ILCA
MONOGRAPH

2

TRYPANOTOLERANT LIVESTOCK IN WEST & CENTRAL AFRICA

VOLUME 2 · COUNTRY STUDIES

UNDERTAKEN BY
INTERNATIONAL LIVESTOCK CENTRE FOR AFRICA
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
UNITED NATIONS ENVIRONMENT PROGRAMME

PUBLISHED BY
INTERNATIONAL LIVESTOCK CENTRE FOR AFRICA • ADDIS ABABA

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PREFACE

The first volume of this report, 'Trypanotolerant Livestock in West and Central Africa: General Study' presents information obtained by the study team on trypanotolerant cattle, sheep and goats in an integrated fashion covering the entire study area. Possibilities are also suggested for further evaluation and research work on the production potential,conservation, and utilization of these livestock breeds.

This second volume presents more detailed information on the trypanotolerant livestock found in each of the 18 countries of the study area, Senegal, The Gambia, Guinea Bissau, Guinea, Sierra Leone, Liberia, Mali, Upper Volta, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Central African Republic, Gabon, Congo and Zaire. Each chapter includes background information on the specific country, livestock numbers and distribution, the information available on trypanotolerant cattle, sheep and goats, research and development activities and a selected bibliography. References which contain information on a number of countries are listed in a general bibliography at the end of the volume and a list of acronyms is also included.

CONTENTS

CHAPTER 1

SENEGAL

1. BACKGROUND

The Republic of Senegal lies on the west coast of Africa, bordered to the north by Mauritania, to the east by Mali and to the south by Guinea and Guinea Bissau. In the southern part of the country, The Gambia forms a narrow enclave extending some 350 kilometres inland. The country, with its capital at Dakar, is divided into eight administrative regions - Fleuve, Diourbel-Ferlo, Louga, Thiès, Cap Vert, Sine Saloum, Senegal Oriental and Casamance - and each of these regions is divided into departments which are sub-divided into arrondissements.

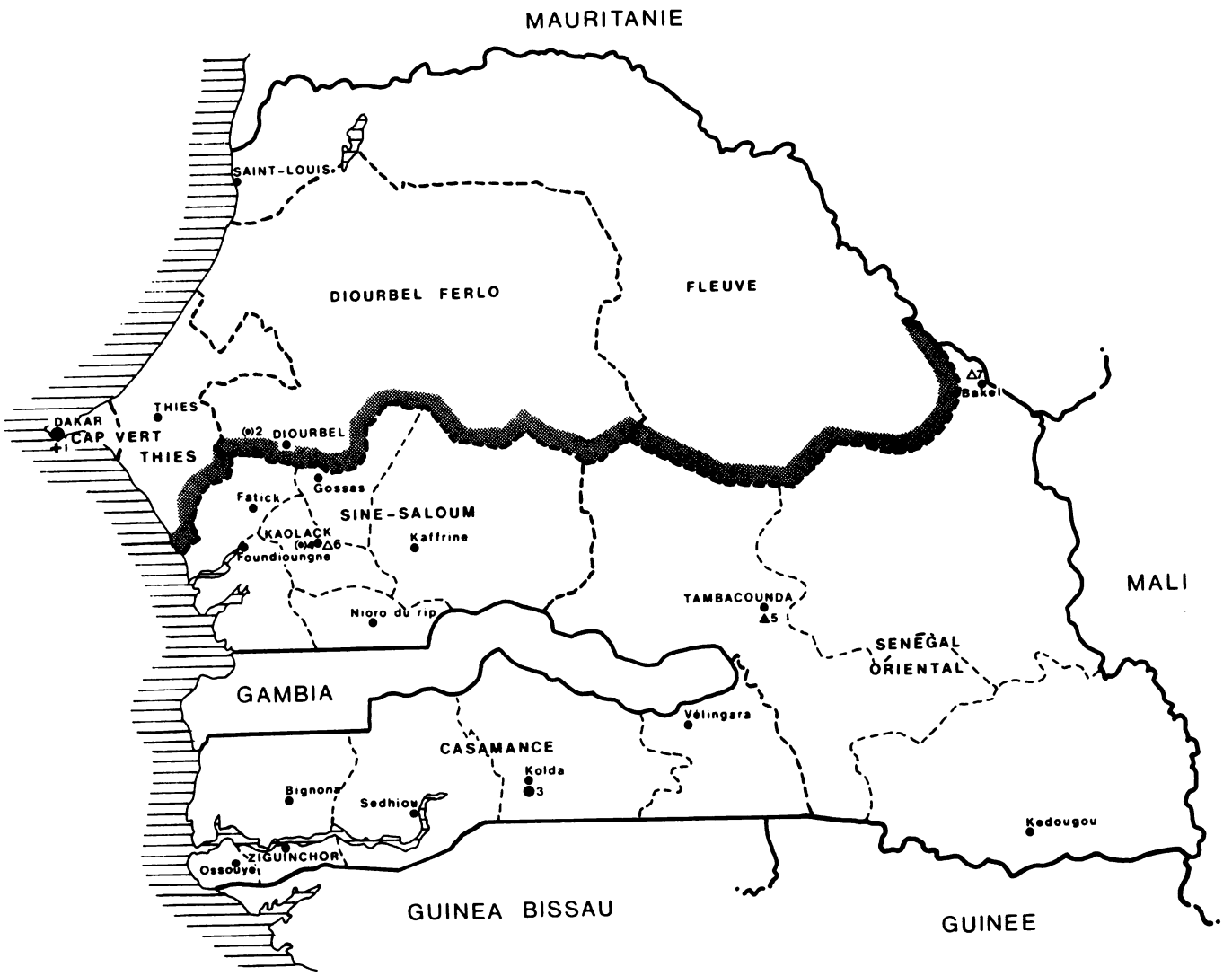
The Direction de la Santé et des Productions Animales is under the control of the Ministère du Développement Rural with divisions based on the administrative system. There are Services Régionaux de la Santé et des Productions Animales, Secteurs and Sous-secteurs d'Elevage, and, at the local level, Postes Vétérinaires. The study area covers the three regions, Casamance, Sine Saloum and Senegal Oriental where most of the trypanotolerant breeds are found. The regions with their capitals are shown in Figure 1 except for Louga which was created recently. Basic data for the country as a whole and for the study area are given in Table 1.

Table 1. Background data for Senegal.

	Whole Country	Study Area
Area	196 200 km^2	111 480 km^2
Latitude	17°20' - 11°20' W	16°50' - 11°20' W
Longitude	12°18' - 16°41' N	12°18' - 14°40' N
Population		
number	5 135 000	1 700 000
density	26.2/km^2	15.2/km^2
Livestock numbers		
cattle	2 440 000	1 310 000
sheep, goats	2 660 000	1 039 000

Sources: For population, OAU, 1978: for livestock numbers, national census, 1976.

Figure 1. Administrative divisions, boundaries of study zone, location of research centres and development projects.



National boundary

Administrative boundaries

Capital

Administrative centre

Study zone below this line

Research centres

Laboratory working on trypanotolerance and/or trypanosomiasis

Centre with trypanotolerant livestock as main activity

(●) Centre with trypanotolerant livestock as subsidiary activity

Development projects

▲ Livestock project focussing on trypanotolerant breeds

△ Agricultural project with trypanotolerant livestock component

The three regions under study have a rainy season from June to October. Sine Saloum has a Sahelo-Sudanian climate, with an annual rainfall averaging 600-800 to 800-1000 mm. Senegal Oriental also has a Sahelo-Sudanian climate, with annual rainfall averaging 600 to 1300-1500 mm. Casamance has a Sudano-Guinean climate, with rainfall averaging 1000-1800 mm annually.

According to the tsetse distribution map prepared by Touré (1971a) and a synthesis published by OAU/STRC (1977) all of the Casamance Region is infested with tsetse, as well as a large part of Senegal Oriental and a strip in the south of Sine Saloum along the Gambian border and the coast. *G. morsitans submorsitans* is found throughout the study area. *G. palpalis gambiensis* is found in dense forest and along river galleries throughout the Casamance Region, in the south of Sine Saloum and in the south and southeast of Senegal Oriental.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

The number of cattle in the departments of the three regions under study is shown in Table 2, broken down according to the three breeds found in the area - N'Dama, Djakoré and Gobra Zebu. Figure 2 shows the total number of cattle in each region and the proportion of each of the three breeds. This map also shows the northern limit of the tsetse belt (according to Touré, 1971a) and the areas where each breed is dominant, based on field observations.

The N'Dama make up 56% of the cattle population in the study area and about 30% of the total number of cattle in Senegal. The Djakoré account for 30% of the herd in the study area and 17% of the total population. Thus, these two breeds represent slightly less than half the total number of cattle in Senegal.

Statistics in Senegal do not usually differentiate sheep from goats. The overall figures for small ruminants are given in Tables 1 and 2. It is generally believed that two-thirds of the total are sheep and one-third goats, and this is confirmed by the FAO (1978a) which estimates that there are 1.76 million sheep and 0.895 million goats in the country.

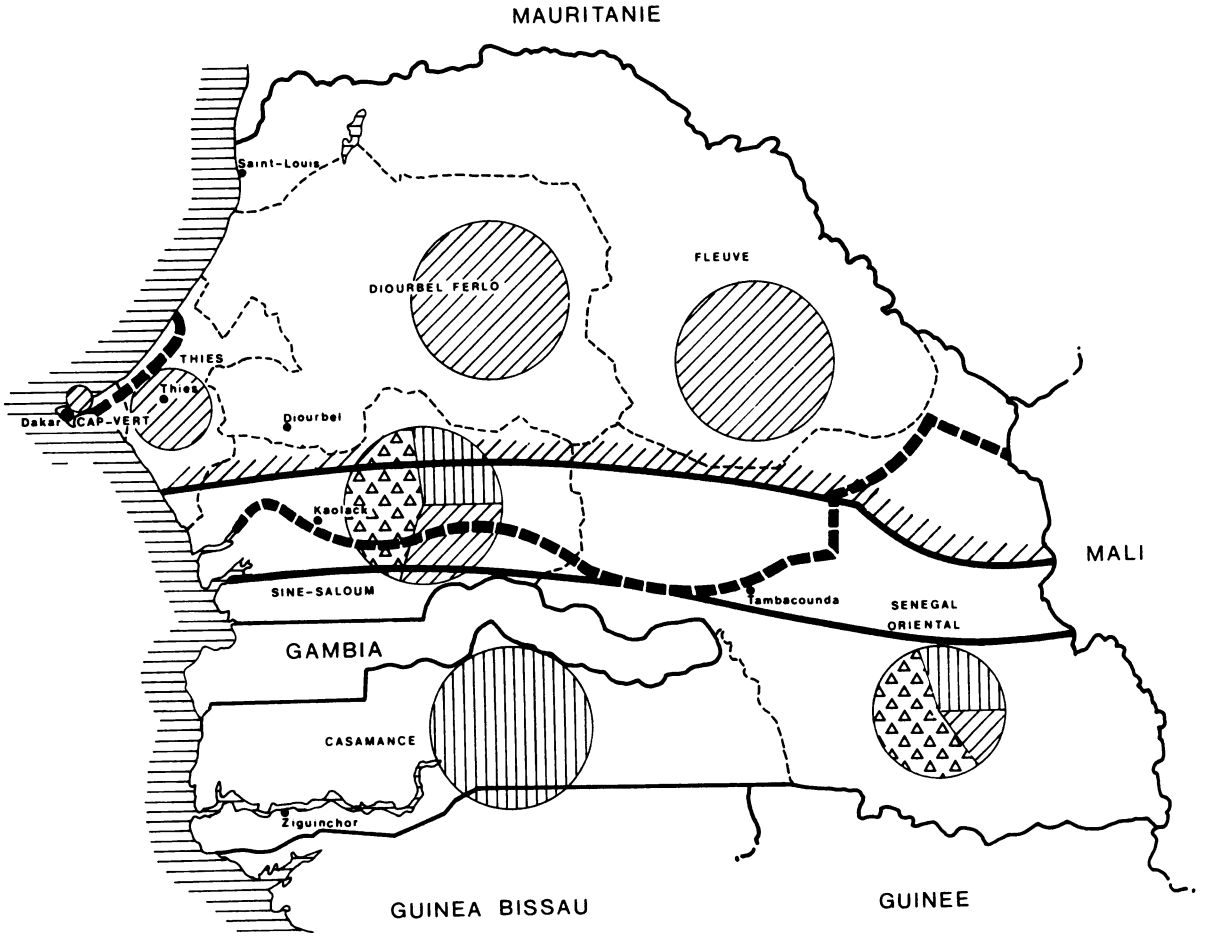
3. CATTLE

3.1 BREED DESCRIPTIONS

3.1.1 N'Dama

In the past, two types of N'Dama were identified in Senegal, the N'Dama petite and the N'Dama grande (Larrat, 1948, quoted in Touré, 1977). The so-called N'Dama grande are found in Upper Casamance in the Velingara District, which is

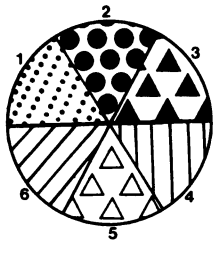
Figure 2. Cattle numbers and breeds distribution.



■ ■ ■ Boundary of tsetse-infested zone

Boundary of zone where Zebu predominate

Boundary of zone where crossbred cattle predominate



1. Dwarf West African Shorthorn
2. Savanna West African Shorthorn
3. Shorthorn x Zebu
4. N'Dama
5. N'Dama x Zebu
6. Zebu

the district where the greatest phenotypic variability is observed (see Figures 3.8 and 3.11, volume 1). It is likely that these cattle in fact contain a small mixture of Gobra Zebu, which are found in this region as well as in the extreme eastern part of The Gambia. For this reason, it seems unnecessary to maintain the classification of N'Dama grande as a distinct type (SATEC, 1973). In Lower Casamance some animals of the N'Dama type were observed with atypical horns - short, horizontal and flat in section - reminiscent of shorthorn cattle. These could represent an influence from the Manjacas, which were reported in the past in the area next to Guinea Bissau (Epstein, 1971). In Velingara Department, N'Dama with white coats and black mucosa were observed. These are described as the Guinea Bissau variety in the discussion in section 3.1 of volume 1. In the south of Senegal Oriental (Kedougou Department), the typical Guinean N'Dama is found in almost pure form.

3.1.1.1 Performance Traits. SATEC (1973) gives data on N'Dama reproduction parameters in Casamance. The age at first calving is given as 3.5 years in Upper Casamance and slightly lower in Lower and Middle Casamance. The calving interval is about 19 months in Lower Casamance and 16 to 17 months in Middle and Upper Casamance. Eighty percent of calving takes place in the last six months of the year. The abortion rate is 10 to 20%, which leads to an average calving rate of 56%.

Calves are weaned at around 12 months; castration, when it occurs, is at about three years. Annual mortality is about 12% overall: 30% for calves under one year, 15% for one- to two-year-olds, 5% for two- to three-year-olds and 2% for adults. The N'Dama reproduction parameters seem to be similar in Senegal Oriental and Sine Saloum.

Some milk production data were recorded by the Centre National de Recherches Agronomiques at Bambey for the Bambey crossbred (métis de Bambey). Between 1955 and 1958, 48 cows averaged 521 kg of milk over 266 days, milked twice a day in the presence of the calf (Gaudefroy-Demombynes, 1958a).

At Bambey, the body weights of about 100 animals on improved feeding were recorded as follows (Gaudefroy-Demombynes, 1958b):

	birth	6 mo	1 yr	1½ yrs	2 yrs	3 yrs	4 yrs	over 6 yrs
Female (kg)	21.5	80.0	112.0	141.0	183.0	251.0	281.0	300
Male (kg)	24.0	86.0	122.0	142.0	217.0	272.0	350.0	420 - 430

At the Station de Recherches Zootechniques at Kolda, calf weights were recorded which are presented in Table 3 (personal communication).

Information on meat production is available from a fattening trial carried out at Dakar-Hann, in which three- to five-year-old animals of four breeds were fed molassed groundnut husks and cotton seed over a 112-day period. A food conversion

Table 2. Livestock numbers in the study area of Senegal, 1976 ('000)

Region and Department	Total	Cattle - N'Dama	Cattle - Djakore	Cattle - Zebu	Sheep	Goats
Casamance						
Ziguinchor	10.5	10.5	-	-	8.5	12.5
Oussouye	8.5	8.5	-	-	2.0	3.5
Bignona	113.0	113.0	-	-	55.0	22.0
Sedhiou	113.0	113.0	-	-	40.0	39.5
Kolda	170.0	170.0	-	-	74.0	112.0
Velingara	95.0	95.0	-	-	21.0	29.0
Total	510.0	510.0	-	-	201.0	218.5
					419.5	
Senegal Oriental						
Tambacounda	174.0	60.0	93.0	21.0	324.0	
Bakel	130.0	-	98.0	32.0	154.0	
Kedougou	43.0	43.0	-	-	80.0	
Total	347.0	103.0	191.0	53.0	558.0	
Sine Saloum						
Fatick	75.0	-	25.0	50.0	146.5	
Foundiougne	41.0	41.0	-	-	157.2	
Gossas	46.0	-	12.0	34.0	52.5	
Kaffrine	174.0	44.0	87.0	43.0	99.5	
Kaolack	64.0	-	43.0	21.0	79.0	
Nioro	96.0	48.0	48.0	-	94.3	
Total	496.0	133.0	215.0	148.0	629.0	
National Total	1 353.0	746.0	406.0	201.0	1 606.5	

Source: National census, 1976.

ratio (kg feed per kg weight gain) of 9.3 was obtained for the N'Dama, which compared favourable with the results obtained for the other breeds (Pugliese and Calvet, 1973). The results of this trial are shown in Table 4.

Table 3. Calf weights at the Station de Recherches Zootechniques at Kolda.

Year	Sex	Birth		3 months		6 months		12 months	
		n	kg	n	kg	n	kg	n	kg
1975	Female	17	16.7	16	44.7	15	60.9	15	94.5
	Male	26	16.7	26	45.6	26	70.7	26	109.0
1976	Female	23	18.1	20	44.2	14	68.1	2	98.0
	Male	35	19.3	30	46.4	16	74.7	4	136.0

Source: Personal communication.

Table 4. Results of fattening trial for four breeds at Dakar Hann.

	N'Dama	Djakoré	Gobra Zebu	Maure Zebu
Number of animals	10	9	9	9
Initial weight (kg)	224	236	245	223
Final weight (kg)	315	341	363	352
Daily gain (g)	809	938	1 060	1 152
Food conversion (kg feed per kg gain)	9.3	8.1	7.5	6.7
Number of carcasses	5	5	5	5
Dressing out %	54	55	56	54

Source: Pugliese and Calvet, 1973.

3.1.1.2 Index of Productivity. Table 5 summarizes estimates of the main production traits required to build up a productivity index based on the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for two basic production environments, meat and milk production under village conditions in a light tsetse challenge area (SATEC, 1973) and meat production under improved research station conditions, also in a light tsetse challenge area (Station de Recherches Zootechniques, Kolda, 1976).

3.1.2 Djakoré

The typical Djakoré found in Senegal is described in volume 1, chapter 3. In addition, a type of Djakoré was bred in 1921 at the Centre National de Recherches

Table 5. N'Dama productivity estimates.

	- Production Environment -	
	Village/low tsetse challenge/ meat and milk	Station/low tsetse challenge/ meat
Cow viability (%)	98	98
Calving percentage	56	45
Calf viability to one year (%)	70	90
Calf weight at one year (kg)	100.0	104.0
Annual milked out yield (kg)	89.6	-
Productivity index[a] per cow per year (kg)	49.6	42.5
Cow weight (kg)	237.0	219.0
Productivity index[a] per 100 kg cow maintained per year (kg)	21.0	19.4

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Sources: SATEC, 1973; Station de Recherches Zootechniques, Kolda, 1976.

Agronomiques at Bambey, the Bambey crossbred. This is, in fact, a stabilized crossbred, 13/16 N'Dama and 3/16 Gobra Zebu (Hamon, 1969). The result is an animal which has the frame of the Zebu and the conformation and colour of the N'Dama (see Figures 3.49 and 3.53, volume 1). The adult male measures between 125 and 128 cm at the withers, compared with 105 to 110 cm for the N'Dama in Casamance.

There are no figures on the performance of the typical Djakoré. Some productivity data are available for the Bambey crossbred, but only under research station conditions. Calves at Bambey from three- to eight-months-old were given a daily supplement of up to 7 kg of millet and up to 3 kg of groundnut hay. Their weights were recorded as follows (Nourissat, n.d.):

	birth		8 months		12 months	
	n	kg	n	kg	n	kg
Female	46	19 ± 0.5	19	129 ± 3	15	146 ± 5
Male	46	21 ± 0.3	11	132 ± 6	9	142 ± 5

Draught power trials have been reported for 13 pairs of Bambey crossbred oxen. The average weight of a pair was 754 ± 36 kg and the average draught power was 494 ± 23 kg, with maximum effort reaching 623 ± 30 kg (Hamon, 1969).

3.2 DISEASES

Information on infectious cattle diseases is contained in the government's 'Rapport succint sur la situation sanitaire et les méthodes de prophylaxie appliquées au Sénégal pendant l'année 1976'. According to this report, no rinderpest outbreak has been recorded in Senegal since 1968 in spite of the presence of this disease in neighbouring countries. In 1978, however, a few outbreaks occurred in the northern part of the country for the first time in 10 years. Only one outbreak of pleuropneumonia has been recorded, in Senegal Oriental where there are many N'Dama cattle. Since the N'Dama are particularly susceptible to this disease, such an outbreak poses a serious threat. There were 14 reported outbreaks of botulism throughout the country in 1976, an increase over previous years due to incomplete vaccination coverage, as this vaccination is not given free. Clostridial diseases are confined to a few areas where they continue at a low level because vaccination is not systematic. In the study zone, the incidence of infectious diseases is not very high. Only black-quarter, anthrax and haemorrhagic septicaemia are enzootic. Some brucellosis also occurs, especially in Casamance (SATEC, 1973).

Parasitic diseases are often recorded, especially streptothricosis and scabies, but only the tick-borne fevers, piroplasmosis and rickettsiosis have been of importance. Gastro-intestinal helminths cause serious damage and are responsible for heavy losses among calves. These include *Trichostrongylus, Oesophagostomum, Bunostomum* and *Strongyloides*. The association of various *Stronglus* species with coccidiosis is very common.

A detailed study of animal trypanosomiasis in Senegal was carried out by Touré (1971b). Although Lower Casamance has a relatively high tsetse challenge, this region has the fewest recorded cases of trypanosomiasis. In Upper Casamance and the highlands of Senegal Oriental, trypanosomiasis is not widespread, although the incidence of the disease tends to increase from south to north. Trypanosomiasis occurs frequently on the southern border of the Sine Saloum Region and in Senegal Oriental along the latitude of Tambacounda. Outbreaks are seasonal, with the greatest morbidity between May and October when the tsetse population is largest due to the rains. Animals are also most likely to be affected when they are in a weakened condition at the end of the dry season due to food deficiencies (Touré, 1971a).

In Senegal, *G. palpalis gambiensis* and *G. morsitans submorsitans* transmit *T. gambiense, T. brucei, T. congolense* and *T. vivax*. Cattle trypanosomiasis is observed everywhere that *G. palpalis* or *G. morsitans* is present, with a greater incidence of *T. vivax* compared to *T. brucei* and *T. congolense*. Analysis reveals that *T. congolense* is more common among N'Dama cattle and the disease caused by this strain is more severe.

3.3 HERD MANAGEMENT AND COMPOSITION

A succinct description of herd management practises in Casamance has been published by SATEC (1973). The people settled in this region are agriculturalists

with no pastoral tradition except for the Fulani. They generally practise *élevage de cuillette* (occasional sale or slaughter as needed). Among the Diolas, where cattle are symbols of wealth and religious values, improved husbandry techniques are generally poorly received, even when they lead to better animal health. Cattle are used for ceremonies, particularly at the time of circumcision, and the entire herd of a dead man may be slaughtered at his funeral. Among the Mandingo people, the herd represents capital which is easily held, but from which the owner draws little or no profit. The Fulani, Balantes and Toucouleurs show the greatest interest in their cattle. They use cattle manure on their fields, participate in vaccination campaigns and increasingly cultivate with draught oxen. These people herd their animals themselves, in contrast to the practises of other groups in the region.

Herd management is generally the same throughout the region. During the rainy season, the cattle are herded carefully to keep them away from the crops. After the harvest, the animals roam freely with little supervision, grazing near the villages on fallow land or savanna pasture. There is no transhumance as such, though temporary movements of small groups of cattle occur occasionally. They may be moved short distances during the rainy season to avoid damaging the crops, and during the dry season to bring them closer to watering places. At night, the animals are gathered near the villages in fenced pens or tethered. Non-Fulani owners frequently combine their herds and hire a Fulani herdsman to look after all the animals together, paying him in milk. Thus, in Lower and Middle Casamance, all the animals of a village are kept together in one herd, or at most two or three.

SATEC (1973) records that herds in this region average about 70 head, with a great deal of variation. In Lower Casamance, 40.7% of the herds were composed of less than 10 animals, while 10.4% had more than 100. Herds of average size (20 to 80 animals) were more than 69% of the total in Middle Casamance, while 14.2% of the herds included more than 100 animals. In Upper Casamance, 63% of the herds were of average size and 16.1% over 100. The average compositions of the herds in the region are given in Table 6.

In Senegal Oriental, cattle are generally tended all year round by Fulani herdsmen who keep them away from the crops during the rainy season and bring them to the watering places during the dry season. Cows are usually milked morning and evening, and calf mortality is high. Particularly in Bakel Department, herds managed by the Fulani average 100 to 150 animals. A typical herd composition would be 41% mature cows, 4% mature bulls, 16% calves, 14% one- to three-year-old heifers, 14% one- to three-year-old bulls and 11% three- to five-year-old steers.

In Sine Saloum, during the rainy season, the herds are usually kept at night on fallow land near the village. The animals are kept in a circle, with the calves and sheep in the middle and the most aggressive animals on the outside. The bull is left free. The herdsman sleeps on a covered, raised platform in the middle of the circle. Generally a wood fire is kept burning until late at night. The cows are milked around 8.00 h, and the herd is untied and led to the pasture between 9.00 and 10.00 h. Calves and small stock are kept near the village, but with the expansion of

Table 6. Cattle herd composition in Casamance (%).

Class	Lower Casamance	Middle Casamance	Upper Casamance	Whole Region
Females under 1 year	15.6	15.8	14.9	14.9
Males under 1 year	11.8	14.2	12.9	12.9
Heifers from 1 to 3 years	13.8	14.6	15.9	15.0
Bulls from 1 to 3 years	7.2	8.9	9.7	8.8
Cows of 3 years and above	44.8	43.3	39.0	41.7
Bulls of 3 years and above	4.9	1.9	6.5	4.9
Oxen	1.9	1.3	2.0	1.8

Source: SATEC, 1973.

cultivation, it has become more difficult to find grazing for the animals near the villages during the cropping season. During the dry season after the crops are harvested, the animals stay in pastures near the village without supervision. This period extends from January to June. The herdsmen untie the animals in the morning and lead them to the edge of the village where they leave them on their own. Around 14.00 h, the herdsmen go out to find the animals, which walk to the watering places independently. After watering, the herd is led back to the pasture. At around 17.00 h, the herdsmen return to bring in the animals and tie them for the night. The average herd size is between 10 to 60 head and herd compositions are similar to those observed in Casamance.

4. SHEEP AND GOATS

In the three regions studied, the great majority of the sheep are of the Djallonké type (see Figure 3.75 in volume 1), while the goats are of the West African Dwarf type. In addition, in Senegal Oriental near Tambacounda and to the north, some Maure sheep with short hair (Touabir), some Senegalese-Fulani sheep (Peul-Peul) and some Sahelian goats were observed.

Gueye (1972) indicates an average height of 40-60 cm and an average weight of 20-30 kg for sheep in Senegal, and an average height of 40 cm and an average weight of 20 kg for goats. Recently, a multiplication flock of Djallonké sheep was started up at the Station de Recherches Zootechniques in Kolda, with encouraging results. Weights for lambs have been recorded as follows:

	birth		10 days		30 days		50 days		70 days		90 days	
	n	kg	n	kg	n	kg	n	kg	n	kg	n	kg
Females	71	1.3	40	2.5	35	3.0	22	4.4	22	5.1	23	5.4
Males	66	1.6	36	2.8	34	3.2	21	5.5	20	6.0	17	6.7

In 1976, the fecundity rate at this station was 122%, with an abortion rate of 1.8% and a twinning rate of 15.5%.

Among diseases affecting small ruminants, the *peste des petits ruminants* (PPR) will remain a problem for some time.

4.1 INDEX OF PRODUCTIVITY

Table 7 summarizes the estimates of major production traits required to build up a productivity index based on the total weight of five-month-old lamb produced per 10 kg of ewe maintained per year. This productivity index has been derived for production under station conditions in a low tsetse challenge area.

Table 7. Djallonké productivity estimate.

Parameter	Production environment Station/low tsetse challenge
Ewe viability (%)	95[b]
Lambing percentage	183
Lamb viability to one year (%)	50
Lamb weight at five months (kg)	10
Productivity index[a] per ewe per year (kg)	9.4
Ewe weight (kg)	25
Productivity index[a] per 10 kg ewe maintained per year (kg)	3.8

a. Total weight of five-month-old lamb produced.
b. Estimate.

Source: Station de Recherches Zootechniques, Kolda; country visit information.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

The research centres in Senegal which work on trypanotolerance or with the trypanotolerant breeds are listed in Table 8 and their locations shown in Figure 1.

5.2 DEVELOPMENT PROJECTS

The Republic of Senegal is at present reviewing its national livestock development policy. The country has been divided according to ecological conditions and herd distribution into five zones: (1) the syvo-pastoral zone (Ferlo Basin), which is planned as a breeding zone (with young males removed from 6 months); (2) the valley of River Senegal, planned as a rearing and fattening zone; (3) the groundnut basin, planned as a rearing and fattening zone; (4) Cap Vert, planned to specialize in intensive industrial fattening and milk production; and (5) Casamance and the southern part of Senegal Oriental, which is planned in three areas:-

a. South of Tambacounda and Bakel Departments and Upper Casamance, to be a calving, rearing and fattening zone due to the lower population density and the existence of vast rangelands,

b. Middle and Lower Casamance, with priority to be given to milk production from N'Dama x Jersey crossbreds, and

c. Kedougou Department to specialise in the breeding of pure N'Dama. Breeding stock would be exported from this department to the forest zone of other African countries.

The Direction de la Sante et des Productions Animales, two marketing organizations and five Societes d'Encadrement (extension organizations) are responsible for the implementation of government livestock policy. The government has decided that every development project covering a specific region should be centralized and controlled by one extension organization. Thus, for the regions incolved in this study, three extension organizations are responsible for development projects: in Casamance the Societe de Mise en Valeur de la Casamance (SOMIVAC), in Sine Saloum the Societe de Developpement et de Vulgarisation Agricole (SODEVA) and in Senegal Oriental the Societe de Developpement des Fibres Textiles (SODEFITEX).

Present development projects concerned with the trypanotolerant breeds are listed in Table 9, with headquarters locations shown in Figure 1. In addition to the projects listed in the table, the European Development Fund of the European Economic Community (EEC) has financed a preliminary study for an extension project to encourage livestock development in Casamance. The EEC also finances a project in the sylvo-pastoral zone (outside the study area) and 'Operation Sauvetage des Veaux 1978' (calf rescue operation) on the lines of a similar project carried out in 1974.

Table 8. Research centres working on trypanotolerance or with trypanotolerant breeds.

Name	Laboratoire National de l'Elevage et de Recherches Vétérinaires	Centre National de Recherches Agronomiques	Centre de Recherches Zootechniques	Unites Experimentales (UE)
Location (reference in Figure 1)	Dakar-Hann ✚ 1	Bambey, 130 km east of Dakar (●) 2	Kolda, in Casamance Region ● 3	Kaolack, in Sine Saloum Region (●) 4
Organization responsible	Institut Sénégalais de Recherches Agronomiques (ISRA), DGRST, Primature, Dakar	ISRA	ISRA	ISRA
Size		614 ha ($\frac{1}{3}$ crops, $\frac{2}{3}$ livestock grazing)	2600 ha in 18 plots	1 or 2 villages (an example is the UE Thyssa Kaymor/Sonkorong) (Mbodji-Faye, 1976)
Breeds and numbers		Bambey crossbreed (13/16 N'Dama, 3/16 Gobra Zebu, 100 head	400 N'Dama cattle 300 Djallonké sheep	
Objectives and activities	Vaccine production. Within the laboratory a parasitology service carries out experiments on trypanosomiasis, trypanotolerance and trypanotolerant cattle (Touré, 1978).	Mainly crop research. Animal breeding only to improve the N'Dama as draught oxen. Some trials were carried out to introduce the Bambey crossbreed more widely in infested areas in the south. Annual reproduction and weight records are available on 100 to 150 head from 1966.	Improvement of N'Dama cattle, of Djallonké sheep and of grazing (180 ha artificial pasture). Identification and complete data since 1973 for cattle and since 1976 for sheep.	Demonstration of the value of forage reserve and mineral supplementation. Trial system of integrating agriculture and livestock production at the rural level. Milk yields are recorded fortnightly, calf weights monthly and adult weights quarterly.
External Aid	France (IEMVT)		Launched by EEC (EDF) in 1972	

Table 9. Development projects.

Name	Projet de Développement de l'Elevage au Sénégal Oriental	Projet de Développement de l'Agriculture au Sine Saloum	Amélioration de l'Elevage et des Pâturages dans le Département de Bakel
Location (headquarters) (reference in Figure 1)	Tambacounda ▲5	Kaolack △6	Bakel △7
Organization responsible	SODEFITEX, B.P. 41, Tambacounda	SODEVA	SODEFITEX
Size	All of Senegal Oriental	All of Sine Saloum	Department of Bakel (111 000 ha)
Breeds and numbers	300 000 cattle (mainly Djakore and Zebu	470 000 cattle (Zebu, Djakore, N'Dama) 460 000 small ruminants	160 000 Animal Units
Objectives and activities	Development and increased utilization of rangelands on 1.4 million ha of under-exploited land in the northeast of the region. Improvement of animal health services in the region. Training, supervision and monitoring of the project. Marking of individual animals is envisaged and surveys of herd composition are being carried out.	Integrated agriculture project with a small livestock component aimed at improving animal production for meat and draught oxen.	Organization and development of an integrated pasture management system with fire barriers, watering facilities, animal health programme and a training component.
External aid	IBRD, BADEA, Kuwait	World Bank, France (Caisse Centrale de Cooperation Economique)	USAID
Project period	1976 - 1980	1975 - 1976 to 1979 - 1980	1975 - 1978

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CHAPTER 2

THE GAMBIA

1. BACKGROUND

The Republic of The Gambia is a narrow strip of land in West Africa on either side of the River Gambia surrounded on three sides by Senegal. The country, with its capital at Banjul, is divided into five divisions - Western, Lower River, McCarthy Island, Upper River and North Bank (see Figure 1).

The Ministry of Agriculture and Natural Resources is made up of five departments, including the Animal Health and Production Department (AHPD) composed of four sections - the Directorate, the Animal Health Division, the Animal Husbandry and Production Division and theAnimal Industries Division. The AHPD maintains five livestock field stations and 26 satellite sub-stations distributed throughout the five administrative divisions.

In order to increase the effectiveness of government field work in the livestock sector and to give local stock raisers a greater sense of participation in planning and decision-making, the AHPD has recently begun organizing Livestock Owner's Associations around the country. The basic objective of these associations is to facilitate the communication of information and advice from government agencies to the stock raisers and to allow them in turn to feed back information to the AHPD on specific local problems and their aspirations for future development.

Basic data for the country are given in Table 1. The Gambia has a Sudano-Guinean climate with one rainy season from June to October. Annual rainfall averages 1 000 to 1 200 mm. According to the OAU/STRC tsetse distribution map (1977), *G. palpalis* is found throughout the country and *G. morsitans* everywhere except the extreme western region near Banjul. There are also a few areas in Senegal and The Gambia where *G. longipalpis* is indicated on the map, but Touré (1971) claims that this species is no longer present.

Snow produced maps in 1972 of the distribution of *G. morsitans submorsitans* and *G. palpalis gambiensis*. He concluded that *G. morsitans* was present throughout the country except in Western Division and in a small area of the town of Basse, and that *G. palpalis* could be found near the coast and over a few kilometres on either side of the river. In general, the tsetse challenge decreases from west to east.

Figure 1. Administrative divisions, location of research centres, cattle numbers and breed distribution.

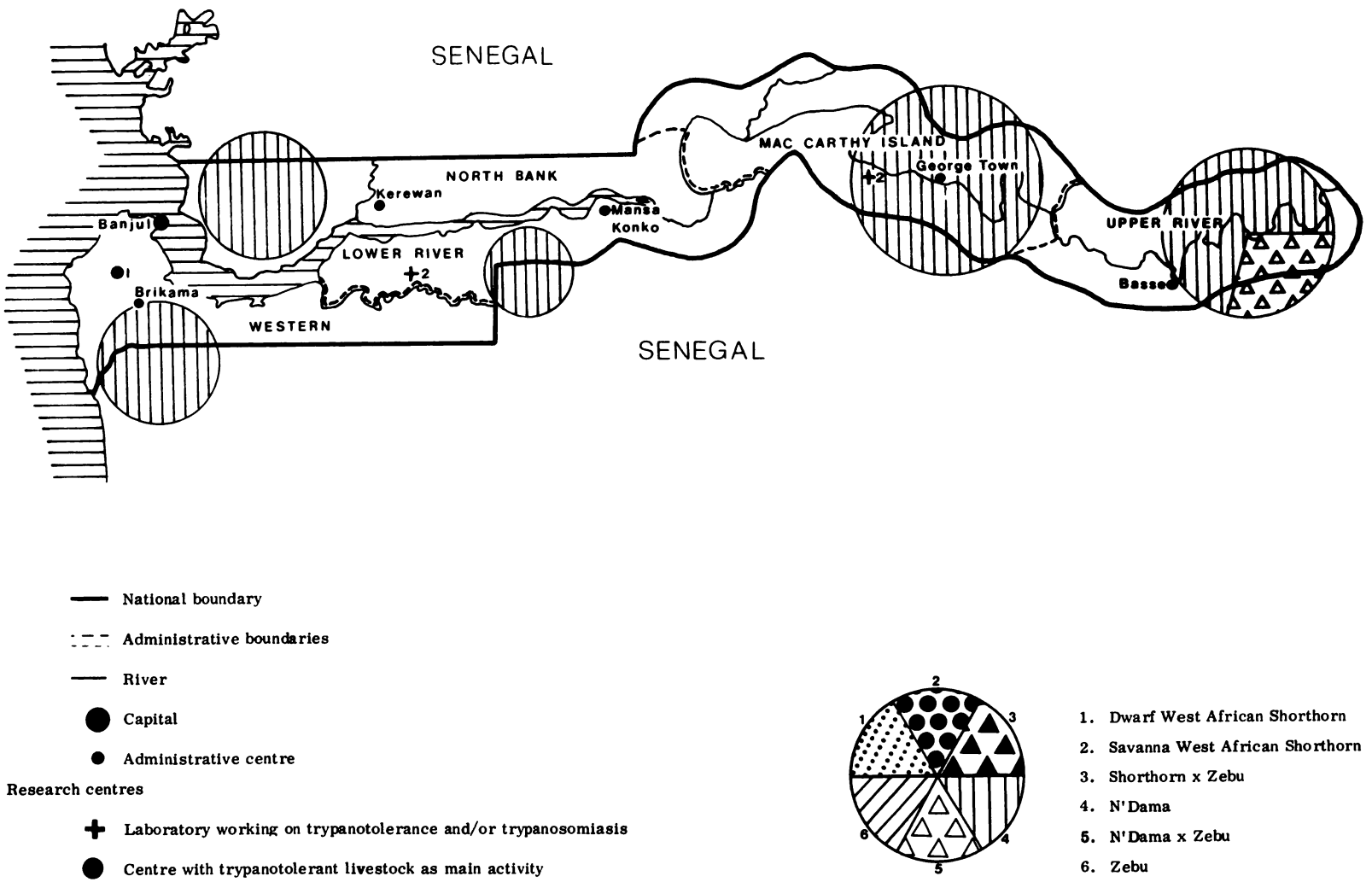

Table 1. Background data for The Gambia.

Area	11 300 km^2
Latitude	13^o - 14^o N
Longitude	14^o - 17^o W
Population	
number	540 000
density	47.8/km^2
Livestock numbers	
cattle	296 000
sheep	113 000
goats	187 000

Sources: For population, OAU, 1978; for livestock numbers, national census, 1978.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

A national livestock census was carried out in 1978 during a contagious bovine pleuropneumonia (CBPP) vaccination campaign. Table 2 shows the cattle population by geographic division and cattle numbers per square kilometre and per inhabitant.

Table 2. Cattle numbers and distribution in The Gambia, 1978.

Administrative Division	Cattle Population	Cattle per km^2	Cattle per Inhabitant
Western	42 221	22.9	0.24
Lower River	24 444	16.1	0.59
McCarthy	101 010	35.6	0.99
Upper River	81 517	40.7	0.93
North Bank	45 732	20.9	0.48
Total	295 924	26.2	0.59

Source: National census, 1978.

This table reveals that The Gambia has one of the densest stocking rates in Africa. Cattle numbers seem fairly stable - the stocking rate was 25.5/km^2 in 1973, 27/km^2 in 1975 and 26.2/km^2 in 1978.

No precise census of sheep and goats has been carried out. FAO (1978a) estimated a population of 95 000 sheep and 92 000 goats in 1977, but the government reports approximately 113 000 sheep and 187 000 goats, giving a ratio of about 3 to 5.

3. CATTLE

Almost the whole cattle population of The Gambia is of the N'Dama type. Some Zebu and crossbreds (Gobra Zebu x N'Dama) are found in the eastern part of the country, but no exact report of their numbers is available. They probably account for less than 10% of the national herd. The crossbreds look exactly like the Djakore of Senegal (see chapter 4, volume 1). There is no information on their productivity.

3.1 N'DAMA BREED DESCRIPTION

The Gambian N'Dama (see Figures 3.7 and 3.12, volume 1) is slightly taller than the typical Guinean type. Its coat is generally lighter, with white and grey fairly common.

Some production data under village conditions have been obtained, mainly from surveys undertaken by Clifford (1977), while figures on the productivity of the breed under improved management are available from the Yundum Experimental Station.

3.1.1 Performance Traits

Dunsmore et al. (1975) give countrywide data on N'Dama reproductive performance. They found an age at first calving between 34 and 40 months and a calving interval of 29 months, giving a calving percentage of 41%. Clifford (1977) has recorded calving rates of 35% in 1974-75 and 42% in 1975-76 in a high tsetse challenge area, compared with 50 and 60% for the same two years in a low challenge area. At Yundum Experimental Station, under no tsetse challenge or a very slight challenge, the age at first calving ranges from 28 to 40 months, with an average of 35 months, and the calving interval averages 13 months.

Under traditional management, the mortality rate for calves to one year is about 30%, from one to two years about 12% and for adults about 3% (IBRD, 1976). Clifford (1977) indicates that total annual mortality in a high tsetse challenge area averages 20%, compared with 10% in a low challenge area. Corresponding calf mortality figures are 35 to 45% under high challenge and 5 to 10% under low challenge.

During a field survey body weights were determined under traditional management conditions. 2 302 animals were weighed using a weighband (Clifford, 1977). The following results were obtained:-

Age in years	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - over
Female	40.4	98	141	187	200	221
Male	46.3	101	153	188	244	310
Castrate		154	182	191	283	310

In the same study, Clifford observes that one- and two-year-old animals weight on average about 10 kg less under high challenge than under low challenge. He records average adult female weights of 237 kg under low challenge and 222 kg under high challenge.

In development project plans, average adult liveweights under traditional management are estimated at 295 kg for bulls, 227 kg for cows, 340 kg for oxen, 113 kg for one-year-old steers, 181 kg for two- to three-year-old steers, 227 kg for three- to four-year-old steers and 259 kg for four- to five-year-old steers.

Body weights obtained under improved management conditions from a random sample at Yundum Experimental Station in 1976 were as follows (kg):

Age in Months	Birth	6	12	18	24
Females (n:30)	20.4	97.5	130	172	190
Males (n:30)	20.4	92.4	140	181	206

During a draught power trial, a pair of oxen ploughing paddy fields achieved a rate of 0.03 to 0.04 ha/hour (a person can plough by hand at a rate of 0.002 to 0.005 ha/hour). The oxen harrowed the same fields at a rate of 0.065 to 0.099 ha/hour and levelled at a rate of 0.052 to 0.100 ha/hour.

3.1.2 Index of Productivity

Table 3 summarizes the estimates of major production traits required to build up a productivity index based on the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for three basic production environments, meat and milk production under village conditions in a high tsetse challenge area and in a low challenge area and meat production only under improved ranching conditions with no or very light tsetse challenge.

3.2 DISEASES

Annual vaccination campaigns are carried out against rinderpest and CBPP. The other chief infectious diseases are anthrax, blackquarter and haemorrhagic septicaemia. An important activity of veterinary posts is spraying for lice, ticks and mangemites with portable hand-pump sprayers. The major disease problem of N'Dama cattle in The Gambia is anaemia caused by trypanosomes (McIntyre et al., 1975). The most common trypanosome found in N'Dama cattle is *T. congolense*,

Table 3. N'Dama productivity estimates.

