumonia, and botulism in the infected areas and anthrax (both symptomatic and bacterial). As for pleuropneumonia, according to our present knowledge, two vaccinations a year must be given, and the use of Novarsenobenzol for the treatment of sick animals must be immediately forbidden. For the control of botulism, which certainly causes more deaths than rinderpest and pleuropneumonia, vaccination must be supplemented by the distribution of salt licks. Other types of vaccination do not pose any particular problem.

3. Control of various parasitic diseases

124. Action must be taken against parasitic diseases of young cattle. In association with malnutrition, they are responsible for the heavy losses recorded when calves are weaned. Mortality in sheep is also due to passive gastro-intestinal parasitic infestation. Bearing in mind the importance in the revenues of graziers, of the stockraising of small ruminants, campaigns for the control of parasites must be undertaken. Trypanosomiasis and mange

are the main diseases of the pack camel that deserve attention. Regular campaigns for the control of all these parasitic diseases must be undertaken during the tours of the mobile teams for vaccinations.

125. We have noted that, for several years, pleuropneumonia will undoubtedly require two inoculations each year. It is therefore perfectly reasonable, depending on the more or less favorable season for worm treatment, to associate various vaccinations and anthelmintic treatments. All it would take would be the medicaments used, the time taken, and the establishment of a systematic organization.

126. These activities for the control of gastro-intestinal parasites are all the more valuable, since, when completed, they could be taken over and carried out by the stockraisers themselves. This is not the case for vaccinations, for they are of no value unless all or at least the great majority of the animals are covered. Thus, for a considerable time, these vaccinations will continue to be compulsory, free, and administered by the Livestock Service.

127. On the other hand, worm treatments will undoubtedly be a success with graziers (those being made at the present time on large herds in Madagascar<sup>1/</sup> prove it). Therefore, after several campaigns, stockraisers can well be expected to purchase the drugs and distribute them themselves. This system has already been used in Mauritania itself in the 1950's for camel mange and parasitic diseases of sheep (with much less active treatments than those used today). the Livestock Service was the drug depository and very simple, very stylized, and very effective posters<sup>2/</sup> were used to encourage stock breeders to purchase these products. Unfortunately, this program has not been continued. It could be resumed, after demonstration campaigns using the same methods. The most important thing is to use highly effective products whose economic effects will be obvious to stockraisers.

#### 4. Difficulties involved in such a program

128. The institution of such a cattle disease control program poses very great difficulties. In the first place, because the present Livestock Service is not in a position to carry it out. This operation calls for perfect organization, the coordination of operations in each region, a permanent "maintenance and supply service" for all kinds of materials, vehicles, ice factories, vaccines, medicaments, campaign materials. In view of the scanty resources of the country no wastage can be tolerated. For example vehicles must not be used for purposes other than those for which they are intended. Not only will the Livestock Service have to undertake a much bigger activity but the regional administration will also have to help, with all the means at its disposal, to set up the operation.

1/ Campaigns being undertaken by the Institut d'Elevage et de Medecine veterinaire des pays tropicaux.

2/ Some of them are still to be seen in field centers.

129. Finally, highly qualified personnel must be stationed on the spot to ensure effective supervision of program execution and must be capable of taking the emergency measures called for by unforeseen events and consequently of indicating the changes to be introduced into the initial program. In conclusion, the greatest technical difficulty will be in the rational control of pleuropneumonia, which calls not only for one or two vaccinations a year, but also for coercive measures in foci, in markets, and in trade stock.

130. Account must also be taken of the recurrent charges that such an operation will entail if it is not to be merely a "flash in the pan". The joint rinderpest control campaign must be followed up for a reasonable period of time by a maintenance phase. The same will apply to the program at present under consideration: a sustained and prolonged effort will be essential to maintaining at an effective level the activity of the Livestock Service, the motivation of stockraisers, and field operations without which the efforts of several years might be lost. In fact it is merely a matter of putting the Livestock Service back in its former place and maintaining it at a level commensurate with the pastoralism of the country.