Parameter	Production Environment - Village/high tsetse challenge/ meat and milk	Village/low tsetse challenge/ meat and milk	Station/low tsetse challenge/meat
Cow viability (%)	96.0	98.0	98.0[b]
Calving percentage	38.5	55.0	92.4[b]
Calf viability to one year (%)	60.0	92.0	92.5[b]
Calf weight at one year (kg)	95.0[b]	105.0[b]	135.0
Annual milked out yield (kg)	69.3	98.9	-
Productivity index[a] per cow per year (kg)	30.1	64.9	116.6
Cow weight (kg)	222	237	255
Productivity index[a] per 100 kg cow maintained per year (kg)	13.6	27.4	45.7

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.
b. Estimate.
Source: Clifford, 1977 and country visits.

rather than *T. vivax*, but it appears that *T. brucei* is more common than was suspected. This trypanosome was found in approximately 50% of the cases diagnosed as positive on microscopic examination for other trypanosomes (McIntyre et al., 1975).

An experiment comparing the responses of Zebu and N'Dama cattle exposed to an artificial challenge (inoculation with *T. brucei* at three levels) was carried out by Murray et al. (1977). Cattle were maintained under village husbandry conditions, tethered at night and grazing during the day. No supplementary feed was given and they were investigated carefully prior to inoculation for evidence of pre-existing disease. In all, 120 cattle were involved, with 48 slaughtered in the course of the experiment for sequential pathological studies. Of the remaining 72, 29 of the 39 Zebu died from the infection, but none of the N'Dama died.

3.3 HERD MANAGEMENT AND COMPOSITION

A description of cattle herd ownership and management patterns in The Gambia will be quoted here from USAID (1977):

> With regard to cattle in The Gambia, there are two basic systems of herd management. In one, the ownership and herd management functions are combined in the same person or group of persons. In the other, the ownership of the cattle is in the hands of a single person or group of people who do not have any direct, daily managerial supervision over them. Herd management is the responsibility of one or more herders, usually Fula [Fulani] men who are paid by the owners.

In general terms, one is likely to find that ownership and direct management of a herd are correlated with ethnic group and herd size. The Fula who are concentrated geographically in the eastern half of the country, are primarily herders by preference and training. They tend to have managerial control of the majority of the cattle in the country either through direct management of their own cattle or hired herding of cattle belonging to other ethnic groups. Chief among these other ethnic groups are the Mandinka, the Wolof and the Serahuli. These groups are primarily sedentary agriculturalists concerned with cash and food crop production or, as in the case of the Serahuli, heavily engaged in commercial activities. While they own cattle for a variety of reasons, they are not generally noted for their stock-handling abilities or knowledge and thus generally depend on hired herders for stock maintenance.

Slightly more than half of the herds in The Gambia, which commonly number from 50 to 150 animals, are owned by a principal owner and several other unrelated individuals. The former will often own more than half of the animals in the composite herd. A quarter of the herds are owned either by a single person or jointly by a single family unit, usually Fula. Slightly less than a quarter of all herds are owned by several unrelated owners with each having approximately the same number of animals. Owners of fewer than 30 animals are said to have a great inducement to join with others in forming these composite herds since they find it individually infeasible to support a hired herder from the produce of their own animals. In the absence of such arrangements, these smaller herds are likely to be owner-managed.

The interest taken by cattle owners in their stock varies from an almost total preoccupation in the case of the owner/manager [see Figure 3.10, volume 1]; to daily owner inspection when the herder brings the herd conveniently close to the village; to weekly, monthly or even yearly visits when the owner and herder are not in close proximity to each other. In some extreme cases owners may never see their animals but depend wholly on reports from the herder as to their location and state of wellbeing. It seems presently the custom in non-owner-managed herds that the hired herder has the primary responsibility for daily management decisions regarding herd welfare with the owner intervening only on major items like cattle sales and/or decisions about purchases of production inputs and services.

When hired herdsmen are employed, they always receive part of their remuneration in kind - namely milk - but many also receive accommodation and food. An increasing number are paid an agreed sum of between US$0.60 and $0.90 per animal per year.

The same report (USAID, 1977) gives a description of typical cattle husbandry practices under village conditions:

The calves do not graze with the main herd but are kept tethered in the mornings - until the herd is out of sight - and then released. They remain in the proximity of the tethering site with little or no supervision or care. Little or no water, mineral salt, and/or supplementary feeds are supplied to the

calves on a routine basis. Apparently some substantial number of calves also suffer from a local belief that mutilation by slashing on the flanks is beneficial for unthrifty animals. Immature and adult animals are often tethered without feed, water or other supplements for upwards of fifteen hours of each day [see Figure 3.5, volume 1]. This practice is said to reduce productivity by denying the individual animal sufficient time for grazing during the best times of the day - early morning and late evening - and to reduce reproductive efficiency by limiting sire access to cows in season to short periods during daylight hours when the herd is released.

During the rainy season according to Dunsmore et al. (1976) there is an abundance of natural forage. However, herdsmen often complain that not only is dryland farming increasingly encroaching on their traditional grazing areas but that cropped fields frequently are so close together as to prevent access to what good grazing exists. Disputes and litigation over damage to growing crops are said to be increasingly frequent. During the dry season, the cattle and other livestock maintain themselves on the standing straws, crop residues, floodplain and swamp grazing, and woody browse....

The net result of the variable and inadequate feed supply in The Gambia is that animals grow at a very slow rate by modern standards and probably never reach their full genetic potential. Periods of satisfactory growth during the rainy season each year are followed by several months of inadequate nutrition when the animals, at best, maintain previous weight gains and generally lose weight.

Turning to management of breeding herds, there seems to be considerable variation in calving seasons in different parts of The Gambia. 'In some districts, the calf drop occurs during the early months of the dry season (November - December); whereas in other districts calving occurs during the rainy season. Both periods would seem to have distinct disadvantages from the point of view of calf survival and growth' (USAID, 1977). Blair Rains (1975) emphasizes another important problem affecting both the development of calves and the reproductive efficiency of the dams the extended suckling period allowed by the herders: 'The objective seems to be to keep the dam in lactation for as long as possible to sustain milk supply for the herder and his family [see Figure 3.14, volume 1]. Few calves are weaned earlier than 12 months of age and many are still suckling at 18 to 24 months, when the calf is often nearly as big as its mother.'

The management of draught oxen differs in some respects from that of the rest of the herd. Peasant farmers are increasingly renting draught oxen for land preparation at the beginning of the planting season, and during the dry season cattle herds composed of as many as 40% oxen can be observed. Ox ploughing costs about D 5.7 (US $ 3.60) per acre (0.4 ha), with one pair of oxen generally ploughing about 4 acres (1.6 ha) a day. The period of field preparation is very short - about three weeks - and the oxen must be in good condition at this time. Although they are herded with the other animals at the beginning of the dry season, but with bells attached to their necks, as the critical ploughing season approaches they are given some supplementary feed and are even sometimes kept in the owner's compound to be in peak

condition at the beginning of the rains.

There have been a number of estimates of herd composition in The Gambia. The most recent work based on actual field samples is that of Clifford (1975), showing marked differences in herd structures in different parts of the country. These findings are shown in Table 4. The principal differences are higher retention of females in some herds, a higher percentage of castrates in others, and some evidence of different mortality rates, particularly among calves and yearlings.

Table 4. Herd composition in two areas of The Gambia, 1974 (%).

Age in Years	Sapu Area (n: 2032)			Keneba Area (n: 276)		
	Females	Males	Castrates	Females	Males	Castrates
0 - 1	8.7	7.8	0	2.5	5.1	0
1 - 2	10.0	8.5	0	7.2	8.3	0
2 - 3	4.5	4.3	0	5.1	4.7	0
3 - 4	4.8	3.0	1.3	3.6	4.4	0.7
4 - 5	12.1	2.7	2.5	7.2	4.0	3.3
5 - 10	17.4	0.8	2.2	18.5	2.9	13.0
over 10	9.1	0.0	0	8.7	0.0	0.7
Total	66.6	27.1	6.3	52.9	29.4	17.7

Source: Clifford, 1975.

At the division level, estimates of herd structure are all very similar, except for Upper River Division. The typical herd structure is 70% females, 25% males and 5% castrates, except in Upper River where herds are typically composed of 63% females, 25% males and 12% castrates (drawn from Dunsmore et al., 1975).

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

The typical West African Dwarf sheep and goats are found in The Gambia (see Figure 3.71, volume 1). Coat colours vary from white to tan to black in various combinations - quite often the animals are black in front and white in back.

Macadam (1974) inspected many flocks in the western part of Western Division in 1973, weighing and examining sheep. Mortality rates appeared to be high, with lamb mortality possibly at about 50%. The body weights he recorded are presented

in Table 5. Clifford (personal communication) found low prolificacy among sheep in The Gambia, with twinning particularly rare in areas under medium to high tsetse challenge.

Table 5. Body weights of sheep in Western Division (kg).

Number of Permanent Teeth	Adult Females			Adult Rams			Adult Castrates		
	n	Mean	Range	n	Mean	Range	n	Mean	Range
2	48	21.3	11.8-33.1	31	24.5	16.8-41.7	17	25.9	17.7-36.7
4	45	25.9	17.2-32.7	9	30.8	25.4-46.5	16	30.8	24.5-41.7
6	54	24.5	15.4-33.1	2	34.5	34.4-44.0	14	31.8	23.1-43.5
8	92	26.8	15.4-44.5	1		40.8	13	37.6	29.0-19.9
Total	244	24.9	11.8-44.5	43	27.2	16.8-46.5	60	31.3	17.7-49.9

Source: Macadam, 1974.

4.2 DISEASES

A report published by the Animal Husbandry and Production Division in July 1976 identifies the major disease problems of sheep and goats in The Gambia as *peste des petits ruminants* (PPR) originating in Senegal, which causes heavy losses among both species, sheep pox *(Dermatophilus)* and heartwater. Streptothricosis is widespread only among sheep (Bremaud et al., 1976). Internal parasites are present which do not cause mortality by themselves, but lower the resistance of animals to other diseases. Clifford (personal communication) has never identified any trypanosome in the blood smears of sheep or goats, even after inoculation. However, anaemic sheep and goats are found in the field

4.3 FLOCK MANAGEMENT

The 1976 report of the Animal Husbandry and Production Division indicates that sheep are generally herded with cattle in The Gambia, especially during the rainy season. One family typically owns three to six sheep, which are taken out by the children to graze during the day, possibly tethered in the fields, and collected in the evening. Macadam (1974) reports that sheep are usually crowded into small pens at night near the farmer's house, occasionally floored with cut palm beams. According to the Animal Husbandry and Production Division report, families from one village sometimes combine their animals into a large flock which is usually tended by a young boy or a shepherd hired from outside the village. In such a situation, the village goats are usually herded with the sheep and the flock is brought back to the village in the evening.

During the rains, sheep are tethered in a fallow area or herded on the fallow

or on uncleared land. Once the crops are harvested, the flocks move freely in the stubble during the day and return to the village or family compound at night. As the dry season advances, sheep tend to move closer to the village areas where they are fed household waste.

Goats appear to receive less attention than sheep. Even when sheep and goats are herded together, the goats usually separate to graze and browse. It is felt that goats are more prolific than sheep, but that their numbers are kept down because they are more often slaughtered for meat.

There are some differences among tribes in the preference for mutton or goat meat. It is generally believed that the Mandinka traditionally prefer goat meat, while the Wollof prefer mutton because they believe it is unhealthy to eat goat meat, but this difference is not absolute.

People in The Gambia generally give four reasons for keeping sheep and goats: for the tabaski (Moslem feast) celebrations; as a means of saving, possibly to buy cattle (six to ten chickens have the same value as one sheep or goat, and four to eight sheep or goats have the same value as one bovine); to slaughter for guests; and to comply with the custom of keeping a 'charity sheep'. This is a white castrated male, kept in the compound and given special food until about four years old and then slaughtered for tabaski, but only if a replacement is available.

Sheep and goats are sometimes milked to pay the shepherd or for home consumption. Goat's milk is believed to have special medicinal properties or it may be consumed simply because no cow's milk is available. Small ruminants may also be milked by the owner's children who consume the milk on the spot. This milk is never sold.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

Three research programmes underway in The Gambia are concerned with N'Dama cattle. These are described in Table 6.

5.2 MULTIPLICATION HERDS

An N'Dama Multiplication and Improvement Project has been submitted for financing. The planned annual output would be about 800 young heifers for export, a number of selected young bulls for distribution to village herds and for export, and young oxen to be trained under the Oxen Training Scheme.

Table 6. Research centres and programmes in The Gambia.

Name	Yundum Experimental Station	Trypanosomiasis Research in The Gambia	Milk Recording Schemes
Location (and reference in Figure 1)	Yundum, 25 km from Banjul ●1	Two areas: Keneba in the west of Lower River Division, 160 km west of Manga Kanko with a high tsetse challenge, and Sapu in McCarthy Island Division, 70 km west of Georgetown, under light tsetse challenge. ✚2	13 areas in different divisions
Organization responsible	Animal Health and Production Department (AHPD), Banjul	AHPD	AHPD with the participation of the Livestock Owners' Associations
Size	200 ha		
Breeds and numbers	210 N'Dama (85 breeding females)	N'Dama and some Zebu	N'Dama lactating cows (10 cows eartagged randomly in each of the 13 areas)
Objectives and Activities	Improvement of the N'Dama breed. Castration trials and study of the effect of dicalcium phosphate. Identification, breeding performance since 1965 and weights at monthly intervals since 1968.	Comparison of artificial trypanosome infection in N'Dama and Zebu cattle. Epidemiology of natural trypanosome infections in village cattle. Comparative studies in early 1976 of 60 N'Dama and 60 Zebus; since late 1974, blood samples from village herds are clinically examined at regular intervals. Data have been collected on about 2 000 animals.	Evaluation of the milk production of N'Dama cows under traditional management.
External aid		Continuation of The Gambia Government/ Glasgow University collaborative trypanosomiasis research work. Participation of ILRAD and FAO.	
Project period			August 1978 to February 1979

5.3 DEVELOPMENT PROJECTS

The Ministry of Agriculture and Natural Resources at Banjul is in charge of a rural development project aimed at strengthening the agricultural extension services, improving animal health and livestock services, supplying credit to farmers and improving crop and livestock marketing.

A second project, The Gambia Mixed Farming and Resource Management Project will be carried out with financing from USAID. The Final Project Paper has already been written.

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CHAPTER 3

GUINEA BISSAU

1. BACKGROUND

The Republic of Guinea Bissau lies on the west coast of Africa, with Senegal to the north and Guinea to the east and south. It includes the adjacent archipelago of Bijagoz with the island of Bolama. The country is made up of eight regions plus Bissau, the capital. Each region is divided into three to six sectors, with 34 sectors in all. The administrative boundaries and regional centres are shown in Figure 1. The Bolama region includes the Bijagoz archipelago.

The Department of Veterinary Services, with headquarters in Bissau, is part of the State Commissariat for Agriculture and Animal Husbandry. There is a regional Veterinary Services office in the main town of each region.

Basic data for the country are given in Table 1.

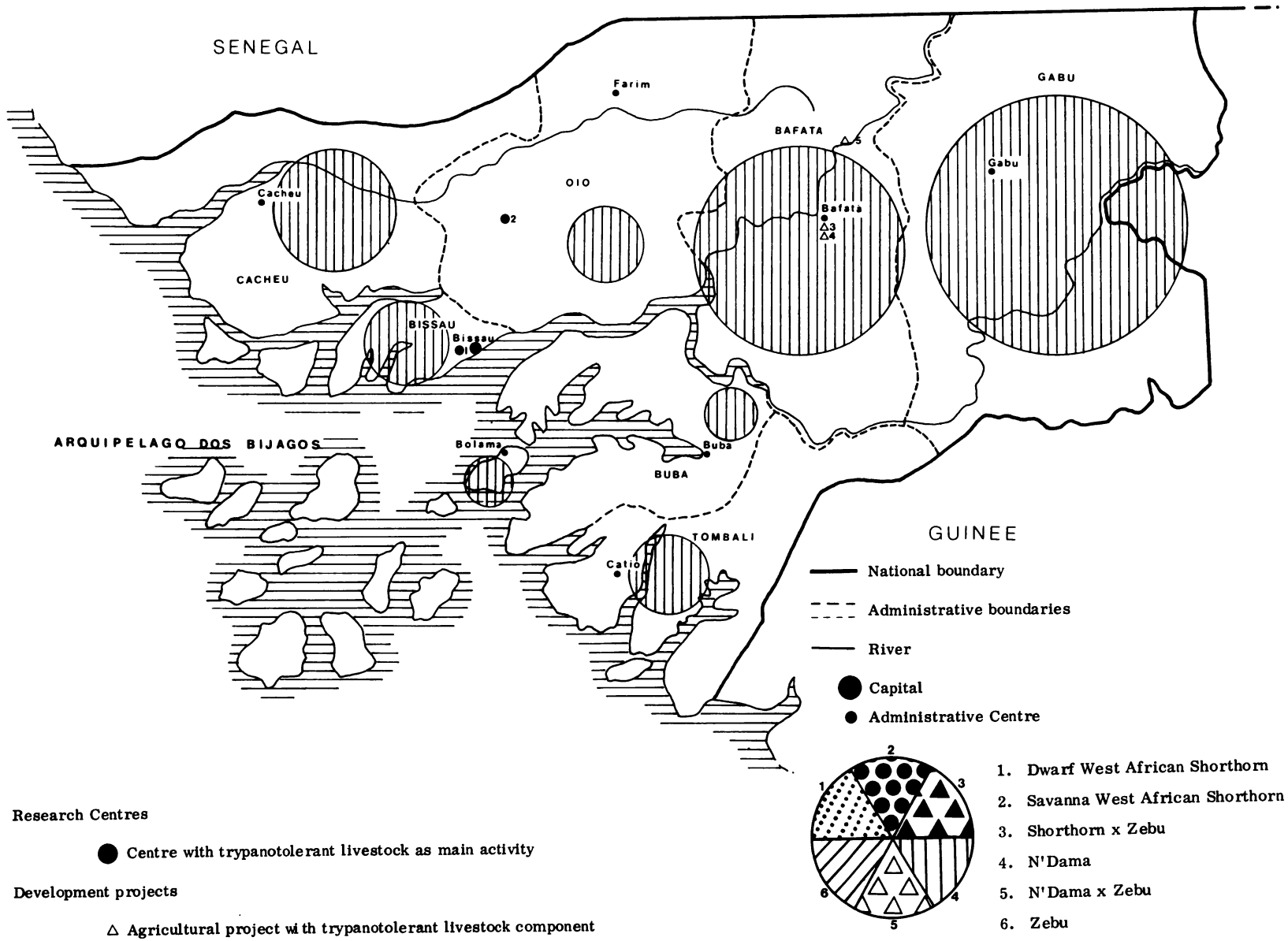
Table 1. Background data for Guinea Bissau.

Area	36 125 km^2
Latitude	$10^o55'$ - $12^o40'$ N
Longitude	$13^o40'$ - $16^o40'$ W
Population	
number	530 000
density	14.7/km^2
Livestock numbers	
cattle	166 016
sheep	25 253
goats	74 735

Sources: For population, OAU, 1978; for cattle numbers, national census, 1977; for sheep and goat numbers, agricultural statistics, 1975.

Most of the country has a Sudano-Guinean climate with one rainy season from May to November. The average annual rainfall ranges from 1 400 to 2 600 mm. The

Figure 1. Administrative divisions, location of research centres and development projects, cattle numbers and distribution.



southern area has a Guinean climate, with rainfall at the higher end of the range.

According to the OAU/STRC *tsetse distribution* map (1977), *Glossina palpalis*, *G. longipalpis* and *G. morsitans* are found throughout the country, and *G. fusca* in the south. However, no information is available concerning the exact distribution and level of challenge.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

A cattle census was carried out as part of a 1977 national vaccination campaign, with results shown in Table 2. Though these figures are given as representing the total herd, in fact, the vaccination campaign probably only reached about 80 to 85% of the cattle in the country. Thus, the actual total number of cattle in Guinea Bissau is probably closer to 200 000. About 75% of the animals vaccinated were in Bafata and Gabu Regions in the east, and 9% were in Cacheu Region on the northern part of the coast.

Table 2 also gives figures for the sheep and goat population. There are about 100 000 small ruminants in Guinea Bissau, with about three times as many goats as sheep. The distribution of sheep is similar to that of cattle, with about 76.4% in Bafata and Gabu Regions. Goats are fairly evenly distributed throughout the country.

3. CATTLE

3.1 BREED DESCRIPTION

3.1.1 N'Dama

The majority of the cattle in Guinea Bissau described as 'N'Dama' or 'Foula' are not of the typical N'Dama type, but represent a rather heterogeneous population. Field observations of about 10 herds indicated that about 60% of the cattle are of modest size (1.00 to 1.10 m at the withers), with very pale coats, often white with black markings (particularly the ears) and horns of medium size (see Figure 3.6, volume 1). only about 20 to 30% of these animals are the typical N'Dama type and the rest are heterogenous.

A sub-type of the N'Dama, called 'Boenca' or 'Boyenca' was described as nearer the typical Guinean N'Dama. These 'Boenca' are found in the southeastern part of the country on the border with Guinea.

Table 2. Livestock numbers and distribution in Guinea Bissau, 1977.

Region	Cattle									Sheep		Goats	
	- Females -			- Males -			Draft						
	Cows	Heifers	Calves	Bulls	Steers	Calves	Oxen	Total	%	Number	%	Number	%
Cacheu	7 645	1 587	2 403	597	826	1 853	98	15 009	9.0	893	3.5	7 585	10.1
Bissau	3 575	1 240	939	350	501	708	79	7 392	4.5	849	3.4	13 820	18.5
Oio	2 750	825	679	526	575	483	128	5 966	3.6	2 922	11.6	10 960	14.7
Bafata	21 820	6 592	7 276	2 034	3 954	5 895	432	48 003	28.9	7 174	28.4	10 252	13.7
Gabu	33 837	10 250	9 918	4 639	6 775	8 557	2 834	78 810	46.3	12 134	48.0	19 979	26.8
Bolama	1 114	331	336	134	207	281	159	2 562	1.5	146	0.6	2 020	2.7
Buba	1 328	395	401	160	246	334	70	2 934	1.8	700	2.8	5 113	6.8
Tombali	3 305	998	1 000	431	601	828	177	7 340	4.4	435	1.7	5 006	6.7
Total	75 374	22 218	22 952	8 871	13 685	18 938	3 977	166 016		25 253		74 735	100
%	45.4	13.4	13.8	5.3	8.3	11.4	2.4		100.0				

Sources: For cattle, national census, 1977; for sheep and goats, agricultural statistics, 1975.

3.1.1.1 Performance Traits. There is little information available on the performance of the N'Dama in Guinea Bissau. Average daily milk yields of 1.6 kg over 136 days of lactation were recorded for 21 N'Dama cows at the Bissau station, according to the 1977 annual report of the Department of Veterinary Services. These cows were partially milked, with the calves suckling after milking.

Ten white N'Dama cows with black ears and mucosae were measured at the Bissau station. Their size was considered fairly representative of animals under village husbandry conditions. Their mean height at the withers was 106 cm (with a range of 101 to 110 cm), their mean heart girth was 138.4 cm (ranging from 125 to 145 cm) and their mean scapulo-ischial length was 122.5 cm (ranging from 110 to 131 cm). From these measurements and observations in the field, the average weight of adult cows can be estimated at 170 to 180 kg.

A 1975 census recorded 137 527 cattle, with an annual offtake rate of 6.4%, consisting of 3.4% sales and 3.0% slaughter. Mortality rates reported were 3.2% at birth and 4.6% for other age categories. These are much lower mortality rates than those recorded in the other survey countries.

3.1.1.2 Index of Productivity. Table 3 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for meat and milk production under village conditions in a light tsetse challenge area (country visit information).

Table 3. N'Dama productivity estimates.

Parameter	Production Environment Village/low tsetse challenge/ meat and milk
Cow viability (%)	96[a]
Calving percentage	55[a]
Calf viability to one year (%)	75[a]
Calf weight at one year (kg)	90[a]
Annual milked out yield (kg)	82.5
Productivity index[b] per cow per year (kg)	47.0
Cow weight (kg)	190[a]
Productivity index[b] per 100 kg cow maintained per year (kg)	24.8

a. Estimate.
b. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Source: Country visit information.

3.1.2 The 'Manjaca' breed, which has been described as a Shorthorn type found in Guinea Bissau, seems to be disappearing. A few of these animals can be found in some herds in Cacheu Region towards the coast, and on the islands. This shorthorn type is being absorbed: its influence is only recognized by a greater heterogeneity in the herds of these areas, with a higher proportion of black and black spotted animals and horns which are atypical for the N'Dama (shaped in a short crescent, for example).

3.2 DISEASE

According to the Director of Veterinary Services, rinderpest and contagious bovine pleuropneumonia (CBPP) have been eradicated. Blackquarter and anthrax are present, and regular vaccinations are carried out. Brucellosis is also a problem.

Trypanosomiasis is not considered a major problem. No information was available on the more common trypanosome species or the distribution of the disease. The use of Berenil is fairly common, however, which suggests that there are cases of trypanosomiasis, even though virtually all of the cattle in the country are of the trypanotolerant breeds.

3.3 HERD MANAGEMENT AND COMPOSITION

Herd management varies widely from the coastal region towards the eastern part of the country. In the western area, the Balante and Mandjako are crop farmers, and households keep only a small number of cattle. In the east, the Fulani and Mandingo have a traditional livestock system based on larger herds. These differences are revealed in Table 4.

Table 4. Cattle herd sizes in five regions of Guinea Bissau.

Herd Size (number of cattle)	Number of Herds - Cacheu	Bissau	Oio	Bafata	Gabu	Total
250 - 500	-	-	-	14	29	43
150 - 249	1	-	-	37	62	100
100 - 149	2	-	3	61	95	161
50 - 99	19	3	19	209	318	568
25 - 49	40	12	52	271	439	814
5 - 24	736	591	165	196	261	1 949
1 - 4	1 777	652	57	-	-	2 486
Total	2 575	1 258	296	788	1 204	6 121
Cattle per region	15 009	7 392	5 966	48 003	76 810	153 180
Average cattle per household	5.8	5.9	20.9	60.9	63.8	25

Source: National census, 1977.

The use of draught oxen in farming is rare, except in Bafata and Gabu Regions, where there are an estimated 1 000 pair of working oxen. The numbers of oxen reported for all the regions are given in Table 2.

4. SHEEP AND GOATS

The sheep and goats in Guinea Bissau are of the West African Dwarf type. Their numbers and distribution among regions are indicated in Table 2. No performance data are available.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

Two governments livestock stations are in operation, at Bissau and Bissora, and a third one is planned at Pradis. These are described in Table 5.

Table 5. Research centres in Guinea Bissau.

Name and reference to Figure 1	Bissau Station ● 1	Bissora Station ● 2	Pradis Station Project
Organization responsible	Direction of Veterinary Services, B.P. 26, Bissau	Direction of Veterinary Services	
Breeds and numbers	About 100 N'Dama cattle and a few Charollais and Friesian crossbreds	About 150 N'Dama	Planned to have 500 ha and 200 milking cows
Objectives	Improvement of milk production		Dairy farming station
External aid	German Democratic Republic		Switzerland
Comments	There is a small laboratory which should soon be developed into an animal pathological laboratory with the help of the US and Brazil.		

5.2 DEVELOPMENT PROJECTS

At present there are no development projects aimed exclusively at livestock, though a number of integrated agricultural development projects include a livestock component focusing on the use of draught oxen. These are the Integrated Development Project - Rice and Cotton, at Bafata with French cooperation (CFDT), the Development Project - Groundnuts, also at Bafata with French cooperation (IRHO) and including a training centre and a draught oxen component, and the Multiplication Project for Seed-Rice supported by the FAO at Contuboel in Bafata Region (FAO Guinea Bissau 75/039).

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CHAPTER 4

GUINEA

1. BACKGROUND

The Republic of Guinea lies on the west coast of Africa, with Senegal and Guinea Bissau to the north, Mali and Ivory Coast to the east and Sierra Leone and Liberia to the south. The country, with its capital at Conakry, is divided into 33 regions, grouped under seven Ministères du Développement Rural (MDR). The boundaries and administrative centres of the MDRs are depicted in Figure 1.

Livestock production is supervised by the Direction Générale de l'Elevage, which is part of the Ministère des Aménagements, Pêche et Elevage (MAPE). Every region has a Direction Régionale de l'Elevage which is responsible to the Direction Générale at the technical level and to the regional authorities at the administrative level.

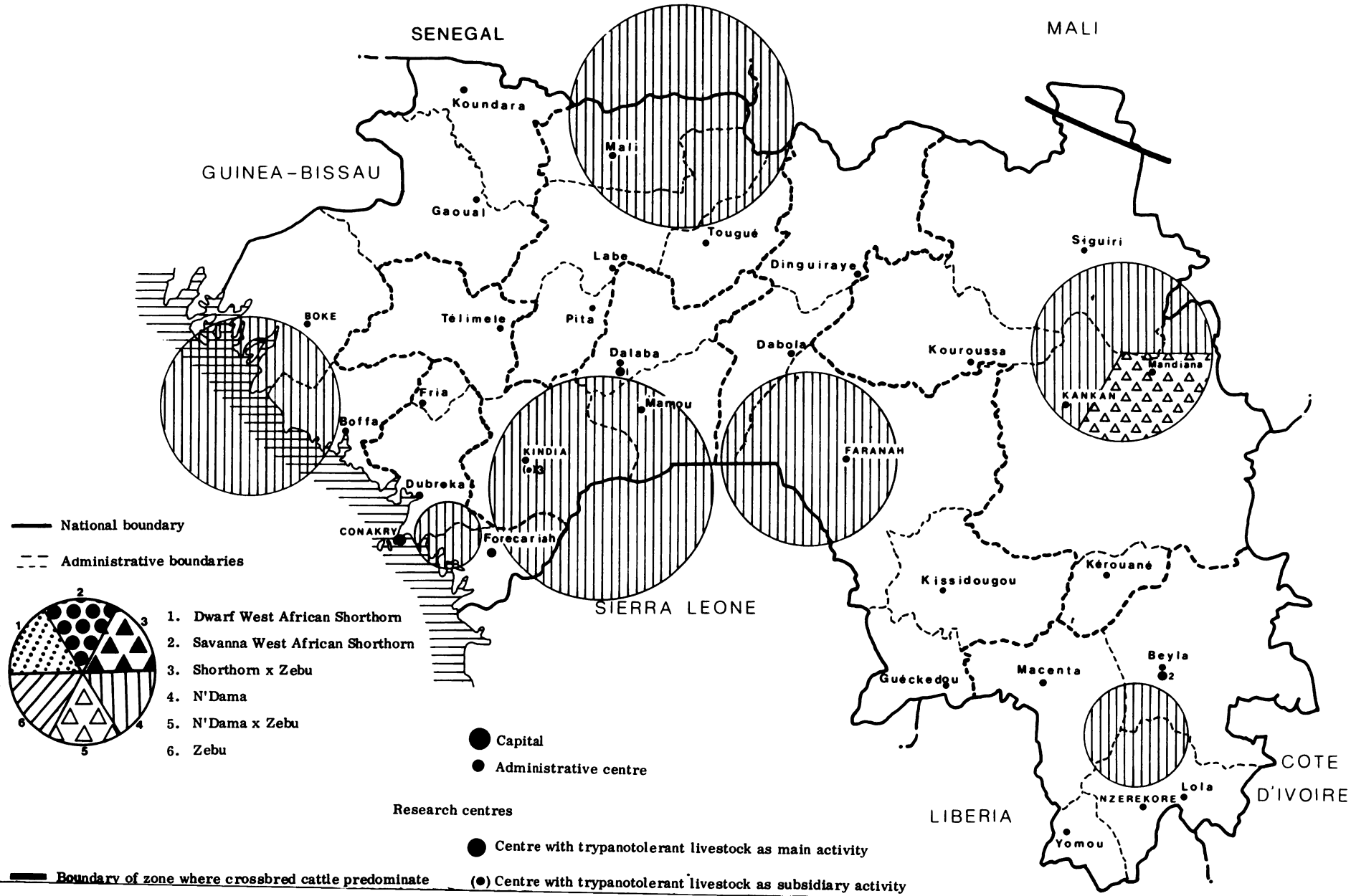
Basic data for the country are given in Table 1.

Table 1. Background data for Guinea.

Area	245 900 km^2
Latitude	7^o - $12^o30'$ N
Longitude	8^o - 15^o W
Population	
number	5 695 000
density	23.2/km^2
Livestock numbers	
cattle	1 215 000
sheep	540 000
goats	535 000

Sources: For population, OAU, 1978; for livestock numbers, national census, 1976.

Figure 1. Administrative divisions, location of research centres, cattle numbers and breed distributions.



Guinea can be divided into four distinct ecological zones:-

1. Lower Guinea (Basse Guinée), which extends 300 km along the Atlantic coast in the west. This area covers 45 000 km^2, with a Guinean climate and an average annual rainfall between 2 000 and 4 000 mm. The main towns are Boké, Conakry and Kindia.

2. Central Guinea (Moyenne Guinée), with a Guinean climate, covering 54 000 km^2 along the Fouta Djallon massif. The altitude ranges from 600 to 1 500 m and the average annual rainfall is between 1 500 and 2 000 mm. The main towns are Mamou and Labé.

3. Upper Guinea (Haute Guinée) in the northeast is the largest region, extending over 100 000 km^2. The climate is Sudano-Guinean, with an average annual rainfall between 1 200 and 1 800 mm. The main towns are Faranah and Kankan.

4. Forest Guinea (Guinée forestière) in the southwest covers 46 000 km^2 with a forest climate and average annual rainfall from 1 700 to 3 000 mm. The main towns are Beyla, Kissidougou and Nzérékoré.

According to the OAU/STRC tsetse distribution map, *G. palpalis* is found throughout the country, *G. fusca* in the west (Lower Guinea), *G. longipalpis* and *G. morsitans* in Central and Upper Guinea, *G. tachinoides* in the northeast and *G. pallicera* in the southeast. However, the level of tsetse challenge is light to negligible in large areas of the country. Some of the relatively heavily infested areas are: the northern part of the Fouta Djallon massif in Central Guinea, including Gaoual, Koundara, Mali and Tougué Regions; in Upper Guinea in Siguiri and Mandiana Regions towards the northeastern border; and in Kindia Region in Lower Guinea.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

Table 2 gives livestock numbers in 1976 for the MDRs and for the country as a whole, according to the Direction Générale de l'Elevage.

2.1 CATTLE NUMBERS AND DISTRIBUTION

Official estimates of the cattle population in Guinea are around 1.2 million, though some (e.g. Mongodin, 1975) estimate 2 million head. Government sources report a reduction in the cattle population from 1.5 million, recorded in 1958 and 1962, to 1.3 million in 1974 and 1.2 million in 1976.

These figures (like those in Table 2) are not based on an actual livestock census, but are estimates produced by the Direction Générale de l'Elevage, which

Table 2. Livestock numbers in Guinea, 1976.

MDR	Cattle	Sheep	Goats
Boké	185 000	74 500	91 000
Conakry	27 000	29 900	19 000
Faranah	179 000	74 400	59 000
Kincha	289 200	116 500	109 000
Kankan	183 000	81 000	50 000
Labé	290 000	116 500	137 000
Nzérékoré	61 800	47 200	75 000
Total	1 215 000	540 000	535 000

Source: Official estimates.

usually revises upwards the figures submitted by the regional authorities. Even if these adjustments are insufficient and cattle numbers are in fact greater than the figures quoted here, the estimates still suggest that the cattle population has been decreasing in Guinea or has at least remained static over the past few years. This finding is surprising, particularly as it contrasts sharply with the situation in the neighbouring countries.

The natural increase in herd numbers may be slow, but it is likely that there are other reasons for the stagnation or decline in herd size, in particular the illegal export of cattle to neighbouring countries such as Sierra Leone, Liberia, Ivory Coast and Mali. This illegal trade is encouraged by the rigid regulations governing formal livestock trading in Guinea, such as fixed prices and offtake rates and the channeling of all trade through an official board.

Table 2 and Figure 1 show the distribution of cattle according to the MDRs. The distribution by ecological zone is shown in Table 3. This table reveals that the Fouta Djallon plateau in Central Guinea accounts for nearly 50% of the national herd. The human and animal populations on this plateau are relatively dense, especially in the central area, around Labe and Pita towns.

Table 3. Cattle distribution by ecological zone.

	Area		Cattle		Average
	km^2	% of total country	Number	% of National herd	Density Cattle/km^2
Lower Guinea	45 000	18	219 200	18	4.9
Central Guinea	54 900	22	572 000	47	10.4
Upper Guinea	100 000	41	309 000	26	3.1
Forest Guinea	46 000	19	114 800	9	2.5
	245 900	100	1 215 000	100	4.9

Source: Based on official estimates.

Lower Guinea accounts for 18% of the national herd, with a cattle population density similar to the national average. However, the distribution of cattle within this zone is extremely uneven. The greatest number of herds are found near the Fouta Djallon massif in Boké, Télimélé and Kindia Regions. There are many fewer cattle in Boffa, Dubreka and Forecaria Regions along the coast, and in large areas there are no cattle whatsoever. The cattle population of Central Guinea, on the other hand, is fairly evenly distributed throughout the zone. Upper Guinea is about twice the size of Central Guinea and accounts for about one-quarter of the cattle: the density of the cattle population in this zone is one-third that of Central Guinea, and the distribution is more irregular. The cattle population is small in the forest zone, except in the transitional regions of Beyla, Kissidougou and Gueckedou.

2.2 DISTRIBUTION OF SHEEP AND GOATS

Table 2 shows that sheep and goats are found throughout the country, but estimates of their numbers reported by local authorities differ widely from those of the central government. A recent study by Latinoconsult (1977) estimates a national population of 562 000 sheep and goats, while official estimates are double this figure. FAO 1978a) indicates 420 000 sheep and 385 000 goats. The discrepancies in these estimates reveal the lack of reliable information in this sector. An approximate distribution by ecological zone is shown in Table 4.

Table 4. Distribution of sheep and goats by ecological zone, 1976.

	Sheep		Goats	
	Number	% of National flock	Number	% of National flock
Lower Guinea	116 900	22	108 000	20
Central Guinea	220 500	41	245 000	46
Upper Guinea	124 500	23	84 000	15
Forest Guinea	78 100	14	100 000	19
	540 000	100	537 000	100

Source: Official estimates.

3. CATTLE

3.1 BREED DESCRIPTION

Most cattle in Guinea are of the N'Dama breed. About 5% are Zebu crosses, called Méré, found particularly in Siguiri Region and also in Kankan Region of Upper Guinea.

3.1.1 Guinean N'Dama

The appearance of the Guinean N'Dama varies considerably, as described in detail by Ducos (1961). Only the general traits and the most important variations observed in the field will be described here. (See Figure 3.9, volume 1).

In Lower Guinea and near the northeastern border in Gaoual and Koundara Regions, the appearance of the cattle is fairly uniform. The animals are relatively large (110 to 115 cm at the withers) with large horns, often of classical lyre shape. Their coats are generally light coloured as in the classical type, but pale yellow to light fawn, and the mucosa are also light. About 80 to 90% of the animals in these areas are of this type.

In Central Guinea (Fouta Djallon), which is considered the cradle of the N'Dama breed, the animals are smaller (100 to 110 cm at withers) and more heterogeneous in appearance. About two-thirds have self coloured coats, varying in shade from pale yellow to brown, and there are also black, white and pied animals. The size and position of the horns vary considerably. They are not necesarily long: a medium crescent is common, and 2 to 3% of the animals are hornless.

The animals in Upper and Forest Guinea tend to be larger than those of Fouta Djallon. Their coats are generally darker. Most of the animals are brown, but about 10% are multicoloured with a white background.

3.1.1.1 Performance Traits. Cattle performance in Guinea is generally very low. According to the Latinoconsult study (1977), the calving rate is 66%. The annual mortality rate for calves below one year is 30 to 40%, for calves one to two-years it is 10% and for adult animals 5%. Weights gains average approximately 40 kg/year, and average carcass yield is 45%.

3.1.1.2 Index of Productivity. Table 5 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for meat and milk production under village conditions in a light tsetse challenge area.

3.1.2 Zebu x N'Dama Crossbreds or 'Méré'

The 'Méré' are found in Upper Guinea near the Mali border and in the Niger River valley, in Kankan and particularly in Siguiri Region. The only Zebus are bulls imported from Mali which are used to produce the crossbreed. The Malinke people in this area carry out crossbreeding largely because the 'Méré' tend to be heavier and more sturdily built than the local N'Dama and thus make better draught oxen.

3.1.3 Exotic Cattle

A number of imported purebred cattle are kept on government breeding stations. At present, the most important exotic breed is the Red Steppe (Krasnaya Steppnaya),

imported from the USSR. These animals are bred as purebreds and as crosses on state farms at Ditinn and Famoyla. Jersey, Ayrshire and Friesian, imported from Bulgaria, are kept at the Institut de Recherches Agronomiques de Foulaya.

Table 5. N'Dama Productivity Estimates.

	Production Environment
	Village/low tsetse challenge/ meat and milk
Cow viability (%)	95
Calving percentage	66
Calf viability to one year (%)	65
Calf weight at one year (kg)	90
Annual milked out yield (kg)	99
Productivity index[a] per cow per year (kg)	50.6
Cow weight (kg)	225
Productivity index[a] per 100 kg cow maintained per year (kg)	22.5

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Source: Information obtained during country visit.

3.2 DISEASES

Rinderpest has practically disappeared in Guinea, with no outbreaks for the past ten years. Contagious bovine plueropneumonia (CBPP) is still a major problem, though the incidence of this disease has decreased due to a prevention campaign carried out by the government with the collaboration of FAO. This disease is particularly widespread in Upper Guinea and occurs occasionally in Forest Guinea, but not in Central or Lower Guinea. Anthrax, blackquarter and pasteurellosis are widespread, particularly in Central Guinea (Fouta Djallon).

Gastro-intestinal parasites are common. They cause serious problems, particularly mortality among calves.

Trypanosomiasis is generally not a serious problem among cattle in Guinea due to the trypanotolerance of the N'Dama. However, the incidence of trypanosomiasis is high in Madiana and Siguiri Regions of Upper Guinea and in Koundara, Tougue and Dabola Regions at the edge of the Fouta Djallon massif.

3.3 HERD MANAGEMENT AND COMPOSITION

3.3.1 Cattle Husbandry

Cattle husbandry practises in Guinea have been described by several authors, including Balde (1939) and Diallo (1965). Traditional management systems vary among ethnic groups. The largest of these groups are the Malinké in Upper Guinea, the Fulani in Central Guinea and the Soussou in Lower Guinea. The Fulani and Malinké play an important role in livestock production throughout West Africa, though livestock management practises differ to some extent between the Fulani of Fouta Djallon and those elsewhere.

Transhumance has become rare in Guinea, except in Lower Guinea and the areas north and west of the Fouta Djallon plateau. People still move between the Télimélé plateau during the rainy season and the Lower Guinea plains of Boké and Boffa Regions during the dry season. In densely populated agricultural areas, the herds are sometimes moved short distances during the growing season to keep them from damaging the crops. During this period, they are herded during the day and kept in pens at night, but during the dry season they are left to graze relatively freely. In some areas the herds roam without supervision; in others they are maintained under varying degrees of control.

The cows are milked regularly during the rainy season, and when possible during the dry season as well. In Fouta Djallon, milking is nearly always done by women. In areas where the animals are looked after by a hired herdsman, he generally milks them and traditionally keeps the milk for himself two days a week, though this custom appears to be dying out. Milk is not only important in terms of family consumption, but also the sale of fresh and curdled milk is an important source of income.

Under intensive farming systems in Fouta Djallon, women gather manure and spread it on the fields. During the dry season, the cattle are kept at night in enclosures, called 'tapades' which are fertilized in this way and then used for crop production. During transhumance, the manure left by the herds sometimes serves as a form of payment to farmers who allow the animals to graze on their land.

The people in Forest Guinea do not have a tradition of keeping cattle, and the animals in this zone tend not to be as well looked after as those in other parts of the country. However, these cattle are generally of a good size and healthy appearance, probably due to an abundance of grazing and the fact that they are not milked.

Two mixed farming systems can be identified in Guinea in which cattle play an important role. In Upper Guinea, crop production is based to a large extent on the use of draught oxen. High quality beef is also produced when the animals are slaughtered young. In Fouta Djallon, crop and livestock production are well integrated, with cattle providing manure for the 'tapades' and in turn grazing on crop residues such as eleusine straw and others.

3.3.2 Herd Size and Composition

According to Hamon (1967), households generally own about 5 to 15 cattle, while herds usually contain animals belonging to a number of households. In Fouta Djallon herds tend to be smaller than in Lower and Upper Guinea. The Latinoconsult study (1977) reported the figures on herd sizes in Central and Upper Guinea given in Table 6 which indicate differences between the two zones.

Table 6. Herd sizes in Central and Upper Guinea.

	- Central Guinea -				- Upper Guinea -			
	Tougué, Mali		Gaoual		Boké		Kindia	
No. of Cattle in Herd	No. of Herds	% of Total	No. of Herds	% of Total	No. of Herds	% of Total	No. of Herds	% of Total
1 - 10	523	80	5 646	80	1 373	71	290	54
11 - 50	130	20	1 328	19	489	25	232	43
51 and above			87	1	81	4	15	3
Total	653		7 061		1 943		537	

Source: Latinoconsult, 1977.

The Latinoconsult study (1977) also reports herd composition figures from a survey of 3 000 cattle in the four ecological zones. Herd composition percentages derived from this study are presented in Table 7.

Table 7. Cattle herd composition by ecological zone (percent).

	Lower Guinea	Central Guinea	Upper Guinea	Forest Guinea
Cows	40	41	33	36
Calves	27	20	18	19
Heifers	16	25	26	29
Young bulls	15	8	7	9
Bulls	1	4	7	4
Oxen	1	2	9	3
Total	100	100	100	100

Source: Latinoconsult, 1977.

3.3.3 Draught Oxen

Draught oxen have been used in Guinea for some time. Diallo (1965) reports that the Fulani of Fouta Djallon have been using ploughs since 1925. Draught oxen are now used particularly widely in Upper Guinea, and it is because of this that the herds in that zone show a higher percentage of males than elsewhere in the country (see Table 7). According to official statistics, as well as Hamon (1967), the males in the herds of Central Guinea and Upper Guinea can be categorized as follows:

	Central Guinea[a]	Upper Guinea[b]
Draught oxen	1.7%	14.6%
Non-draught oxen	2.8%	1.0%
Bulls	3.9%	5.8%
Total adult males in herd	8.4%	21.4%

a. Mamou, Télimélé, Gaoual, Pita, Mali and Tougué Regions.
b. Siguiri, Dabola, Kankan and Kouroussa Regions.

The 1973 annual report of the Direction de l'Elevage also includes figures on teams of two oxen, as well as the total cattle population, for a number of regions. These are reproduced in Table 8.

Table 8. Cattle population and ox teams in nine regions.

	Teams of Two Oxen	Cattle
Kindia (Lower Guinea)	86	57 000
Labé (Central Guinea)	400	57 800
Pita (Central Guinea)	1 177	66 700
Dabola (Upper Guinea)	3 638	36 700
Faranah (Upper Guinea)	1 834	35 400
Kankan (Upper Guinea)	6 707	64 300
Kouroussa (Upper Guinea)	5 007	44 700
Siguiri (Upper Guinea)	12 000	65 500
Beyla (Forest Guinea)	1 500	51 800

Source: Guinea, Direction de l'Elevage.

4. SHEEP AND GOATS

The sheep in Guinea are of the dwarf Djallonké breed, with average body weights of about 20 kg, though the sheep in Upper Guinea tend to be much larger than elsewhere in the country. The West African Dwarf goats weigh on average about 15 kg. Flock productivity is low, especially among sheep, due to high mortality rates.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

All animal husbandry research in Guinea is focused on the improvement of N'Dama milk production by crossbreeding with exotic animals. There is little research on pasture production or on small ruminants. Three research centres in the country are described in Table 9, and their locations are shown in Figure 1.

5.2 MULTIPLICATION HERDS

Studies are being carried out on the possibility of opening two selection centres for N'Dama cattle, one in Lower Guinea in Boké Region and the other in Upper Guinea between Kissidougou and Kankan. This project is funded by FAO/UNDP (Project No. GUI/74/022).

The World Bank is carrying out a feasibility study for an N'Dama selection and multiplication project to follow up a preliminary study carried out by Latinoconsult. The objectives are to improve animal health and zootechnical services, to establish a rearing and fattening ranch and to establish pilot centres for cattle breeding. There would also be project components for training, pig farming and animal nutrition.

These FAO and World Bank projects may possibly be coordinated in a common programme of selection, multiplication and production of the N'Dama breed.

Table 9. Research centres in Guinea.

Name	Ferme d'Etat de Ditinn	Ferme d'Etat de Famoyla	Institut National de Recherches Agronomiques de Foulaya (INRAF)
Location (reference in Figure 1)	35 km from Dalaba (Kindia MDR) in Central Guinea, Fouta Djallon ● 1	25 km from Beyla (Nzérokoré MDR) in the savanna of Forest Guinea at an altitude of 1000 m ● 2	near Kindia (●) 3
Organization responsible	Ministère des Aménagements, Pêche et Elevage	Ministère des Aménagements, Pêche et Elevage	Sécrétariat d'Etat à la Recherche Scientifique
Size	approximately 600 ha, half of which is cultivated	475 ha in use (1000 ha available)	5000 ha
Breeds and numbers	450 in 1976, 305 in 1978: 79 N'Dama, 147 Red Steppe and 79 crossbreds	380, including N'Dama, Red Steppe and crossbreds (April 1978)	INRAF has imported a number of cattle for crossing with the N'Dama: Jersey, Ayrshire, Holstein imported between 1972 and 1976.
Objectives and activities	Genetic improvement of N'Dama for milk production. It is intended to introduce the Red Steppe, ¼ N'Dama crossbreds, bred inter se, into the 'Centres d'Accouplement' (mating centres).	Genetic improvement N'Dama through crossbreeding (as at Ditinn). Improvement of cattle feeding by production of forage (maize, etc.). Training: a livestock faculty of 150 students is associated with the farm (2-year training for agricultural assistants).	This is the main national agricultural research institute, associated with a Faculty of Agronomy. Work with cattle focuses on N'Dama improvement, mainly for milk production.
External aid	USSR	USSR	Bulgaria

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CHAPTER 5

SIERRA LEONE

1. BACKGROUND

The Republic of Sierra Leone lies on the west coast of Africa, with Guinea to the north and east and Liberia to the south. The country is divided into three provinces plus a small Western Area including the Freetown penninsula and the capital, Freetown. The provinces are made up of 12 districts as follows:-

Province or Area	Capital	Districts (with headquarters if different)
Southern	Bo	Bo, Bonthe (Matru), Moyamba and Pujehun
Eastern	Kenema	Kailahun, Kenema and Kono (Sefadu)
Northern	Moken	Kambia, Bombali (Makeni), Koinadugu (Kabala), Port Loko and Tonkolili (Magburaka)
Western Area	Freetown	

Livestock services are provided by the Veterinary Division of the Ministry of Natural Resources, formerly the Ministry of Agriculture and Natural Resources, with regional offices in all the provinces. For the provision of livestock services, the Northern Province is divided into northeastern (Kabala) and northwestern (Teko-Makeni) sections.

Basic data for the country are given in Table 1.

Sierra Leone has a humid tropical rainforest climate, with a rainy season from April to November. The annual rainfall averages between 2 000 and 5 000 mm.

According to the OAU/STRC tsetse distribution map (1977), the whole country is infested with *G. palpalis* and *G. fusca*. *G. longipalpis* and *G. morsitans* are found in the north and *G. nigrofusca* and *G. pallicera pallicera* in the east. No further information on the tsetse distribution in Sierra Leone was collected. However, it appears that in the northern half of the country, the challenge is low and trypanosomiasis is not a major problem.

Table 1. Background data for Sierra Leone.

Area	72 300 km^2
Latitude	7^o - 10^o N
Longitude	10^o - 13^o 30' W
Population	
number	3 053 00
density	42.2/km^2
Livestock numbers	
cattle	207 100
sheep	47 400
goats	112 100

Sources: For population, OAU, 1978; for livestock numbers, Veterinary Division estimates, 1978.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

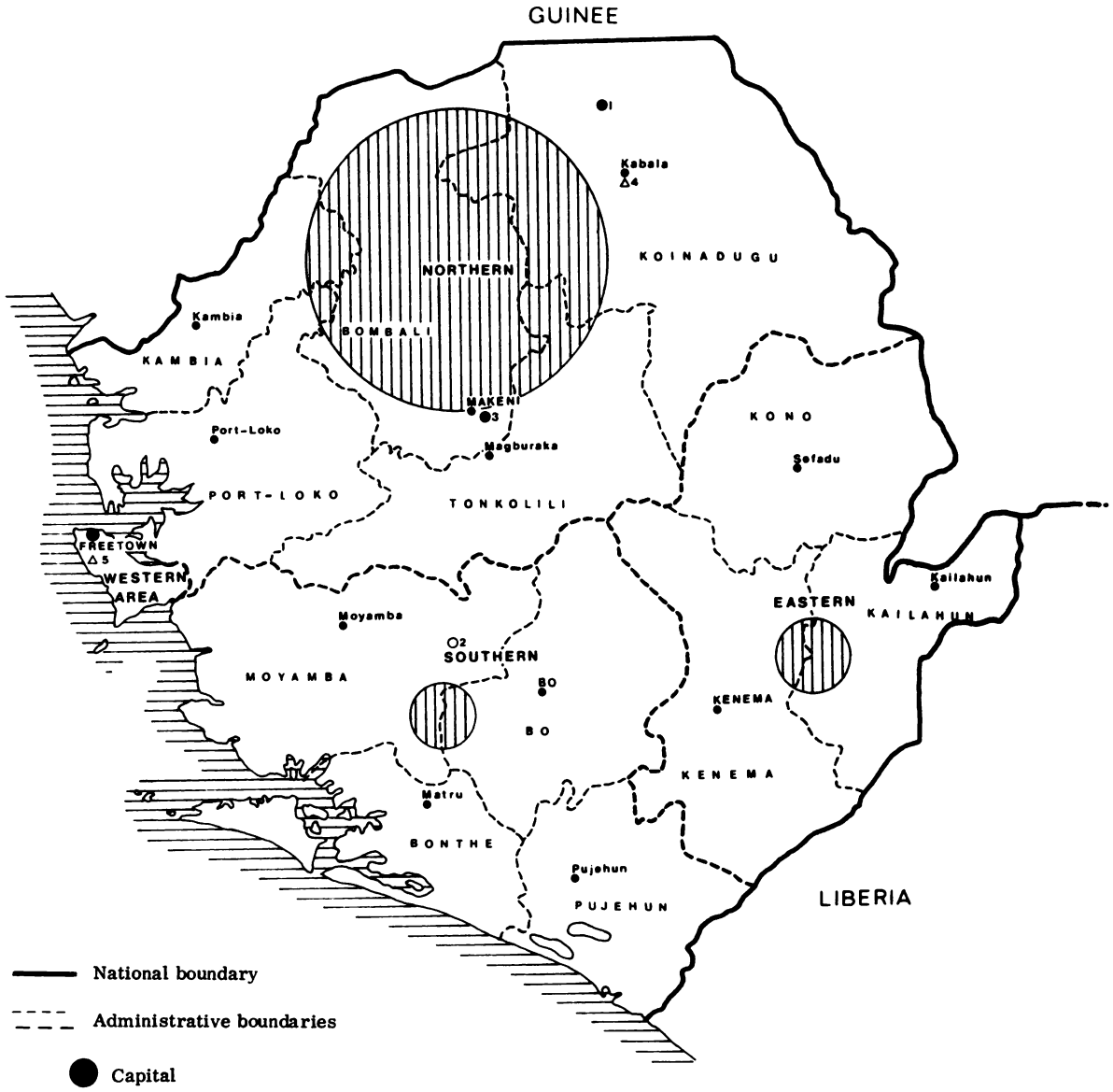
There has been no recent cattle census in Sierra Leone. Official estimates are still based on figures collected during the joint vaccination campaign (JP 15) carried out in 1967/68. At that time, 163 329 animals were vaccinated and FAO (1971) derived from this figure an estimate of the total cattle population at 204 855 which has been widely used since then. The distribution of cattle throughout the country is very uneven, as shown in Table 2 and Figure 1. Two districts in Northern Province account for more than 80% of the national herd - Koinadugu with 52% and Bombali with 32% (FAO, 1971). More recently, the number of cattle has increased in the south, from 2 036 in 1968/69 (FAO, 1971) to 8 600 in 1978, i.e. from 1 to 4% of the national herd.

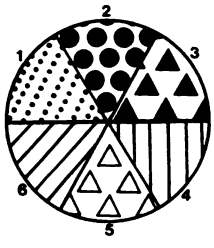
Table 2. Livestock distribution in Sierra Leone.

Province or Area	Cattle		Sheep		Goats	
	Number	% of Total	Number	% of Total	Number	% of Total
Southern	8 600	4.1	14 800	31.2	42 300	37.7
Eastern	11 800	5.7	11 200	23.6	25 300	22.6
Northern	186 700	90.2	21 200	44.8	42 200	37.6
Western Area			200	0.4	2 300	2.1
Total	207 100	100.0	47 400	100.0	112 100	100.0

Source: Veterinary Division estimates, 1978.

Figure 1. Administrative divisions, location of research centres and development projects, cattle numbers and distribution.





1. Dwarf West African Shorthorn
2. Savanna West African Shorthorn
3. Shorthorn x Zebu
4. N'Dama
5. N'Dama x Zebu
6. Zebu

Sheep and goats are distributed more evenly throughout the country, with about one-third in Southern Province. There are more than twice as many goats as sheep and approximately twice as many cattle as goats. Trends in the sheep and goat population are not known, but it is likely that they are more numerous than indicated in the official estimates.

A recent aerial survey carried out by the consultants for the National Livestock Development Study suggests that the total livestock numbers in the country may be significantly higher than the quoted figures.

3. CATTLE

3.1 N'DAMA BREED DESCRIPTION

All the cattle in Sierra Leone belong to the N'Dama breed. They are generally of the classical N'Dama type, but with uniformly pale coats, varying in shade from yellow to fawn. A small number of Sahiwals have been imported from Kenya and bred as pure and crossbred types at Teko Station, but are not described here.

3.1.1 Performance Traits

Touchberry (1967) gives a good deal of precise data on N'Dama performance at the Musaia Stock Farm from the period 1949 to 1965. It must be kept in mind that all these figures were obtained under research station conditions.

Concerning reproduction performance, Touchberry (1967) recorded an average age at first calving of 39.4 months for 231 cows at Musaia. Under village conditions, the typical age at first calving is from three to four years (FAO, 1971). The average calving interval at Musaia was 407 days, with a range of 267 to 1 062 days. Under village conditions, the calving interval may be as low as 12 to 14 months, but usually it is closer to 16 months (Holt, 1973). The average lifetime production for the cows at Musaia was 3.7 calves. In the village herds, the calving season extends from November to March. At Musaia, the season is longer, but 67% of the cows calve between September and February.

Touchberry (1967) recorded an annual mortality rate of 7% for animals under two years old. Mortality rates tend to be higher under village conditions: Holt (1973) reports 23.5% mortality from birth to one year, accompanied by a 5% abortion rate.

Partial milking in village herds gives a daily milk yield of 0.6 litres per cow (FAO, 1971). The FAO report also quotes a study by Jones (1953) of milk yields under station conditions which averaged 2 kg per day, as shown in Table 3.

Figures reported for body weights of N'Dama in Sierra Leone vary widely. Touchberry (1967) reports the following weights for animals of various ages at Musaia Stock Farm (kg):

Age (mo)	Birth	6	9	12	18	24	36	48
Females	15	70	89	101	128	162	207	219
Males	17	75	96	109	132	164	220	277

Table 3. Milk production by N'Dama cows at Teko Station and Musaia Stock Farm, 1944 to 1952.

Station or Farm	Year	Av. No. Cows in Milk	Av. Lactation (days)	Av. Milk Yield per Lactation (kg)
Teko	1944	8	152	177
Teko	1945	9	203	327
Teko	1946	8	337	489
Teko	1947	9	294	503
Teko-Musaia	1948	10	285	556
Musaia	1949	10	263	626
Musaia	1950	11	237	523
Musaia	1951	12	197	420
Musaia	1952	17	136	365
Overall		94	225	442.7

Source: Jones, 1953, quoted in FAO, 1971.

Joshie et al. (1957) report much higher weights from Musaia: 136 kg for males and 138 kg for females at 1 year, 220 and 151 kg at 2 years and 363 and 238 kg for adults. Boston gives weights recorded at Niala University College farm from 1944 to 1951 in kg as follows (quoted in Holt, 1973):

Age/Sex	Birth	6 mo.	2 yr	Adult male	Adult female
Natural pasture	17	75	145	311	235
Improved pasture	20	95	220	390	310

Fattening trials with N'Dama cattle were carried out at Njala University College farm. These showed that daily weight gains over a period of about two months increased from 0.33 kg on pasture only to 0.49 kg on pasture plus supplementary wheat flour and rice.

Table 4. Results of fattening trials at Njala University College farm.

	Diet			
	- Wheat Flour Only	Wheat Flour and Rice Only	Pasture, Wheat Flour and Rice	- Pasture ad Libitum plus Minerals
Average age (days)	375	436	490	557
Initial weight (kg)	130	122	141	174
Final weight (kg)	122	141	174	183
Average daily change (kg)	-0.14	0.35	0.49	0.33

Source: Boston, quoted in Holt, 1973.

Liveweight, carcass weight and dressing out percentages are reported for animals slaughtered at Musaia and at the Njala University College abattoirs. These figures are given in Table 5.

Table 5. Liveweight, carcass weight and dressing out percentages at Musaia and Njala University College abattoir, 1970-72.

	Musaia Farm 51 Males 3 Females	Njala University College Abattoir[a]		
		Bulls	Steers	Cows
Number	54	233	149	72
Estimated age (yrs)	3.3	4.5	4.7	5.8
Liveweight (kg)	232	199±37[b]	205±38[b]	190±22[b]
Carcass weight (kg)	97			
Dressing out % (cold)	41.6	47±3	48±3	45±3

a. Cattle purchased on the hoof throughout the country and also from Guinea.
b. After 18-hours starvation.

Sources: For Musaia, Touchberry, 1967; for Njala, Boston et al., 1975.

3.1.2 Index of Productivity

Table 6 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for meat production under station conditions in a light tsetse challenge area (Touchberry, 1967).

Table 6. N'Dama productivity estimates.

	Production Environment
	Station/low tsetse challenge/meat
Cow viability (%)	98
Calving percentage	78.2
Calf viability to one year (%)	93
Calf weight at one year (kg)	105
Annual milked out yield (kg)	-
Productivity index[a] per cow per year (kg)	77.1
Cow weight (kg)	238
Productivity index[a] per 100 kg cow maintained per year (kg)	32.4

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Source: Touchberry, 1967.

3.2 DISEASES

According to Kamara (1978), rinderpest and contagious bovine pleuropneumonia (CBPP) have not been a problem since the 1966/67 joint vaccination campaign (JP 15), which was accompanied by follow-up measures extending until 1974. There are a few fairly localized seasonal cases of blackquarter and anthrax, and annual vaccinations for these diseases are still carried out. Streptothricosis and demodectic mange cause problems for imported animals, but N'Dama are resistant to these diseases.

Helminthiasis is an important limitation on meat production. The most frequent parasites are *Haemonchus contortus*, *Trichostrongylus*, *Bunostomum*, *Gaigeria*, *Strongyloides* and *Ascaris*, particularly in calves.

Trypanosomiasis occurs, even among the N'Dama. These animals are more likely to become susceptible to this disease when they are under stress from other diseases or undernourished during the dry season.

3.3 HERD MANAGEMENT AND COMPOSITION

Most of the cattle in Sierra Leone belong to Fulani who have come from Guinea. These people have tended to keep their traditional livestock management systems in all the neighbouring countries which they inhabit.

Generally, the stock keepers do not own their own land, but rent land from the sedentary population through the local chiefs. They move from time to time in search of better grazing. Even the herds belonging to sedentary groups may be moved short distances, with the night pens reestablished occasionally in a new location. Cattle tend to graze on the hills during the rains and in the lowlands and cultivated areas during the dry season. The cattle are kept in *wari* at night and are milked regularly. Among the Fulani, cattle are usually tended by the owner or a member of his family; outside herders are seldom employed. Other people who own cattle tend to hire Fulani herders. According to the 1971 FAO report, the average herd consists of 20 to 30 cows. In the north the herds tend to be larger, with a maximum of 50 to 150 head (see Figure 3.40, volume 1).

From 1930 to 1950, the use of oxen as draught animals was encouraged, and a number of farmers actually began using oxen in Bombali District. However, this practice subsequently declined (FAO, 1971).

A programme to settle the Fulani was carried out between 1953 and 1968 in Koinadugu District, called the 'Foula Settlement Scheme in the Koinadugu District'. Seven-year renewable leases were granted on tracts of about one square mile (259 ha) for every 100 cows and their female calves, with the agreement of the local authorities. The Fulani were meant to keep their animals on their rented land most of the year, but were allowed to move elsewhere at the end of the dry season. The Agriculture Division of the Ministry of Agriculture and Natural Resources supervised the programme with the agreement of the local chief who received one-third of the rent.

This programme cannot be judged a success, as only 80 to 100 Fulani families were settled out of a total of 1 000 to 2 000. The FAO report (1971) cites a number of reasons for this failure. For one thing the rents charged under the programme were higher than what the Fulani might have been paying for the use of pasture land elsewhere. Also, the tracts of land which were rented were too small, which led to overgrazing due to permanent overstocking. Finally, the government extension and veterinary services were insufficient.

In Kailahun District of Eastern Province, the local farmers keep small herds of cattle, estimated at about 3 000 head in all. The husbandry system here is quite different from that of the Fulani. The herds are smaller, averaging about 30 head, and are formed by combining the animals of several different owners. Cows are seldom milked, and the herds are penned during the harvest season.

4. SHEEP AND GOATS

The small ruminants in Sierra Leone are of the typical West African Dwarf breeds - Djallonké sheep and Guinean goats. (see Figure 3.74, volume 1).
The average weight of adult sheep is about 20 to 30 kg and of adult goats about 20 to 25 kg.

Although small ruminants have been bred at various stations, there is little information on their productivity. FAO (1971) reports the age at first lambing of local sheep kept at Musaia as 15 to 18 months and prolificacy as 141%, with two lambings a year. These data indicate high potential fertility, but there are also high annual mortality rates among lambs, ranging from 16 to 67%, depending on the year.

Sheep breeding trials carried out at the stations have not been a success. FAO (1971) quotes a 1945 report of the Department of Agriculture as follows: 'Experience with local sheep over several years at Njala and Teko indicates that they are completely uneconomic under any treatment. They are of poor conformation, slow growing and very subject to disease.'

At Teko Station, milk production from local goats averaged 25 kg over a lactation of 56 days. Lactations ranged from 24 to 111 days, with a maximum yield per lactation of 46 kg.

Although tolerant to trypanosomiasis, the sheep and goats in Sierra Leone are sensitive to a number of other diseases. These include internal parasites, heartwater and foot rot.

Small ruminants are generally kept for home meat consumption and are not sold commercially. They are usually slaughtered for traditional ceremonies. Households generally keep only a few sheep and goats, except the Fulani in the north whose flocks tend to be larger. Sheep and goats are sometimes tethered to prevent damage to crops.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

There are three main centres in Sierra Leone which carry out research and multiplication activities with N'Dama cattle and with local sheep and goats. These are depicted in Table 7.

Two development projects are underway in the livestock sector. The Koinadugu Integrated Agricultural Development Project in Koinadugu District, with headquarters at Kabala, has its objectives to redevelop the Musaia Stock Farm, to carry out a training programme in the use of draught oxen and to establish three ranches. Financial support is from the European Development Fund (EDF) of the European Economic Community (EEC) and technical assistance from Carl Bro of Denmark. The project period is 1978 to 1982. The location is shown in Figure 1 by △4.

A Northern Integrated Agricultural Development Project (NIADP) with headquarters at Makeni (shown by △5 in Figure 1) has a small livestock component. The aims are to investigate the potential for cattle development in the northern area and the four year project financed by the World Bank includes the building up of a fact finding ranch.

A general study is also being carried out, supported by the EDF of the EEC, to determine the best government strategy for project preparation and other activities aimed at improving the integration of the livestock sector in the agricultural economy, improving the marketing of livestock products, reducing dependence on imported animal products, reinforcing the framework of government activities in the livestock sector and increasing the provision of other services. This project is scheduled for 1978/79 and covers the whole country.

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Table 7. Research and multiplication centres.

Name	Musaia Stock Farm	Njala University College, Animal Science Department Farm	Teko Station
Location (reference in Figure 1)	20 km north of Kabala, Koinadugu District, Northern Province ● 1	Moyamba District, Southern Province ○ 2	5 km south of Makeni in Northern Province ● 3
Organization responsible	Ministry of Agriculture, Freetown	University of Sierra Leone	Veterinary Division, Ministry of Natural Resources, Freetown
Size	936 ha	76 ha	800 ha
Breeds and numbers	About 120 N'Dama cattle in 1978, between 600 and 800 cattle from 1964 to 1968	93 N'Dama cattle, 97 local sheep and 11 goats	85 N'Dama, 32 Sahiwal and 70 N'Dama x Sahiwal cattle, 56 sheep
Objectives	N'Dama breeding and improvement	Improving cattle, sheep and goats through breeding and better feeding. Performance is recorded and there is a small veterinary laboratory.	Improvement of the N'Dama breed by crossing with Sahiwal imported from Kenya in 1974.
External aid	It is planned to redevelop Musaia Stock Farm in the framework of an integrated development project funded by the European Economic Community.		External aid is required for analysis and interpretation of the results (Kamara, 1978).
Comments	Touchberry (1967) analysed data recorded at Musaia from 1949-64. The station is now less active for various reasons and the size of the herd is considerably reduced.		

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CHAPTER 6

LIBERIA

1. BACKGROUND

The Republic of Liberia lies on the west coast of Africa, with Sierra Leone and Guinea to the north and Ivory Coast to the east. The country is divided into nine counties, as shown in Figure 1, with the capital at Monrovia.

The National Livestock Bureau of the Ministry of Agriculture is responsible for government work in animal husbandry, including animal health, production and extension services.

Basic data for the country are given in Table 1.

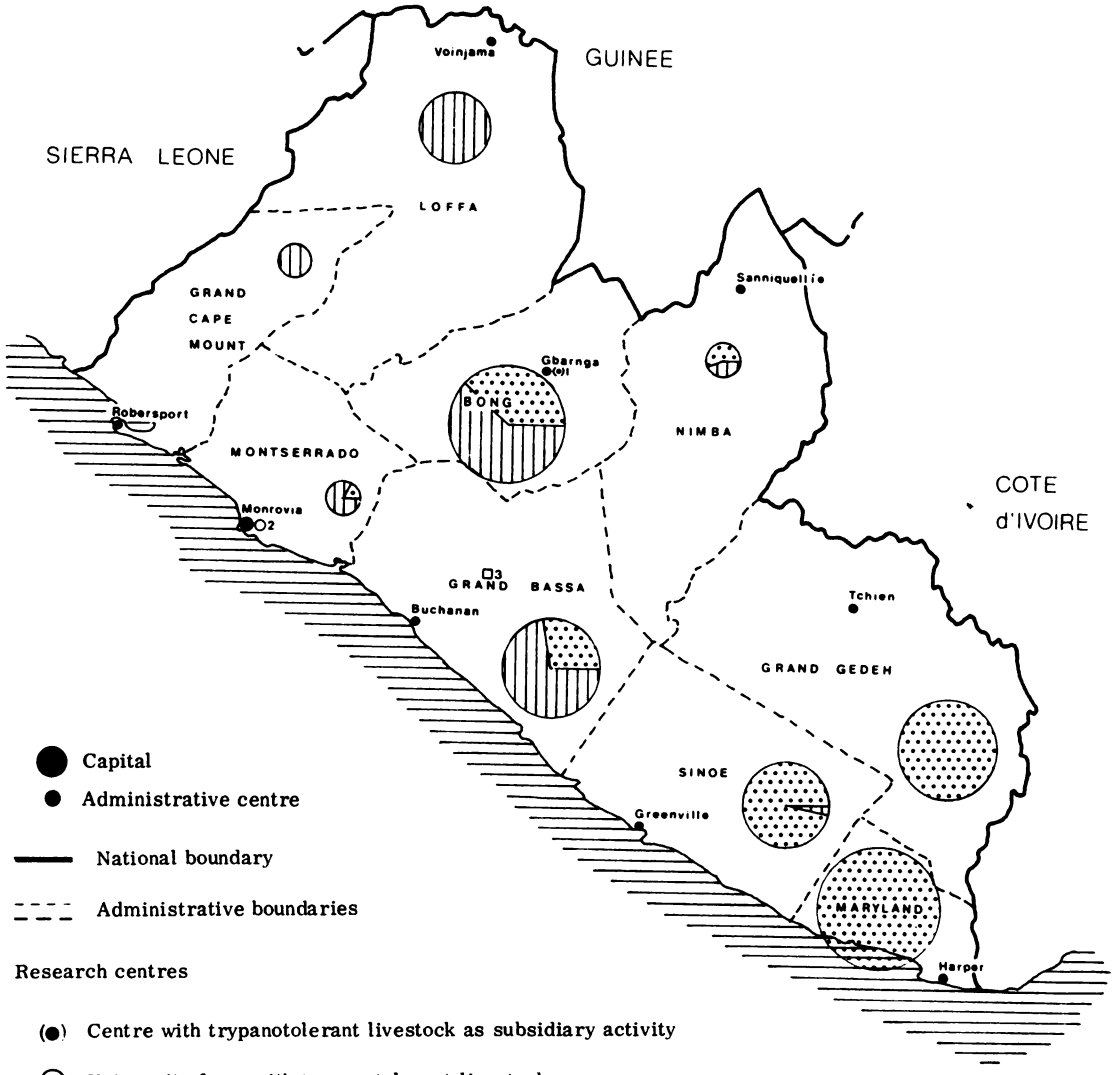
Table 1. Background data for Liberia.

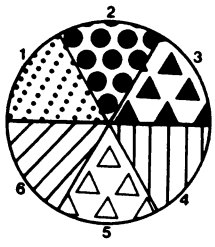
Area	111 400 km^2
Latitude	4^o - 9^o N
Longitude	7^o - 12^o W
Population	
number	1 600 000
density	14.4/km^2
Livestock numbers	
cattle	25 500
sheep	65 000
goats	120 000

Sources: For population, OAU, 1978; for livestock numbers, Ministry of Agriculture, 1977.

Liberia has a humid tropical forest climate with a rainy season from April to November. The average annual rainfall varies from 1 800 mm in the north to 5 000 mm at the coast.

Figure 1. **Administrative divisions, location of research centres and multiplication herds, cattle numbers and breed distribution.**





1. Dwarf West African Shorthorn
2. Savanna West African Shorthorn
3. Shorthorn x Zebu
4. N'Dama
5. N'Dama x Zebu
6. Zebu

According to the OAU/STRC tsetse distribution map (1977), the entire country is infested with tsetse. *G. palpalis*, *G. pallicera pallicera* and *G. fusca* are distributed widely, while *G. medicorum* is found in the south and *G. nigrofusca* in the north. There is no more recent information on tsetse distribution, though work on trypanosomiasis has been carried out at Bong Mine by the Liberian Research Unit of the Tropical Institute, Hamburg and at Suakoko by the Central Agricultural Experimental Station (CAES).

2. LIVESTOCK NUMBERS AND DISTRIBUTION

Cattle production is not very important in Liberia, partly due to the forest environment which is very humid and not well suited to cattle. The density of the cattle population for the country as a whole is 0.23/km^2, which is extremely low. The distribution of cattle is depicted in Figure 1 and the number of cattle in each county is given in Table 2.

Table 2. Livestock numbers in Liberia (1976).

County	Area (km^2)	Cattle		Sheep		Goats	
		Number	% of Total	Number	% of Total	Number	% of Total
Bong	11 770	4 845	19.1	16 275	25.0	22 268	18.7
Cape Mount	5 740	408	1.6	781	1.2	3 359	2.8
Grand Bassa	8 000	3 519	13.8	6 575	10.1	14 804	12.4
Grand Gedeh	16 200	3 850	15.1	7 812	12.0	12 316	10.3
Loffa	19 530	1 683	6.6	2 995	4.6	7 464	6.3
Maryland	4 560	5 278	20.7	651	1.0	6 718	5.6
Montserrado	3 000	561	2.2	3 515	5.4	3 608	3.0
Nimba	12 280	535	2.1	16 340	25.1	25 875	21.7
Sinoe	15 100	2 856	11.2	1 367	2.1	4 230	3.5
'Remote and Large Rural'		1 938	7.6	8 788	13.5	18 784	15.7
Total		25 473	100.0	65 099	100.0	119 426	100.0

Source: Ministry of Agriculture, 1977.

Sheep and goats are found in nearly every village throughout the country. However, they are most numerous in Bong and Nimba Counties, which together account for 50% of the national herd.

3. CATTLE

There are two main types of cattle in Liberia: the N'Dama and the Dwarf West African Shorthorn whose local name is Muturu. The boundary between the areas of distribution of longhorn and shorthorn cattle groups is located in this country.

The distribution of the two types within the country is difficult to assess, particularly as there are numerous crossbreds in the rural areas. An estimate based on observations in the field is presented in Table 3.

Table 3. Distribution of cattle types (estimated numbers).

	N'Dama	Muturu	Total
Bong	3 000	1 850	4 850
Cape Mount	410	-	410
Grand Bassa	2 500	1 020	3 520
Grand Gedeh	1 000	2 850	3 850
Loffa	1 700	-	1 700
Maryland	-	5 270	5 270
Montserrado	500	60	560
Nimba	240	300	540
Sinoe	150	2 700	2 850
'Remote and Large Rural'	950	1 000	1 950
Total	10 450(41%)	15 050(59%)	25 500(100%)

Source: Country visit information.

The N'Dama predominate in the north, mainly in Loffa County, which is adjacent to the breeding areas in Sierra Leone and Guinea. The Muturu are more numerous in the south, in Sinoe and Maryland Counties. In the intermediate area, the N'Dama are apparently increasing in numbers, as they are preferred by the more progressive stock raisers for private farms and plantation herds.

3.1 BREED DESCRIPTION

3.1.1 Liberian Dwarf

The southern cattle in Liberia are generally known by the name Muturu, but they are also called Lagoon or West African Shorthorn. It is difficult to identify the various types which occur within this population, which will be referred to as a whole as the Liberian Dwarf or Muturu of Liberia, belonging to the Dwarf West African Shorthorn sub-group.

Typical animals are found in relatively large numbers in the coastal savannas of Maryland and Sinoe Counties. These are of the characteristic dwarf type, measuring less than one metre at the withers. Their bodies are heavy and the heads strong; plain black or black-and-white coats predominate, and the horns are generally very short. Less characteristic animals are found in other parts of Liberia, particularly in Grand Gedeh, Grand Bassa, Bong and Nimba Counties. These are in small, scattered herds and often show the influence of N'Dama blood.

There is apparently no information concerning the productivity of these animals, but they are known to be early maturing, fertile and well adapted to their habitat, surviving with a minimum of care.

3.1.2 N'Dama

The N'Dama population is also very small, but there is more information on the N'Dama than on the Muturu. This breed in Liberia is of the classical Guinean type, particularly on private farms or government stations - with uniform fawn coats and long horns. There is more variation among N'Dama in village herds because breeding is not selective and there is some crossing with the Muturu.

3.1.2.1 Performance Traits. The only performance data available are from the herd kept on the Firestone Plantation. This herd was started at Harbel in 1947 with one bull and two cows, which, according to Weijer and Tappan (1965), may have been Muturu x N'Dama crossbreds. By 1956, the herd had reached 63 head. N'Dama cows were inseminated in 1961 with Jersey, Brown Swiss and Santa Gertrudis semen brought frozen from the USA. However, in 1967, the herd was disbanded, and some of the animals went to the College of Agriculture and Forestry.

This herd was raised on improved pasture without supplement. Performance was completely satisfactory: there was no trypanosomiasis and few other disease problems. McIndoe (quoted in Weijer and Tappan, 1956) recorded an age at first calving of 28 to 30 months, which was later reduced to 25 to 26 months. Fecundity was excellent: the first two cows each produced six calves between 1948 and 1953. From 1952 to 1956, offtake consisted of 14 steers at an average age of 33 months and average weight of 242 kg, 5 young bulls averaging 21 months old and 205 kg, and 2 cull cows averaging 8 years old and 215 kg (Weijer and Tappan, 1956). The crossbred calves weighed considerably more than the pure N'Dama - 18 kg at birth for Jersey crosses and 21 to 26 kg for Brown Swiss and Santa Gertrudis crosses - but there were no calving problems (Anliker, 1964).

The N'Dama herd kept by the Liberian Agricultural Company offers another example of the rapid rate of increase possible with this breed. This herd was reduced by contagious bovine pleuropneumonia (CBPP) and foot-and-mouth disease from 734 in July 1974 to 186 in December of the same year. But by June 1978 the herd had doubled without any introduction of new stock (see Table 4).

Table 4. Natural increase in the N'Dama herd kept by the Liberian Agricultural Company.

Date	Total Number	Births	Slaughter	Deaths	% Deaths	% Offtake
January 1975	186	+ 92	-32	-27	12.9	15.9
January 1976	233	+120	-39	-17	6.6	15.1
January 1977	286	+113	-45	-18	5.9	14.7
January 1978	327					
June 1978	360					

Source: Country visit information.

3.2 DISEASE

The animal health situation is considered relatively favourable in Liberia due to the low density of the cattle population and the isolation of individual herds. Nevertheless, the Ministry of Agriculture notes that a number of diseases are present. Outbreaks of CBPP occur, related to the importation of infected animals. Vaccination is carried out against this disease and also against rinderpest. Brucellosis is present, but its importance has not been determined, and there was an epidemic of foot-and-mouth disease in 1974 (virus type SAT 2). Blackquarter and anthrax occur occasionally, and haemorrhagic septicaemia, pasteurellosis, piroplasmosis, anaplasmosis, babesiosis and theileriosis are also present but of unknown importance.

Trypanosomiasis is widespread throughout the country. Studies have been carried out at Suakoko by the CAES Veterinary Service and at Bong Mine by the Liberia Research Unit. The Liberia Research Unit has carried out epidemiological studies to assess the importance of the different types of trypanosomes and the role of different domestic animals as potential reservoir hosts for sleeping sickness (Mehlitz, 1977). From 51 samples taken from untreated N'Dama cattle in Bong, Nimba and Loffa Counties in 1974, positive serological reactions (indirect fluorescent antibody test) were observed in 41, or 80.4%. Parasitological examination (blood-smears) revealed that 9 of the 51 were infected with *T. congolense*, , 3 with *T. vivax* and 1 with *T. brucei*, *T. congolense* and *T. vivax*, altogether 25.5% of the sample.

The work at Suakoko (Pan, 1978) confirms the results obtained at Bong Mine. Both studies show clearly the strong resistance of N'Dama adults to trypanosomiasis. However, such studies often neglect the heavy mortality among calves due to this disease.

3.3 HERD MANAGEMENT AND COMPOSITION

In addition to traditional cattle production systems under village conditions, commercial production is being initiated in Liberia on the rubber plantations

(Liberian Agricultural Company and Firestone) and on private commercial farms, which are increasing in number. However,these operations still account for only a small proportion of the total herd.

According to a survey carried out by the Ministry of Agriculture in 1977, only 9 100 households in Liberia, or 6%, out of a total of 152 100, keep cattle. Among these, the average number of animals per household is very low - 2.6 in 1975 and 2.8 in 1976.

Throughout the country, cattle are kept exclusively for slaughter on special occasions. Particularly in Maryland and Sinoe Counties in the south, where most of the cattle are Liberian Dwarf, the animals receive very little care. They are rarely herded or milked, and sometimes they are tethered, as small ruminants are, to avoid damage to crops.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

Both sheep and goats are of the Djallonké or West African Dwarf breeds. Some coat variations in goats are illustrated in Figure 3.80, volume 1. Very little information is available on their productivity. For sheep, CAES at Suakoko reports an average body weight of 25.25 kg for two rams and 17.1 kg for five ewes. Birth weights averaged 1.46 kg for five single births and 1.06 kg for four twins. Corresponding figures for goats are 22.3 kg for adult males, 20.7 kg for adult females, 1.48 kg at birth for single births and 1.31 kg for twins.

4.2 DISEASE

Very little information is available on diseases among small ruminants in Liberia. Research work is now being initiated, however, at CAES in Suakoko, focussing, inter alia, on diseases among goats and sheep.

The epidemiological survey carried out by the Liberian Research Unit in 1974 included 257 goats and 64 sheep. Serological tests showed positive reactions for 86 of the goats (24.4%) and 17 of the sheep (26.6%). Evidence of parasites was found among 23 of the goats (8.9%) and 9 of the sheep (14.1%): 17 goats and 8 sheep were infected with *T. congolense*, 5 goats and 1 sheep with *T. vivax* and 1 goat with *T. brucei* and *T. congolense*.

4.3 FLOCK MANAGEMENT AND COMPOSITION

Table 5 shows the average number of animals per household according to a survey conducted by the Ministry of Agriculture in 1976.

Table 5. Distribution of sheep and goats by household.

		Number of Households with Animals	Percentage of All Households	Total number of Animals	Mean Number of Animals per Household with Animals
Sheep	1975	13 500	9%	48 300	3.6
	1976	16 700	11%	65 100	3.9
Goats	1975	32 200	21%	133 300	4.1
	1976	30 400	20%	124 400	4.1

Source: Ministry of Agriculture, 1977.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

Two research centres are carrying out work on trypanotolerant livestock in Liberia, the Central Agricultural Experimental Station (CAES) at Suakoko, which is carrying out two separate projects, and the College of Agriculture and Forestry, near Monrovia. These activities are described in Table 6, and their locations shown in Figure 1.

5.2 MULTIPLICATION HERDS

The Liberian Agricultural Company (LAC), a subsidiary of the Uniroyal Group, owns a private rubber plantation 55 km north of Buchanan in Grand Bassa County. There is a farm of 160 ha within the plantation. A herd of N'Dama cattle, which numbered about 360 as of June 1978, is kept on the farm and grazed throughout the plantation. The location is shown by □3 in Figure 1. The purpose of the operation is to produce meat for the plantation staff. Calves are weighed every month and adult animals occasionally.

6. SELECTED BIBLIOGRAPHY

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Table 6. Research centres in Libera.

Name	Central Agricultural Experimental Station (CAES)	College of Agriculture and Forestry
Location (and reference in Figure 1)	Suakoko, Bong County, 15 km from Gbarnga and 170 km from Monrovia (●) 1	23 km from Monrovia ○2
Organization responsible	Livestock Bureau, Ministry of Agriculture, Monrovia	University of Liberia, Monrovia
Size	100 ha	100 ha (15 ha of pasture)
Breeds and numbers	150 N'Dama and 30 Holstein-Friesian cattle, 12 sheep and 17 goats	58 N'Dama x Brown Swiss crosses (from the Firestone Plantation)
Objectives	Study possibilities of milk production. Select N'Dama. Study smallstock production as a project of the Mano River Union (grouping Sierra Leone and Liberia).	Though performance is recorded there is no research programme on this herd.
External aid	FAO and World Bank	FAO
Comments	It is anticipated that the Mano River Union Project carrying out precise animal health and related productivity studies on smallstock will be further expanded in the future.	

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CHAPTER 7

MALI

1. BACKGROUND

The Republic of Mali is a landlocked country in West Africa surrounded by Algeria to the north, Mauritania and Senegal to the west, Guinea and the Ivory Coast to the south and Upper Volta and Niger to the east. The capital is at Bamako, and the country is divided into 6 regions and 42 administrative Cercles. In each Cercle there is a Secteur d'Elevage (livestock sector) under the Service de l'Elevage et de la Santé Animale, which is a part of the Ministère du Développement Rural. This ministry is also in charge of the Institut d'Economie Rurale (IER), which is responsible for agricultural research, and the Office Malien du Bétail et de la Viande (OMBEVI) with responsibilities for livestock production and marketing.

The Secteurs d'Elevage included in this study are those below the northern tsetse limit where significant numbers of cattle of the trypanotolerant types are found. These are listed in Table 2 and their locations are shown in Figure 1.

Basic data for the study area and for the country as a whole are given in Table 1.