### III. Water Development of Grazing Lands

131. Water is a vital problem in Mauritania. Rapid solutions to a certain number of difficulties will make it possible to increase the national herd under satisfactory conditions and to enable an increasing number of graziers' families to live better, since their income is directly related to the number of livestock they own. Throughout the world the search for water and the installation of equipment is a permanent problem. It is therefore not possible to attempt to resolve all the problems in the course of a single program. Nevertheless, account must be taken of the present situation: many structures constructed in the last 20 years had been abandoned by graziers because they are damaged, in a bad state of repair, or unusable. Sometimes, even wells in good conditions are not used because there is not sufficient pasture in the vicinity, or it has sometimes been destroyed by fire. Now, it should not be forgotten, that the only purpose of establishing water points is to open up new pasturelands.

132. Before any decision is taken either to re-establish a former well or to sink a new one, a thorough on-the-spot examination must be made to ascertain whether the available grazing land justifies the operation and whether the well will be used by a sufficient number of graziers. Every decision to sink or to repair a well should therefore be based on the opinion of a qualified agent of the Livestock Service or of a range ecologist.<sup>1/</sup> The enquiry should not consist of a mere visit but of a proper study including collection of samples, determination of the density of

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<sup>1/</sup> A young Mauritanian range ecologist is at present being trained at the Institut d'Elevage et de medecine veterinaire des pays tropicaux. More must be trained.

useful trees, of the area available, of the presence or absence of temporary water points in the area, and whether or not they are already occupied by herds. It should be recalled that the maximum permissible grazing radius around a water point is 12 kilometers and that a radius of 15 kilometers must be considered the upper limits that cannot be exceeded.<sup>1/</sup>

133. Work should not be begun unless the conclusions of the study are very favorable; if it appears that a considerable outlay is required to obtain a mediocre return, the operation should be postponed. Bearing in mind the deplorable condition of most of the wells, the program will have to:

- give priority to the repair of wells that are damaged but are well sited; and
- construct or renovate structures using the methods best adapted to the way in which wells in the country are used.

134. Indeed, it is no longer possible to sink more wells while a considerable number of them are unused and nothing is being done to maintain them: for, otherwise, there may merely be an increase in damaged structures. Stockraisers could indeed maintain, sometimes with many risks, the shallow traditional wells (water holes) or the very deep wells with only a casing of branches. But they cannot do the slightest work on cemented structures. Therefore when the filter is damaged or the casing is broken, the graziers simply abandon the well. The first thing to do, to improve water resources therefore should be to make provision for well maintenance teams furnished with sufficient resources.

135. The damage to structures has been caused either by the users or by the infiltrations;

1. When the height of the free water at the bottom of the well is too great, the users have thrown into it branches, boughs, etc., so as to recover their sheep or goat skin bags which sometimes fall to the bottom. This practice often breaks the filters, hence the fall in the output and even the silting up of the well. If the wells sunk have a large amount of water at the bottom, it is advisable to add gravel, so as to leave less than a meter of free water.
2. The superstructures of wells we saw are badly suited to local customs. The cement protection around the lip of the well is narrow; also the drinking troughs for the cattle are too close to the well and the overflow filters under the superstructure and undermine the casing which buckles and breaks.

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<sup>1/</sup> P. Receveur, Definition d'aménagement, hydro-pastoraux dans la zone sylvo-pastorale.

136. For the construction of new wells (and the overhaul of old ones):

1. The drinking troughs will be placed at least 20 meters from the well and connected to spillway by conduits in which the water cannot overflow;
2. A circular pavement at least 10 meters in diameter will protect the lip of the well and will be encircled by a low wall to prevent the immediate surroundings from becoming a quagmire;
3. Rather large basins will be arranged on the pavement where the women can easily fill their waterbags. Excess water will be returned to the well.

137. If possible, it is essential to prevent the formation of a quagmire and, even if this is inevitable around the water troughs, then it should be pushed back as far as possible from the structure which is likely to be damaged by infiltrations.

138. When the structures have been built and their maintenance is ensured by specialized teams, it is still necessary, if the area is to be used to the best advantage without the likelihood of damage, for the graziers to submit to a rigorous collective discipline. Indeed, to conserve pasture land, to prevent overloading in the years when rainfall is light and to prevent damage to the structures, it is up to the graziers to submit to community rules. Yet we feel that it is difficult to get nomads to accept the necessary constraints.

139. Two points in particular deserve attention because, often, for theoretical reasons, the actual conditions on the spot are left out of account:

1. The building of definitive structures has often caused traditional wells or water holes to be abandoned. Where this happened, the area of pasturelands or grasslands opened up has sometimes been smaller than that previously used. One of the precautionary steps to be taken then is to consider all the water possibilities of a region and to make use of all of them. It may be just as advantageous to develop an area around a water hole as to establish deep wells. Very often, temporary water points make it possible to delay transhumance towards a permanent well and thus to preserve intact as long as possible the pastureland which will be needed during the height of the dry season.
2. Priority has been given so far to areas reputed to be "poor in water" and this method was perfectly justified when one began to deal with the problem, but, if a closer look is taken, it will be seen today that in certain regions classed as well provided with water, large areas of pastureland remain unused at the end of the dry season yet the livestock has suffered. Further study of needs is called for, and no livestock region, not even among those which seem the best shared, should be neglected.

140. The provision of water, even abundant water supply, should never have as its purpose the sedentarization of cattle. Even if regions can be equipped with bore holes, as in Senegal, or even artesian borings, as in Nigeria, that policy should not be followed. In those countries, indeed, what at first appeared to be a development possibility has turned into a virtually insoluble problem because of the sedentarization of the graziers. The stockraisers who have not changed their age-old patterns of behavior, have ruined enormous areas of pastureland; there has been no increase in the number of cattle; and new diseases are decimating them. The use of such water points should be paralleled by a change in stockraising methods, including the distribution of feed and the creation of fodder reserves by graziers.

141. It must be remembered that a water point is of no value unless the range surrounding it can support the number of animals watered. Now it so happens that uncontrolled brush fires destroy thousands of hectares of pastures. This scourge can be prevented by means of firebreaks. Their economic justification is of the "all or nothing" type. Either the wells constructed at great expense will be frequently visited, or they will not be used at all because they are surrounded by a desert.

142. It has been observed that more than 3,000 kilometers of firebreaks existed in 1960. Because of lack of maintenance, they have completely disappeared today. As with wells, it is not enough to provide the structure, it is essential to ensure that they are regularly maintained and to persistently and doggedly keep an eye on the condition of firebreaks, which can, moreover, serve as tracks in certain areas. We noted on the list of external assistance provided by FAC in 1963, mechanical equipment for the maintenance of these firebreaks; we could find no trace of it.

143. We believe it is our duty to emphasize, and this holds true for all the livestock development programs, that the essential thing in all activities is tenacity, resolution, and painstaking supervision. We have had the feeling that many activities considered complete were not carried out and forgotten.

D. THE FUTURE OF STOCKBREEDING

144. A program is but one step forward. It should be designed to reach a certain stage and to prepare the ground for the future. It cannot solve all problems, and it is up to the Mauritanian authorities to take the essential decisions. One thing is certain, and justifies a livestock policy: the country and the people are devoted to stockbreeding. The conditions are good; the graziers have no other means of livelihood; and the meat markets in the neighboring countries are rapidly expanding.

145. To enable the livestock service to play the essential part assigned to it in this development, it is extremely important to rapidly direct a dozen or so secondary school graduates into veterinary studies and to assign them in all the regions to the essential tasks of the countryside.

146. The human development of stockbreeders must be achieved through the improvement of their production. This result will not be achieved by sending the youth to primary school. On the contrary the usual result of such education is that the peasants lose their roots. Graziers can only be educated during the dry season around the wells. This education must interest both the grown-ups and the children, for, among nomads, knowledge is passed on by the elders. It is impossible for the young to change anything without the cooperation and agreement of their family.

147. Among the programs that might be studied (in addition to those mentioned in Chapter C) are:

- the possibilities of intensive cattle fattening in the Kaedi region when the Gorgol project comes into being;
- the possibilities of developing the branches of the river Senegal in the Delta, provided that an in-depth range ecology study indicates the value of developing the region. Rather extensive areas could be opened up;
- the place of livestock in the agricultural development of the river Senegal valley. That is where Mauritania should create a "new stock farm" where animals will not be bred (that requires too much room) but where the bull calves produced by the nomads will be used. This use will make it possible to produce not only draught animals but also slaughter animals through additional feeding.