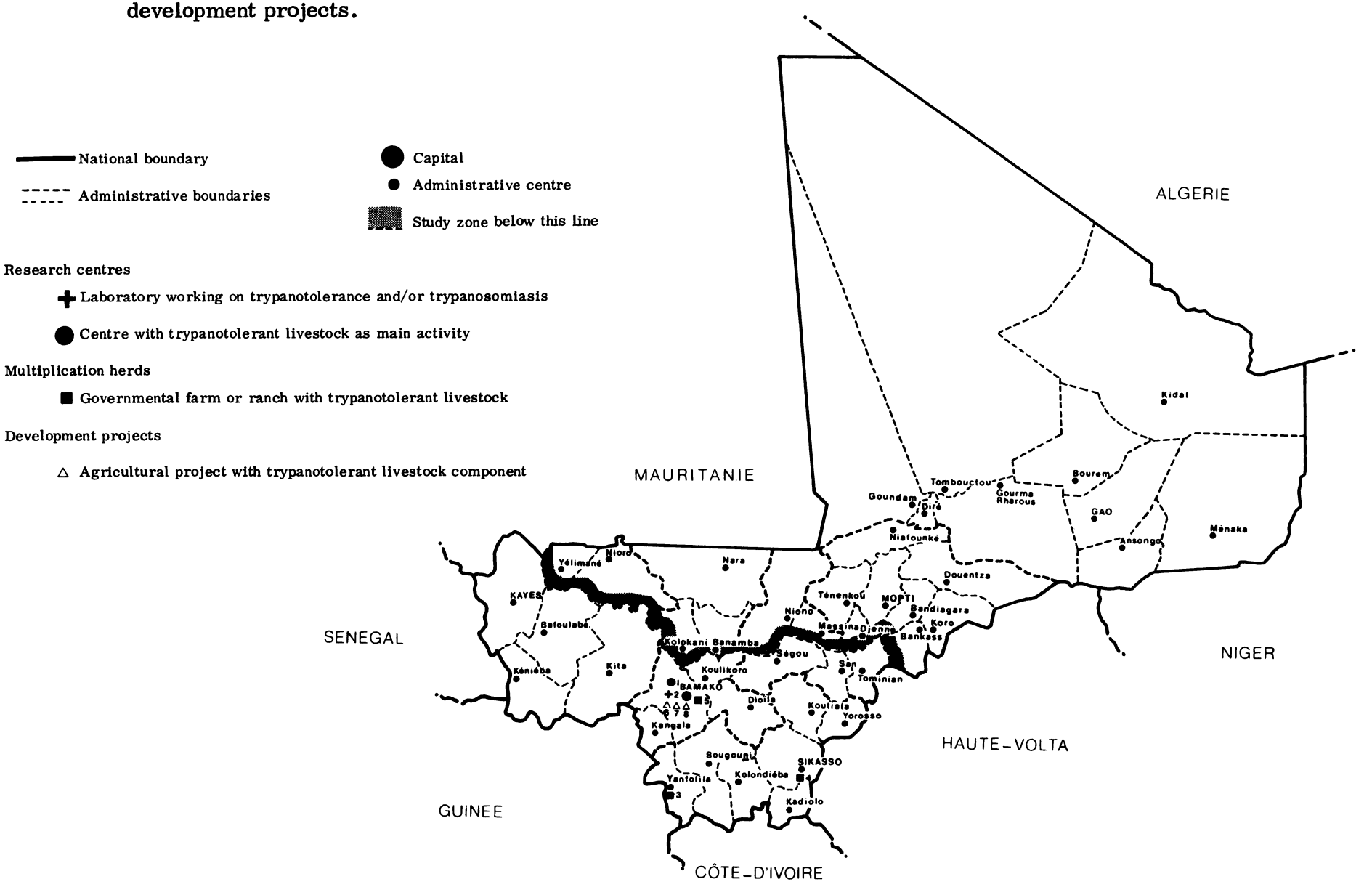
Table 1. Background data for Mali.

	Whole Country	Study Area
Area	1 240 000 km^2	220 000 km^2
Latitude	10^o - 25^o N	10^o - 14^o N
Longitude	4^o E - 12^o W	4^o W - 12^o W
Population		
number	5 840 000	3 500 000[a]
density	4.71/km^2	15.9/km^2
Livestock numbers		
cattle	3 915 000	1 810 000
sheep and goats	8 000 000	1 600 000

a. Estimate.

Sources: For population, OAU, 1978; for livestock numbers, government veterinary reports, 1976.

Figure 1. Administrative divisions, boundaries of study zone, location of research centres, multiplication herds and development projects.



The area under study extends from the Sudano-Guinean to the Sahelo-Sudanian climatic zones, with one rainy season from April/May to October. The annual rainfall ranges from 700 to 1 400 mm.

In addition to the OAU/STRC tsetse distribution map (1977), Gruvel (1977) carried out a survey of trypanosomiasis in Mali in the framework of a UNDP/FAO project on the economics of trypanosomiasis. He identified three glossina species, two riverine species, *G. palpalis gambiensis* and *G. tachinoides* and one savanna species, *G. morsitans submorsitans*. He described their distribution in detail as follows:

> The northern limit of glossina in Mali can be defined by a line including from West to East the river Senegal, the river Baoulé and its large curve, the river Niger from the south of Kolokani to up stream of Segou, the river Bani up to the vicinity of San, then continuing more-or-less due east in the direction of Upper Volta ....
>
> The distribution of each species is still little known. However, it seems that *G.m. submorsitans* is present in high density west of the Senegal river basin, and south west towards Guinea and Ivory Coast. It is also present in the Dioila region, then towards the east near Upper Volta. *G.p. gambiensis* and *G. tachinoides* are present almost everywhere along the bush covered banks of the big rivers and their tributaries. Their habitat is sometimes distinct, but often overlapping.
>
> From the small amount of information concerning tsetse distribution in Mali and the observations made during the mission, it seems that the tsetse infestation south of the river Niger decreases regularly from the southwest to the northeast, from the Yanfolila Sector where the three species are found together up to the Koutiala Sector where the scarcity of the savanna species and the presence of the riverine species are noticed. Consequently, the infection risk decreases progressively towards the east along with the deep forest following the river networks.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

There has been a general movement of cattle from north to south following the recent droughts. This exodus has changed the distribution of animal numbers and of breeds throughout the country and to some extent has disrupted the farming societies in the southern areas. Herds of Fulani cattle can now be observed on the southern border with Upper Volta.

Livestock numbers in the Secteurs of the study area are given in Table 2. The cattle population is broken down into N'Dama, Zebu and crossbred types. The N'Dama

account for 26% of the cattle in the study area and 12% of the national herd. The crossbreds are 29% of the cattle in the study area and 13% of the national herd. Thus a quarter of the national herd is composed of N'Dama and crossbreds.

Figure 2 shows the distribution of the cattle population in each region and the percentage of each breed type. This figure shows the northern limit of the tsetse zone, as described by Gruvel (1977), and the approximate boundaries of the areas where Zebu, crossbred and N'Dama cattle predominate. These boundaries reflect Atabani's (1966) field observations of a Zebu/humpless boundary between Nioro Du Sahel in the northwest and Sikasso in the southeast.

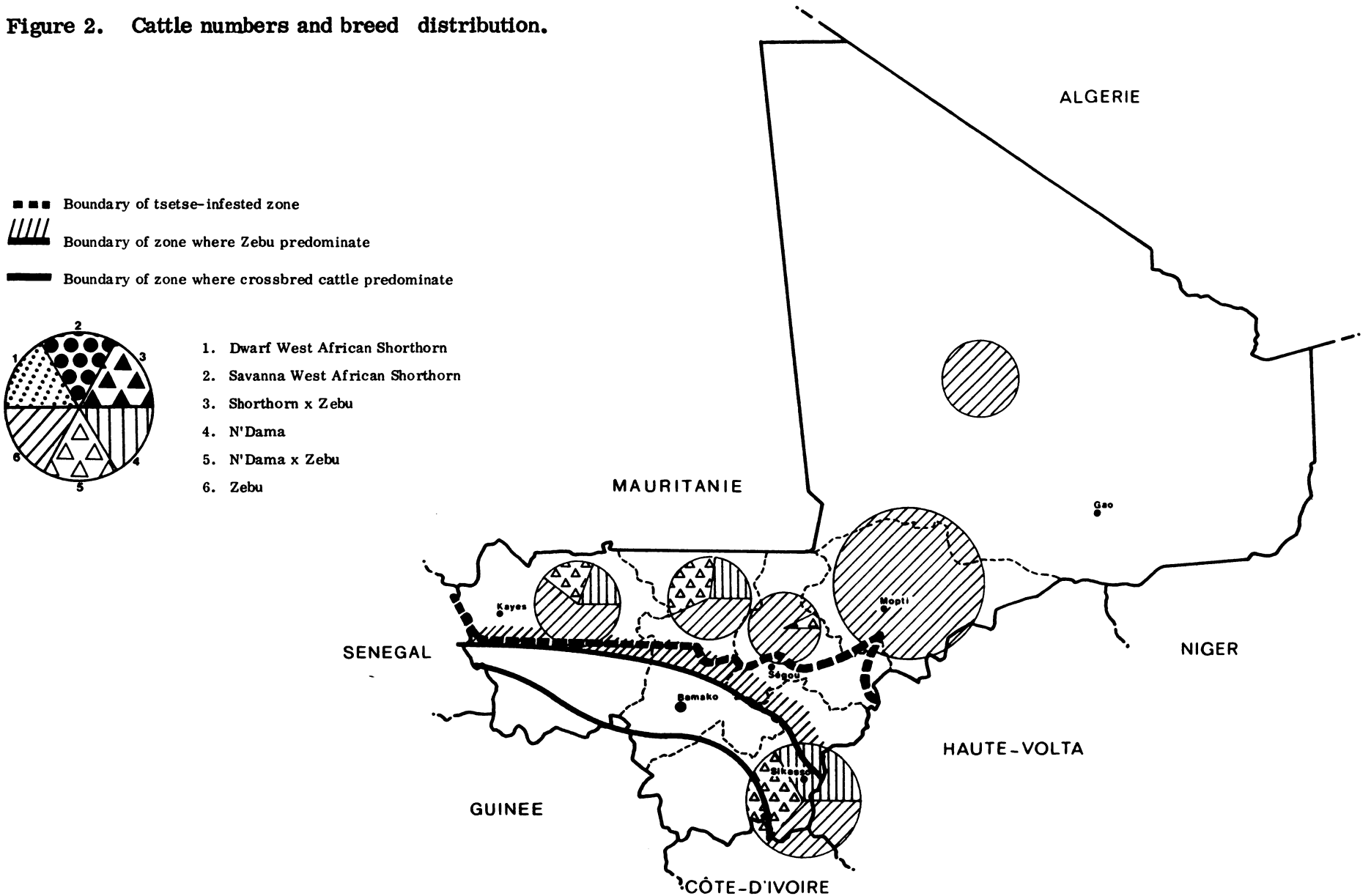
Only approximate numbers can be given for sheep and goats and no figures for individual breeds are available. Though the Zebu cattle have apparently been moving south as a result of the drought, no similar trend has been observed among the Sahelian sheep and goat populations.

Table 2. Livestock numbers and distribution in the study area of Mali ('000).

	Cattle							Sheep	Goats
	Total	N'Dama	%	Cross breed	%	Zebu	%		
Kayes Region									
Kayes	155	5	3	30	19	120	78	65	150
Bafoulabé	98	28	29	50	51	20	20	35	30
Kénéba	28	28	100	-	-	-	-	20	15
Kita	49	29	59	15	31	5	10	14	10
Bamako Region									
Koulikoro	30	5	17	15	50	10	33	15	15
Bamako	150	40	27	70	46	40	27	100	100
Kangaba	24	24	100	-	-	-	-	7	2
Dioila	125	30	24	60	48	35	28	40	40
Ségou Region									
Ségou	195	-	-	25	13	170	87	124	187
San	66	-	-	-	-	66	100	68	38
Tominian	60	-	-	-	-	60	100	83	28
Sikasso Region									
Yanfolila	55	55	100	-	-	-	-	15	8
Bougouni	178	90	51	38	21	50	28	33	22
Kolondiéba	104	15	14	42	40	47	46	25	14
Kadiolo	81	40	49	21	26	20	25	7	11
Sikasso	213	50	23	63	30	100	47	107	58
Koutiala	181	25	14	90	50	66	36	57	20
Yorosso	18	1	6	3	17	14	77	18	6
Total	1 810	465		522		823		833	754

Source: Compiled by authors from Mali, Secteurs d'Elevage, *Rapport Annuel*, 1975, 1976, 1977.

Figure 2. Cattle numbers and breed distribution.



3. CATTLE

Three main types of cattle are observed in the study area: N'Dama, Zebu (mainly Sudanian Fulani Zebu) and Méré or Bambara. A few Savanna West African Shorthorn (Baoulé type) may be observed in the southeastern part of the country (Coulomb and Deslandes, 1978).

3.1 BREED DESCRIPTIONS

3.1.1 N'Dama

The classical Guinean N'Dama, as described in chapter 3 of volume 1, is found in Kenieba, Kangaba, Yanfolila and Bougouni Secteurs. In Yanfolila, the adult cows typically measure about 105 cm at withers, and oxen over 6 years old can reach 118 ± 13 cm (IEMVT, 1971). The N'Dama in the other Secteurs of the study area are more variable, with black, red, grey, black and white or red and white coats and fairly typical horns. (See Figures 3.2, 3.3 and 3.19, volume 1.)

3.1.1.1 Performance Traits. In discussing the performance of N'Dama cattle in Mali, a distinction must be made between production data collected under village conditions and performance levels achieved under research station conditions at the Centre National de Recherches Zootechniques de Sotuba, near Bamako. The figures given in different sources and for different years vary widely and must be treated as approximations.

Among reproduction traits, age at first calving was recorded by IEMVT (1971) as 42 to 48 months under village conditions in Yanfolila Secteur. At the Sotuba station, the age at first calving was 42.5 months ± 40 days between 1952 and 1957 (Pagot and Delaine, 1959). SEDES (1971) reports a calving rate of 60 to 65% for N'Dama in Yanfolila; at Sotuba station, the calving rate was 75% in 1974 (CNRZ, 1975).

The mortality rate among calves under village conditions tends to be high: SEDES (1971) reports calf mortality at 35 to 40% in Yanfolila Secteur, and Morel (1973) gives an estimate of 21% for all of southern Mali.

Based on surveys carried out in 1975 in Yanfolila Secteur, Diarra (1977) estimated an average daily milk production of 1.5 litres per cow, with a 190-day lactation, giving a total production of 285 litres per lactation, with 4.7% butterfat content. Reports of the Secteurs d'Elevage of the study area give an average daily production of 1.5 litres over a lactation period of 180 to 210 days, or a total production of 270 to 315 litres per lactation. Under research station conditions at Sotuba, yields were significantly higher, totalling 566 to 600 kg per cow over an average lactation of 200 days (CNRZ, 1974, 1975, 1976). Cows at the station were supplemented with cotton seed and millet bran.

Growth was measured at the Sotuba station for the period 1952-57 under an improved feeding regime of grazing plus concentrates. During the dry season, these animals were supplemented with sorghum and maize silage. Weights were recorded in kg as follows (Pagot and Delaine, 1969; Capitaine, 1972):

	6 months	12 months	18 months	24 months	36 months
female	46	80	99	123	188
male	46	82	101	124	188

IEMVT (1971) recorded weights under village conditions in Yanfolila Secteur without any supplementation for the period 1970-71:

	6 - 12 months		12 - 24 months		24 - 36 months		24 - 48 months	
	n	kg	n	kg	n	kg	n	kg
female	24	81 ± 2	29	92 ± 2	-	-	30	98 ± 2
male	20	82 ± 2	23	94 ± 3	45	102 ± 1	-	-

At Bafoulabé abattoir in Kayes Region, average carcass weights in 1977 were 162 kg for bulls (n = 175), 146 for oxen (n = 66) and 133 for cows (n = 51). At Sikasso abattoir average carcass weights in 1976 were 123 kg for bulls (n = 503), 115 kg for oxen (n = 1 104) and 82 kg for cows (n = 2 976). The Sikasso abattoir recorded average liveweights and carcass weights for humped and humpless cattle over seven years old, as given in Table 3.

Table 3. Liveweights and carcass weights recorded at Sikasso abattoir.

	- Bulls -		- Oxen -		- Cows -	
	humped	humpless	humped	humpless	humped	humpless
Liveweight (kg)	375	290	380	300	300	260
Carcass weight (kg)	180	154	188	163	155	132
Dressing out %	48	53	49	54	52	51

Source: Mali, Secteur d'Elevage de Sikasso, 1976.

3.1.1.2 Index of Productivity. Table 4 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for two main production environments, meat and milk production under village conditions in a high tsetse challenge area and meat production only under ranch conditions, also under high tsetse challenge.

Table 4. N'Dama productivity estimates.

	Production Environment	
	Village/high tsetse challenge/ meat and milk	Ranch/high tsetse challenge/ meat
Cow viability (%)	95	98
Calving percentage	62.5	75
Calf viability to one year (%)	62.5	70
Calf weight at one year (kg)	81	120[b]
Annual milked out yield (kg)	178.1	-
Productivity index[a] per cow per year (kg)	52.2	63.6
Cow weight (kg)	230	250
Productivity index[a] per 100 kg cow maintained per year (kg)	22.7	25.5

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.
b. Estimate.

Source: For village conditions, SEDES, 1971 and IEMVT, 1971; for ranch conditions, personal communication from ranch management.

3.1.2 Méré or Bambara

The Méré or Bambara is a stabilized Zebu x N'Dama cross. The size and appearance of these animals depend mainly on the proportion of Zebu blood and the type of Zebu involved (see Figure 3.55, volume 1). Dumas (1973) recorded average linear measurements and weights for Méré over five years old which are presented in Table 5.

Table 5. Measurements and weights of adult Méré.

	Bulls (n = 9)	Oxen (n = 103)	Cows (n = 159)
Height at withers (cm)	105.4 ± 4.6	110.7 ± 1.0	102.1 ± 0.7
Heart girth (cm)	149.6 ± 9.3	153.7 ± 1.7	138.0 ± 0.9
Scapulo-ischial length (cm)	134.5 ± 6.7	138.2 ± 1.4	125.3 ± 0.9
Weight (kg)	255 (range: 210 - 340)	270 (range: 190 - 375)	210 (range: 140 - 190)

Source: Dumas, 1973.

Another crossbred called the N'Dama of Kaarta or crossbred of Kaarta is found north of Kita. This seems to be a stabilized N'Dama x Zebu cross. These animals have the light coat of the N'Dama with no trace of hump, but they are larger,

with an average size at withers of 1.10 to 1.20 m (CNRA, 1978). It would seem worthwhile to collect more information on this crossbreed, but the area where the animals are found is difficult to reach.

3.1.3 Other Crossbreeds

Production data are only available for the N'Dama x exotic crosses kept at Sotuba under experimental conditions. Figures for milk production and liveweights are presented in Tables 6 and 7.

Table 6. Milk production from crossbreds at Sotuba.

	Jersey x N'Dama	Red Steppe x N'Dama	Mont-beliard x N'Dama	Holstein x N'Dama	Maure Zebu x N'Dama	Red Steppe x Zebu
Number of cows	23	13	10	2	2	5
Milk produced (kg)	1 135	1 022	1 530	939	256	1 593
Length of lactation (days)	251	269	328	313	75	300
Lactation number	1 - 6	1 - 4	2 - 4	1	1 - 2	1 - 3
Survey period	1974-75	1974-75	1974-75	1975	1975	1974-75

Source: CNRZ, 1975, 1976.

3.2 DISEASE

Among contagious diseases, rinderpest has been under strict control for some time and no cases have been recorded in the study area recently. Contagious bovine pleuropneumonia (CBPP) is observed nearly everywhere, but particularly in Kayes Region in the west and Koutiala, Yorosso, Tominian and San Secteurs in the east, where it has been occurring with increasing frequency. Other infectious diseases occur locally, usually without causing serious problems. Tuberculosis has occurred recently in Kayes Region, especially affecting the Zebu herds.

Among parasitic diseases, the most important of those caused by external parasites in the study area are scabies, streptothricosis and tick-borne fevers. Gastro-intestinal parasites occur everywhere, but especially in Yorosso, Tominian, San and Segou Secteurs in the eastern part of the study area. These are mainly *Strongylus* and *Ascaris*.

Trypanosomiasis is the most serious animal health problem throughout the study area, particularly in the Secteurs with Zebu and crossbred herds. In Kayes Region, it is an important cause of mortality among Zebus, and even among crossbreds, while in the other regions under study it is less important but still poses a serious problem.

Table 7. Liveweights of crossbreeds at Sotuba[a].

	Jersey x N'Dama								Holstein x N'Dama				(Jersey x Red Steppe) x N'Dama	Jersey x Red Steppe) x Zebu
	Female		Male		Female	Male	Female	Male	Female	Male	Female	Male		
	no.	kg	no.	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
Birth	20	17+1	36	18+1	17	18	18	18	19	19	23	21	30	20
6 months	20	94+8	36	105+6	80	87.5	98	115	111	126	135	144	102	100
12 months	19	105+8	28	180+8	142	149	154	195	161	178	205	173	165	178
Survey period	1973 - 75				1972 - 75		1974		1973 - 75		1974		1974	1974

a. Calves of N'Dama cows were allowed to suckle, while calves of crossbred cows were bucket fed. From the age of four months they were grazed on improved pasture during the day, supplemented with 1 kg concentrates daily.

Sources: For Jersey x N'Dama crosses, CNRZ, 1976, for the period 1973 - 75; Braeunig and Braeunig, 1975, for 1972 - 75; and CNRZ, 1975, for 1974. For Holstein x N'Dama crosses, Braeunig and Braeunig, 1975, for the period 1973 - 75; and CRNZ, 1975, for 1974. For (Jersey x Red Steppe) x N'Dama and (Jersey x Red Steppe) x Zebu crosses, CNRZ, 1975.

According to Gruvel (1977):

Three species of glossina present in Mali can transmit pathogenic trypanosomes to cattle, *T. vivax*, *T. congolense* *T. brucei*.

A distribution map of animal trypanosomiasis in West Africa, established by Mornet (1953), indicates the incidence of these different species of trypanosomes in each region and shows the predominance of *T. congolense*, followed by *T. vivax* in Mali.

Studies carried out by Morel (1973) show the existence of *T. congolense* in the Secteurs of Segou (at Katiana), San (at Jene and Diele) and Sikosso (at Zignasso and Klela), and of *T. vivax* in the Secteurs of Macina (at Macina) and Sikasso (at Nkonala).

Trypanosomiasis enzootics, are severe everywhere, but more so among Zebus and crossbreds with substantial Zebu blood, either in the savannas or along rivers under forest galleries. The disease is even found among the trypanotolerant N'Dama and causes some mortality especially among the young. However, these humpless cattle can live in areas where Zebu and Méré would die.

The Fulani tend to treat their animals themselves with Berenil, while the settled farmers tend to rely on the annual visits of government veterinary staff.

3.3 HERD MANAGEMENT AND COMPOSITION

3.3.1 Management

In general, two livestock production systems occur in the study area: transhumance, which is more important toward the north, and settled agriculture, which predominates in the south. These systems overlap to some extent. The special features of production systems in the four regions of the study area will be described, moving from west to east.

In the northern part of Kayes Region, the nomadic Fulani herd their cattle all through the year and move with the herds in response to environmental conditions. Breeding animals are chosen according to their fertility and conformation, and inferior bull calves are castrated and old or sterile animals culled. Government veterinary measures are generally accepted by the cattle owners.

In Kayes Secteur, the Toronké people select animals according to their conformation and their colour. The cows are milked completely and the calves put out to pasture at a very early age.

Towards the south, the Malinké are agriculturalists who have not given much attention to cattle production until recently with the introduction of draught oxen. In

Keneba Station, particularly in the southern part, the large herds are owned by Fulani from Fouta Djallon.

In the parts of Bamako Region under study, cattle are kept chiefly by settled Bambara, Fulani and Malinké people. The animals are moved every year between March and May to be closer to permanent sources of water. The Bambara of Dioila Secteur are agriculturalists who tend to leave herding to the older children or to hired Fulani herdsmen.

In this region, as well as Sikasso, cattle are herded during the day and tethered at night during the rainy season, but after the harvest they are left to roam freely from December to May. This leads to serious losses due to thefts, accidents and predators, as well as weight loss. The government livestock services have been campaigning to end this practice, and some of the local cattle owners have come to realize the advantages of herding their cattle during the dry season and have begun taking steps to provide an adequate feed supply for this period.

In the southwestern part of Sikasso Region (Yanfolila and Bougouni Secteurs), the local people do not practise crop farming or livestock raising on an intensive basis. N'Dama cattle are kept for ceremonial occasions and sometimes for sale. They roam freely during the dry season and are herded during the cropping season, often by hired Fulani herdsmen. During this time, the animals are penned at night two or three km from the village, with the milk cows tethered outside the pen. A shelter is sometimes constructed for the calves. A large family may keep a separate herd, but more often the animals of one area are herded together. The herdsman is generally paid FM 50 (US $ 0.11) per month for each animal in the herd, plus the milk obtained on Mondays and Fridays. The transhumant cattle owners of the area are accustomed to inoculating their animals and by their example have influenced the the settled population to do the same.

Draught oxen have been used for some time and their use is now increasing. There are about 25 000 oxen in this area out of a total of 250 000 throughout the country, according to a 1978 estimate of the CNRA. Manure is often used on the fields.

In Kolondieba Secteur in the central part of Sikasso Region, crossbreeding is widely practised and the Méré or Bambara are used as draught oxen. The Fulani Zebu is used more widely for crossbreeding than the Maure, as it is considered less sensitive to trypanosomiasis. Though the people in this area are agriculturalists, they do not tend to use manure. The cattle are left to roam freely during the dry season, with the attendant problems already mentioned.

A number of Fulani came with their herds from further north to Kadiolo, Sikasso, Koutiala and Yorosso Secteurs, in the eastern part of the region, as a result of recent droughts, and they have never gone back. This has led to conflicts with the local farming population.

Among the farmers, cattle are herded during the day and tethered at night, except for the largest herds which might be fenced. The animals are generally herded

by the older children, rather than by hired Fulani herdsmen. Both the Fulani and the local farmers must move their cattle short distances during the rainy season to avoid areas of tsetse infestation. The animals do not roam widely during the dry season because they must stay near the few permanent sources of water.

In general, only the Fulani milk their cattle, and sheep and goats are seldom milked. Oxen have been used for some time in this area: the four Secteurs together account for about 80 000 oxen, or 32% of the total for the country. Manure is widely utilized for cropping. Farmers often allow animals to graze on their land in return for the manure produced.

In Segou Region there are both sedentary farmers and a substantial transhumant population. The sedentary Bobo, Marka and Minianka keep their animals in the fields in pens or tethered near their houses. Draught oxen and manure are widely used.

3.3.2 Herd Size and Composition

Herd sizes vary widely, but in general Fulani herds consist of 150 to 200 cattle, while the settled population keeps family or village herds of about 50. Typical herd composition percentages were given for Yanfolila Secteur by IEMVT (1971). These are reproduced in Table 8.

Table 8. Typical herd composition in Yanfolila Secteur (%).

	0 - 1 Years	1 - 2 Years	2 - 3 Years	3 - 10 Years
Female	9.0	7.5	7.3	43.5
Male	8.8	7.2	5.2	4.7
Castrate	-	-	-	6.8
Total	17.8	14.7	12.5	55.0

Source: IEMVT, 1971.

The government veterinary service reported the composition of two herds, one belonging to Fulani and another to settled farmers in the 1976 annual report for Yorosso Secteur as follows (%):

	Oxen	Bulls	Cows	Young Bulls	Heifers	Calves
Fulani	8	4	44	12	14	18
Settled farmers	20	4	26	20	12	18

The composition of these two herds can only be taken as suggestive of the general pattern. They reveal the tendency of farmers, who use draught animals for cultivation, to keep a higher proportion of oxen than pastoralists.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

The sheep and goats of the study area are typical of the Djallonké and West African Dwarf types described in Volume 1. Dumas (1973), quoting veterinary reports from Bougouni Secteur, gives an average height at withers for Djallonké sheep of 45 to 60 cm and an average weight of 20 to 30 kg. The average carcass weight of 1 424 sheep slaughtered at the Sikasso abbatoir was 10 kg. Dumas reports an average height of 40 to 50 cm for the Fouta Djallon goats and an average weight of 18 to 20 kg. The average carcass weight of 1 163 goats slaughtered at Sikasso abbatoir was 10 kg.

4.2 DISEASE

According to Raymond and Dumas (1973), the most important diseases affecting small ruminants are those caused by gastro-intestinal parasites and liver flukes (fascioliasis), as well as respiratory diseases, foot-rot and scabies. At Sotuba from 1953 to 1959, under improved management conditions, 55% of the deaths among Djallonké sheep were due to respiratory diseases, 20 to 22% were due to gastro-intestinal diseases and internal parasites (with 10% of this due to parasitaemia), 8% were due to external parasites, 0.8% to viral diseases and the rest to other causes (including 13% losses of young due to lack of milk from the ewes).

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES AND PROGRAMMES

The Centre National de Recherches Zootechniques (CNRZ) with 150 ha of land at Sotuba, five km from Bamako, comes under the Institut d'Economie Rurale (IER, B.P. 258, Bamako) of the Ministère du Développement Rural. Its location is indicated in Figure 1 by ●1. As of the end of 1977, this centre kept 169 N'Dama, Jersey x N'Dama, Red Steppe x N'Dama and Brahman x N'Dama cattle. Work underway includes comparative studies of the performances of different crossbreeds, experimentation on oestrus synchronization among Maure Zebu, early weaning trials and feeding trials using rice bran and mango silage.

A research programme on tsetse and trypanosomiasis is being carried out at the Laboratoire Central de Recherches Veterinaires, 10 km from Bamako, with funding from USAID and technical assistance from Texas A & M University. The location is shown by + 2 in Figure 1.

5.2 MULTIPLICATION HERDS AND DEVELOPMENT PROJECTS

There are three multiplication herds in Mali which include N'Dama cattle and three livestock development projects underway. These are described in Tables 9 and 10.

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Table 9. Multiplication herds.

Name	Opération N'Dama Yanfolila (ONDY)	Ferme de Thé (Tea farm)	Opération de Développement Intégré de Baguinda
Location (and reference in Figure 1)	103 km south of Bougouni ■ 3	20 km from Sikasso ■ 4	20 km from Bamako ■ 5
Organization responsible	Service de l'Elevage et de la Santé Animale	Ministère de l'Agriculture	Ministère de l'Agriculture
Size	16 000 ha (8 000 ha in use)	402 ha (102 ha of tea)	3 300 ha (250 ha used to grow tomatoes, green peppers)
Breeds and numbers	984 N'Dama, 204 Djallonké sheep, 167 draught oxen	169 N'Dama (original herd imported from Yanfolila in 1973)	150 N'Dama, 40 Maure Zebu x N'Dama crosses
Objectives	Selection and multiplication of the N'Dama herd. Rural extension services. Identifying the animals and setting up a production data recording system.	Meat production	Milk and meat production
External aid	European Development Fund of the European Economic Community, 1974 - 1979		

Table 10. Development projects.

Name	Mali Livestock I	Mali Livestock II or Projet Terres Nouvelles	Développement de l'Elevage dans le Sud du Mali
Location (and reference in Figure 1)	One feedlot at Tienfala (30 km from Bamako) △ 6	At present three areas - Kita, Mandingues Mounts, Dioila △ 7	All of Sikasso Region, Dioila Secteur in Bamako Region and the southern parts of the Segou, San and Tominian Secteurs in Segou Region △ 8
Organization responsible	Office Malien du Bétail et de la Viande (OMBEVI), B P 1382, Bamako	OMBEVI	Service de l'Elevage et de la Santé Animale, Ministère de la Production, B.P. 265, Bamako
Objectives	Meat production through village-level fattening operations and feedlots (establishment of two feedlots)	Livestock development envisaged in one of the three zones surveyed, including a tsetse eradication programme	Improvement of animal health (vaccination and anthelmintic treatment), marketing, loans for fattening operations, expansion of the use of draught oxen
External aid	USAID	USAID	European Development Fund of the European Economic Community, for 4 to 5 years beginning in 1978

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CHAPTER 8

UPPER VOLTA

1. BACKGROUND

The Republic of Upper Volta is a landlocked country in West Africa surrounded by Mali to the north and west, Niger to the east and Benin, Togo, Ghana and the Ivory Coast to the south. The capital is at Ouagadougou, and the administrative structure is complex. There are three government organizations in Upper Volta with responsibilities in the field of animal health and production which in some cases overlap. There are the original Service de l'Elevage, the Offices Régionaux de Développement (ORD) now being developed and a third organization in charge of regional projects externally financed. (See Figure 1.)

The country is thus divided into 11 ORDs; there are also 10 administrative departments with 44 arrondissements and at the same time 8 Circonscriptions d'Elevage with 14 sectors and 51 veterinary stations. The study area includes all the ORDs except Kaya, Ouahigouya and Dori.

Basic data for Upper Volta as a whole and for the study area are given in Table 1.

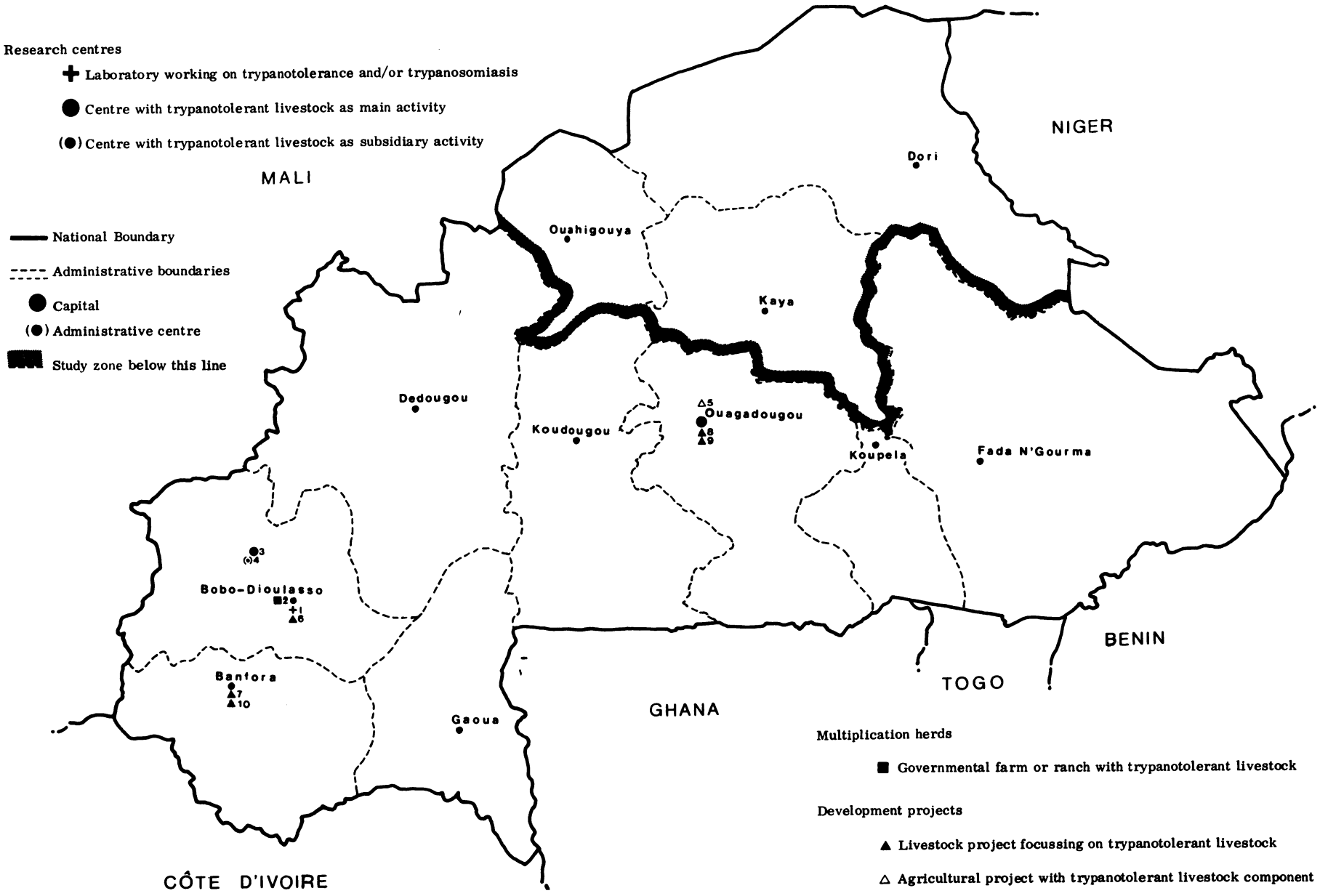
Table 1. Background data for Upper Volta.

	Whole Country	Study Area
Area	274 200 km^2	203 000 km^2
Latitude	$9^o30'$ - 15^o N	$9^o30'$ - 13^o N
Longitude	$5^o30'$ W - $2^o30'$ E	$5^o30'$ W - $2^o30'$ E
Population		
number	6 170 000	5 000 000[a]
density	22.5/km^2	24.6/km^2
Livestock numbers		
cattle	2 550 000	1 534 000
sheep	1 800 000	1 000 000
goats	2 600 000	1 800 000

a. Estimate.

Sources: For population, OAU, 1978; for livestock numbers, Upper Volta, Direction des Services de l'Elevage, 1977.

Figure 1. Administrative divisions, boundary of study zone, location of research centres, multiplication herds and development projects.



There is one rainy season, which occurs between June and October and is often very short. In the northern part of the study area, the climate is Sahelo-Sudanian, with an annual rainfall between 600 and 1 000 mm. The southern part of the study area, which comprises about 15% of the entire country, has a Sudano-Guinean climate with annual rainfall between 1 000 and 1 400 mm.

According to the OAU/STRC tsetse distribution map (1977), over two-thirds of the country is infested with tsetse. *G. tachinoides* is found throughout the infested area, while *G. morsitans* is found mainly in the eastern region and less frequently in the north. *G. palpalis* is found in the west and southwest, and a small number of *G. longipalpis* and *G. medicorum* are found in the southernmost part of the country.

Gruvel and Gauch (1977) carried out a study of animal trypanosomiasis in Upper Volta as part of an FAO/UNDP regional project. They found that the northern tsetse limit has moved south in the past 50 years and reported that tsetse are now confined to the area south of the 800 mm isohyet.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

Table 2 gives livestock numbers in the 11 ORDs as of 1977. The proportions of humpless, Zebu and crossbred cattle are estimates.

Table 2. Livestock numbers in Upper Volta, 1977 ('000).

ORD	Cattle						Sheep and Goats	
	Total No.	Humpless No.	% of cattle in ORD	Crossbred No.	% of cattle in ORD	Zebu No.	% of cattle in ORD	No.	% of national total
Banfora	97	67.9	70	19.4	20	9.7	10	207	5.00
Diébougou	130	117.0	90	10.4	8	2.6	2	207	5.00
Bobo Dioulasso	163	65.2	40	40.8	25	57.0	35	362	8.75
Dédougou	322	81.7	25	147.2	45	98.1	30	414	10.00
Koudougou	184	55.2	30	36.8	20	92.0	50	259	6.25
Ouagadougou	237	35.6	15	47.4	20	155.0	65	311	7.50
Koupéla	107	32.1	30	64.2	60	10.7	10	104	2.50
Fada N'Gourma	289	28.9	10	115.6	40	144.5	50	362	8.75
Kaya	293			58.6	20	234.4	80	673	16.75
Ouahigouya	155					155.0	100	311	7.50
Dori	573					573.0	100	932	22.50
Totals	2 550	483.6	19	540.4	21	1 531.0	60	4 142	100.00

Source: Upper Volta, Direction des Services de l'Elevage, 1977.

Of the total 4 142 000 small ruminants in 1977, approximately 2 485 000 were goats and 1 657 000 were sheep, giving a ratio of three goats for every two sheep. In the study area, there are about 1 500 000 goats and 1 000 000 sheep.

Humpless cattle account for about 19% of the total cattle herd throughout the country, and crossbreds for another 21%. In the study area, which includes all the ORDs except Dori, Ouahigouya and Kaya, about 32% of the 1 529 000 cattle are humpless and 35% crossbreds. Figure 2 shows the northern limit of the tsetse zone, the distribution of the national herd and the proportions of Zebu, crossbred and humpless cattle in the 11 ORDs.

3. CATTLE

3.1 BREED DESCRIPTION

The humpless cattle of Upper Volta belong mainly to the West African Shorthorn group and are known as Méré or Lobi (see Figure 3.38, volume 1) or Lobi Gouin in the south. Crossbreeding with Zebu is common, as indicated by numbers of crossbreds shown in Table 2. In Banfora ORD, there are also a number of N'Dama originating from Mali, and some Azaouak, imported from Niger, are kept, mostly on government research stations.

3.1.1 Méré

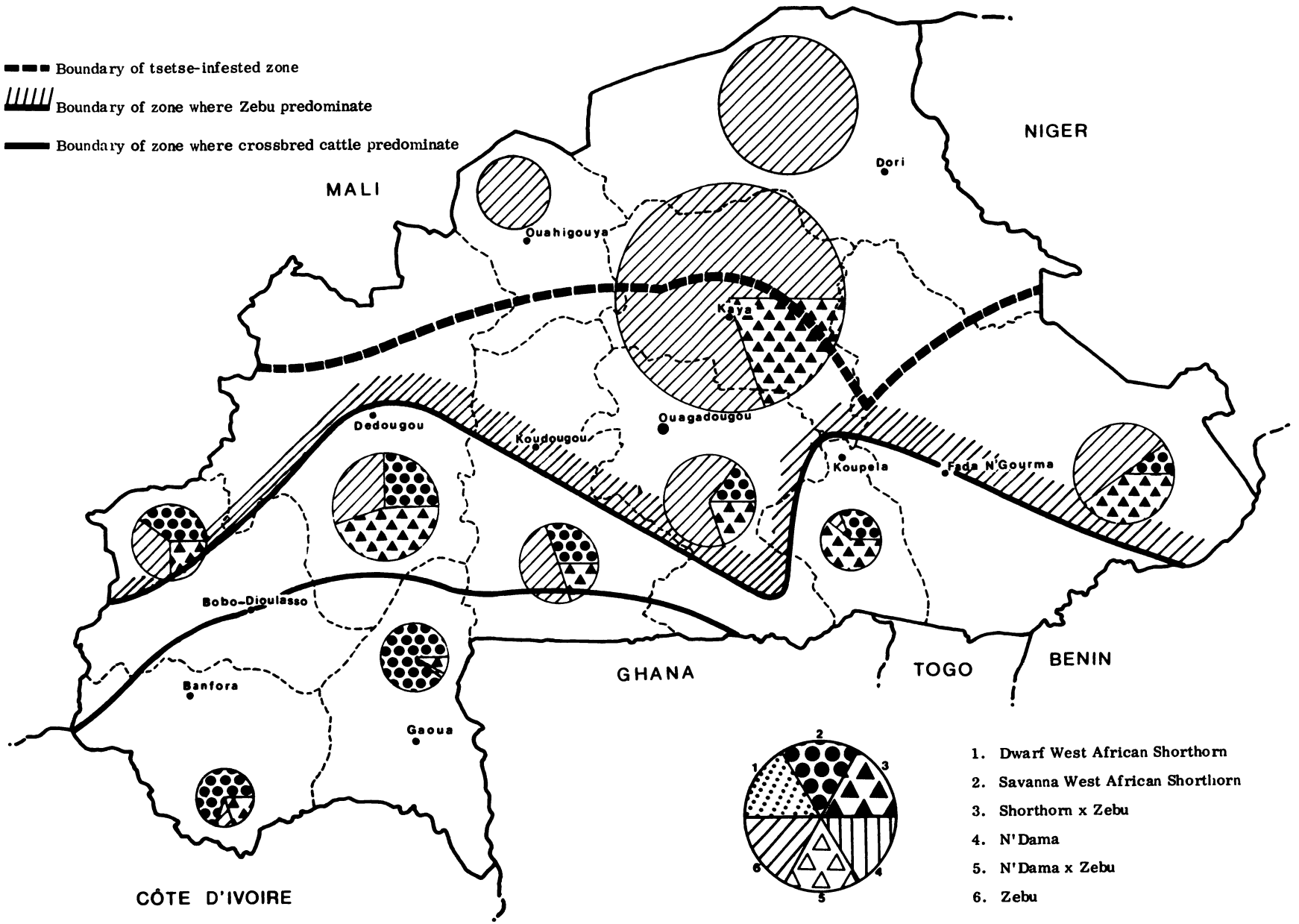
The Méré of Upper Volta resemble the Baoulé of Ivory Coast (see Chapter 3, volume 1), though according to Tyc and Legrand (1972) the Méré tend to be smaller in Banfora ORD in the south. These authors report that the Méré tend to increase in size from south to north, from Banfora to Gaoua and Dédougou, even without any signs of crossbreeding.

The mortality rate in the southwestern area, according to Tyc and Legrand (1972), ranges from 30 to 50% for calves up to one year old, mainly due to internal parasites. The average carcass weights for Méré at Banfora abbatoir in 1971 were 68 kg for 134 females and 74 kg for 258 males. Higher weights were reported from the Bobo Dioulasso abbatoir, namely 99.5 kg for 258 females, and 95 kg for 575 males, most likely because humpless cattle and crossbreds were grouped together. The average carcass weight for Zebu at Bobo Dioulasso was 114 kg. SCET (1972) reports average carcass weights from a number of abbatoirs around the country similar to those at Banfora; among humpless cattle, 80 kg for males and 75 kg for females, and among Zebu, 110 kg for males and 95 kg for females.

3.1.2 Zebu x Humpless Crossbreds

There are many Zebu x humpless crossbreds in Upper Volta, and their numbers seem to be increasing. There are already more crossbreds than pure

Figure 2. Cattle numbers and breed distribution.



humpless cattle, though both are often called Méré (see Figure 3.56, volume 1). The main crossbred area is a belt from west to east, including Bobo Dioulasso and Koudougou and widening parallel to the southern border south of Koupela and Fada N'Gourma.

These crossbreds include all types of mixtures between the two original breeds and their appearance varies considerably. Their coats are mostly black, black-and-white or brown-and-white, and their horns are of medium length. They are generally small, smaller than the Borgou of Benin for instance.

According to Mordant and Lebrun (1969), the age at first calving under village conditions is between 4 and 5 years, with a calving interval of 540 to 730 days. The same authors report a mortality rate from birth to 4 years of about 50% in the southern part of the country under village conditions. Weights at birth and at eight months recorded on two government stations are given in Table 3. At Farako-Ba Station, crossbreds with a more humpless appearance studied from 1966 to 1977 were fed improved pasture plus hay, while at Saria Station, crossbreds with a more Zebu appearance were fed improved pasture plus straw and fodder from 1965 to 1967.

Table 3. Weights of crossbred cattle at birth and 8 months on two government stations.

	Farako-Ba Station		Saria Station	
	Female	Male	Female	Male
Number of births	14	15	14	15
Birth weight (kg)	18	18	15	18
Number at 8 months	4	3	5	5
8-month weight (kg)	91	111	128	138

Source: Borget, 1969.

The only information available on draught capacity is from a trial carried out at Saria Station in 1965. An average continuous draught power of 60 kg was achieved by a pair of oxen weighing 480 kg, reported by Mordant and Lebrun (1969).

3.1.3 N'Dama

There are very few N'Dama in Upper Volta. A few are found in Banfora ORD near the Mali border, and some purebred N'Dama are kept on government stations in Matourkou and Samandeni in the southwestern part of the country.

The N'Dama kept on the stations are the classical Guinean type, with fawn coats, while those kept under village conditions are very often crossbred with Méré.

Adult cows kept at Matourkou Station under improved grazing on average measured 107 cm at withers and weighed 249 kg (van Binsbergen, 1973). Three

two-year-old steers were kept for two months on a diet of cotton seed and Brachiaria ruziziensis hay: their average weight was 158 kg at the beginning and 188 kg at the end of the experiment, indicating an average weight gain of 517 g daily (van Binsbergen, 1973).

Draught capacity was tested by the Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières (IRAT) at Farako-Ba and Saria Stations. At Farako-Ba, a pair of oxen weighing 730 kg achieved an average continuous draught power of 89 kg and a maximum of 235 kg (Pagot, et al., 1972). At Saria, a pair weighing 650 kg achieved a draught power of 70 to 80 kg on a continuous basis (Mordant and Lebrun, 1969).

3.1.4 Zebu

The Zebu of Upper Volta will not be described in detail, but they account for about one-third of the cattle in the study area, which is considered a tsetse-infested zone. These herds are owned by Fulani and are found mainly in the northern, drier portions of the study area where tsetse infestation is lower, but large herds are also moved into the areas where humpless cattle predominate, down as far as the southern border and into northern Togo, for example. They are also sometimes kept in small pockets in areas of humpless cattle and crossbreds, for example in the White Volta valley and the region west of Bobo Dioulasso. More recently, the Fulani seem inclined to move their herds towards the southwest, rather than only to the open plains of the southeast.

In Upper Volta, the Zebu are of the Sudanese Fulani Zebu breed. Their external appearance varies, both in terms of coat colour and the shape of the horns. They tend to be relatively small and light weight compared with other Zebu of this part of Africa.

Studies of Zebu are largely carried out at the herd level in the Sahelian and Sub-Sahelian zones. However, at Matourkou Station four adult females were measured, averaging 1.16 m at withers and 270 kg liveweight. Rochez (1977) reported the results of five intensive fattening trials carried out with local Zebus in Kou Valley in Bobo Dioulasso ORD. The weight gains of these animals are presented in Table 4. Their average dressing out percentage was 56.5%.

Table 4. Zebu fattening operations in Kou Valley.

	Intensive fattening			Fattening under village conditions	
	I	II	III	I	II
Number of animals	10	9	9	11	10
Length of trial (days)	252	236	124	90	180
Average weight:					
beginning	218	243	230	382	325
end	296	318	304	417	362
Average daily weight gain (g)	308	550	593	388	205

Source: Rochez, 1977.

Zebu tend to be more popular than the humpless breeds in Upper Volta for several reasons: a higher offtake rate is possible with Zebu and they are more suitable for training as draught animals. Almost all draught animal development projects in the country use Zebu or crossbreds. However, in the southwest and the valleys of the Voltas, these animals must be kept under chemoprophylaxis. Throughout the southern area, trypanocidal drugs are heavily used, though not necessarily under veterinary supervision.

3.1.5 Azaouak and their Crosses

Data on Azaouak and their crosses are available from Matourkou Station. According to van Binsbergen (1973), milk yields averaging 1 059 kg over 238 days were obtained from 50 cows with lactations over 100 days, and Mordant and Lebrun (1969) reported average yields at the same station of 1 300 kg per lactation. Body weights for Azaouak and their crosses are shown in Table 5. As part of a fattening trial, three 12-month-old steers were fed a ration of cotton seed and Brachiaria ruziziensis hay over 58 days. Their average weight at the beginning of the period was 130 kg and at the end it was 172 kg, representing a daily weight gain of 724 g.

A crossbreed between West African Shorthorn, Azaouak and N'Dama was produced at Saria and Farako-Ba Stations by IRAT in an effort to produce improved draught animals. Malcoiffe (1972) reported the average age at first calving and calving intervals for this crossbreds given in Table 6. Weaning occurred naturally at 7.5 to 11 months, and cows were not milked.

Table 6. Age at first calving and calving interval for crossbreds between WAS, Azaouak and N'Dama (number of animals in brackets).

	Average Age at First Calving (months)	Average Calving Interval (days)
Saria		
1969	31 (9)	371 (16)
1970	31 (5)	388 (18)
Farako-Ba		
1970	38 (4)	378 (20)
1971	37 (6)	408 (20)

Source: Malcoiffe, 1972.

The average weights of these crossbreds at the two stations are given in Table 7.

Table 5. Body weights of Azaouak and their crosses at Matourkou Station.

	Azaouak				Azaouak x N'Dama				Azaouak x Local Zebu				Azaouak x (N'Dama x Zebu)			
	Female		Male		Female		Male		Female		Male		Female		Male	
	No.	kg	No.	kg	No.	kg	No.	kg	No.	kg	No.	kg	No.	kg	No.	kg
Birth	48	21	45	23	29	19	19	21	10	21	10	23	8	22	6	21
6 months	18	84	12	104	17	79	16	87	7	94	6	102	3	111	3	79
12 months	21	134	12	168	16	122	14	132	8	132	5	160	3	155	3	126
18 months	24	181	7	233	13	156	8	159	6	169	2	207	-	-	-	-
24 months	21	212	5	254	12	190	7	178	7	198	2	225	-	-	-	-
30 months	15	252	4	316	4	211	1	160	-	-	-	-	-	-	-	-
Study period	1966 - 1972				1969 - 1972				1969 - 1972							

Source: van Binsbergen, 1973.

Table 7. Average weights of WAS, Azaouak and N'Dama crossbreds.

	12 Months		18 Months		24 months		30 Months		36 Months	
	no.	kg	no.	kg	no.	kg	no.	kg	no.	kg
Farako-Ba										
female	22	155	20	204	13	255	11	291	6	290
male	10	174	8	224	5	259	3	328	1	345
Saria										
female	17	159	13	193	10	242	5	270	1	307
male	8	189	6	230	4	302	2	389	-	-

Source: Malcoiffe, 1972.

3.2 DISEASE

The animal health situation in Upper Volta is a major concern; the cattle are generally in poor condition (Gruvel and Gauch, 1977; Tyc and Legrand, 1972).

Rinderpest and contagious bovine pleuropneumonia (CBPP) are the most serious contagious diseases, spread widely through trade and transhumance. In 1974, two outbreaks of rinderpest and 13 outbreaks of CBPP were reported, though the outbreaks of CBPP were reduced to eight in 1977. This situation is disturbing because the government health authorities do not have the means to control these diseases. Tuberculosis occurs mainly in the north, and other contagious diseases, such as blackquarter, anthrax and foot-and-mouth, occur but have less serious economic consequences. There were 46 foci of foot-and-mouth in 1974.

The incidence of parasitic diseases is similar to the situation in other countries, except for a high incidence of rickettsiosis in the south, affecting mostly young animals. Veterinary treatments for trypanosomiasis and other parasitoses have been available in each ORD since 1956-57, though fees are charged. Gruvel and Gauch (1977) reported that *T. congolense* and *T. vivax* are predominant in Upper Volta, together with *T. brucei* in the south. Their distribution and relative importance are totally unknown.

3.3 HERD MANAGEMENT AND COMPOSITION

Both transhumance and settled agriculture are common in Upper Volta. Philippe (1975) describes the traditional farmers and transhumants of the Leo area in the central southern part of the country, and his descriptions are quoted here as typical of the two predominant production systems.

3.3.1 Herd Management Under a Farming System

The Gurunsi, like all the inhabitants of savanna country, is above all a farmer. Therefore each village has its herds, however small they may be,

> usually tended by a Fulani herdsman: 900 cattle for 16 villages (= 2 cattle per 10 inhabitants). Cattle are the private property of the richest families in the village: often the chiefs, the marabouts and also old warriors.
>
> Traditionally, quantity is more important than quality. However, for two years now, villagers have begun to want to buy Zebus on ORD advice to train them as draught animals. Unfortunately, they have not received any assistance... .

The herds constitute capital and animals are only slaughtered when they are either old, tired or sick, for weddings, funerals, feasts, sacrifices, of when money is needed (for taxes, purchase of millet, etc.). The economic role of the herd is th thus very limited: manure is never utilized, the milk goes to the Fulani herdsmen, and meat is hardly ever consumed (game meat is preferred). We would like to point out, however, the case of a farmer who owned more than 100 cattle. He started selling them off to buy a millet crusher, but he was also motivated by the fear of seeing his herd disappear with the herdsman. Often the Gurunsi livestock owners split up their cattle into small herds, each with its own herdsman (this is insurance against theft) (Philippe, 1975).

3.3.2 Problems of Transhumance

Only since 1972 have the villages situated away from the traditional trading routes with Ghana had regular dealings with the transhumants. Transhumants come from north of the area, from Kedougou and from further north. The northern Fulani herds are mainly made up of Zebus, while the others are made up of crossbreds, humpless cattle and some Zebus. They are less healthy than the village herds and the Fulani of the region accuse the transhumants' herds of spreading parasites to their cattle. This is very possible since all the herds meet at the same water ponds where they tread in the mud and contaminate the water. The transhumant herds have from 40 to 300 head, with an average of 100.

> Transhumance is looked down upon by the local Gurunsi, Mossi and Fulani. Here one comes across the typical antagonism between the pastoralist from the north and the farmer from the Sudanese belt. Transhumants present a number of problems to the inhabitants of the region: the farmers' fields are not respected, waterponds are used up, well water is used at a time when it does not even meet human requirements, and thefts occur. The transhumant with his herd behaves like a master and has no respect for the farming population (Philippe, 1975).

3.3.3 Herd Composition

SCET (1972) carried out surveys of herd composition in 1969-70 in Diebougou and other ORDs. In all, 63 330 cattle were covered, with typical herd compositions by sex and age given in Table 8.

Table 8. Herd composition in Diebougou and other ORDs (percentages).

	Humpless Cattle						Zebu and Crossbreds		
	Diébougou ORD			Other ORDs					
	Females	Males	Total	Females	Males	Total	Females	Males	Total
No adult teeth	8.6	8.1	16.7	18.0	10.9	28.9	14.4	11.2	25.6
2 or 4 adult teeth	10.9	8.9	19.8	15.5	13.1	28.6	14.0	9.8	23.8
6 and over adult teeth	46.5[a]	17.0	63.5	37.0[a]	5.5	42.5	40.1[a]	10.5	50.6
Totals	66.0	34.0	100.0	70.5	29.5	100.0	68.5	31.5	100.0

a. Breeding females.

Source: SCET, 1972.

Tyc and Legrand (1972) report the herd structure of the Méré in Banfora ORD, as given in Table 9. They remark that 'in our opinion sedentary breeders exploit their herds at too young an age; in fact, 65% of calves are sold or slaughtered during their second year and 30% between two and three years'.

Table 9. Herd composition of the Méré in Banfora ORD.

Females	%	Males	%
Cows 3 to 12 years	53	Bulls (4% of adult cows)	2
Heifers 2 to 3 years	9	Young males 1 to 3 years	5
Female calves 0 to 2 years	20	Male Calves 0 to 1 year	11
Total females	82	Total males	18

Source: Tyc and Legrand, 1972.

3.3.4 Draught Animals

Rochez (1977) described the role of draught animals in Upper Volta as follows:

> Draught animals play one of the most important roles in the economic and agricultural development of the country. This method has not always been very popular with technicians, but the person directly involved, the Voltaian farmer, made up his mind about it a long time ago. In fact, with the return of favourable weather conditions, the number of ox and donkey teams has practically doubled in two years, from 21 000 in 1975 to 40 000 in 1977. Introduced 25 years ago on pilot farms, the popularity of draught animals has varied according to the regions.

He estimated the total number of draught oxen at 29 800 as of mid-1977. The rapid increase in the number of draught animals in recent years is illustrated by the fact that there were 36 pairs of oxen in Banfora ORD in 1971/72, according to Tyc and Legrand (1972), and there were 600 pairs in 1977.

4. SHEEP AND GOATS

4.1 SHEEP

The sheep of Upper Volta vary considerably, ranging from the Djallonké type in the southwest to the Sahelian breeds in the north. The Djallonké are found throughout the study area. Among the Djallonké, the Mossi variety, which is larger than the variety found further south, can be considered a savanna Djallonké (see Figure 3.76, volume 1). In the northern parts of the study area, there is considerable crossbreeding with the Sahelian breeds.

Mordant and Lebrun (1969) reported a lambing rate of 80 to 90% under village conditions in the southern part of the country. Lambing occurs chiefly from April to June and in September.

SCET (1972) reports an average carcass weight for sheep of 12.8 kg, while the Service de l'Elevage reports an average carcass weight of 8.5 kg in its 1976 meat production statistics, based on the weights of animals slaughtered at the freezing plant at Ouagadougou.

4.2 GOATS

According to Mordant and Lebrun (1969), the goats of Upper Volta are of an intermediate Sudanian type, between the Guinean and Sahelian goats in appearance. However, they cannot be considered a cross between these two breeds. SCET (1972) reports an average carcass weight for goats of 11 kg, while the average carcass weight recorded at the Ouagadougou freezing plant was 7.5 kg.

The chief diseases among goats, as well as sheep, are pleuropneumonia and internal parasites (Tyc and Legrand, 1972).

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

There is no animal husbandry research as such in Upper Volta. However, there are several biological research and training centres in the town of Bobo Dioulasso.

The Centre de Recherches sur les Trypanosomiases Animales in Bobo Dioulasso (B.P. 454) is indicated by +1 in Figure 1. This research centre, with assistance from IEMVT, is now studying the biological control of tsetse flies by the sterile male technique (see IEMVT, 1977). *G. palpalis gambiensis* is bred in the laboratory and the males are sterilized by radiation and released in the infested area. As of 1978, the centre planned to diversify its activities by initiating a study of the biochemical and genetic aspects of trypanotolerance. This new project was supported by West Germany and DGRST and IEMVT in France.

The Ecole de Lutte Anti-Tsetse (ELAT) is also at Bobo Dioulasso. With support from West Germany and France, this school trains technical staff for tsetse control organizations. Three other institutions at Bobo Dioulasso carry out work on human trypanosomiasis: the Organisation Commune de Contrôle des Grandes Endémies (OCCGE), the 'Muraz' centre doing medical research, particularly focussing on parasitology, and a centre of the French Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM) with a medical entomology team.

5.2 MULTIPLICATION AND EXTENSION

Multiplication and extension herds in the study area are described in Table 10. The main station engaged in multiplication work is at Markoye outside the study area in the Sahel. Here, a multiplication herd of Azaouak Zebu is kept, as well as sheep and goats.

Although the Samandeni and Farako-Ba stations are listed here as multiplication herds, they could also be described as research stations in terms of the work carried out in the past. They are designated as research stations in Figure 1.

5.3 DEVELOPMENT PROJECTS

There are six livestock development projects currently underway in Upper Volta with activities in the study area. These are described in Table 11.

Table 10. Multiplication and extension herds.

Name	Centre de Formation de Matourkou	Station de Samandeni, c/o CRTA, B.P. 454, Bobo Dioulasso	Station de Farako-Ba
Location (and reference in Figure 1)	15 km south of Bobo Dioulasso ■ 2	Near Bobo Dioulasso ● 3	Near Bobo Dioulosso (●) 4
Organization responsible		Direction des Services de l'Elevage	IRAT
Size	1 000 ha		
Breeds and numbers	250 head including 80 N'Dama, 40 draught oxen and 115 Azaouak Zebu (1978)	103 local humpless cattle or Méré, 30 N'Dama (1978)	180 head, including 30 crossbred cows (humpless x Azaouak) and 13 Méré cows
Objectives	Training centre with a livestock component. Animal performance is recorded but there are no recent publications.	The herd is mixed and no performance data are recorded. Could be integrated with the trypanotolerance research project.	Draught animal research. Local humpless and N'Dama were crossed and the crossbred obtained was crossed with the Azaouak Zebu from Niger. Results for the first generation were satisfactory.

Table 11. Development projects.

Name	Aménagement des Vallées des Volta (AVV)	Projet Elevage Ouest-Volta (PEOV)	Feedlot de Banfora	Assistance à la Culture Attelée	Elevage Villageois	Amélioration de l'Elevage traditionnel dans l'ORD de Banfora
Location and headquarters (and reference in Figure 1)	White, Red and Black Volta valleys, Ouagadougou △ 5	Dedougou and Bobo-Dioulasso ORD, Bobo Dioulasso ▲ 6	Comoe ORD, Banfora ▲ 7	Entire country, Ouagadougou ▲ 8	Kaya, Koupéla and Fada Ngouma ORDs, Ouagadougou ▲ 9	Banfora ORD, Banfora ▲ 10
Organization responsible	Ministère du Développement Rural	Direction de l'Elevage, Ministère du Développement Rural, B.P. 116, Bobo Dioulasso	ONERA - Ministère du Développement Rural, B.P. 33, Banfora	Secrétaire Permanent du Comité de Coordination du Développement Rural, Ministère du Développement Rural, B.P. 575, Ouagadougou	CIDR, Ministère du Developpement Rural, B.P. 35, Ouagadougou	Ministère du Développement Rural
Size		58 000 km^2, 900 000 inhabitants	facilities for 2 feedlots with 3 000 head each		5 villages	
Breeds and numbers	In 1978, approx. 3 500 cattle, mainly Zebus, of which 1 500 were draught oxen	Cattle and small stock	Approx. 400 Zebus	All type of cattle and donkeys	Cattle, sheep and goats	Méré, crossbreds, Zebus
Objectives	Expansion and improvement of traditional herds. Establishment of villages in new areas using draught oxen for farming.	Increase breeding stock for ranch development. Improve livestock marketing and reinforce veterinary facilities. Create 9 ranches and their development centre. Internal and external parasite control for sheep and goats.	Industrial fattening pilot project including village fattening trials and introduction to local people.	Encourage the use of draught animals in new regions. Consolidate their establishment where they are already in use. Use of animals for cultivation as well as pulling vehicles. Develop and extend improved ox-drawn equipment.	Assist the livestock service in planning and establishing cattle and/or small-stock breeding projects at the village level. Vaccination programmes, village fattening; creation of reserves, pasture control, training.	Promote cattle production in traditional areas to make it profitable at peasant farming level. Veterinary assistance, supplementary feeding, Zebu crossbreeding.
External aid	Netherlands and France (FAC)	IBRD	Germany (GTZ)	UNDP, FAO and Denmark (DANIDA)	USA (USAID)	EEC (EDF)
Project period	3 years: 1975-1978	1976-1980	1976-1979	4 years: 1975-1979	1976-1978	4 years: 1976-1980

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CHAPTER 9

IVORY COAST

1. BACKGROUND

The Republic of Ivory Coast lies on the west coast of Africa, with Ghana to the east, Liberia to the west and Guinea, Mali and Upper Volta to the north. The country, with its capital at Abidjan, is divided into 26 administrative departments grouped into six regions with their regional centres as follows: Nord (Korhogo), Centre (Bouaké), Ouest (Man), Centre-Ouest (Daloa), Est (Abengourou) and Sud (Abidjan). (See Figure 1.)

In 1966, Ivory Coast created a Ministère de la Production Animale which includes among other sections a Direction des Services Vétérinaires, a Direction de la Production Animale and a Service d'Agrostologie et de Production Fourragère. The Direction de la Production Animale has an office in each region and department.

The Ministry has also created a Société de Développement des Productions Animales (SODEPRA) which is responsible for breeding, extension and development activities.

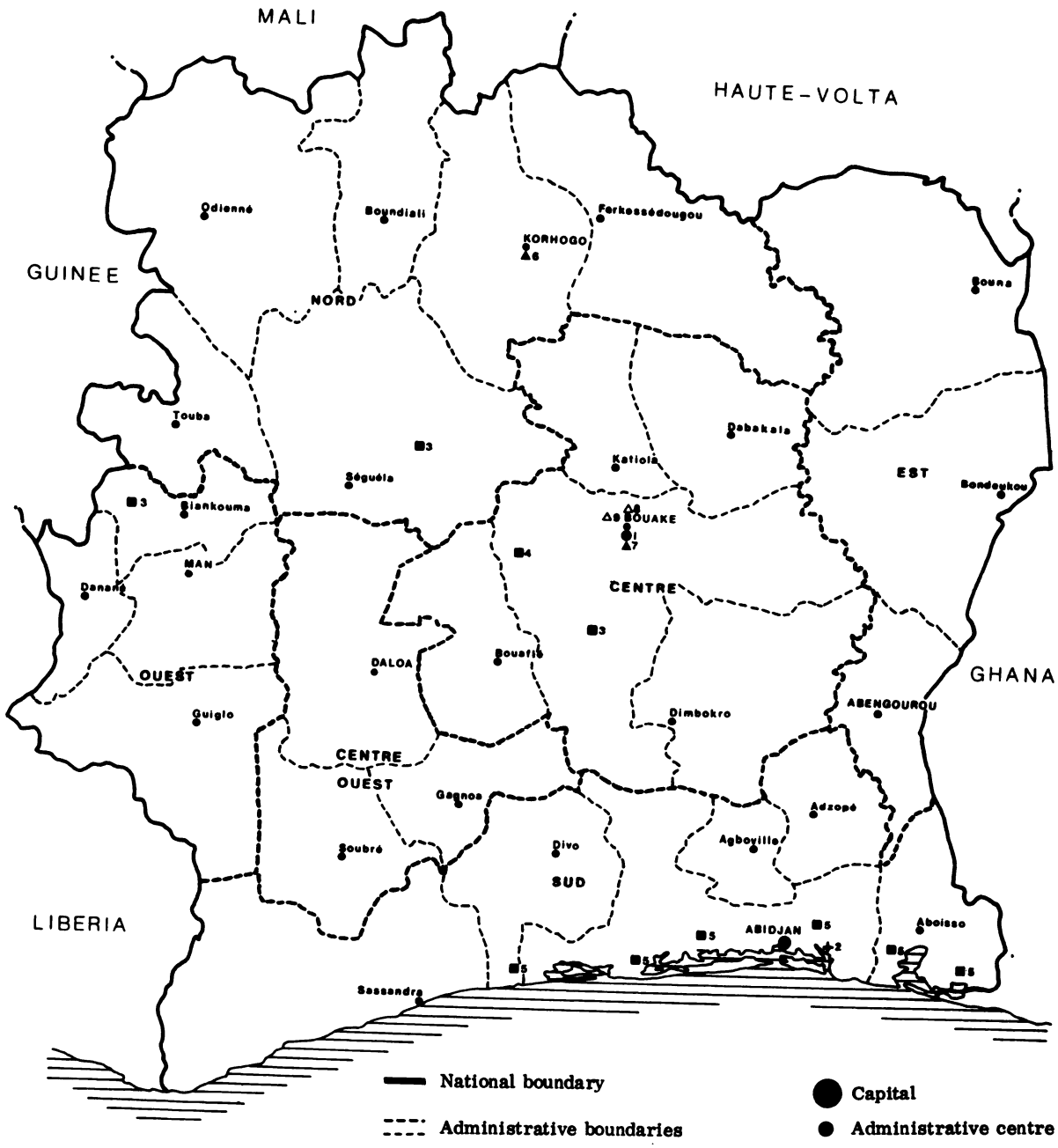
Basic data for the country are given in Table 1.

Table 1. Background data for the Ivory Coast.

Area	322 500 km^2
Latitude	5^o - 10^o N
Longitude	3^o - 8^o E
Population	
number	7 028 000
density	21.8/km^2
Livestock numbers	
cattle	516 000
sheep	722 000
goats	568 000

Sources: For population, OAU, 1978; for cattle numbers, national census, 1978; for sheep and goats, national estimate, 1975.

Figure 1. Administrative divisions, location of research centres, multiplication herds and development projects.



Research centres

✚ Laboratory working on trypanotolerance and/or trypanosomiasis

● Centre with trypanotolerant livestock as main activity

Multiplication herds

■ Governmental farm or ranch with trypanotolerant livestock

Development projects

▲ Livestock project focussing on trypanotolerant breeds

△ Agricultural project with trypanotolerant livestock component

Ivory Coast has a forest and Guinean climate south of the eighth parallel with two rainy seasons from May to mid-July and October to November and an annual rainfall between 1 200 and 2 400 mm. In the north,the climate is Sudano-Guinean with one rainy season from July to November and an annual rainfall between 1 100 and 1 600 mm.

According to the OAU/STRC tsetse distribution map (1977), the entire country is infested with tsetse. The principal species are: *G. palpalis* which is found throughout the country, *G. morsitans*, *G. longipalpis* and *G. tachinoides* in the northern savanna region and *G. fusca*, *G. medicorum* and *G. pallicera pallicera* in the south. Gruvel and Gauch (1977) report that the distribution of these species is not known in more detail.

A number of surveys have been carried out recently in connection with ranching development projects in the savanna areas. Four species of tsetse have been identified in these areas: *G. palpalis gambiensis* and *G. tachinoides* found principally in the forest galleries, and *G. morsitans submorsitans* and *G. longipalpis* which are more widespread.

A general study of tsetse infestation in the savanna zone was launched in 1978 with assistance from FAO. This study should provide more exact information on tsetse distribution in the northern half of the country.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

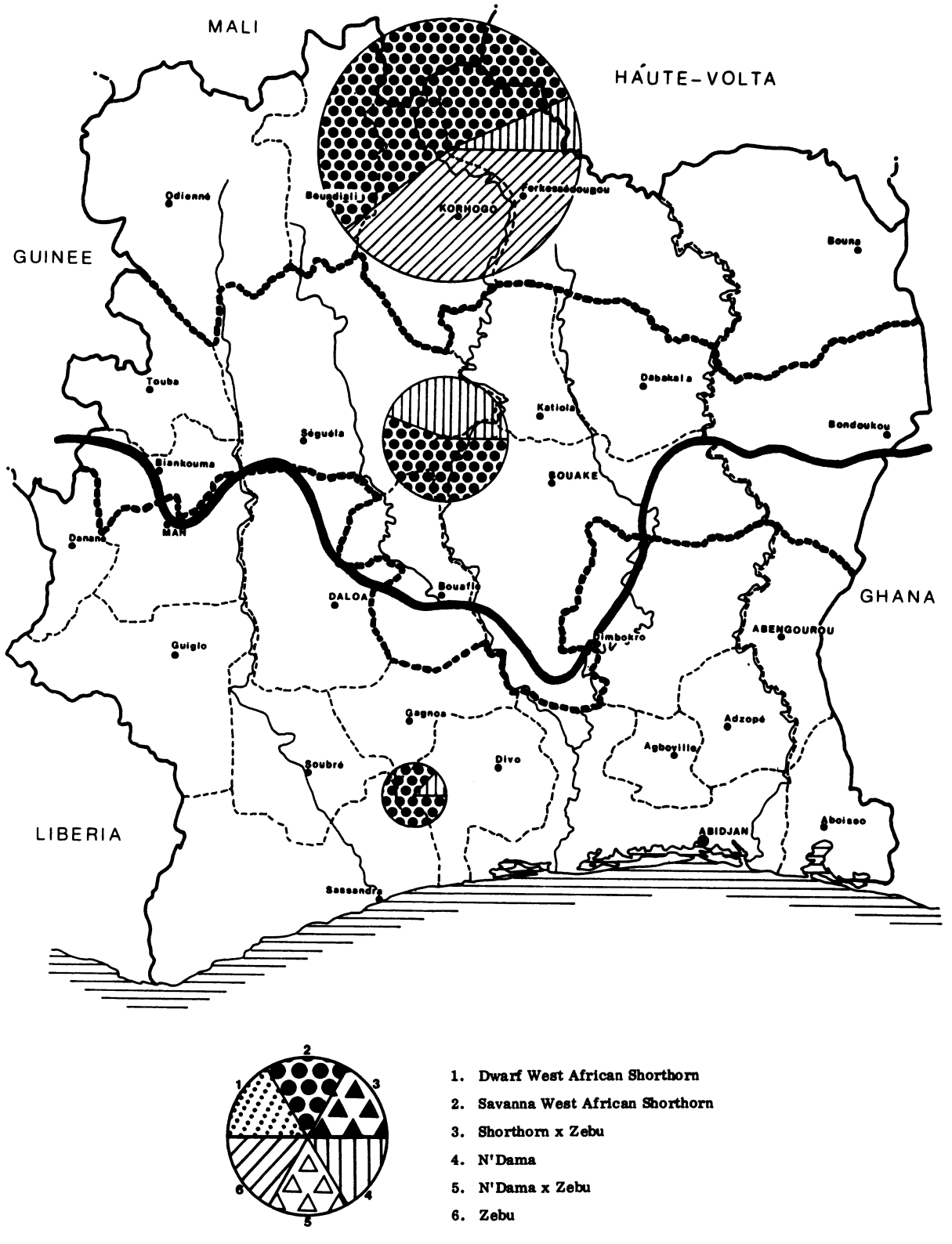
The cattle population is given in Table 2, broken down by region. In Nord Region, which accounts for nearly 80% of the national herd, figures are also given for each department. This table shows that 23% of the national herd are Zebu and 77% are of the humpless breeds.

A more recent census (1978) carried out by the Ministère de la Production Animale recorded 160 000 Zebu in Nord Region, which brings the national herd up to about 516 000 head.

Table 3 and Figure 2 show the distribution of cattle according to three vegetational zones: the northern savanna including the five northern departments, the central savanna including eight departments and the forest region with thirteen departments. The table also gives the estimated total population of the three main cattle types, N'Dama, Baoulé and Méré, and Zebu.

As this table indicates, only 4% of the cattle in Ivory Coast are found in the southern forested area. In the savanna zones, cattle are distributed unevenly, with some very densely populated areas, such as Korhogo, the area north of Bouna, Boundiali and Tingrela, some intermediate areas and some areas with almost no cattle at all.

Figure 2. Cattle numbers and breed distribution.



1. Dwarf West African Shorthorn
2. Savanna West African Shorthorn
3. Shorthorn x Zebu
4. N'Dama
5. N'Dama x Zebu
6. Zebu

Savanna - forest boundary

Boundaries of SODEPRA livestock development projects

Table 2. Cattle numbers in Ivory Coast, 1977.

Region	Department	Zebu	Humpless	Total
Nord	Odienné	7 800	28 400	36 200
	Boundiali	45 000	34 100	79 100
	Korhogo	32 500	86 800	119 300
	Ferkéssédougou	22 000	35 900	57 900
	Bouna	-	58 800	58 800
Sub-Total		107 300	244 000	351 300
Centre		-	43 400	43 400
Ouest		-	29 100	29 100
Centre-Ouest		-	13 700	13 700
Est		-	12 800	12 800
Sud		-	13 200	13 200
Total		107 300	356 200	463 500

Source: Ivory Coast, Ministère de la Production Animale.

Table 3. Cattle distribution in Ivory Coast according to breed and vegetation zone.

Vegetation Zone	N'Dama	Baoulé and Méré	Zebu	Total	% of National Herd
North savanna	27 000	217 000	160 000	404 000	78.3
Central savanna	40 000	50 000	-	90 000	17.4
Forest region	3 000	19 000[a]	-	22 000	4.3
Total	70 000	286 000	160 000	516 000	100.0
% of national herd	13.6	55.4	31	100.0	

a. Including a few Lagune cattle from the coastal region.

Source: Ivory Coast, Ministère de la Production Animale.

The Baoulé account for about half the cattle population in the country. They predominate in the savanna areas, except in the west and northwest where the N'Dama are more numerous. They are also found in the forest area in small isolated groups. In 1967, the Baoulé were estimated at about 75% of the national herd, but their numbers have been decreasing, mainly due to crossbreeding with Zebu.

The N'Dama are found in the northwest, in Odienné, Touba, Biankouma and Man Departments, which border the original breeding area of the Guinean type. N'Dama are also kept on three government ranches and on a number of private and government stud farms.

The Zebu have been introduced recently in Ivory Coast in a small area below the northern border of Tingrela, Boudiali, Korhogo and Ouangolodougou. They are kept alone or sometimes together with Baoulé.

In the areas where Zebu and humpless cattle are kept together, the crossbreds or 'Mere' are found, though it is difficult to estimate their numbers, especially as they include a variety of intermediate types. For the country as a whole, there are an estimated 36 000 Mere or 10 to 15% of the group classified as Baoule or Mere in Table 3. There seems to be a good deal of crossbreeding going on in the north. Most often Zebu and Baoule are crossed, but also Zebu and N'Dama.

There are still a few Lagune cattle in the coastal and forest areas, though they are no longer in the majority because of the introduction of N'Dama and Baoulé from the savannas. Their numbers are often overestimated. Keita (1973), for example, reports 7 000 head, but they probably represent no more than 10% of the total cattle population in Sud Region, or about 1 000 in all.

No recent census of sheep and goats has been carried out. National estimates in 1975 were 722 000 sheep and 566 000 goats, but FAO (1978a) estimated one million sheep and one million goats in 1976.

3. CATTLE

3.1 BREED DESCRIPTION

Ivory Coast has five main cattle breeds or types: Baoulé (Savanna West African Shorthorn), N'Dama, Méré (Zebu x humpless), Lagune (Dwarf West African Shorthorn) and Zebu (Sudanese type from Mali and Upper Volta).

3.1.1 Baoulé

This breed is described in Chapter 3 of volume 1, (see Figures 3.33 and 3.37, volume 1). In Bouna Department in the northeast, these cattle are called Lobi, after a local tribe.

Some measurements have been carried out at Bouaké Centre by Tidori et al. (1975) as presented in Table 4.

Table 4. Measurements of Baoulé cattle.

	Females	Males
	N = 40	N = 26
Weight (kg)	183 ± 4	267 ± 20
Height at withers (m)	0.951 ± .014	1.001 ± .017
Height at sternum (m)	0.467 ± .006	0.485 ± .010
Heart girth (m)	1.284 ± .016	1.405 ± .026
Scapulo-ischial length (m)	1.123 ± .017	1.212 ± .026

Source: Tidori et al, 1975.

Verly (1968) and Glattleider (1977) both recorded slightly lower heights at withers for Baoulé kept under village conditions: 0.92 to 0.94 m for adult cows.

3.1.1.1 Performance Traits. At Bouaké Centre, Tidori et al. (1975) recorded an average age at first calving of 25 months and 21 days ± 40 days. Several surveys indicate this is between three and four years under village conditions.

The average calving interval calculated from 234 observations at Bouaké Centre (Tidori et al, 1975) was 421 days, and 80% of the observations ranged between 300 and 480 days, leading to an average fecundity rate of 85% per annum. Estimates under village conditions are 45% (Lemaitre, 1969) and 59% (SEDES, 1972).

Poivey and Seitz (1977) calculated average fecundity rates for 290 Baoulé cows in village herds at Dabakala and Korhogo. The average fecundity rate for cows with four teeth was 28%, for cows with six teeth 39% and for mature cows with eight teeth 56%. Thus, neither fecundity nor the level of precocity among these cows was very high.

Camus (1977) carried out two surveys of fecundity among herds in northern Ivory Coast under village conditions. Among cows with male calves, there were 4 754 births for all breeds, with a fecundity rate of 39.2%. Of these, there were 2 743 births for Baoulé cows, giving a fecundity rate of 40.3%, though the author mentioned that these figures could be underestimates. The second survey covered 150 000 cattle under the supervision of SODEPRA between June 1976 and June 1977. The average fecundity rate for cows from 2 to 11 years old was 40% and for cows from 3 to 10 it was 45%. Fecundity rates according to age group were as follows:

Age	2 - 3 Years	3 - 4 Years	4 - 12 Years	12 - 13 Years
Fecundity Rate	0.2%	15.6%	46.9%	18.9%

These surveys indicate that the fecundity rate under village conditions is low and that precocity is also low, as there is practically no calving under three years and very little under four years.

At Bouaké Centre, Tidori et al (1975) observed a calving season among Baoulé from September to December which accounted for 55% of the annual calving. Under village conditions, Poivey and Seitz (1977) observed that 68% of the annual calving occurred in three months from October to December. These calving seasons are the result of services at the end of the dry season (January to March) when there is maximum sunlight in the day time and nights are cooler.

It is difficult to get estimates of mortality rates, especially for calves. Gruvel and Gauch (1977) give a calf mortality rate of 45%. Camus (1977) estimates 12 to 15% and Poivey and Seitz (1977) 17%,and these two estimates, based on recent surveys, seem more reliable. However, Camus (1977) stresses the great variability in calf mortality among herds and among regions.

Few data are available on Baoulé milk production. Glattleider (1976) reports milk yields under village conditions in two areas as shown in Table 5.

Table 5. Baoulé milk production under village conditions.

Area	Number of Cows	Average Yield per Lactation (kg)	Average Length of Lactation (days)	Method of Milking
Bouaké	35	215 ± 29	285	direct milking (monthly recording)
Dabakala	6	318 ± 69	180	calf weighing before and after suckling

Source: Glattleider, 1976.

Tidori et al. (1975) estimated 309 kg of milk produced from a sample of Baoulé cows during the first 120 days of lactation based on calf weights. Godet (1977) reported a milked-out yield of about 400 g per day in the dry season and about 700 g per day in the rainy season under village conditions.

Growth among Baoulé cattle at Bouaké Centre, as measured by Tidori et al. in terms of weight, is shown in Table 6.

Poivey and Seitz (1977) estimated average calf growth under village conditions from the following linear regressions:

	n		r^2
female	32	$W = 19.5 \pm 0.117D$	0.68
male	23	$W = 14.7 \pm 0.162D$	0.79

where W is weight in kg and D is age in days.

Table 6. Baoulé growth at Bouaké Centre.

	Birth	6 Months	1 Year	18 Months	2 Years	3 Years	Over 4 Years
Female	12 ± 0.3	62 ± 2	96 ± 3	124 ± 3	146 ± 3	166 ± 6	183 ± 4
(N)	(209)	(172)	(144)	(111)	(97)	(41)	(96)
Male	13 ± 0.3	61 ± 2	93 ± 3	127 ± 4	162 ± 5	213 ± 10	267 ± 20
(N)	(176)	(138)	(111)	(81)	(65)	(28)	(9)

Source: Tidori, et al., 1975.

Lhoste (1977) derived an average growth rate of 200 to 350 g/day for periods varying from 80 to 460 days from a number of fattening trials carried out in Centre Region. An intensive fattening trial reported by CRZ (1973) achieved an average growth rate of 496 g/day with 12 Baoulé cattle over a period of 84 days grazing *Stylosanthes* with supplementation.

Dressing out percentages for Baoulé are around 50%. Rombaut (1973) recorded 74% meat, 15% fat and 11% bone for a four-year-old ox weighing 281 kg.

3.1.1.2 Index of Productivity. Table 7 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for three production environments, two involving meat and milk production under village conditions in medium tsetse challenge areas and one involving meat production under improved station conditions under light tsetse challenge.

3.1.2 N'Dama

The Ivory Coast N'Dama seem on the whole very similar to those of Guinea, with uniform coats of yellow, fawn or more rarely brown. However, in the transition zone (Madinani) between Boundali and Odienné, 20 to 30% of the N'Dama have black coats (uniform pied) and about 30% have other variations, indicating a Baoulé influence.

Coulomb (1976) recorded a number of measurements for N'Dama at Bouaké Centre. Measurements of four-years-old animals are given in Table 8 to illustrate the size of this breed.

N'Dama in village herds tend to be smaller, as shown by the measurements reported by Glattleider (1976) given in Table 9.

Table 7. Baoulé productivity estimates.

Parameter	- Production Village/low challenge/ meat and milk	Environment Village/low challenge/ meat and milk	- Station/low challenge/ meat
Cow viability (%)	97	98	98
Calving percentage	48	70	86.7
Calf viability to one year (%)	80	55	88
Calf weight at one year (kg)	70[a]	75[a]	94.5
Annual milked out yield (kg)	48	70	-
Productivity index[b] per cow per year (kg)	32.6	37.3	72.8
Cow weight	180	200	183
Productivity index[b] per 100 kg cow maintained per year (kg)	18.1	18.7	30.8

a. Estimate.
b. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Source: For first environment, personal communication from SODEPRA-Nord, 1978; second environment, Gruvel and Gauch, 1977; third environment, personal communication from Centre d'Elevage de Bouaké, 1978.

Table 8. Measurements of N'Dama at Bouaké Centre.

	Weight (kg)	Height at withers (m)	Heart Girth (m)	Scapulo-Ischial Length (m)
Female (n = 34)	287 ± 8	1.14 ± 0.01	1.56 ± 0.02	1.41 ± 0.02
Male (n = 20)	329 ± 20	1.16 ± 0.02	1.64 ± 0.06	1.45 ± 0.05

Source: Coulomb, 1976 .

Table 9. Measurements of N'Dama cows in two village herds.

	- Odienné 2 Teeth	4 Teeth	6 Teeth	8 Teeth -	- Dabakala 2 Teeth	4 Teeth	6 Teeth	8 Teeth -
Number of observations	17	24	13	48	11	20	25	74
Weight (kg)	142	212	223	267	202	215	219	262
Heart girth (cm)	1.22	1.35	1.42	1.46	1.40	1.43	1.45	1.50
Height at withers (m)	0.99	1.00	1.03	1.04	0.99	1.00	1.00	1.02

Source: Glattleider, 1976.

3.1.2.1 Performance Traits. The age at first calving for heifers with a bull permanently in the herd averages 35 months and 17 days ± 20 days (Coulomb, 1976). When bulls are only introduced during a mating season, the average age at first calving is three years. On the Abokouamekro Ranch (SEDES, 1972) the age at first calving is between 42 and 45 months.

The fecundity rate for N'Dama under improved conditions is excellent - over 80%. At CRZ Bouaké, the fecundity rate is 88.5 ± 3.2% and the average calving interval is 420.8 ± 9 days (Coulomb, 1976). At Abokouamekro Ranch, the fecundity rate is 80%. Under village conditions, however, fecundity is much lower, often only about 50% according to SODEPRA staff members. Camus (1977) reports an average fecundity rate of 36.8% among N'Dama covered by a large survey in northern Ivory Coast. The average fecundity rate for all animals surveyed was 39.2%. He mentions, however, that the survey method could have led to underestimates. Nevertheless, these results indicate that fecundity among N'Dama under village conditions tends to be very low, probably less than 50%. This is lower than the rates achieved under improved conditions on government ranches and research stations by a ratio as large as 1:2.

The calving season for N'Dama cows is mainly from October to January. Coulomb (1976) calculated the percentage of calving in each month for 686 calvings recorded at Bouaké Centre over a ten-year period as follows:

JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
9.2%	8%	5.3%	7.7%	7.9%	3.4%	3.6%	5.5%	8.3%	17.7%	12.3%	11.1%

The greatest number of calvings occurred in October, and 50% of all calvings occurring during the four-month period from October to January.

The mortality rate recorded under improved conditions at the SODEPRA ranches is about 4% for the entire herd, and about 10 to 12% for unweaned calves (Glattleider, 1976). Camus (1977) reports 11.9% mortality for calves under one year under village conditions for the entire SODEPRA Nord Operation, 7.9% for the Odienné area with N'Dama herds, and 6.6% for the Touba area where the herds are largely N'Dama. However, because a number of calf mortalities may not have been recorded, the actual mortality rates have likely been underestimated.

Average N'Dama milk production was estimated by Coulomb (1976) at CRZ Bouaké at 3.3 litres per day during the first four months, based on calf growth. The average length of 11 lactations recorded at CRZ Bouaké was 206 ± 29 days, with an average yield of 588 ± 158 kgs. At the Bingerville breeding Centre in 1964 the average length of 12 lactations was 212 + 48 days with an average yield of 384 ± 136 kg. Some crossbreeding with the Jersey breed to improve milk production has also been undertaken at CRZ Bouaké (Letenneur, 1978) but these results are not quoted here.

The growth of a selected group of N'Dama was recorded at Bouaké Centre as shown in Table 10. Little information is available on N'Dama growth rates under village conditions. Camus estimated weights from measurements of heart girth among village herds as given in Table 11.

Table 10. N'Dama growth at Bouaké Centre.

	Female		Male	
	number	kg	number	kg
Birth	119	17 ± 0.5	111	18 ± 1.0
6 months	189	84 ± 2.0	190	90 ± 2.5
12 months	158	121 ± 3.0	163	130 ± 4.0
18 months	139	154 ± 4.0	134	177 ± 5.0
2 years	128	191 ± 5.0	111	227 ± 5.5
3 years	44	260 ± 8.0	65	311 ± 10.0
4 years	34	287 ± 8.0	20	329 ± 19.0

Source: Centre de Recherches Zootechniques de Minankro-Bouaké.

Table 11. Estimated weights of cattle in village herds (kg).

	2 Teeth	4 Teeth	6 Teeth	8 Teeth
N'Dama	167	184	204	225
(size of sample)	(668)	(342)	(163)	(132)
Zebu x N'Dama	217	233	242	267
(size of sample)	(8)	(9)	(6)	(6)
Baoulé	148	168	187	204

Source: Camus, 1977.

This table indicates that N'Dama under village conditions tend to weigh 10% more than Baoulé, while crossbred Zebu x N'Damatend to weigh more than N'Dama.

Many fattening trials were carried out at Bouaké Centre between 1970 and 1976. From these Lhoste (1977) derives average daily weight gains for N'Dama males from 250 to 700 g, depending on the length of the trial (from 65 to 365 days) and the feeding regime. The conversion ratio is between 9.4 and 18.4. Dressing out percentages for N'Dama are high, ranging from 46.3 to 57.3%.

3.1.2.2 Index of Productivity. Table 12 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for four production environments, two involving meat and milk production under village conditions in medium tsetse challenge areas, one involving meat production under improved station management with light tsetse challenge and one involving meat production under ranch management with medium tsetse challenge.

Table 12. N'Dama productivity estimates.

Parameter	Village/ medium challenge/ meat and milk	Village/ medium challenge/ meat and milk	Station low challenge meat	Ranch/ medium challenge/ meat
Cow viability (%)	98	98	98	98
Calving percentage	45	70	86.7	80
Calf viability to one year (%)	85	55	88	88
Calf weight at one year (kg)	100[a]	100[a]	126	108
Annual milked out yield (kg)	54.1	84.1	-	-
Productivity index[b] per cow per year (kg)	44.6	48.2	97.1	76.8
Cow weight (kg)	250	250	287	260
Productivity index[b] per kg cow maintained per year (kg)	17.9	19.3	33.9	29.5

a. Estimate.
b. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Sources: For first environment, personal communication from SODEPRA-Nord, 1978; for second environment, Gruvel and Gauch, 1977; for third environment, Coulomb, 1976; for fourth environment, personal communication from SODEPRA ranches, 1978.

3.1.3 Méré

Crossbreeding between Zebu and the humpless breeds is extensive in the northern areas, though there is little information about the Méré crossbreds or their numbers (see Figure 3.52, volume 1). Camus (1977) reports out of 1 016 herds observed in the SODEPRA-Nord area, 283, or 27.8%, had a Zebu or crossbred bull or some evidence of crossbreeding. Out of 578 herds observed in Korhogo and Boundiali-Ferké areas, 250, or 43.2%, showed some crossbreeding. He estimates weights of the males in these herds from measurements of heart girth, as given in Table 13. A total of 4 200 animals were measured.

Table 13. Weights of male cattle estimated from heart girths.

	Baoulé		Méré (Zebu x Baoulé)		Zebu	
	no	kg	no	kg	no	kg
2 Teeth	1 229	148	146	186	38	204
4 Teeth	593	168	108	212	67	239
6 Teeth	305	187	61	234	31	268
8 Teeth	189	204	55	260	57	309

Source: Camus, 1977.

Taking average Baoulé weights as a base of 100, the index figures are 126 for Méré and 144 for Zebu. Thus, the average weights of Baoulé males increase by 25% as a result of crossbreeding with Zebu.

3.1.4 Lagune

The Lagune cattle which are found in the coastal and forest areas of Ivory Coast have been described in detail by Verly (1968). Their conformation is similar to the Baoulé, but they are smaller. Generally, they are black-and-white or all black, and sometimes fawn. In the southwest around Sassandra and Tabou, however, the Lagune are frequently red-and-white or patchy red or brown, possible due to a mixture with N'Dama (see Figure 3.29, volume 1). Some authors consider the Lagune from the Sassandra as degenerate N'Dama. Table 14 gives measurements of various southern groups of Lagune cattle recorded by Verly (1968) and obtained during the 1978 country visit on which this report is based.

Table 14. Measurements of Lagune cattle.

	Jaqueville Area (Sud)	Abidjan Area (Sud)	Sassandra Area (Sud)	Sassandra Area (Sud)
Number of animals	74	36	42	10
Age (years)	-	-	5	adults
Liveweight (kg)	156-162[a]	186-201[a]	193-201[a]	130-150[a]
Height at withers (cm)	85 ± 0.3	86 ± 0.5	90 ± 0.5	90.9(88-98)
Scapulo-ischial length (cm)	106.8 ± 0.7	109.4 ± 1.0	113 ± 0.7	109.4(99-124)
Heart girth (cm)	122.6 ± 0.8	131.6 ± 1.3	132 ± 0.7	124.7(120-132)
Husbandry system	traditional	traditional	traditional	palm plantations

a. Weight estimated from measurements.

Sources: For first three columns, Verly, 1968; for last column, country visit, 1978.

3.1.5 Zebu

The Zebu of Ivory Coast are of the Sudanese Fulani type, similar to those of Mali and Upper Volta where they originate. In the northern part of the country, in the Bagoué valley between Tingrela and Boundiali and between Niellé and Ouangolodogou, the Fulani are concentrated with their Zebu herds and there are very few humpless cattle. In more populous areas, Zebu herds are found in small isolated pockets, such as at Tawara, Niofoin and Dikodougou. These herds are fairly stationary: transhumance only occurs on a small scale and over short distances. It is government policy to settle the Fulani herders in the better developed, healthier areas whenever possible.

No detailed information will be given on the performance or productivity of Zebu as they are not in their natural area of distribution. Based on a survey of 9 000 head, Gruvel and Gauch (1977) reported a 40% calf mortality rate, a 28.5% mortality rate for females under one year, an abnormally long generation interval of 6.5 years, a 20% growth rate which was probably an overestimate, a 0.5 to 1.0% surplus of adult males and a 12% average offtake rate, with an annual herd increase of less than 2%.

3.2 DISEASE

The disease situation among cattle in Ivory Coast has been described by Gruvel and Gauch (1977). According to these authors, among infectious diseases rinderpest is a constant threat, requiring annual vaccinations, though there has not been an outbreak since 1973. Contagious bovine pleuropneumonia (CBPP) also causes major problems, stemming from the introduction of diseased animals from Guinea. Brucellosis requires stringent medical precautions, and vaccinations are necessary for blackleg and anthrax, which are endemic. Streptothricosis is found among settled Zebu herds and among improved breeds, which are particularly susceptible. Foot-and-mouth and lumpy skin disease are also present. Parasitical diseases are also widespread. Among samples from Odienné, Boundiali and Korhogo, the Korhogo Laboratory found 39% gastro-intestinal strongylosis, 14% coccidiosis, 37% piroplasmosis, 7% trypanosomiasis and 7% filariosis.

It is generally agreed that trypanosomiasis is widespread throughout Ivory Coast and presents a major obstacle to upgrading or the introduction of new stock. The Korhogo laboratory carried out a survey of the northern departments in 1976. Out of 2 126 samples, 152 were positive, or 7.4%. A number of surveys undertaken over the years confirm this finding, indicating a trypanosomiasis infestation of about 7% in the savanna areas where the humpless breeds predominate

The Korhogo laboratory carried out a survey in 1975 of animals in poor condition from Zebu, crossbred, Baoulé and N'Dama herds likely to be infected with trypanosomiasis. The rate of infection ranged from 4.3 to 6.6% according to breed, but the differences were not significant.

Young animals seem to be the most susceptible to trypanosomiasis. Camus (1977) reported an infection rate of 9.6% among calves under two years, as compared with 4.9% for older animals, among sedentary herds of humpless cattle. The highest percentage of infected animals was in the 15-day-to-3-month age group.

Surveys undertaken by the Dakar laboratory in 1952 found *T. congolense*, *T. vivax* and *T. brucei* in Ivory Coast. Surveys carried out in 1975 by IEMVT found *T. vivax* and *T. congolense* among Zebu and humpless cattle, and it seems that these two species predominate in the north.

3.3 HERD MANAGEMENT AND COMPOSITION

The most common cattle production system in Ivory Coast is a sedentary system, with humpless cattle owned by farmers. There is also some transhumance

or semi-transhumance among Fulani with Zebu herds who have recently come from neighbouring countries, but only the settled production system will be discussed here.

In the north, Baoulé cattle from one village are often herded together by a hired Fulani herdsman. Cattle play an important social role and are often slaughtered for traditional, religious or family feasts. They also represent a form of saving, and commercial offtake is low.

The role of the Fulani herdsmen is very important as the farmers who own the cattle do not supervise their care and may not even be able to identify which animals are theirs. The herdsmen generally receive a salary plus all or part of the milk from the herd, but their social status is precarious and they are often dissatisfied with their terms of employment. For this reason, there is often rapid turnover among herdsmen and the health and wellbeing of the animals tends to suffer.

In a survey in Nord Region supervised by the extension services, Godet (1976) found that among the Lobi people of Bouna the village children looked after the cattle herd. Milking in this area was rarer than elsewhere in the region: less than 50% of the herds were milked at all and only 25% were milked every day.

Poivey and Seitz (1977) surveyed Baoulé herds in Bouna, Dabakala and Korhogo and found from a sample of 761 animals an average herd composition of 31% males and 69% females. They found very few males over two years - virtually no steers and only 6 adult bulls. These findings were confirmed by Kouakou (1977) from a survey of 1 800 head and are probably due to a high offtake rate of young males. Field observations carried out in connection with this study varied widely: there were herds with as many as 5 adult bulls, but 5% of the herds had no bulls over 2 years old at all.

The Baoulé in Ivory Coast are kept almost exclusively under traditional village conditions. However, a few herds have been established under improved conditions by SODEPALM on palm tree plantations. They appear to have adapted very well to this new environment.

The government extension services have distributed N'Dama sires among sedentary herds in the north in an attempt to improve the Baoulé stock. Results have been mixed. Large herds of N'Dama are also maintained on government ranches. Sipilou and Abokouamekro ranches have reached their full stocking capacity of 5 000 and 4 000, while La Marahoué Ranch, with 3 000 N'Dama, is still growing. The management system on these ranches is described in chapter 3 of volume 1.

N'Dama have also been introduced on palm tree plantations by SODEPALM with the aim of absorbing the Baoulé. In addition, they are the most suitable breed for draught animals. The use of draught oxen is a fairly recent innovation in Ivory Coast, linked with cotton cultivation. As of 1977, there were about 15 000 draught oxen used in the cotton-growing area.

Lagune cattle are kept in areas where the farmers do not traditionally keep cattle. They are rarely herded.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

Sheep in the Ivory Coast are of the Djallonké breed, also called Guinea or Dwarf West African sheep. Two varieties may be distinguished: the dwarf sheep found in forest areas, and the larger Djallonké Savanna sheep in the north.

Goats in the Ivory Coast are of the West African Dwarf or Guinea type. They are found throughout the country.

4.1.1 Sheep

4.1.1.1 Performance Traits. Rombaut and Van Vlaenderen (1976) report for sheep under village conditions an average height at withers of 40 to 60 cm and an average weight of 20 to 30 kg for adult females and 25 to 35 kg for adult males. Measurements recorded by Ginisty (1976) are given in Table 15.

Table 15. Measurements of sheep.

	Females					Young Males
	1 Tooth	2 Tooth	3 Tooth	4 Tooth	5 Tooth	over 1 Year after Fattening
Average weight (kg)	17.8	19.1	21.1	23.3	21.0	24.0
Heart girth (cm)	61.7	63.2	66.7	69.1	65.7	67.4
Height at withers (cm)	50.7	50.8	51.2	54.7	52.2	52.7
Height to sternum (cm)	29.7	30.2	29.5	30.8	30.2	29.5
Scapulo-ischial length	-	-	-	-	-	60.0

Source: Ginisty, 1976 .

The same author checked oestrus twice a day in female lambs, and observed the first heat on average at 259 days (206 - 322 days). From this, the age at first lambing can be reckoned at 13 to 14 months. Rombaut and Van Vlaenderen (1976) reported a faster rate of development in southern Ivory Coast, with an average at first lambing of 11.5 months (9.5 - 14 months) They calculated a fecundity rate of 206%, based on short lambing intervals (75% were 7 months or less) and a 27% twinning rate.

In spite of these indications of excellent fecundity and satisfactory prolificacy among local sheep, Rombaut and Van Vlaenderen (1976) report a poor reproductive performance due to high mortality rates among the young. Among ewes mated when they were four to eight months old, there was an 89% mortality rate for lambs under

one year. Among adult ewes, the mortality rate of lambs under one year was 62.5%. Lamb mortality rates were also higher among ewes who gave birth very frequently. Among those with a lambing interval of less than seven months, the lamb mortality rate was 76%. Among ewes with a lambing interval of seven months or more, on the other hand, the lamb mortality rate was only 19%. This poor productivity could be improved by better flock management, including controlled weaning, protection of female lambs and better spacing of mating, which would improve the condition of the ewes.

These findings were confirmed by Ginisty (1976), who studied reproductive parameters among sheep under traditional village conditions. He found that fertility was higher than 160%, as the females mated freely and lambed more than three times in two years. The prolificacy rate, on the other hand, was only 110%, meaning 10% twin births. This gave a fecundity rate of around 175%. However, the actual productivity of these village flocks was poor because up to 50% of the lambs died under four months of age.

The same author carried out an experiment with 400 ewes, comparing the reproductive performance of animals fed four types of improved diet with that of a control group. The results are shown in Table 16, with all the animals fed on improved diets grouped together.

Table 16. Reproduction performance of ewes under normal and improved feeding.

	Improved Diet	Control Group	Total
Fertility	88%	83%	86%
Prolificacy	113%	102%	110%
Fecundity	99%	85%	95%
Mortality of young	15%	48%	24%

Source: Ginisty, 1977.

These results confirm the observation that high lamb mortality rates are due to the poor condition of the ewes which is related to the reproduction pattern (Rombaut and van Vlaenderen, 1976) and to inadequate feeding.

Rombaut and Van Vlaenderen (1976) compared birth weights with lamb mortality rates for a sample of Ivory Coast sheep. Results are given in Table 17.

Ginisty (1976) reported preweaning growth rates for male lambs. The average daily gains are shown in Table 18. He also carried out several fattening trials with young male sheep (1976, 1977). The most important results are given in Table 19.

Table 17. Birth weights and lamb mortality.

Weight	% of all Births	Mortality to 5 months
under 1 kg	13%	100%
between 1 and 1.5 kg	45%	80%
between 1.5 and 2 kg	29%	56%
over 2 kg	13%	-

Source: Rombaut and van Vlaenderen, 1976.

Table 18. Average daily gains for male lambs.

	0-30 Days (g/day)	0-60 Days (g/day)	30-120 Days (g/day)	0-120 Days (g/day)	Weight at 4 Months (kg)
Improved conditions at SOCIABE Station	125-145	110-125	90	100	14
Village conditions	70-95	50-65	50-55	55-60	9-10

Source: Ginisty, 1976.

Table 19. Weight gains and conversion ratios for young male sheep.

	1976 Trial - Fodder + Concentrates	1977 Trial - Straw + Concentrates	1977 Trial - Savanna + Concentrates
Animals	young males	6-month-old males	7-month-old males
Trial period	182 days	90 days	90 days
Weight at start (kg)	12.2	15.4	15.6
Weight at end (kg)	25	23.8	25.5
Average gain (g/day)	70	93	110
Conversion ratio	8.2	7.4	-

Source: Ginisty, 1976, 1977.

Ginisty (1976) reports excellent dressing out percentages of 46.7% for ungraded Djallonké males and 49.6% for fattened males. He found a typical carcass composition of 64% muscle, 20% fat and 16% bones.

4.1.1.2 Index of Productivity. Table 20 summarizes estimates of the major production traits required to build up a productivity index based on the total weight of five-month-old lamb produced per 10 kg of ewe maintained per year. This productivity index has been derived for production under village and simulated village conditions in medium tsetse challenge areas.

Table 20. Productivity estimates.

Parameter	- Production Environment -	
	Village	Village Simulation
Ewe viability (%)	84	38
Lambing percentage	175	206
Lamb viability to one year (%)	50	50
Lamb weight at five months (kg)	11.5	14
Productivity index[a] per ewe per year (kg)	10.9	20.9
Ewe weight (kg)	23	23
Productivity index[a] per 10 kg ewe maintained per year (kg)	4.7	9.1

a. Total weight of five-month-old lamb produced.

Source: Country visit information.

4.1.2 Goats

There is no written information on goat production in Ivory Coast, but general observation suggests that goats tend to weigh slightly less than sheep in the same area, that prolificacy is higher among goats than among sheep (more frequent twinning), and that growth among goats is slower than among sheep (see Figure 3.85, volume 1).

4.2 DISEASES

The main disease problems among sheep and goats are Peste des Petits Ruminants (PPR), gastro-intestinal parasites, which mainly present problems among the young, and respiratory diseases.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

Ivory Coast has a Ministère de la Recherche Scientifique. Within this Ministry, the animal production research activities are essentially confined to the Centre de Recherches Zootechniques de Minankro-Bouaké.

In the framework of the Ecole Nationale Supérieure d'Agronomie (ENSA), the Departement de Zootechnie also plans to carry out animal production research on mineral nutrition and small ruminants. These activities are still being set up, and have not yet produced any results. Other organizations under the Ministère de la Production Animale carry out field and laboratory studies in animal production, including the Cellule d'Appui of SODEPRA Nord and the Laboratoire de Pathologie Animale at Bingerville.

The Centre de Recherches Zootechniques de Minankro-Bouaké (CRZ) (B.P. 1152, Bouaké) is located 7 km north of Bouake as indicated by ●1 in Figure 1. The centre also operates a sheep farm at Foro, 30 km north of Bouaké. The CRZ is part of the Departement Elevage of the Institut des Savanes (IDESSA), based in Bouaké, which is under the Ministère de la Recherche Scientifique.

The centre covers 470 ha (80% of which has been improved), and the sheep farm accounts for another 100 ha. As of 1978, there were 500 head of cattle, including 250 N'Dama and 150 Jersey x N'Dama, as well as 150 Baoulé which had been purchased but not yet brought to the centre. As of December 1977, about 500 head of local sheep were kept on the sheep farm.

The centre carries out studies of local cattle and sheep breeds, focussing on such areas as genetics, nutrition and production systems, in order to improve their productivity. Studies of natural pastures are also carried out, as well as possibilities for improvement in the areas of management, pasture dynamics, fertilization and fodder crops.

The centre also operates five outposts in cattle rearing areas. Their work is designed to provide information on productivity at the village level for the different local breeds.

The Laboratoire de Pathologie Animale de Bingerville (B.P. 206, Abidjan) is located near Abidjan, as shown by +2 in Figure 1, with one outpost in Korhogo (Nord Region) and another planned in Bouaké (Centre Region). This laboratory comes under the Ministère de la Production Animale.

Diagnostic work is carried out in the fields of parasitology, bacteriology and virology, poultry vaccines are produced. In 1977-78, the laboratory was supported by FAO/UNDP.

5.2 MULTIPLICATION HERDS

The major livestock multiplication activities in Ivory Coast are carried out by the Société de Developpement de Productions Animales (SODEPRA) (B.P. 1429, Abidjan) through its three N'Dama ranches described in Table 21.

Table 21. SODEPRA ranches for N'Dama cattle.

Name	Abokouamekro	Sipilou	La Marahoue
Location and reference in Figure 1	near Yamoussoukro 120 km south of Bouaké ●3	near Biankouma northwest of Man ●3	northeast of Séguéla ●3
Size	12 000 ha	10 000 ha	60 000 - 100 000 ha
Numbers	4 000 N'Dama	5 000 N'Dama	3 000 N'Dama (still being developed)
Starting year	1962	1964	1975
Objectives: Selection and multiplication of the N'Dama breed.			

The Ministère de la Production Animale is also responsible for three livestock breeding centres distributed in each of the three main production areas. The Centre d'Elevage de Bingerville in the Sud Region near Abidjan works with poultry, but has recently set up an artificial insemination centre equipped to collect and freeze cattle semen. The Centre d'Elevage de Bouaké in the Centre Region kept a herd of Baoulé in the past and more recently a sheep flock. At present, this centre has no permanent herd, but rather serves as a transit station. The Centre d'Elevage de Korhogo in the Nord Region, with 350 ha, mainly works on pig production, but has a small herd of 20 Zebu cows and 20 crossbred Gobra Zebu x N'Dama.

The Centre National Ovin is located at Beoumi in the Centre Region 60 km west of Bouaké, as shown by ■4 in Figure 1. This centre, under the Ministère de la Production Animale, is currently developing its own local sheep flock with the aim of improving and multiplying the local sheep. External aid is provided by the Economic Development Fund of the European Economic Community.

The Société pour le Développement du Palmier à Huile (SODEPALM) (B.P. 2049, Abidjan) has recently started cattle production on its palm plantations. Herds are kept on six coastal plantations as shown by ■ 5 in Figure 1, composed of Baoulé, crossbred and N'Dama cattle from Nord Region. As of 1977, there were 2 800 Baoulé and crossbreds at Ehania plantation, 1 100 Baoulé at Toumanguié, 850 N'Dama at Fresco, 300 N'Dama and 100 Baoulé at Tamabo, 70 N'Dama and 250 Baoulé and crossbreds at Anguedou and 220 N'Dama at Eloka. These herds are still being expanded (see Koua Brou, 1977).

5.3 DEVELOPMENT ACTIVITIES

Livestock development activities in Ivory Coast are mainly carried out by SODEPRA.

The Opération d'Encadrement de l'Elevage Sédentaire au Nord Côte d'Ivoire (known as SODEPRA-Nord), with headquarters at Korhogo (B.P. 24, Korhogo) as shown by ▲ 6 in Figure 1, covers eight departments of the Nord and Ouest Regions: Bouna, Ferké, Korhogo, Boundali, Odienné, Touba, Biankouma and Séguéla. Work is carried out with Baoulé, N'Dama and Zebu x humpless crossbreds. The objectives are to set up extension services and to increase the trypanotolerant cattle population in northern Ivory Coast. These activities are organized in five areas, covering 30 sectors and 200 extension centres which are responsible for about 1 200 extension herds. External aid is provided by France (IEMVT and SEDES), Germany (GTZ) and Belgium (AGCD). The project period is 1975 - 1979, following up an earlier project carried out during 1972 - 1974. This project will be followed in turn by another phase, lasting until 1982.

More recently, in the Nord Region, an Operation d'Encadrement des Zebus dans le Nord has been initiated which provides extension services to the Fulani aimed at improving their livestock production.

The Projet de Promotion des Fermes d'Elevage en Region Centre (known as SODEPRA-Centre) has its headquarters at Bouaké (B.P. 1366, Bouaké), as shown by ▲ 7 in Figure 1. This project was launched in 1975-1976 with FAO cooperation and objectives similar to those of SODEPRA-Nord. It covers seven departments: Bouaké, Katiola, Dabakala, Dimbokro, Boundoukou, Bouaflé and Daloa. The objective is to provide extension services aimed at developing cattle, sheep, goats, pigs and poultry production. External aid is provided by FAO.

Some other programmes of the Ministère de la Production Animale are the Centre d'Embouche Industrielle de Ferkessedougou (a project aimed at fattening Zebus from Mali and Upper Volta with West German aid); the Ferme Semencière de Badikaha, largely involved in seed production but with some N'Dama steers and Baoulé; and the Bovins - Industriels - Viande Project, an intensive cattle breeding project aimed at meat production which is still at the planning stage.

The Compagnie Ivoirienne des Textiles (CIDT), with headquarters at Bouaké (B.P. 622, Bouaké) as shown by △ 8 in Figure 1, carries out cotton cultivation with 15 000 draught oxen in the savanna area. The Société pour l'Aménagement de la Vallée du Bandama (AVB), with headquarters at Bouaké, is interested in developing agricultural production systems based on rotation with fodder crops (*Stylosanthes* spp.). Cattle fattening and sheep breeding trials have been carried out in cooperation with the Centre de Recherches Zootechniques de Minankro-Bouaké.

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CHAPTER 10

GHANA

1. BACKGROUND

The Republic of Ghana lies on the west coast of Africa, with the Ivory Coast to the west, Upper Volta to the north and Togo to the east. The country is divided into nine regions, with the capital at Accra, as shown in Figure 1.

Two departments in the Ministry of Agriculture have responsibilities in the livestock sector: the Veterinary Services and the Animal Husbandry Department. These both have regional offices in the main towns of each region.

Basic data for the country are given in Table 1.

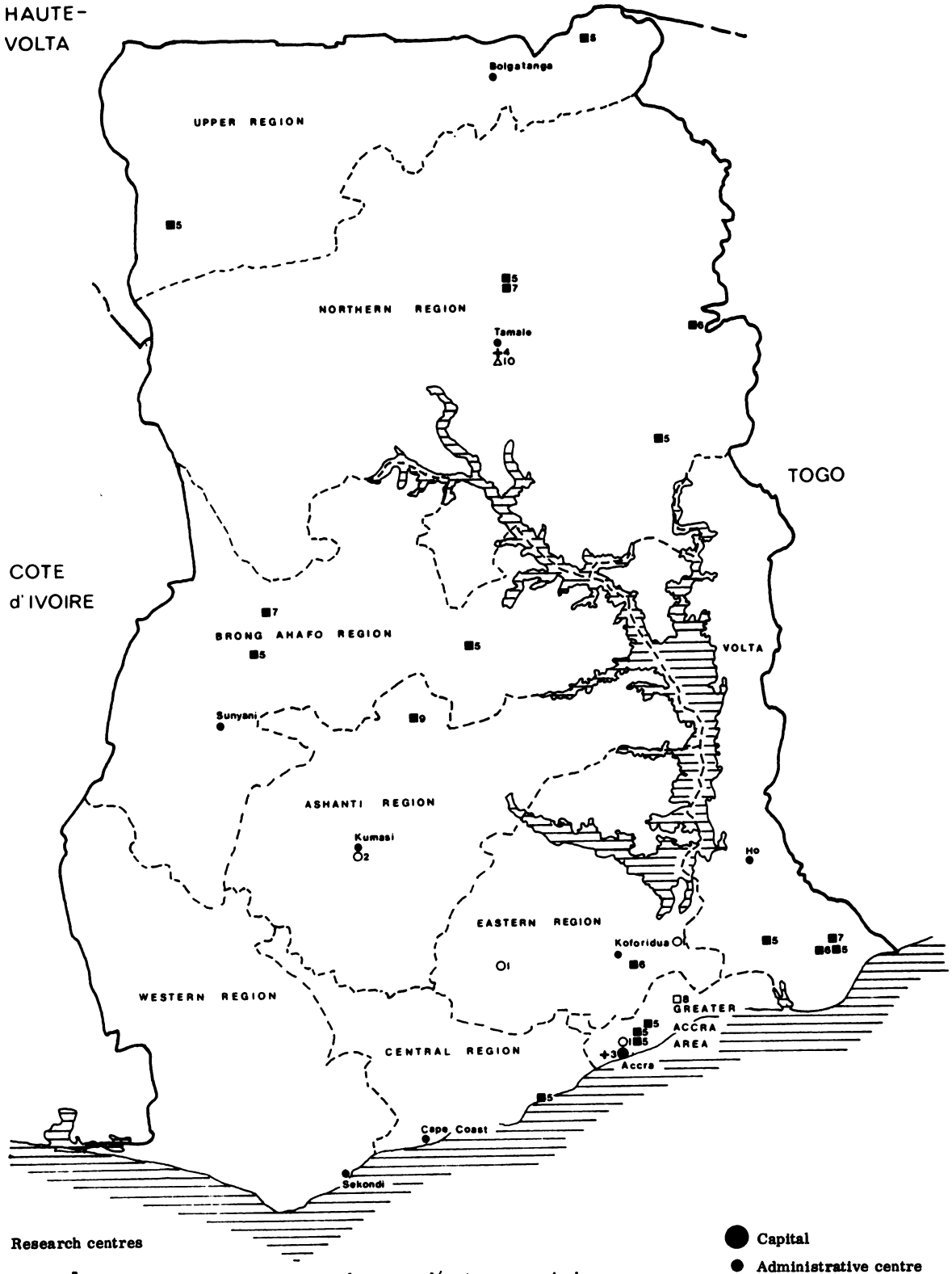
Table 1. Background data for Ghana.

Area	238 500 km^2
Latitude	$4^{o}30'$ - 11^{o} N
Longitude	$1^{o}15'$ E - $3^{o}15'$ W
Population	
number	10 000 000
density	41.9/km^2
Livestock numbers	
cattle	777 000
sheep	905 000
goats	780 000

Sources: For population, national estimates and FAO, 1976; for livestock numbers, Ghana, Veterinary Services, Ministry of Agriculture, 1975.

From north to south, the climate varies from Sahelo-Guinean to Sudano-Guinean to Guinean savanna and forest. The annual rainfall ranges from 1 000 mm in the northeast to 2 300 mm in the southwest. In addition, the Accra plains form a

Figure 1. Administrative divisions and location of research centres, multiplication herds and development projects.



savanna region which is unusual for the coastal belt. This region, which extends eastward as far as Togo, receives an annual rainfall of only 800 to 1 000 mm.

According to the OAU/STRC (1977) tsetse distribution map, the entire country is infested with tsetse. *G. tachinoides* and *G. morsitans* are found in the northern region, though *G. morsitans* is less common. *G. palpalis* is found throughout the country except for a small pocket in the north, and *G. longipalpis* is found in the transitional savannas of the central region. *G. fusca, G. pallicera pallicera, G. medicorum* and *G. tabaniformis* are found in the southwestern forest zone. Though many types of tsetse are present, many specialists believe that the level of infestation is low in several regions, for example, the extensive northern areas and the Accra plains.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

Table 2 gives livestock numbers in the nine regions as reported in the 1975 census carried out by the Ministry of Agriculture.

Table 2. Livestock numbers in Ghana, 1975 ('000).

Region	Cattle		Sheep		Goats	
	No.	%	No.	%	No.	%
Upper	305	39.3	241	26.6	230	29.5
Northern	276	35.5	224	24.8	215	27.6
Brong Ahafo	17	2.2	80	8.8	67	8.6
Ashanti	5	0.6	107	11.8	64	8.2
Western	2	0.3	65	7.2	35	4.5
Central	5	0.6	38	4.2	33	4.2
Eastern	8	1.0	43	4.8	40	5.1
Volta	77	9.9	85	9.4	82	10.5
Greater Accra	82	10.6	22	2.4	14	1.8
Total	777	100	905	100	780	100

Source: Ghana, Veterinary Services, Ministry of Agriculture, 1975.

According to these figures, the distribution of cattle is very uneven. Upper and Northern Regions account for 75% of the national herd, and the relatively dry plains of Greater Accra and Volta Regions in the southeast account for another 20%. There are very few cattle in Ashanti or Brong Ahafo Regions in the central part of the country or in the forest zone, which includes Western, Central and Eastern Regions.

The Central Bureau of Statistics (1977) reports a much higher cattle population, as indicated in Table 3, though this discussion will be based on the figures provided in Table 2.

Table 3. Livestock population, 1969-74 ('000).

	1969	1970	1971	1972	1973	1974
Cattle	900	926	855	839	876	912
Sheep	1 300	1 315	1 337	1 421	1 506	1 606
Goats	1 400	1 356	1 615	1 587	1 559	1 616

Source: Ghana, Central Bureau of Statistics, 1977.

Sheep and goats are more evenly distributed than cattle, but they are also heavily concentrated in the north. Upper and Northern Regions account for 50% of the national sheep population and 57% of the goats according to the Veterinary Services (1975).

3. CATTLE

The local cattle breeds found in Ghana, in order of numbers, are West African Shorthorn or Ghana Shorthorn (WAS), Sanga, Zebu (White Fulani and Sokoto Gudale), N'Dama and Dwarf West African Shorthorn. In addition, a number of exotic breeds have been imported for research purposes and are bred both as purebreds and crossbreds. These include Holstein-Friesian, Jersey, Droughtmaster (from Australia) Santa Gertrudis, Nellore Zebu (from Brazil), Red Poll and Austrian Brown. There are also small numbers of Hereford, Boran, Sahiwal, Brahman and Braford. The distribution of the main local breeds among the regions can be estimated from the Veterinary Services' census (1975), as shown in Table 4.

Table 4 indicates that the Ghana Shorthorn is the predominant cattle breed in Ghana, accounting for 79% of the national herd together with its crosses. Most of the crossbreds resemble the shorthorn type more closely than they do the Zebu. Next in number are the Sanga, a cross between the Ghana Shorthorn and the Zebu, accounting for about 120 000 head. Like the Zebu, the Sanga are found in the drier areas: towards the northern border and on the Accra plains extending into Volta Region. The proportion of Sanga and Zebu increases towards the northeastern corner of the country around Bawku. Relatively pure Zebu are found on the Accra plains, often in the same herds with Sanga. The N'Dama are scattered throughout the country, and are often crossbred in the villages (see Figure 2).

Figure 2. Cattle numbers and breed distribution.

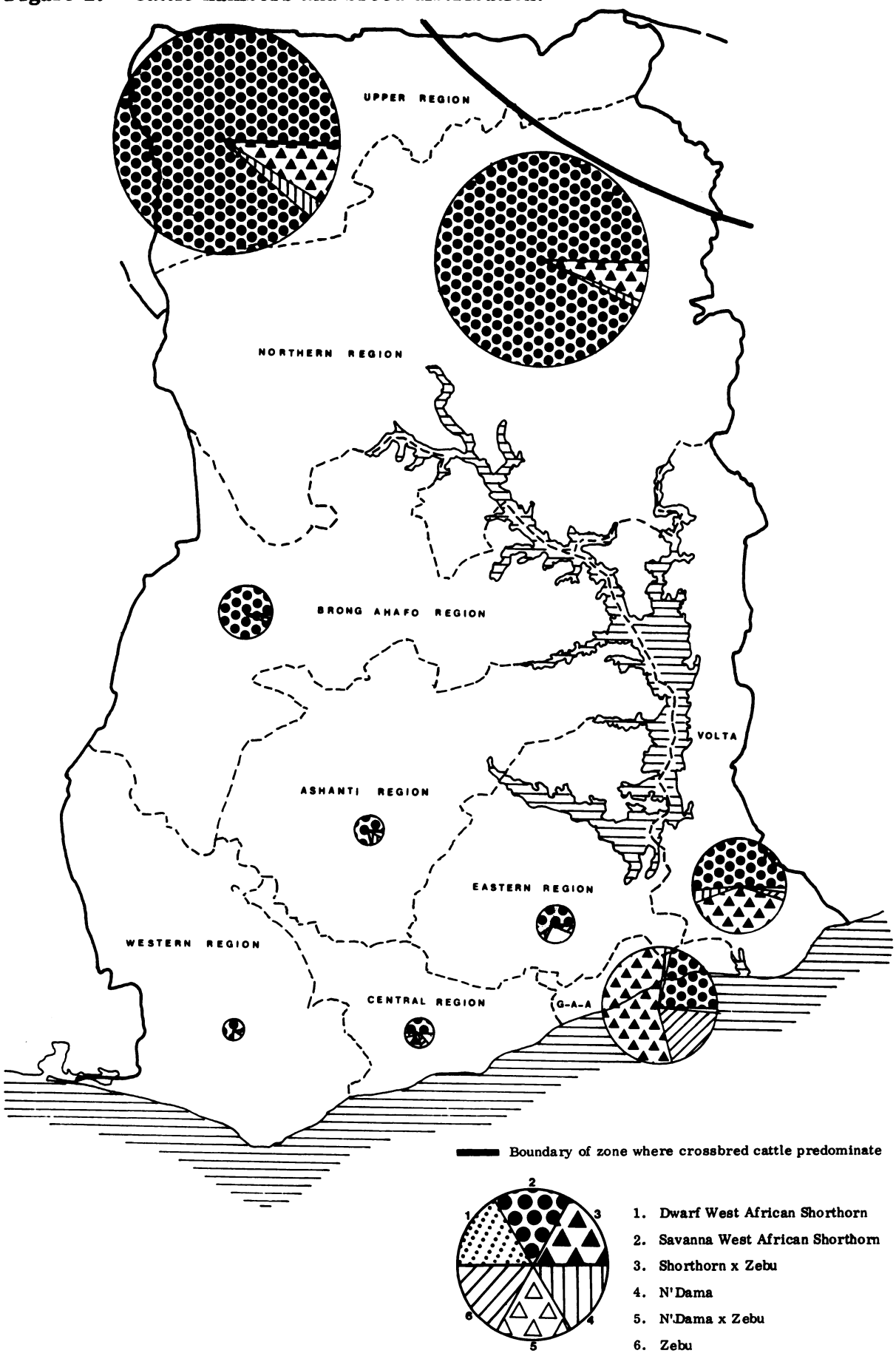


Table 4. The distribution of local cattle breeds in Ghana.

Region	Ghana Shorthorn and Crosses	Sanga	N'Dama	Zebu	Others
Upper	270 000	25 000	8 000	2 000	
Northern	257 000	15 000	3 000	1 000	
Brong-Ahafo	16 000	300	500	200	
Ashanti	4 000	300	600	100	
Western	1 500	400	-	100	
Central	2 500	1 300	200	500	500
Eastern	5 200	2 000	300	500	
Volta	42 000	30 000	3 000	1 000	1 000
Greater Accra	18 000	48 000	1 000	14 000	1 000
Total	616 200	122 300	16 600	19 400	2 500
% of National Herd	79%	16%	2.1%	2.6%	0.3%

Source: Ghana, Veterinary Services, Ministry of Agriculture, 1975.

3.1 BREED DESCRIPTION

3.1.1 Ghana Shorthorn

The Ghana Shorthorn breed belongs to the West African Shorthorn (WAS) group. WAS (pronounced 'wass') is the term most frequently used in Ghana to describe all cattle with a general Shorthorn appearance, even if traces of crossbreeding are evident.

Towards the northwestern border around Bole, Wa, Lawra and Tumu, there is a high concentration of relatively pure Ghana Shorthorns similar to the populations found in Ivory Coast around Bouna and in Upper Volta near Gaoua. Towards Bawku in the northeast, the proportion of Zebu in the herds increases and signs of crossbreeding can be seen, such as a generally larger size and stronger horns. The average height of the Ghana Shorthorn ranges from 1.00 to 1.10 m at withers according to Ngere (1974) and USAID (1967), but the purebred animals around Wa rarely reach this size.

The age at first calving is around 34.8 $\pm$ 1.2 months, compared with 39 $\pm$ 1.6 for the N'Dama and 38.6 $\pm$ 1.1 for the Sokoto Gudale Zebu, according to studies carried out at Nungua (now Legon Agricultural Research Station) (Sada, 1968). Field observations suggest that calving generally occurs during the dry season from November to February. Calving rates recorded at government stations are between 60 and 70% (Capitaine, 1972). At Nungua from 1957 to 1966, the calving interval for the Ghana Shorthorn was 444 $\pm$ 13 days (n=99), compared with 457 $\pm$ 12 days (n=111) for the N'Dama and 465 $\pm$ 17 days (n=60) for the Sokoto Gudale Zebu (Sada, 1968).

Capitaine (1972) reported a mortality rate among calves to one year of 35 to 45% under village conditions and 10% under ranch conditions. Mortality from one to two years was 10 to 15% under village conditions and 3 to 4% under ranch conditions, and adult mortality was around 4% under both conditions.

Montsma (1960, 1962) compared milk production estimates for Ghana Shorthorn, N'Dama and Sokoto Gudale Zebu cows by weighing calves three times a day before and after suckling at the Nungua station. Two experiments were carried out under different conditions. First, the milk yields were compared of cows lactating mostly during the dry season who were given small quantities of silage and concentrates. The average milk yields over 182 days were 383.5 ± 30.4 kg for Ghana Shorthorn, 460.4 ± 18.4 kg for N'Dama and 604.0 ± 30.8 kg for Sokoto Gudale Zebu (Montsma, 1960).

In the second experiment, the milk yields were compared of cows lactating mostly during the rainy season who were on a high level of supplementation. Their average milk yields over 252 days were 1 001 ± 27.4 kg for Ghana Shorthorn, 943 ± 38.1 kg for N'Dama and 1 531 ± 65.6 kg for Sokoto Gudale Zebu (Montsma, 1962). A similar experiment was carried out at Nungua in 1971, estimating the milk yields of 14 Ghana Shorthorn cows between their third and fifth lactation. Over a period of 295 days, the average milk yield was 774 ± 27 kg, and the butterfat content was estimated at 5.4% (Ngere et al., 1975).

Montsma (1960) reported birth weights of 19 to 20 kg for male Ghana Shorthorn calves and 18 to 19 kg for females, depending on the time of calving. The same author in 1962 reported average birth weights of 21 kg for Ghana Shorthorn, 19 kg for N'Dama and 27 kg for Sokoto Gudale Zebu and weaning weights at 36 weeks of 154, 138 and 214 kg for the three breeds respectively.

Capitaine (1972) reported a survey carried out by Kassem in 1965 who obtained the following average weights for Ghana Shorthorn:

	6 months	12 months	18 months	24 months	36 months
female	101	134	147	182	229
male	80	135	134	178	256

USAID (1967) reported adult weights of 170 to 180 kg for Ghana Shorthorn cows and 190 to 200 kg for bulls under village conditions.

Ghana Shorthorn cattle are very good natured: in northern Ghana they are often tended by children who may ride on their backs (see Figure 3.47, volume 1). Around Tamale, this breed is used as draught oxen, but crossbreds are more often used because the purebred animals tend to be small.

3.1.2 Ghanaian Sanga

In Ghana, the Sanga is a crossbreed between a humpless breed and Zebu (see Figure 3.57, volume 1). This natural crossbreed seems to have been in existence for some time and is also found in other countries. The humpless breed used for the cross is nearly always a Ghana Shorthorn, while the Zebu is usually one of the Sudanese types, often the White Fulani. Sometimes, the N'Dama replaces the

Ghana Shorthorn, and the Sokoto Gudale Zebu may also be used. Some government stations have bred a special Sanga type called the Ndagu, which is a N'Dama x Sokoto Gudale Zebu cross.

There are about 122 000 Sanga in Ghana and their numbers are increasing at the expense of the Ghana Shorthorn. The Sanga are often herded with Zebu in the drier areas with relatively low tsetse challenge, particularly in the Greater Accra and Volta Regions.

As a crossbreed, the Sanga is understandably variable. In southern Ghana there is a fairly uniform type, predominantly white, frequently with black pigmentation on the ears and mucosa and sometimes with black spots, resembling the Borgou of Benin. This type is apparently a cross between the Ghana Shorthorn and White Fulani Zebu, but it is not clear how the White Fulani ancestry was introduced in this area on such a large scale.

Although the Sanga is kept on a number of government farms, there is little information available on performance traits. According to USAID (1967), average body weights are as follows (kg):

	Birth	1 Year	2 Years	3 Years
female	24	120	238	306
male	24	125	250	328

Observations in the field suggest that these weights are higher than those generally achieved under village conditions.

The Sanga has a higher milk yield than the Ghana Shorthorn, and because it is larger it is more widely used as a draught animal. In low tsetse challenge areas, it is considered a good breed for beef production under ranch conditions, such as on the Shai Hills Ranch near Accra.

3.1.3 N'Dama

N'Dama were first brought to Pong Tamale in northern Ghana in 1932, and since then have been bred on government farms, stations and ranches. They are also kept in the villages for crossbreeding with the Sanga and Ghana Shorthorn. Though traces of N'Dama ancestry can be detected in the local cattle, this breed has not made a substantial contribution to Ghanaian stock outside the government farms and ranches.

In some cases, such as at the Legon Agricultural Research Station, two types of N'Dama may be distinguished: the Guinean N'Dama and the Gambian N'Dama. Most of the N'Dama are of the Guinean type; those recently imported from The Gambia are distinguished by their lighter colour and longer and slightly better shaped horns.

Most of the production data available for the N'Dama were presented in the discussion of the Ghana Shorthorn for comparison purposes. Capitaine (1972)

reported the following average weights for this breed:

	6 Months	12 Months	18 Months
female	97	142	147
male	106	164	176

3.1.4 Dwarf West African Shorthorn

Typical Dwarf West African Shorthorn, similar to the Lagune breed, are found in Ghana but their numbers appear to be decreasing. These cattle are also called Muturu. They are found in the southeastern coastal area near Ada and Keta Lagoon. There is very little information on this breed in Ghana. Montsma (1959) reported an average weight for 40 adult cows in village herds of 166 $\pm$ 2 kg, an average height at withers of 0.88 $\pm$ 0.04 m, a heart girth of 1.30 $\pm$ 0.1 m and a body length of 1.07 $\pm$ 0.06 m.

3.1.5 Zebu

The Zebu breeds account for only 26% of the cattle population in Ghana, as shown in Table 4. Those in the northern regions have come from Upper Volta and are of the Sudanese Fulani type. Zebu have also been bred as part of government multiplication and crossbreeding schemes. The white breeds, such as the White Fulani, are particularly popular because they have been bred extensively on government farms, along with the Sokoto Gudale Zebu from Nigeria and the Nellore Zebu, recently imported from Brazil.

A great deal of data are available at the Legon Station on milk yields, growth and other production traits of the Sokoto Gudale Zebu (Montsma, 1962; Thompson, 1975). Some of this information was presented in the discussion of the Ghana Shorthorn for comparison.

3.1.6 Exotic Breeds and Experimental Crossbreeding

Substantial numbers of exotic cattle have been introduced in Ghana on government ranches and research stations, and a number of crossbreeding experiments have been carried out. These activities will not be discussed in this report, as they occur in special situations and no pertinent information was collected in the field.

3.2 DISEASE

The most important cattle diseases in Ghana are contagious bovine pleuropneumonia (CBPP), anthrax, blackquarter, brucellosis and foot-and-mouth disease. Trypanosomiasis is also present, but not a serious problem according to the Veterinary Services since most of the cattle are trypanotolerant.

Tick-borne diseases, such as piroplasmosis and rickettsiosis, and streptothricosis are serious problems for imported livestock and restrict the introduction of

exotic breeds. Droughtmaster cattle from Australia are particularly sensitive to streptothricosis, according to staff members of the Pong Tamale Veterinary Laboratory and the Shai Hills Ranch.

A crossbreeding experiment was carried out in the Sogakofe area using artificial insemination with imported semen from seven exotic breeds. All the animals produced proved to be sensitive to streptothricosis to some extent. According to the Veterinary Services, the Droughtmaster crosses were extremely sensitive, the Brahman, Friesian and Hereford crosses were very sensitive and the Bradford, Boran and Sahiwal crosses were somewhat sensitive.

3.3 HERD MANAGEMENT AND COMPOSITION

Most cattle owners in Ghana are farmers, but increasingly town dwellers are becoming absentee cattle owners, using hired herdsmen. Except for these absentee owners, the typical family owns a small number of cattle, 5 to 20 in the Northern Region for example. By contrast, herds on the Accra plains may reach several hundred head. Average herd composition figures for the nine regions are given in Table 5.

Table 5. Herd composition by region (%).

Region	Cows	Heifers	Calves	Bulls	Young Bulls	Oxen	Breeds Probably Dominant
Western	44	21	23	3	6	3	Ghana Shorthorn
Central	38	23	23	3	9	4	Ghana Shorthorn
Volta	45	17	21	2	8	7	Ghana Shorthorn, Sanga
Accra	41	23	20	2	9	5	Sanga, Ghana Shorthorn, Zebu
Eastern	41	22	20	2	8	7	Ghana Shorthorn
Ashanti	40	17	22	6	9	6	Ghana Shorthorn
Brong Ahafo	42	18	19	5	12	4	Ghana Shorthorn
Northern	44	17	19	4	11	5	Ghana Shorthorn
Upper	40	20	15	6	11	8	Sanga, Ghana Shorthorn
Overall	42	19	18	5	10	6	Ghana Shorthorn

Source: Ghana, Veterinary Services, Ministry of Agriculture, 1975.

Herd composition figures were also obtained for four districts in Upper Region by Gunn Rural Management Property Ltd. (1977). These are given in Table 6.

Relatively high percentages of oxen are kept in areas where they are used as draught animals. In Tamale and Bolgatanga, for instance, oxen may account for as much as 10% of the herds.

Table 6. Herd composition in four districts of Upper Region (%) and average holdings.

	Cows	Heifers	Calves	Bulls	Young Bulls	Oxen	Average Number per Owner
Wa	44	22	24	3	7	-	19
Tumu	39	17	28	4	10	2	18
Bolgatanga West	36	17	15	12	9	11	12
Nangodi	37	16	15	12	11	9	8

Source: Gunn Rural Management Property Ltd., 1977.

In the north, which is the main livestock region, herds are usually tended by the village children (see Figure 3.47, volume 1). Often the animals of several households are herded together, tended by a number of children. It is also becoming more common to hire a Fulani herdsman to look after cattle, particularly among absentee owners. The Fulani keep the herds in pens at night and milk them regularly, as the milk is a large part of the herdsman's salary (see Figure 3.46, volume 1). A farmer may allow a herd to graze on his land in exchange for the manure produced: this arrangement is particularly common in the southeast.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

4.1.1 Sheep

Most of the sheep in Ghana are of the West African Dwarf breed, also known as the Forest type. Some crossbreeding is carried out with the larger Sahelian sheep, but crossbreds account for only 10% of the total population. At Legon Agricultural Research Station,a crossbred has been produced called Nungua Blackhead, between the local Forest type and the Persian Blackhead (Somali). Measurements for the Forest type and the new crossbreed are given in Table 7 and weights in Table 8.

Two fattening trials were carried out with West African Dwarf sheep at the Kumasi University Farm. Over a 125-day period, eight animals of both sexes were fed *Cynodon plectostachyus* and concentrates and another group of eight were fed the same diet plus rice straw. The results of this experiment are presented in Table 9.

Table 7. Measurements of Forest and Nungua Blackhead sheep.

	Forest Type			Nungua Blackhead		
	Young (15 mo.)	Ewe	Ram	Young (15 mo.)	Ewe	Ram
Body weight (kg): mean	17	21	26	22	32	39
range	15-19	20-28	-	19-27	26-42	29-48
Height at withers (cm):						
mean	48	49	53	53	58	60
range	45-50	49-50	-	51-56	56-60	59-61
Heart girth (cm): mean	65	68	73	72	84	84
range	56-69	67-69	-	65-80	78-88	81-88

Source: Ngere, 1973.

Table 8. Body weights at birth and weaning for Forest and Nungua Blackhead sheep.

	Forest Type	Nungua Blackhead
Weight at birth (kg)	1.3 ± 0.23	2.3 ± 0.45
Weight at weaning (12 weeks) (kg)	5.8 ± 0.7	9.8 ± 1.9
Average daily gain up to weaning (g)	50 ± 9	90 ± 20

Source: Ngere, 1973.

Table 9. Results of fattening trials with West African Dwarf sheep.

	Feeding Regime	
	Cynodon + Concentrates	*Cynodon* + Concentrates + Rice Straw
Initial age (months)	4.75	4.75
Initial weight (kg)	9.50 ± 0.62	10.50 ± 0.50
Final weight (kg)	13.25 ± 0.88	12.61 ± 0.79
Average daily gain (g)	30 ± 0.46	17 ± 0.46

Source: Tuah and Tetteh, 1972.

4.1.2 Goats

The goats in Ghana are of the West African Dwarf breed, also called the

Forest goat. Oppong (1963) reported an age at first kidding under village conditions of 14 months, implying sexual maturity between 6 and 8 months. Among goats kept at Kumasi University Farm, the prolificacy rate was 185 kids per 100 births, with 35% single, 49% twin, 17% triplet and 1% quadruplet births. The kidding interval was 229 days. Table 10 summarizes estimates of the major production traits required to build up a productivity index based on the total weight of five-month-old kids produced per 10 kg of female goat maintained per year. This index is derived from production estimates under station conditions and low tsetse infestation.

Table 10. Dwarf goat productivity estimates.

Female goat viability (%)	90[a]
Kidding percentage	260
Kid viability to one year (%)	76
Kid weight at four months (kg)	7.5
Productivity index[b] per female goat per year (kg)	15.6
Female goat weight (kg)	25
Productivity index[b] per 10 kg female goat maintained per year (kg)	6.2

a. Estimate.
b. Total weight of five-month-old kids produced.

Source: Sada and Vohradsky, 1973; Vohradsky and Sada, 1973.

4.2 DISEASE

According to the Veterinary Services in Kumasi (Bonniwell, personal communications), sheep in Ghana are affected by a 'confinement and malnutrition syndrome' which is due to the fact that the animals are usually penned a great deal of the time and do not have sufficient opportunity for grazing. They become less resistant to other diseases, such as a gastro-intestinal parasites, bacterial infections and pneumonia. *Peste des petits ruminants* (PPR) is also a major problem. This endemic disease is widespread among sheep in Ghana and also causes very high mortality rates among goats. Other diseases include gastro-intestinal parasitosis, in particular due to *Haemonchus contortus*, heartwater and other tick-borne diseases. At Nungua, the mortality rate among goats reached 85% in 1973-74, with 36% of this due to PPR.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

Research and development activities in Ghana are carried out on university farms, farms under the Animal Husbandry Service and other institutes, farms and

ranches. It is difficult to classify the various facilities strictly into research centres, multiplication herds or development projects.

5.1 RESEARCH

5.1.1 University of Ghana

The Animal Sciences Department of the University of Ghana carries out research at three stations. These are described in Table 11.

5.1.2 Kumasi University Farm

The Animal Production Department of Kumasi University of Science and Technology carries out animal husbandry research on a 150-ha farm in Ashanti Region east of Kumasi town. The location is designated by o 2 in Figure 1. As of 1977, 268 cattle were kept on the farm, including 143 N'Dama, 70 Holstein-Friesian, 45 Ghana Shorthorn and 10 crossbreds. In addition, there were 74 West African Dwarf sheep and 72 West African Dwarf goats. The farm serves a training and multiplication function and research projects are carried out by the students.

5.1.3 Achimota Animal Research Institute

This research institute is situated at Achimota, 10 km from Accra, designated by + 3 in Figure 1. Research on trypanosomiasis is carried out, including studies on the carriers of this disease, *Glossina* biology and pathological studies of the affected animals. The institute maintains two stations with cattle, sheep and goats, one at Pokuasi in Greater Accra Region and the other at Nyankpala in Northern Region near Tamale. No precise information on the activities of these stations was available.

5.1.4 Research Facilities at Pong Tamale

Animal husbandry work is carried out at a number of institutions in Pong Tamale, 25 km north of Tamale town in Northern Region. The Regional Veterinary Service Board is responsible for the Pong Tamale Veterinary Laboratory, which is indicated by + 4 in Figure 1. Though this laboratory has fairly well developed facilities, it lacks the resources to develop its research programme further. Also at Pong Tamale are the Animal Husbandry Regional Service Board, which operates a stock farm, the Veterinary College, which also operates a farm with 40 cattle, and one ranch of the Ghana Livestock Company.

West Germany is assisting a trypanosomiasis control project based at Pong Tamale and covering mainly Northern and Upper Regions. This is a two-year project divided into two phases, first an equipment, training and prospecting phase to be followed by an eradication programme.

Table 11. Agricultural research stations of the University of Ghana.

Name	Legon Agricultural Research Station (formerly Nungua), P.O. Box 68, Legon	Kpong Agricultural Research Station	Kade Agricultural Research Station
Location (and reference in Figure 1)	Greater Accra Region 25 km north of Accra ○ 1	Eastern Region 80 km N.E. of Accra ○ 1	Eastern Region 120 km N.W. of Accra, forest area ○ 1
Size	720 ha		
Breeds and numbers	417 cattle: 122 Ghana Shorthorn, 36 Sokoto Gudale, 9 Droughtmaster, 119 crossbred Jersey, 124 crossbred Friesian, 57 others (January 1978)	200 cattle: 122 N'Dama and various crossbreeds between N'Dama and Red Poll, Santa Gertrudis and Brown Swiss	200 cattle from the Legon Station were transferred here at the beginning of 1978 because of draught
	383 sheep: 152 Forest type, 126 Nungua Blackhead, 6 Sudan type and crossbreds, 99 others	300 sheep	
Objectives	Research on milk yield and nutrition. Genetic improvement of sheep. Performance records kept of all animals.	Farming and animal husbandry research. Plan to breed N'Dama only, progressive elimination of crossbreeds.	Same as Legon Station.

5.2 DEVELOPMENT AND MULTIPLICATION ACTIVITIES

5.2.1 Animal Husbandry Service Stock Farms

The Animal Husbandry Service of the Ministry of Agriculture operates 12 multiplication farms for cattle as listed in Table 12. Their locations are shown by ■ 5 in Figure 1. The objectives of these farms are to improve and multiply livestock breeds for the benefit of local livestock owners, to produce meat and milk, to distribute sires and to carry out adaptation tests.

Table 12. Animal Husbandry Service stock farms.

Region	Name and Location	Cattle	
		Numbers	Breeds
Upper	Wa (western Upper R.)	260	Ghana Shorthorn, N'Dama
Upper	Bazua (northern Upper R.)	140	Sanga, N'Dama, White Fulani
Northern	Pong Tamale (north of Tamale)	50	Ghana Shorthorn
Northern	Bimbila (eastern Northern R.)	100	Ghana Shorthorn, Sanga, N'Dama
Brong Ahafo	Atebubu	70	Ghana Shorthorn
Brong Ahafo	Wenchi	75	Sanga, N'Dama, White Fulani
Central	Winneba (west of Accra)	100	Sanga, White Fulani
		300	Nellore Zebu (Brazil)
		75	Droughtmaster (Australia)
Volta	Amelorkope	290	N'Dama, Sanga, White Fulani
Volta	Adakpo	100	Ghana Shorthorn, Sanga, White Fulani
Greater Accra	Nungua (20 km NE of Accra)	615	N'Dama, Sanga, White Fulani
Greater Accra	Maledjor	100	Nellore Zebu (Brazil)
Greater Accra	Amrahia Dairy Farm	480	Friesian
Total		2 755	

Source: Information from country visits.

5.2.2 State Farms Organization (P.O. Box 299, Accra)

The State Farms Organization is an important business enterprise coming under the Ministry of Agriculture. The organization manages several farms around the country with the primary objectives of agricultural production and extension. On

three of these farms described in Table 13, cattle are raised, mainly of local breeds. There is no well-defined breeding policy and no information is available on performance.

Sheep are raised on a number of other state farms in Ashanti, Western, Central and Volta Regions. Although no detailed information is available, there are apparently serious problems connected with the management of these flocks.

Table 13. State farms which keep cattle.

Name	Demon Ranch	Ohawu-Akatsi Ranch	Kwamoso State Farm
Location (and reference in Figure 1)	East part of Northern Region 120 km from Tamale ■6	Southern part of Volta Region ■6	Eastern Region north of Accra ■6
Size			800 ha
Breeds and numbers	Approx. 100 cattle, mainly Ghana Shorthorn, with Sanga and N'Dama crossbreds	800 - 1000 Ghana Shorthorn plus Sanga and N'Dama (from Tadzewa ranch)	
Comments		This ranch provides other state farms with livestock.	This farm is in the process of building up its own cattle herd with stock from the Ohawu ranch. The main activity is oil palm production.

Source: Information from country visits.

5.2.3 Ghana Livestock Company

This company operates three cattle ranches, one of which is still being developed. Assistance has been provided by the IBRD and a number of commercial banks. The ranches are described in Table 14.

5.2.4 Shai Hills Ranch (P.O. Box 9577, Airport, Accra)

This ranch is being developed in Greater Accra Region about 40 km northeast of Accra with funding from the Bank of Ghana and technical assistance from Gunn Rural Management Property Ltd. of Australia. The location is shown by □ 8 in

Figure 1. As of the end of 1977, 1 100 cattle of different breeds were kept on this 6 400-ha ranch for meat production and to demonstrate the viability of commercial cattle ranching. The goal is to build up a herd of 4 000, including 1 500 breeding cows. The cattle on the ranch have all been identified and the facilities are well developed. Plans have been made to record the performance of the herd.

Table 14. Ghana Livestock Company ranches.

Name	Pong Tamale Ranch	Tadzevu Ranch	Branam Ranch
Location (and reference in Figure 1)	Northern Region north of Tamale ■ 7	Volta Region ■ 7	Brong Ahafo Region north of Wenchi ■ 7
Size	6 000 ha		
Breeds and numbers	1500 cattle, including 180 N'Dama cows, 500 Ghana Shorthorn cows, 100 Sanga cows and 100 White Fulani Zebu cows	Approx 500 cattle, mainly Sanga and White Fulani Zebu	No livestock as of the beginning of 1978
Objectives	Multiplication ranch, Livestock will be transferred to Branam Ranch and this will become an animal husbandry station.		Livestock is to be transferred from Pong Tamale Ranch.

Source: Information from country visits.

5.2.5 Sheep and Goat Production Development Project (P.O. Box 4308, Kumasi)

This project is being carried out by the Ministry of Agriculture on Ejura Farm in Ashanti Region north of Kumasi with assistance from FAO/UNDP. The location is shown by ■ 9 on Figure 1. As of 1977, 830 local and Sahelian sheep and 40 local goats were kept on 800 ha, with the aim of multiplying improved animals and producing sires for local breeders. Performance parameters such as productivity and growth are being recorded.

5.2.6 Ghanaian - German Fertilising

This is an integrated agricultural development project based in Northern Region at Tamale. The animal husbandry component focuses on training personnel and draught animals. Six draught animal training centres have been established, covering 20 to 30 farms each. The location of this project is shown by △ 10 in Figure 1.

5.2.7 Northern Livestock Development Project

A large Ranching and Enclosures Project was being launched in 1978 at Pwalugu in Northern Region with funding from the Bank of Ghana and technical assistance from Gunn Rural Management Property Ltd. This project will include both cattle and sheep production, and local stock raisers will be involved.

5.2.8 Miscellaneous Activities

There are a number of private commercial farms in Ghana, particularly in the south, including dairy farms in Greater Accra Region. A large dairy project is being undertaken at Kwaha Dairy Farm, Ltd. which will import Friesian cattle with assistance from West Germany and Denmark.

5.3 DEVELOPMENT PLAN GUIDELINES FOR THE LIVESTOCK SECTOR

According to the 1975-1980 Development Plan, development of the livestock sector will focus on:

- community projects including pasture improvement, fencing, veterinary assistance, genetic improvement of livestock and artificial insemination services,
- intensified cattle breeding programmes in five regions,
- establishment or improvement of cattle breeding centres for the production of meat and milk, and
- establishment or improvement of small stock breeding centres.

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CHAPTER 11

TOGO

1. BACKGROUND

The Republic of Togo lies on the west coast of Africa with its capital at Lomé. The country forms a narrow strip of land stretching north to Upper Volta, with Ghana to the west and Benin to the east. It is divided into five regions - Region Maritime, Region des Plateaux, Region du Centre, Region de la Kara and Region des Savanes - each of which includes several administrative districts. Most of the government services are organized according to these divisions.

The former Service de l'Elevage et des Industries Animales has recently been divided into a Direction de la Production Animale under the Ministère du Développement Rural and a Direction des Services Vétérinaires et de la Santé Animale under the Ministère de l'Aménagement Rural. These services are provided throughout the country through offices in several circumscriptions, each of which is responsible for a number of veterinary posts at the local level.

Basic data for the country are given in Table 1.

Table 1. Background data for Togo.

Area	56 800 km^2
Latitude	6^o - 11^o N
Longitude	0^o - $1^o 50'$ E
Population	
number	2 280 000
density	40.1/km^2
Livestock numbers	
cattle	214 000
sheep	792 000
goats	730 000

Sources: For population, OAU, 1978; for livestock numbers, Togo, Service de l'Elevage, 1976.

North of the eighth parallel, the climate is Sahelo-Sudanian, with one rainy season from March to October. The annual rainfall averages 1 100 mm in the far north, 1 200 to 1 300 mm in the Fazas mountains and 1 600 mm in the Aledjo mountains. In the southern part of the country, the climate is Sudano-Guinean and Guinean, with two rainy seasons from March to July and September to November. The annual rainfall increases as one moves inland from the coast, and reaches 1 500 to 1 700 mm on the slopes of the Akposso mountains.

According to the OAU/STRC tsetse distribution map (1977), the entire country is infested with tsetse. *G. palpalis* and *G. longipalpis* are found in the south, *G. morsitans* and *G. longipalpis* in the centre and east, *G. palpalis* and *G. tachinoides* in the north and *G. morsitans* in the extreme northern part of the country.

Itard (1968) has drawn up a detailed tsetse distribution map for the Region des Savanes, which has the largest cattle population. He found *G. tachinoides* and *G. palpalis* in this area. The Direction des Services de l'Elevage et des Industries Animales produced a sketch map of tsetse distribution in Togo, and Mawuena (1976) made a summary of tsetse distribution in the country as a whole.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

The distribution of livestock in the five regions is shown in Table 2 and Figure 1. The dominant cattle breeds in each region are indicated, but no precise figures on the distribution of individual breeds are available.

Table 2 reveals that the cattle population in Togo is concentrated in the north, with Region des Savanes and Region de la Kara accounting for 54% of the national herd. Region du Centre and Region des Plateaux in the centre of the country have much smaller cattle populations.

There are seven times as many small ruminants in the country as cattle. They are also concentrated in Region de Savanes and Region de la Kara in the north and in Region Maritime.

3. CATTLE

3.1 BREED DESCRIPTION

In southern Togo, all cattle with a general shorthorn appearance tend to be called Lagune, though, strictly speaking, the Lagune breed, or Dwarf West African Shorthorn, seems to be disappearing. Most of the animals known locally as Lagune should actually be classified as Borgou.

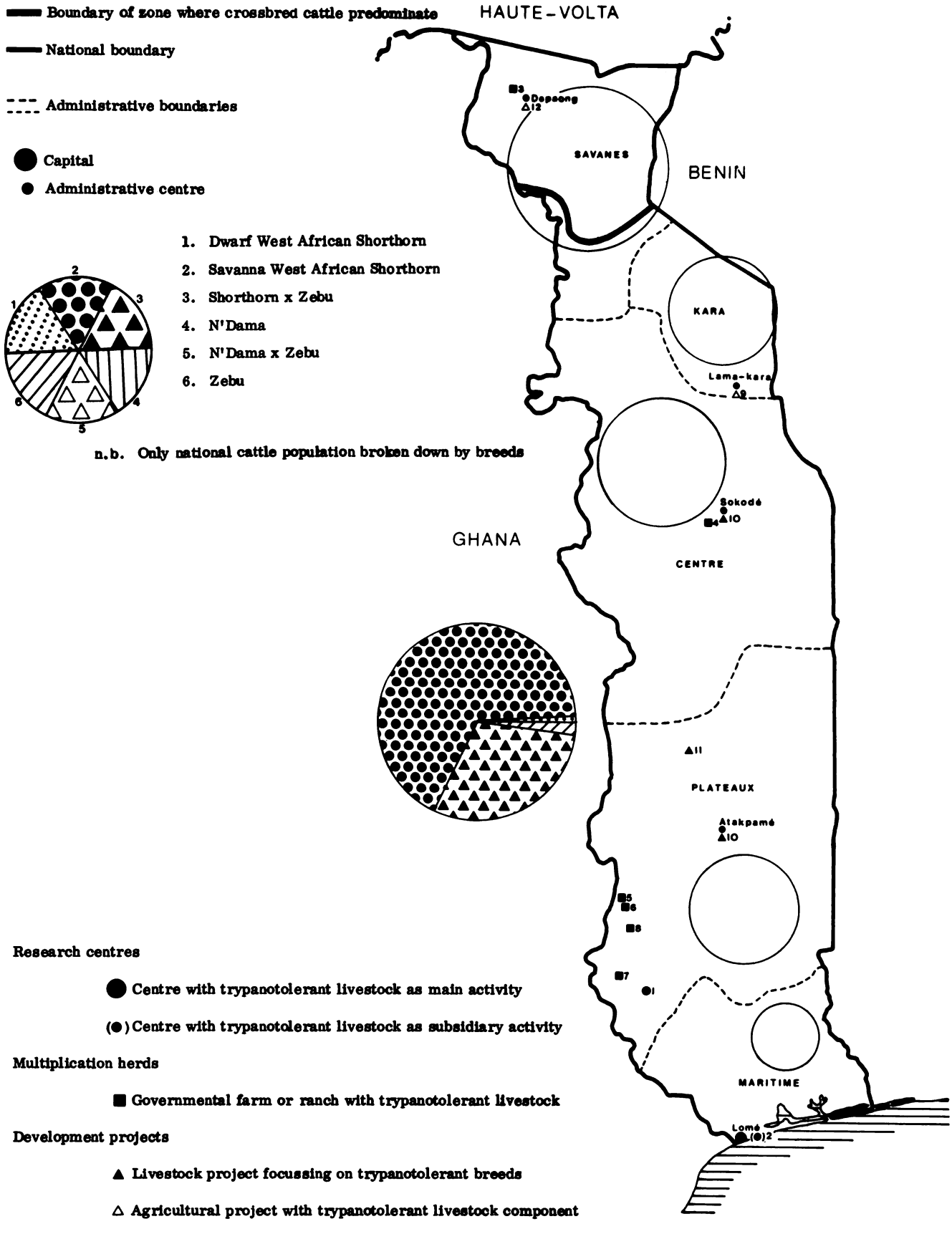
Table 2. Livestock distribution in Togo, 1976.

Region	Cattle - Total Number	% of National Total	Density head/km^2	Breed Distribution Lagune	Somba	Borgou	Zebu	Sheep - Total Number	Density head/km^2	Sheep - Number	% of National Total	Goats - Number	% of National Total
Savanes	80 000	37	9.2	-	a	a	c	440 000	50.9	237 000	30	203 000	28
Kara	36 000	17	8.0	-	a	b	-	219 000	48.7	100 000	13	119 000	16
Centre	51 000	24	2.5	-	a	b	-	187 000	9.3	93 000	12	94 000	13
Plateaux	34 000	16	2.0	-	b	a	c	325 000	19.4	169 000	21	156 000	21
Maritime	13 000	6	2.0	c	c	a	c	351 000	55.3	193 000	24	158 000	22
Entire Country	214 000	100	3.8	1%	67%	30%	2%	1 522 000	27.0	792 000	100	730 000	100

a. Most numerous breed.
b. Breed present, but not dominant.
c. Small number in region.

Source: Service de l'Elevage et des Industries Animales, 1976.

Figure 1. Administrative boundaries, location of research centres, multiplication herds and development projects, cattle numbers and breed distribution.



The Somba, a typical Shorthorn, is the most numerous breed in the country, though crossbreeding seems to be increasing.

The Borgou is a cross between Zebu and Somba, or sometimes Zebu and Lagune. This is a very heterogenous group in Togo. The most typical animals are found in Region des Savanes, though the Borgou are also the most numerous breed in Region Maritime and Region des Plateaux.

Zebu cattle have not been kept in Togo traditionally, though small numbers of Zebu may be found, particularly in the northern part of Region des Plateaux. Nomadic Zebu herds come into the northeastern part of the country from Upper Volta, and Zebu being taken to slaughter also cross over Togo.

Two other African breeds have also been introduced. The N'Dama are kept on research stations and are found in small numbers over a fairly wide area. The Wakwa Zebu, a cross between the Brahman and Adamawa Fulani Zebu, has been imported into the Plateaux de Dayes area from Cameroon. Some exotic breeds are kept on research stations, for example, German Brown and German Yellow at Avetonou and Gir and Guzera Zebu from Brazil at Anécho.

Improved animals have been imported in the past, but have not been kept as pure breeds. Their contribution to crossbreeding, however, may explain the unusual appearance of the cattle in Region des Plateaux.

3.1.1 Lagune

It appears that the Lagune breed in Togo is rapidly being absorbed by the other local breeds, and the population described as Lagune is very heterogeneous. Leclerq (1970) found significant differences in the size of animals from a herd described as Lagune on a coconut plantation and from another herd near Assahoun which had traditionally been considered pure Lagune. The average measurements of these two herds are given in Table 3.

Table 3. Measurements of two herds of Lagune cattle (cm).

	Adults 5 - 8 Years on Coconut Plantation (n = 40)	Adult Females 5 to 10 Years in Assahoun Area (n = 10)
Height at withers	101.4 ± 1.1	93.2 ± 1.4
Height at sternum	46.4 ± 0.9	45.1 ± 1.1
Heart girth	137.5 ± 1.9	128.9 ± 2.4
Body length	116.3 ± 1.9	109.6 ± 2.8
Head length	38.6 ± 0.5	34.9 ± 0.9

Source: Leclerq, 1970.

Domingo (1976) also recorded measurements of Lagune cattle, as well as Somba and Borgou, in different age categories. These are presented in Table 4.

Leclerq (1970) reported a fecundity rate of 70% and an age at first calving between 3 and $3\frac{1}{2}$ years for a herd of Lagune cattle which belonged to the Société Régionale d'Aménagement et de Développement (SORAD) in Anécho. The average carcass weight of these animals was estimated at 80 kg.

3.1.2 Somba

The Somba are typical humpless Shorthorns, similar in appearance to the Baoulé of Ivory Coast and the Ghana Shorthorn. This is still the most numerous breed in Togo, though crossbreeding with Zebu, Borgou and sometimes N'Dama is increasing (see Figure 3.34, volume 1). Relatively pure Somba are found in Region de la Kara and in Region du Centre near Sokodé, which is an extension of the Atacora highlands of Benin, inhabited by the Somba people, where the breed is said to have originated.

There is little information available on the productivity of the Somba in Togo. The measurements made by Domingo (1976) are given in Table 4, suggesting that the Somba and the Lagune are about the same size. Information on carcass weights was obtained from the Service de l'Elevage et des Industries Animales for Region des

Table 4. Measurements of Lagune, Somba and Borgou cattle (cm).

Age Group	Lagune	Somba	Borgou
15 - 18 months			
Number	46	53	45
Height at withers	80.6 ± 0.2	80.3 ± 0.0	91 ± 0.4
Heart girth	102.8 ± 0.3	106.4 ± 0.6	120.7 ± 1.0
Scapulo-ischial length	92.3 ± 0.8	91.9 ± 1.0	106.4 ± 0.8
3 - $3\frac{1}{2}$ years			
Number	54	47	47
Height at withers	95 ± 0.2	94 ± 0.4	95 ± 0.2
Heart girth	126.8 ± 0.7	124.6 ± 0.5	133.3 ± 0.8
Scapulo-ischial length	114.3 ± 0.4	114.7 ± 0.4	116.6 ± 0.6
5 years			
Number	54	76	50
Height at withers	96.2 ± 1.1	97.1 ± 0.8	106.6 ± 0.9
Heart girth	136.3 ± 2.1	136.6 ± 1.4	145.3 ± 1.4
Scapulo-ischial length	119.7 ± 1.3	120.2 ± 1.4	128.4 ± 1.4

Source: Domingo, 1976.

Savanes, Region du Centre and Region des Plateaux, as given in Table 5. Animals were classified as Zebu or humpless, which included Somba and Borgou.

Table 5. Carcass weights of Zebu and humpless cattle.

Region	Number	Weight in kg	
		Average	Range
Region des Savanes: Dapaong and Mango			
Zebu	207	105.4	47-184
humpless	1 421	67.7	18-147
Region du Centre: Sokodé			
Zebu	148	141.0	76-248
humpless	2 085	80.0	18-234
Region des Plateaux: Kpalimé and Atakpamé			
Zebu	815	139.0	-
humpless	1 279	103.0	44-117

Source: Service de l'Elevage et des Industries Animales, 1976.

3.1.3 Borgou

It is almost impossible to define a standard type for the Borgou breed in Togo, as all the intermediate types between the humpless breeds and the Zebu are commonly grouped under this name. Measurements for these animals are given in Table 4. No other specific information is available.

3.1.4 N'Dama

Table 6 summarizes the estimates of the main production traits requires to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for meat production under the conditions of Avetonou Station in a low tsetse challenge area.

3.1.5 Wakwa Crosses

The only information available on the Wakwa Zebu in Togo is derived from data on crossbreds with the local breed at the Centre Agricole de Dzogbegan in the western part of Region des Plateaux. Average weights recorded between 1968 and 1971 are given in Table 7.

Table 6. N'Dama productivity estimates.

Parameter	Production Environment Station/low challenge/ meat
Cow viability (%)	99
Calving percentage (%)	67
Calf viability to one year (%)	95
Calf weight at one year (kg)	126
Annual milked out yield (kg)	-
Productivity index[a] per cow per year (kg)	80.6
Cow weight (kg)	283
Productivity index[a] per 100 kg cow maintained per year (kg)	28.5

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Sources: Information from country visit .

Table 7. Average weights of local and crossbred cattle at Centre Agricole de Dzobegan (kg).

	Birth	6 months	12 months	18 months	24 months	36 months
Local breed (male & female)	13	48	88	131	171	202
Wakwa x local: female	22	114	188	229	276	-
Wakwa x local: male	22	130	202	217	295	393

Source: Information from country visit.

3.2 DISEASE

Among contagious diseases, there has been no outbreak of rinderpest since the end of a vaccination campaign carried out in 1965. Contagious bovine pleuropneumonia (CBPP) was a serious problem from 1960 to 1970, but has not occurred recently. Foot-and-mouth disease occurs in Region de la Kara and Region des Savanes in the north, and anthrax occurs in some areas where cattle have been imported. Tuberculosis is found almost exclusively in animals which have been imported or smuggled in illegally.

Turning to parasitic diseases, treatment for ectoparasites and gastrointestinal parasites is carried out regularly by veterinary teams which visit every region of the country.

Trypanosomiasis is endemic throughout the country, with *T. vivax* and *T. congolense* the most important trypanosomes (Mawuena, 1976). Preventive measures are carried out to control this disease.

3.3 HERD MANAGEMENT AND COMPOSITION

According to Somoko-Balantpli and Freitas (1978), 'Togo, even with certain favourable climatic conditions, is not an important livestock country. Livestock rearing is a minor, almost marginal activity which enables certain traditional expenses to be met'.

Generally speaking, the rural population consists of two groups. The great majority are almost exclusively sedentary farmers from a large number of tribes. In addition, there are Fulani who farm and raise livestock. Both groups practise rotational cropping with a long fallow period.

Though the Fulani in Togo are good farmers, they also spend a great deal of time looking after their livestock. They tend to value large herds more highly than the quality of the animals. They rent land for cultivation from the local tribes, and there is often friction between the two groups, especially during the cropping season.

The Fulani construct pens near their houses where their cattle are tethered at night. Each animal knows its place where it goes independently and waits to be tied b the leg or the horns. Where cattle are kept on coconut plantations at the coast, each animal is tied to a particular tree every night for a month in order to provide manure. The cattle are milked once a day in the morning and then taken out to graze during the day. They are often herded by children during the rainy season, but by adults during the dry season when grazing is more difficult to find.

The local farmers in the southern part of the country are not as interested in livestock production, and even show a certain contempt for cattle herding, though they feel they are exploited by their Fulani herdsmen. Exceptions are the Konkomba of Region du Centre, the Kabré of Region de la Kara and the people of Region de Savanes, who seem to place more importance on livestock. The herding system among the local farmers differs from that of the Fulani in that after the harvest they leave their animals to roam freely until the next cropping season. They also appear to use more herdsmen than the Fulani for the same number of animals, at least in Region des Savanes. According to a study carried out in that region by the Service de l'Elevage et des Industries Animales (Tchaniley, 1975), there were 751 Fulani herdsmen with 66 170 cattle, or 88 cattle per herdsman, and 340 herdsmen of other tribes with 11 967 cattle, or 35 cattle per herdsman.

In Region de la Kara herd sizes tend to be fairly small. According to the Service de l'Elevage et des Industries Animales, 1 171 herds, or 85% of 1 381 herds surveyed in the region were less than 50 head in 1976, 143, or 10%, were 50 to 100 head and only 67, or 5%, were more than 100 head. Sarniguet and Legrand (1974) give the typical herd composition in Togo, based on a detailed census of 3 906 cattle carried out in 1969, as shown in Table 8.

Draught animals are not used in the traditional farming systems. There are very few draught oxen in the country, and these are generally kept on experimental farms.

Table 8. Typical herd structure.

Breeding cows ($3\frac{1}{2}$ - 11 years)	39.8%	Adult bulls	8.0%
Heifers ($1\frac{1}{2}$ - $3\frac{1}{2}$ years)	18.7%	Oxen (over 2 years)	2.8%
Female calves (0 - 18 months)	16.6%	Young bulls (1 - 2 years)	3.8%
Total females	75.1%	Male calves (0 - 18 months)	17.5%
		Total males	24.9%

Source: Sarniguet and Legrand (1974).

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

Sheep and goats in Togo are mainly of the Djallonké or Guinean type. In the more urbanized areas there are also a few crossbred Djallonké x Sahelian sheep. In Region Maritime, this crossbred is called Vogan sheep.

4.1.1 Sheep

For adult sheep over four years, the height at withers is generally about 50 to 55 cm and the liveweight 22 to 24 kg for ewes and 26 to 32 kg for rams. The age at first lambing is about 18 months, and the lambing rate is about 110%. Mortality up to weaning is about 20%, among lambs after weaning it is 10% and among adult animals 5%. Table 9 gives average body weights in three regions according to age. Carcass yields for animals kept under village conditions average about 50% (SEDES, 1975).

Table 10 summarizes estimates of the major production traits required to build up a productivity index based on the total weight of five-month-old lamb produced per 10 kg of ewe maintained per year. This productivity index has been derived for production under village conditions in a light to medium tsetse challenge area.

Table 9. Body weights for sheep in three regions (kg).

Age in months	Region des Plateaux		Region du Centre		Region de la Kara	
	female	male	female	male	female	male
0 - 2	3.5	4.0	5.0	5.0	-	-
4 - 6	7.5	7.0	8.0	10.0	-	-
10 - 12	13.0	13.0	15.5	17.0	11.5	11.0[a]
13 - 18	16.0	17.0	-	-	-	-
19 - 24	17.0	20.0	22.0	26.0	-	-
25 - 36	19.0	21.0	22.0	-	16.0	16.0
37 - 48	21.5	25.0	23.0	28.5	20.0	22.0
over 48	24.0	-	24.0	33.0	22.0	26.0

a. 8 - 12 months

Source: SEDES, 1975.

Table 10. Productivity estimates for sheep.

Parameter	Production Environment Village/light to medium challenge
Ewe viability (%)	95
Lambing percentage	165
Lamb viability to one year (%)	80
Lamb weight at five months (kg)	11.5
Productivity index[a] per ewe per year (kg)	15.6
Ewe weight (kg)	23
Productivity index[a] per 10 kg ewe maintained per year (kg)	6.8

a. Total weight of five-month-old lamb produced.

Source: Information from country visit.

4.1.2 Goats

According to SEDES (1975), typical height at withers for adult goats is 40 to 45 cm and liveweight is 18 to 22 kg for females and 22.5 to 25 kg for males. The age at first kidding is about 15 months and the kidding rate is about 120%. Mortality rates are slightly higher for goats than for sheep: 22% up to weaning, 10% for kids after weaning and 8% for adult animals. Milk production averages about 30 kg over 60 days. Typical body weights among goats in three regions are given in Table 11.

Carcass yields are about 50% for goats kept under village conditions and about 52% for young animals reared on an improved diet. The Service de l'Elevage et des Industries Animales gives the following average carcass weights for sheep and goats in three regions in 1976:

	Region des Savanes		Region du Centre		Region des Plateaux	
	number	kg	number	kg	number	kg
sheep	122	7.9	416	9.1	1 605	10.5
goats	208	6.7	709	7.1	1 560	9.0

Table 11. Body weights for goats in three regions (kg).

Age in months	Region des Plateaux	Region du Centre		Region de la Kara	
		male	female	male	female
0 - 2	2.0	4	4	-	-
4 - 6	5.5	7	8	-	-
10 - 12	11.0	12	13	9[a]	8.0[a]
13 - 18	12.0	-	-	-	-
19 - 24	14.0	17	16	-	-
25 - 36	16.0	22	18	11	13.0
37 - 48	19.0	25	19	13	18.0
over 48	23.0	-	22	19	25.5

a. 8 - 12 months.

Source: SEDES, 1975a.

Table 12 summarized the estimates of major production traits required to build up a productivity index based on the total weight of five-month-old kid produced per 10 kg of female goat maintained per year. This productivity index has been derived for production under village conditions in a light to medium tsetse challenge area.

4.2 DISEASE

Peste des Petits Ruminants (PPR) is the most widespread infectious disease among sheep and goats in Togo, particularly during the rainy season. Generally small ruminants receive no veterinary treatment, but some flocks are beginning to be vaccinated and dewormed on a fairly regular basis (Amaizo and Kavégé, 1978).

4.3 FLOCK MANAGEMENT AND COMPOSITION

Tchaniley (1975) has reported on the management of sheep and goat flocks in Togo. Among the Fulani, small ruminants are kept crowded together at night in

Table 12. Productivity estimates for goats.

Parameter	Production Environment Village/light to medium challenge
Female goat viability (%)	92
Kidding percentage	180
Kid viability to one year (%)	78
Kid weight at five months (kg)	7.5
Productivity index[a] per female goat per year (kg)	11.0
Female goat weight (kg)	20
Productivity index[a] per 10 kg female goat maintained per year (kg)	5.5

a. Total weight of five-month-old kid produced.
Source: Information from country visits.

small pens near the owner's house. Women and children are responsible for their care. During the cropping season, they are tethered during the day near the house with enough rope to allow them to eat the grass and legumes left by the cattle. At midday, they are given water and tethered in a new place. During the dry season, sheep and goats are allowed to roam freely in flocks in search of scarce grazing. Watering is a problem during this season because the animals are not tended and must find sources of water on their own.

Among the local farming population, households generally own a few sheep and goats which are looked after by the old men, women or children. Management of the flocks is the same as among the Fulani, except that they are often supplemented with bran, cassava and yam parings.

According to SEDES (1975a), the average size of flocks in Region des Plateaux is 16, and 24% consist of less than five animals and 7% of more than 50. In Region du Centre, the average flock size is only 3, with 41% of the flocks composed of 1 to 2 animals and only 2% over 30, and in Region de la Kara the average flock size is 19. In Region des Plateaux, 39% of all households keep only sheep, while 30% keep both sheep and goats. In Region de la Kara, 20% of the households keep only sheep, and 63% keep sheep and goats. The typical composition of sheep and goat flocks by age and by sex is shown in Table 13.

Table 13. Composition of sheep and goat flocks (%).

	Sheep		Goats	
	Region des Plateaux	Region du Centre	Region des Plateaux	Region du Centre
Structure by Age				
0 - 6 months	24	22	34	31
6 - 12 months	21	14	20	16
1 - 2 years	18	23	19	21
2 - 4 years	22	21	16	19
>4 years	15	20	11	13
Structure by Sex				
All females	73	76	71	71
All males	27	24	29	29
Females > 2 years	32	39	23	30
Females 1-2 years	14	15	14	17
Females < 1 year	27	22	34	24
Males > 2 years	5	2	4	2
Males 1 - 2 years	4	8	5	4
Males < 1 year	18	14	20	21

Source: SEDES, 1975a.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH

The two centres carrying out research on trypanotolerant livestock in Togo are described in Table 14.

5.2 MULTIPLICATION HERDS

A number of stations around the country keep small herds of cattle, sheep and goats. These include Nassablé Station in Region des Savanes near Dapaong (■3 in Figure 1), Na Station near Sokodé in Region du Centre (■4 in Figure 1), Dzogbegan Monastery on Dayes Plateau in Region des Plateaux (■5 in Figure 1), Dayes-Apeyiné Centre (■6 in Figure 1), the Centre d'Apprentissage Agricole de Tové (■7 in Figure 1) and the Centre Polyvalent d'Adéta (■8 in Figure 1).

Table 14. Research Centres.

Name	Centre d'Elevage et de Recherche sur la Trypanosomiase et la Trypanotolérance (CERTT) (B.P. 27, Agou-Gare)	Ecole Supérieure d'Agronomie (B.P. 1515, Lomé)
Location (and reference in Figure 1)	Avetonou, 100 km from Lomé on Kpalimé road ● 1	Lomé (●) 2
Organization responsible	Ministère du Développement Rural	Université du Benin
Size	650 ha	5 ha
Breeds and numbers	1 783 cattle: 139 Brown Swiss and German Yellow, 759 N'Dama, 50 local breeds, 398 crossbred European x local (F1), 435 crossbred F1 x N'Dama, 2 crossbred local x N'Dama (July 1978)	Sheep
Objectives	Research on trypanotolerance and on the genetic potential of trypanotolerant and non-trypanotolerant types and their crossbreeds. Research on the economic value of the trypanotolerant types. Systematic collectinn of production data.	Improvement of different food crop varieties in Togo combined with sheep production. Genetic improvement of the local breed through selection, crossbreeding and feeding.
External aid	Germany	
Project period	1977 - 1980	

Source: Information from country visit.

5.3 DEVELOPMENT PROJECTS

Four development projects are described in Table 15.

Table 15. Development projects.

Name	'Togo-Nord' Programme d'Amenagement du Nord Togo	PRO-DE-BO Developpement de l'Elevage Bovin pour la Culture Attelée (B.P. 144, Sokode)	Projet du Ranch de l'Adélé	Projet Pilote Agricole
Location (and reference in Figure 1)	Region de la Kara (Lama Kara) △ 9	Region des Plateaux et Region de Centre (Sokodé and Atakpamé) ▲ 10	Region du Centre ▲ 11	Region des Savanes (Dapaong) △ 12
Organization responsible	Ministère du Développement Rural	Ministère du Développement Rural		
Size			60 000 ha, 15 600 tropical livestock units (TLU)	Covering 1 400 farms
Objectives	Integrated rural development and improvement of production techniques. Plans to import 200 Zebus into the Lama Kara area for use as draught oxen.	Establishment of five training and demonstration stations for draught oxen.	WIP feasibility study for three ranches. Breeding ranch to be developed first.	Integrated agricultural development project.
External aid	UNDP/FAO	EEC (EDF)	EEC (EDF)	EEC (EDF)
Project period	1976 - 1978	1977 - 1978		

Source: Information from country visit.

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CHAPTER 12

BENIN

1. BACKGROUND

The People's Republic of Benin is a narrow strip of land on the west coast of Africa, with its capital at Porto-Novo. The country is surrounded by Togo to the west, Upper Volta and Niger to the north and Nigeria to the east. The administration is divided into six provinces, each of which is composed of several districts which in turn are sub-divided into Communes Rurales.

The Service de l'Elevage comes under the Ministère du Développement Rural et de l'Action Coopérative and has its headquarters at Parakou. A Société de Développement des Ressources Animales (SODERA) has also been established under the same ministry. The Service de l'Elevage is organized into seven livestock regions which correspond to the provinces, except for Borgou Province which is divided into South Borgou and North Borgou, or Kandi, regions. These livestock regions are divided into sectors, each with one or more Postes d'Elevage.

In 1975, the Centre d'Action Régionale pour le Développement Rural (CARDER) was formed under the Ministère du Développement Rural et de l'Action Coopérative. This brings together all government activities at the regional level in agriculture, animal husbandry, development of waterways, forestry, fishing and agricultural processing.

Basic data for the country as a whole are given in Table 1.

The climate in the northern part of the country is Sahelo-Sudanian, with one rainy season from May to October. In the south, the climate is Sudano-Guinean and Guinean, with two rainy season from March to July and from September to November. Annual rainfall throughout the country averages about 1 200 mm, increasing from west to east.

According to the OAU/STRC tsetse distribution map (1977) and Gruvel (1978), the entire country is infested with tsetse. *G. fusca* and *G. mediocorum* are found in the south, *G. palpalis gambiensis* is found everywhere except in the northwest, and *G. tachinoides* is found everywhere except in the far south. *G. longipalpis* is found in the southern half of the country and *G. morsitans* in the northern half, except for the northeast. Lazic (1976) carried out a detailed study of the tsetse

Figure 1. Administrative divisions, location of research centres, multiplication herds and development projects, cattle numbers and breeds distribution.

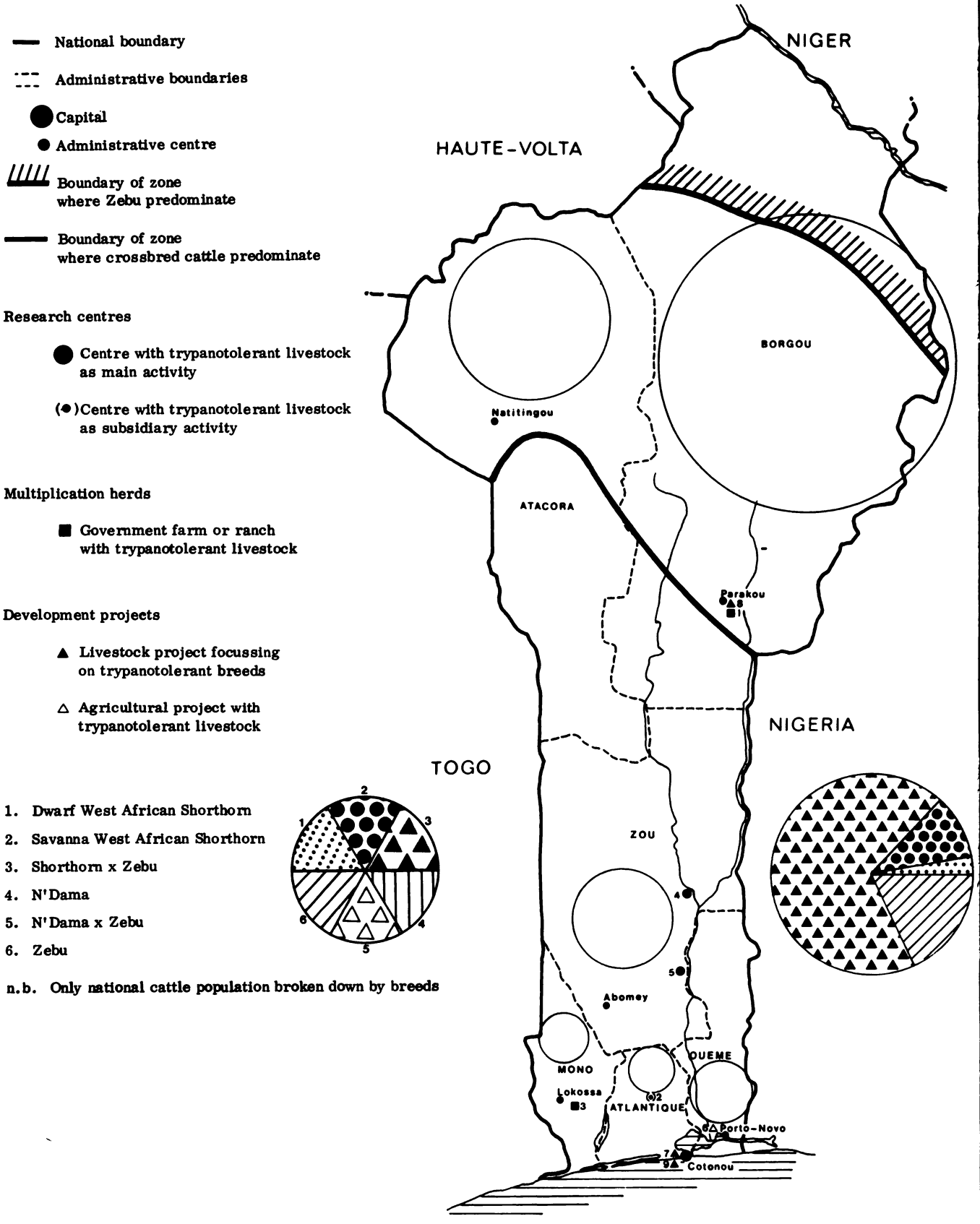

Table 1. Background data for Benin.

Area	112 600 km^2
Latitude	$6^o20'$ - $12^o30'$ N
Longitude	1^o - 4^o E
Population	
number	3 200 000
density	28.4/km^2
Livestock numbers	
cattle	726 000
sheep	881 000
goats	848 000

Sources: For population, OAU, 1978; for livestock numbers, Service National de l'Elevage, 1977.

infestation on the pilot livestock breeding farms at M'Bétécoucou and Samiondji as part of an FAO project entitled 'Développement de la Culture Attelée et de la Production Animale'.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

The livestock population in the six provinces is given in Table 2 as recorded in 1977 by the Service de l'Elevage.

According to Gruvel (1978), the distribution of cattle breeds in Benin is complicated and in a state of change. Estimates of cattle numbers and distribution by breed type are given in Table 3.

This table indicates that the largest breed group is the Zebu x Borgou crossbreed, which illustrates the absorption process of humpless cattle by Zebu which is taking place. The 2 700 Somba recorded for Boukombé District may however be an underestimate. In Table 2 the breed types are reduced to four groups with the approximate distribution of each.

There are more than 1.7 million small ruminants in Benin, with approximately the same number of sheep as goats for the country as a whole. In Borgou Province

Table 2. Livestock distribution by province, 1977.

Province	Cattle						Sheep		Goats	
	Numbers	% of National Total	Lagune	Somba	Borgou & crosses	Predominantly Zebu	Numbers	% of National Total	Numbers	% of National Total
Borgou	482 600	66.5	-	-	a	a	367 500	41.7	284 000	33.5
Atacora	138 700	19.1	-	a	a	-	165 000	18.7	199 000	23.4
Zou	56 100	7.7	-	a	a	-	200 000	22.7	190 000	22.4
Ouémé	21 500	3.0	a	-	b	-	60 000	6.8	73 000	8.6
Atlantique	12 000	1.7	a	-	b	-	14 500	1.7	31 000	3.7
Mono	14 700	2.0	a	-	b	-	74 000	8.4	71 000	8.4
Total	725 600		20 000	75 000	500 000	130 000	881 000	100.0	848 000	100.0
%		100.00	3	10	69	18				

a. Majority group.
b. Minority group.

Source: Service de l'Elevage, 1977.

Table 3. Cattle distribution by breed type, 1976.

Breed Type	Distribution	Number	% of National Herd
Zebu	North of Borgou Province	55 200	7.7
Zebu x Borgou	Centre and south of Borgou Province	253 100	35.3
Somba	Boukombé District	2 700	0.3
Borgou x Somba	Atacora Province	104 600	14.6
Borgou	South Borgou and east Atacora	193 600	27.0
Borgou x Lagune	South and centre of country	81 700	11.4
Lagune	Lower valleys of Ouémé, Aplahoué and Abomey	26 500	3.7
Total		717 400	100.0

Source: P Canard and B Striffling, quoted in Gruvel, 1978.

there are more sheep than goats, while in Zou and Mono Provinces the sheep and goat populations are about equal. There are more goats than sheep in the other southern provinces and Atacora Province.

3. CATTLE

3.1 BREED DESCRIPTION

The four cattle types in Benin are the Lagune, or Dwarf West African Shorthorn, the Somba, or Savanna Shorthorn, the Borgou, which is a Zebu x humpless crossbred, and the Zebu.

3.1.1 Lagune

The Lagune cattle of Benin are typical of the breed as described in chapter 3 of volume 1. The coat is usually black, black with white spots, or black-and-white (see Figure 3.27, volume 1). Red or red-and-white animals are very rare. Mucosa, eyelids and hoofs are black. The average height at withers was 0.88 m for a sample of 17 adult cows recorded by Striffling (1977).

3.1.1.1 Performance Traits. Heinemann (1963) reported a calving rate of only 35 to 45% for Lagune cattle kept under village conditions, and Lazic (1978) recorded a calving rate of 58% at Samiondji Station in 1976-77. The Ministère du Développe-

ment Rural et de l'Action Coopérative gave a calving rate of 70% for metayage operations (see chapter 3 of volume 1) which seems very high compared to the figures given in the other sources.

For metayage operations, the Ministère du Développement Rural reported mortality rates of 15% for calves up to one year and 7% for adult animals. At Samiondji Station, mortality rates of 24% for calves up to one year and 5% for adult cows were recorded by Lazic (1978).

Striffling (1977) reported average birth weights of 11 kg for 8 female calves and 10 kg for 5 males and body weights of 53 kg for the same group of females and 47 kg for the males at six months. The average weight of adult cows was 131 kg. Lazic (1978) gave average weights for different age groups as shown in Table 4.

Table 4. Average weights for Lagune cattle.

	Females		Males	
	number	kg	number	kg
Birth	16	9.5	17	10
6 months	11	47.0	9	49
12 months	6	87.0	5	83
Adults	51	152.0	-	-

Source: Lazic, 1978.

Striffling (1977) recorded average weights of cows under ranching conditions in 1976-77. Six three-year-old cows weighed an average of 159 kg each, six four-year-olds averaged 158 kg, seven five-year-olds averaged 163 kg and 29 cows six-years-old and over averaged 165 kg.

3.1.1.2. Index of Productivity. Table 5 summarizes the estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for meat production under the conditions of Samiondji Station in a medium tsetse challenge area.

3.1.2 Somba

The Somba of Benin are stocky animals with good conformation for meat production. The height at withers is 0.90 to 1.00 m, and the coat is generally dark, either uniformly black, black-and-white, red-and-white or pied, usually with dark extremities (see Figure 3.44, volume 1). Average measurements from two surveys are given in Table 6.

Table 5. Lagune productivity estimates.

Parameter	Production Environment Station/medium challenge/meat
Cow viability (%)	95
Calving percentage	58
Calf viability to one year (%)	76
Calf weight at one year (kg)	85
Annual milked out yield (kg)	-
Productivity index[a] per cow per year (kg)	38.4
Cow weight (kg)	152
Productivity index[a] per 100 kg cow maintained per year (kg)	25.3

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Source: Lazic, 1978.

Table 6. Measurements from two samples of Somba cattle.

	I	II
Number of animals	36	76
Sex and age	adult cows	over 5 years
Height at withers (m)	0.92	0.97
Scapulo-ischial length (m)	1.05	1.20
Heart girth (m)	1.30	1.37
Body weight (kg)	149	-

Sources: For I, Striffling, 1977; for II, Domingo, 1976.

3.1.3 Borgou

The Borgou in Benin is a crossbreed between West African Zebu (main White Fulani Zebu) and West African Shorthorn. The coat is usually white or grey, or sometimes black-and-white, and the mucosa are usually black (see Figures 3.50 and 3.58, volume 1). Height at withers ranges from 1.05 to 1.20 m among adult animals (Striffling, 1977). These animals are much more docile than the Lagune or Somba.

3.1.3.1 Performance Traits. Striffling (1977) reported a calving rate under village conditions of 54.5% in Borgou Province, compared with 73% for a sample of 14 cows at M' Bétécoucou Station in 1975/76. The calving rate varies considerable

according to the degree of trypanosomiasis infestation. Lazic (1978) recorded a calving rate at M'Bétécoucou of only 33% in 1976/77. At M'Bétécoucou, the mortality rate during 1976/77 was 28% for calves and 12% for adult cows (Lazic, 1978). The average weights of Borgou cattle at M'Bétécoucou Station in 1976/77 are given in Table 7.

Table 7. Average weights of Borgou at M'Bétécoucou Station.

Age	Females		Males	
	number	kg	number	kg
Birth	15	16	26	17
6 months	16	66	18	86
12 months	17	112	12	130

Source: Lazic, 1978.

Average weights reported by Striffling (1977) are given in Table 8.

Table 8. Average weights of Borgou.

Age in Months	Females		Males	
	number	kg	number	kg
Birth	26	15.6	29	16.4
6	19	71.5	19	90.9
12	17	116.7	11	125.9
18	13	151.7	10	163.6
24	9	206.7	9	199.5
36	2	197.0	3	225.6

Source: Striffling, 1977.

Average weights for adult animals range around 250 kg. Striffling (1977) recorded an average weight of 244 kg for a sample of 81 adult cows under village conditions and 248 kg for a sample of 30 adult cows under ranching conditions. Lazic (1978) reported an average weight of 226 kg for 73 adult cows at M'Bétécoucou Station. At Okpara Farm, an average weight of 307 kg was recorded in 1974 for a sample of 43 males over 5 years old (Striffling et al., 1975).

Viaut (1966) recorded an average dressing out percentage of 52% at the Parakou abbatoir for 24 males and 8 females. The average liveweight of the males

was 265 kg and the average carcass weight 137 kg, while for the females average liveweight was 227 kg and carcass weight 117 kg.

3.1.3.2 Index of Productivity. Table 9 summarizes the estimates of the main production traits for Borgou cattle needed to build up a productivity index covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for meat production under conditions at M'Bétécoucou Station in a medium tsetse challenge area.

Table 9. Borgou productivity estimates.

Parameter	Production Environment Station/medium challenge/meat
Cow viability (%)	88
Calving percentage	33
Calf viability to one year (%)	72
Calf weight at one year (kg)	119
Annual milked out yield (kg)	-
Productivity index[a] per cow per year (kg)	30.1
Cow weight (kg)	226
Productivity index[a] per 100 kg cow maintained per year (kg)	13.3

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Source: Lazic, 1978.

3.1.4 Pabli

Several authors (e.g. Brémaud, 1967) have mentioned the existence of a Pabli breed in the Kérou area north of Kouandé in Atacora Province. This area is now populated by typical Borgou cattle; red animals were pointed out during the country visit as the remnants of the Pabli breed, which has effectively been absorbed by the Borgou.

3.1.5 Crossbreeds

There is great variety in appearance among crossbreeds in Benin depending on the original breeds which were crossed and the proportions of each (see Figures 3.62 and 3.63, volume 1). There are no precise data on the performance of the crossbreeds, but these values are generally similar to those obtained for the breeds which were crossed. The N'Dama breed has been introduced on Okpara Farm near

Parakou in Borgou Province and in the south at the SOBEPALH palm plantation near Ouédo in Atlantique Province for crossbreeding purposes. There is little trace of N'Dama influence in village herds.

3.2 DISEASE

According to Gruvel (1978) and statistics from the Service National de l'Elevage for 1975, the cattle disease situation in Benin is similar to that found in other West African countries. Serious viral and bacterial diseases are uncommon and seem to be under control, but parasitic diseases are a serious problem.

Among infectious diseases, there has been no sign of rinderpest since 1972. Contagious bovine pleuropneumonia (CBPP) was last reported in the north in 1973, brought in by animals from Upper Volta. Pasteurellosis occurs throughout the country: there were 95 foci in 1975. Anthrax is found largely in Atacora Province, with 20 foci in 1975. Some tuberculosis cases have been reported in Borgou Province, mainly among Zebu.

Parasitic diseases are the chief cause of poor health among cattle in Benin. The most common are coccidiosis, gastro-intestinal strongylosis, ascariasis, piroplasmosis and trypanosomiasis. Streptothricosis occurs mainly in the south.

Trypanosomiasis is a major problem in the northern part of the country: there were 1 125 outbreaks in 1975. Microscopic examinations to determine the types of trypanosomes involved are not carried out on a regular basis. *T. vivax*, *T. congolense* and *T. brucei* have all been reported, with *T. vivax* occurring most frequently. Lazic (1978) found that 86% of a herd of Borgou cows at M'Betecoucou responded positively to trypanosomiasis tests, along with 51% of a herd of Lagune cows at Samiondji. These findings suggest that the level of trypanosomiasis infestation in Benin is very high.

3.3 HERD MANAGEMENT AND COMPOSITION

There are two general types of traditional cattle production in Benin: sedentary production in the Guinean region, which accounts for about 20% of the national herd, and transhumant production, which accounts for the other 80% (Atchy, 1976). Transhumance generally occurs from the south to the north and from the west to the east.

Sedentary production systems in the south can be grouped into three types. The first involves free grazing on flooded plains. When waters are low in tsetse areas from December to June, the animals are left to graze freely on fields demarcated by water. As the water rises, the animals are gathered together and kept on rafts and fodder is collected from outside the flooded area and brought to them every day by boat. Animals belonging to village fishermen and farmers are combined in one herd which is tended by a hired herdsman. In other areas, farm households own two or three cows only, which they take out in the morning to graze tethered at the

edge of the fields. They are brought back to the farms in the evening. Under the third type of production system, cattle belonging to several owners are brought together in herds and tended by hired Fulani herdsmen under palm trees, coconut trees, on fallow land or on bush savanna. These herds are milked regularly and the milk is marketed in the towns. The animals are largely Borgou, and many suffer from streptothricosis.

Most livestock production in the central and northern parts of the country is carried out by Fulani who look after their own animals (accounting for more than 50% of the total cattle population) or are hired to look after animals which belong to other people. The Fulani in Benin are relatively sedentary, but they make brief seasonal migrations, leaving the old people and a few cows which have recently calved at their winter camp which is never moved. In Borgou Province, the herds are brought in every evening and individual animals are tethered in a circular arrangement near the camp. The calves are tethered in the centre and the cows on the outside, with the bulls left free. The cows are milked twice a day.

Somba farmers in the northeast keep cattle in small family herds. They are herded during the cropping season, but after the harvest they are left to roam freely.

The size of cattle herds depends on the owners and the production system employed. Herds in the south tend to be small, while those in the north, particularly in Borgou Province, tend to average about 80 head (Striffling, 1977).

Table 10 gives typical herd compositions for the two main livestock regions, Borgou and Atacora Provinces, and for the south, where the herds are chiefly composed of Lagune cattle.

Table 10. Herd composition in three areas (%).

	Borgou Province	Atacora Province	Southern Area
Male calves (< 1 year)	11.6	10.3	8
Young bulls (1 - 3 years)	9.5	8.8	4
Oxen and bulls	2.4	5.4	2
		3.4	3
Total males	23.5	27.9	17
Female calves (< 1 year)	12.2	10.9	11
Heifers	16.8	18.0	14
Cows	47.5	43.2	58
Total females	76.5	72.1	83

Sources: For Borgou and Atacora, Striffling, 1977; for southern area, Brêmaud, 1967.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

Most of the sheep in Benin are of the Djallonké breed. In the north, there are also Fulani sheep and crossbreds between the two types. Sheep in the north tend to be bigger than in the south.

Arnaud (1977) quoted an annual birthrate over two years of 1.74 lambs per ewe at the Lycée Agricole de Sékou. The same author reported an average age at first lambing of 10 months under village conditions and a lamb mortality rate of approximately 40%. Average weights for adult ewes in good conditions were 20 to 25 kg, and for adult rams 30 to 35 kg.

Table 11 summarizes estimates of the major production traits required to build up a productivity index based on the total weight of five-month-old lamb produced per 10 kg of ewe maintained per year. This productivity index has been derived for production under station conditions in a low to medium tsetse challenge area.

Table 11. Sheep productivity estimates.

Parameter	Production Environment Station/low to medium challenge
Ewe viability (%)	95[a]
Lambing percentage	174
Lamb viability to one year (%)	60
Lamb weight at five months (kg)	11.5
Productivity index[b] per ewe per year (kg)	12.3
Ewe weight (kg)	22.5
Productivity index[b] per 10 kg ewe maintained per year (kg)	5.5

a. Estimate.
b. Total weight of five-month-old lamb produced.

Source: Arnaud, 1977; information from country visits.

The goats in Benin are of the West African Dwarf type (see Figure 3.84, volume 1). No information on their production traits was available.

4.2 DISEASE

The most important disease affecting small ruminants in Benin is *Peste des*

Petits Ruminants (PPR). Many animals suffer from helminthiasis, which makes them weak and more susceptible to infectious diseases such as PPR.

4.3 FLOCK MANAGEMENT

Sheep and goats are owned by individual households and are generally kept in small numbers around the house. The animals from a village are never brought together in one flock. Most households keep sheep and goats together and have two to five animals in all. They are not given any veterinary attention or supplementary feeding.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

There are no livestock research centres as such in Benin. However, M'Bétécoucou and Samiondji Stations, which are listed in Table 12 under multiplication herds, are treated as research stations in Figure 1 because research work is being carried out at these stations by FAO. Multiplication herds are described in Table 12 and development projects in Table 13.

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Table 12. Research and multiplication herds.

Name	Centre d'Elevage de l'Okpara (B.P. 361, Cotonou)	Lycée Agricole de Sékou	Ferme de Kpinnou	Station de M'Bétécoucou	Station de Samiondji
Location (and reference in Figure 1)	Borgou Province, 16 km from Parakou ■ 1	Atlantique Province (●) 2	Mono Province ■ 3	Zou Province ● 4	Zou Province ● 5
Organization responsible	SODERA		SODERA	SODERA	SODERA
Size	37 000 ha		300 ha	5 000 ha (25 000 planned)	9 000 ha (15 000 planned)
Breeds and numbers	about 750 Borgou, about 150 N'Dama	80 cattle, 210 sheep	80 Lagune, 200 Borgou for fattening	Breeding herd of 111 Borgou + 300 Borgou draught oxen	Breeding herd of 112 Lagune, 200 Borgou oxen kept in reserve as draught animals
Objectives	Selection and multiplication of Borgou and N'Dama for distribution in rural areas - 6 000 head planned (2 500 breeding cows).	Demonstration herd as part of the training programme. In 1963-65, several Brown Swiss were introduced, but now only traces remain in the herd.	Selection and multiplication of Borgou x Lagune for the métayage operation in the southern area.	Selection and multiplication of Borgou. Data on trypanosomiasis and weight are available on monthly basis and data on reproduction on daily basis for the past two years.	Selection and multiplication of Lagune breed. Same data as for M'Bétécoucou.
External aid	Banque Ouest Africaine de Développement (BOAD)		FAO/UNDP (B.P. 506, Cotonou)	FAO Project BEN 72/015 (B.P. 506, Cotonou)	FAO Project BEN 72/015 (B.P. 506, Cotonou)

Table 13. Development projects.

Name	SOBEPALH (Société Béninoise de Palmeraies d'Huile)	Projet de Développement de la Culture Attelée et de la Production Animale	Amélioration et Développement de la Production Animale (B.P. 506, Cotonou)	Projet de Développement de l'Elevage dans le Sud Borgou	Projet de Développement de l'Elevage des Petits Ruminants
Location (headquarters and reference in Figure 1)	Ouémé Province (Porto Novo) △ 6	entire country (Cotonou) ▲ 7	entire country (Cotonou) ▲ 7	South Borgou Province (Parakou) ▲ 8	Atacora, Borgou and Zou Provinces (Cotonou) ▲ 9
Organization responsible	Ministère du Développement Rural	SODERA	SODERA	SODERA	
Size	21 cooperatives each comprising several villages				
Breeds and numbers	2 813 cattle (Lagune and some N'Dama crossbreds), 130 pairs of draught oxen	Borgou, Lagune and crossbreds	Borgou, Lagune and crossbreds		
Objectives	Meat and manure production.	Development of draught animals, commercial beef production. Demonstration, establishment of livestock centres for Borgou (M'Bétécoucou) and Lagune (Samiondji) and collection and improvement of draught oxen (Okpara).	Continue work of M'Bétécoucou and Samiondji Stations. Introduce improved livestock husbandry methods in the rural areas.	Improve and expand traditional herds. Introduce veterinary services. Reduce calf mortality from 30 to 10%.	Increase national production and revenue. Raise living standards of small farmers. Introduce improved herd management. Establish supporting technical centre and an animal health component including treatment against PPR and parasites.
External aid		UNDP/FAO 72/015	UNDP/FAO BEN/77/002/A/01/12	EEC (EDF)	USAID
Project period		1974 - 1977	1977 - 1981	4 years	1978 - 1983

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CHAPTER 13

NIGERIA

1. BACKGROUND

The Federal Republic of Nigeria lies on the west coast of Africa, on the Gulf of Guinea, with Benin to the west, Niger to the north and Cameroon and Tchad to the east. The capital is at Lagos, and the country has been divided into 19 states since 1976. Before this, there were 12 states.

Government livestock services are provided by both the national and state governments. Each state has a Ministry of Agriculture and Natural Resources with Livestock or Veterinary Divisions which operate state farms and provide technical and veterinary assistance to livestock raisers. At the federal level, the Federal Livestock Department, which is part of the Federal Ministry of Agriculture and Natural Resources, has offices in each state and coordinates livestock development and animal health controls.

Basic data for the country as a whole and for the study area are given in Table 1.

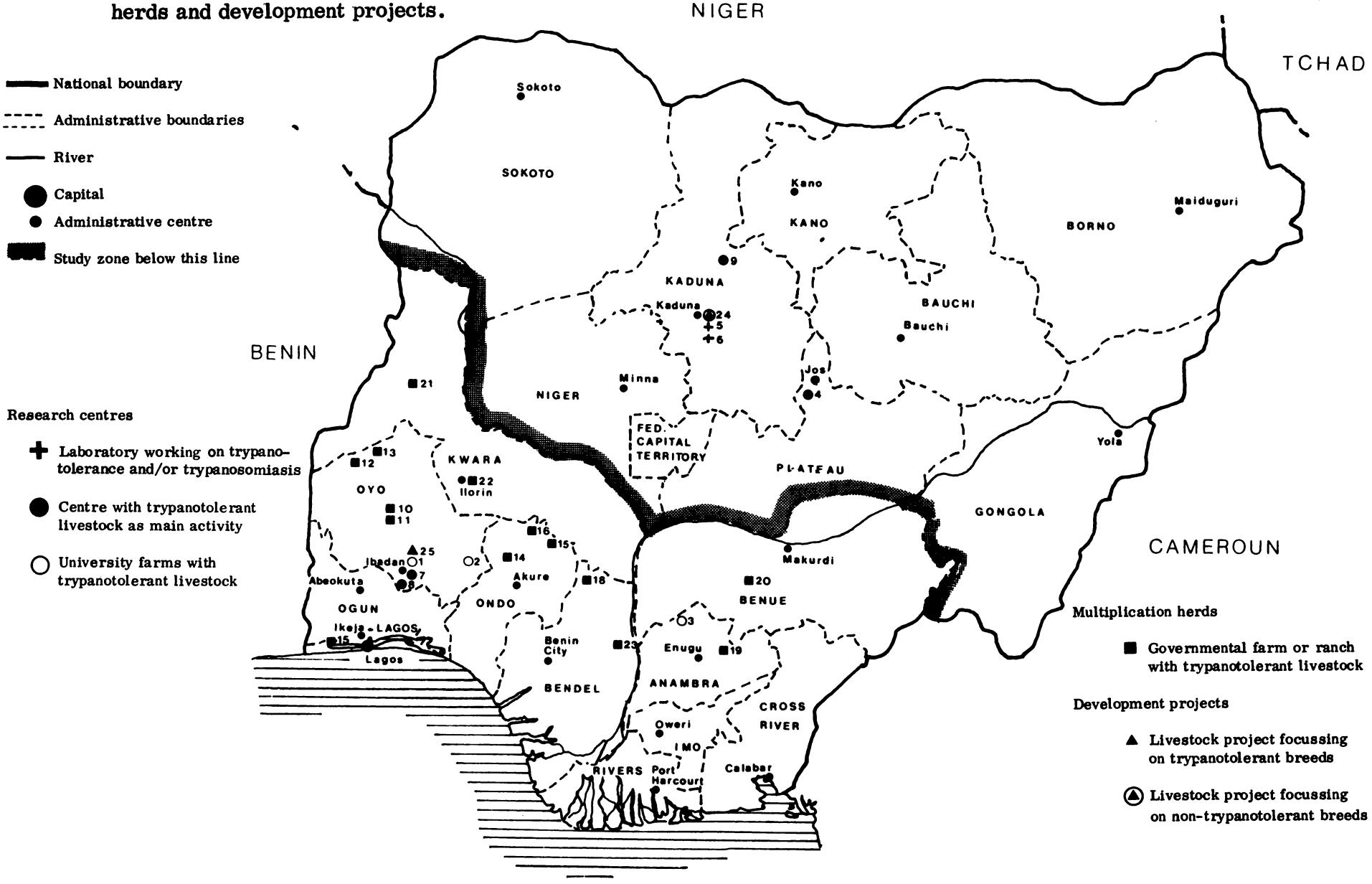
Table 1. Background data for Nigeria.

	Whole Country	Study Area
Area	913 100 km^2	400 000 km^2
Latitude	4^o - 14^o N	4^o - 11^o N
Longitude	3^o - 15^o E	3^o - 11^o E
Population		
number	77 000 000	44 000 000[a]
density	84.3/km^2	110/km^2
Livestock numbers		
cattle	8 235 000	766 000
sheep	18 099 000	1 900 000
goats	23 146 000	5 520 000

a. Estimate

Sources: For population, OAU, 1978; for livestock numbers, Nigeria, Federal Office of Statistics, 1977; for sheep in the study area, Sellers, 1978.

Figure 1. Administrative divisions, boundary of study zone and location of research centres, multiplication herds and development projects.



There is a forest climate in the southern part of the country, below the seventh parallel in the west and the sixth parallel in the east, with annual rainfall between 1 800 and 3 000 mm. Moving north, there is a derived savanna zone, Guinean savanna, Sudanian savanna and finally a Sahelian zone in the northeast, south of Lake Chad. There is generally one rainy season throughout the country, extending from April to October in the south and for a shorter period to the north.

Approximately 600 000 to 700 000 km^2 are infested with tsetse, or 75% of the entire country, including 25% infested only seasonally and 50% infested throughout the year. Since 1956, the Nigerian government has made substantial efforts to clear infested areas in the north, and by 1975 approximately 186 000 km^2 had been cleared, nearly doubling the previous tsetse-free area.

According to the OAU/STRC tsetse distribution map (1977), Kano and Bornu States are free of tsetse, while Plateau, Kaduna, Bauchi, Gongola and Sokoto States are partly infested and Niger is completely infested. As these eight states have no trypanotolerant cattle, except for a small Muturu population in Plateau, they are not included in the study. The remaining 11 states, which are tsetse infested, form the study area: Ondo, Oyo, Ogun, Lagos, Bendel, Anambra, Imo, Rivers, Cross Rivers, Benue and Kwara.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

Out of a total cattle population of 766 000 in these 11 states in 1974/75, about 300 000 were of the trypanotolerant breeds. The rest were Zebu kept in sedentary or transhumant herds or slaughter stock en route to the southern markets. In the country as a whole, 96% of the cattle are Zebu, kept primarily in the north. The main Zebu breeds are White Fulani, Sokote Gudali, Red Mbororo and Shuwa Arab.

Table 2 shows the distribution of the three major breeds of trypanotolerant cattle in the 11 states of the study area. These figures were readjusted between 1975 and 1977 according to the new state boundaries and differ slightly from those of 1974/75 (Nigeria, Federal Office of Statistics, 1977).

The figures for Muturu given in Table 2 are based on information from the veterinary and livestock services, but they seem to be underestimates. There are generally thought to be between 100 000 and 120 000 Muturu in the study area. This population was sharply reduced during the Nigerian civil war and is said to be decreasing still. In the western states, the Muturu are threatened by absorption due to crossbreeding with N'Dama. It is widely reported that Muturu are mainly kept in the forest zone, but large concentrations of these cattle are also found in the southern derived savanna areas, as shown in Figure 2. In Chapter 2 of volume 1, a distinction is made between Forest Muturu and Savanna Muturu.

Table 2. Distribution of trypanotolerant cattle ('000).

State	Total Number	Muturu	N'Dama	Keteku[a]
Ogun	20	2	1	-
Ondo	30	3	4	-
Oyo	100	2	6	-
Lagos	5	1	1	-
Bendel	18	5	1	-
Anambra	50	10	0.35	-
Imo	20	3	-	-
Rivers	0.5	-	0.15	-
Cross Rivers	23	4	0.10	-
Benue	150	25	0.20	-
Kwara	250	2	1	-
Total	666.5	57	14.80	150 - 180

a. Distribution by state unknown.

Source: Information from country visit.

From field observations it would seem that the estimated total of 120 000 can be divided roughly into 38 000 Forest and 82 000 Savanna types.

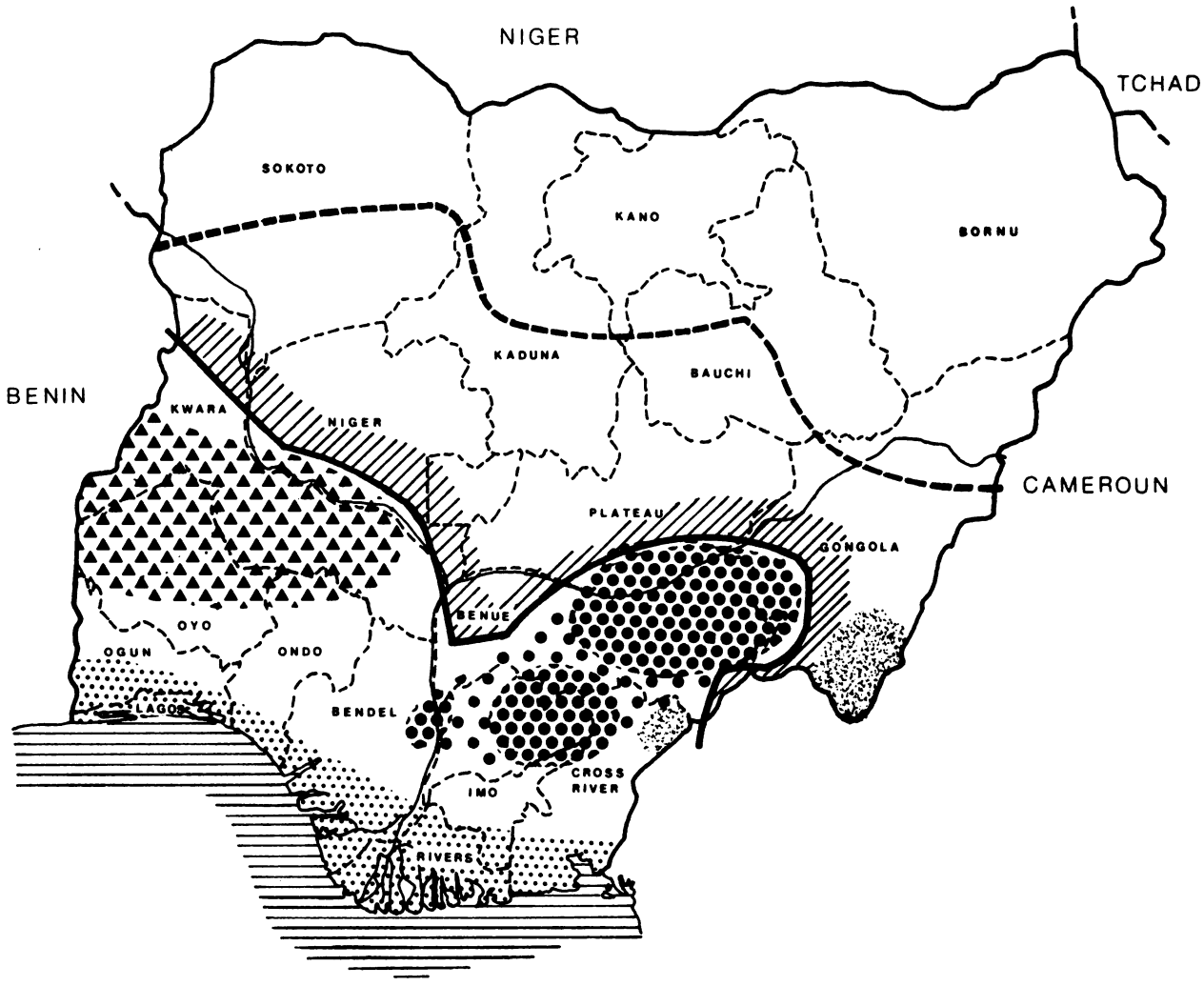
N'Dama are kept mainly on government ranches and on a few commercial farms in the derived savanna and Guinean zones. Some are also found in the forest zone, however, in Lagos and Ogun States. N'Dama bulls have been distributed to small commercial farms by the government livestock services for upgrading Muturu and Keteku herds.

Keteku are found mainly in the derived savanna and Guinean zones of Kwara and Oyo States in the west, as shown in Figure 2. Similar ecological zones exist in Benue, Plateau and Anambra States, but very few Keteku are found there because the local people have traditionally kept pure Muturu herds which play a role in their traditional ceremonies.

The boundaries of the Zebu areas are difficult to define precisely, and the line given in Figure 2 is rather arbitrary. In fact, there are large transitional zones, mainly in the west, with mixed populations of Keteku and White Fulani Zebu, and there are transhumant Zebu herds in trypanotolerant areas and even sedentary herds maintained with regular or occasional treatment with trypanocidal drugs. Substantial Zebu herds are also found on the Obuda plateau in southeastern Cross River State and in the foothills of the Adamawa plateau in southeastern Gongola State, as these two areas are free of tsetse.

A number of Ghana Shorthorn were imported in the early 1940s, but they seem to have vanished, along with the Biu of Boanu and the Yola of Adamawa which

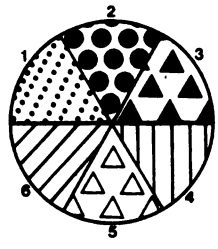
Figure 2. Cattle breed distribution.



Boundary of tsetse-infested zone

Boundary of zone where Zebu predominate

Tsetse-free zones



1. Dwarf West African Shorthorn
2. Savanna West African Shorthorn
3. Shorthorn x Zebu
4. N'Dama
5. N'Dama x Zebu
6. Zebu

were mentioned by Mason (1951).

The national census of 1974/75 reported a sheep population of 5.5 million in the study area, along with an equal number of goats. Sellers (1978), however, estimated the sheep population of the 11 states at 1.9 million. Observations made during the country visit suggest that goats outnumber sheep in Nigeria by a ratio of about three to one, which suggests that Sellers's lower estimate for sheep is probably more accurate. For the country as a whole, there are an estimated 3 million trypanotolerant sheep and 6 million trypanotolerant goats, including some of the animals in the eight states which form an intermediate zone between the trypanotolerant dwarf breeds in the south and the larger Sahelian breeds in the north.

3. CATTLE

3.1 BREED DESCRIPTIONS

3.1.1 Muturu

Muturu is the most common name in Nigeria for a breed which is also known as Dwarf West African Shorthorn, or as Pagan in a small area of the former Benue Plateau State. The breed is described in chapter 3 of volume 1, where a distinction is made between the Forest Muturu, which is the true Dwarf West African Shorthorn, and the Savanna Muturu (see Figures 3.35 and 3.40, volume 1).

The coat colour is generally black or black-and-white. Black is more common in the forest zones and black-and-white in the savanna areas.

Muturu kept at Nsukka under ranch conditions with a small dry-season supplementation were measured in 1977 as follows:

	Number	Age in Years	Weight (kg)	Height at Withers (cm)	Heart Girth (cm)	Body Length (cm)
Females	27	4	140	88	130	96.5
Males	5	4	141	95	125	86.0

These figures seem rather low, especially for the small sample of males. The Vom Substation of the Nigerian Institute for Trypanosomiasis Research (NITR) recorded average weights of 160 to 170 kg for adult cows under ranching conditions with no tsetse challenge.

W. Ferguson (1966) reported a heat tolerance among Muturu of only 65%, based on the Rhoad test. This low figure was derived mainly from their sensitivity to solar radiation, rather than to ambient temperature. Their temperament depends on how they are managed: they are docile under village conditions but

rather wild on the ranches. Muturu are not used as draught animals in Nigeria.

3.1.1.1 Performance Traits. The age of bulls at first service is between four and five years under village conditions. W. Ferguson (1967) recorded an average age at first calving of 26 months at Ado Ekiti Livestock Investigation Centre (LIC) in Ondo State under unrestricted mating conditions. At the NITR Substation at Vom, which is in a tsetse-free zone, the average age at first calving was 21 months with dry-season supplementation (Roberts and Gray, 1973a). In village herds, however, the average is between four and five years.

Calving intervals can be as short as 11 to 13 months under intensive ranching or research station conditions (W. Ferguson, 1967; Olutogun, 1976; Oyenuga, 1967; and Roberts and Gray, 1973a), but is generally from 18 to 24 months under village conditions. Calving occurs throughout the year. Mortality rates of only 2% are reported from research stations, and the mortality rates under village conditions are also very low.

Body weights of Muturu at different ages have been obtained from three locations, as presented in Table 3.

Table 3. Body weights of Muturu cattle.

	Ado Ekiti LIC		NITR Substation at Vom				Upper Ogun Ranch
	females	males	females		males		males
	kg	kg	n	kg	n	kg	kg
Birth	11		8	14 ± 2	7	14 ± 2	16
6 months	58	56	18	61 ± 11	17	71 ± 13	87
12 months	92	91	9	94 ± 12	14	108 ± 11	119
18 months	178	113	3	110 ± 19	10	147 ± 24	-
24 months	136	114	-	-	-	-	-
36 months	177	196	-	-	-	-	-

Sources: For Ado Ekiti, W. Ferguson, 1967 and Olutogun, 1976; for Vom, Roberts and Gray, 1973a; for Upper Ogun, Olutogun, 1976.

Information on the cattle at Ado Ekiti was recorded from 1952 to 1957 under natural grazing conditions with forage supplementation during the dry season. Information on the cattle at Vom was recorded from 1964 to 1976 under natural grazing in a high-altitude tsetse free zone, also with dry-season supplementation, and information on the cattle at Upper Ogun was recorded from 1954 to 1955 under natural grazing conditions.

An average milk production of 421 kg was recorded over 216 days before 1969 at Ado Ekiti (Olaloku, 1976). Dressing out percentages for Muturu range

from 50 to 53% (W. Ferguson, 1967; Nigeria, Ministry of Agriculture and Natural Resources, Western State, 1967).

3.1.1.2 Productivity Index. Table 4 summarizes estimates of the main production traits required to build up a productivity index for Muturu covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for three production environments - meat production under village conditions in a light tsetse challenge area (information from country visit), meat production under station conditions in a light tsetse challenge area (W Ferguson, 1967) and meat production under station conditions with a particularly high level of management in a tsetse-free area (Roberts and Gray, 1973a).

Table 4. Muturu productivity indices.

Parameter	Production Environment		
	Village/light challenge/meat	Station/light challenge/meat	Station/tsetse free/meat
Cow viability (%)	95	95	100
Calving percentage	57	92.4	95.9
Calf viability to one year (%)	85	90+	95
Calf weight at one year (kg)	80	91.5	100.8
Annual milked out yield (kg)	-	-	
Productivity index[a] per cow per year (kg)	39.8	78.0	91.8
Cow weight (kg)	150	177	183
Productivity index[a] per 100 kg cow maintained per year (kg)	26.5	44.1	50.2

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Sources: For column 1, information from country visit; for column 2, W. Ferguson, 1967; for column 3, Roberts and Gray, 1973.

3.1.2 N'Dama

N'Dama were first imported into Nigeria from Guinea in 1939 and kept at Ilorin Farm in Kwara State in order to study their adaptability. In 1942, additional N'Dama were imported from Guinea and a more substantial breeding programme was initiated at Fashola Farm in Oyo State. Since then, more N'Dama have been imported from Guinea, Sierra Leone and Zaire.

The breed is described in more detail in chapter 3 of volume 1 and in the reports on the countries where it originates. Generally, N'Dama seem well adapted to high ambient temperature, moderate humidity and moderate solar radiation. They usually graze in the open at midday without seeking shade. They are docile under village conditions, but wild on the ranches. They are not used as draught animals in Nigeria.

The N'Dama breed has been chosen by the Nigerian government to be used for upbreeding the Muturu and Keteku herds. This policy has been widely accepted by commercial farmers, as indicated by the fact that prices for N'Dama breeding stock have become very high, up to N 600 (US $ 1 000) for heifers and N 1 000 (US $ 1 660) for bulls.

3.1.2.1 Performance Traits. The age of bulls at first service is between three and four years on farms and ranches. Olutogun (1976) reports an average age at first calving of 47.6 months under natural savanna grazing conditions in Oyo State; under the same conditions Akinokun (1970) reports an average of 40.5 months and Claus (1976) 41 months. On some commercial farms in Kwara State, if N'Dama heifers are not pregnant between 30 and 39 months, they are culled.

Olutogun (1976), Akinokun (1970) and Claus (1976) report calving intervals of 472 to 570 days for N'Dama on natural savanna pasture. Roberts and Gray (1973a) report an average calving interval of 363 days in a tsetse-free high-altitude zone. Calves are born throughout the year, with a peak from November to March. On government ranches, calving rates vary from 54 to 78%. Mortality rates are said to be low at around 2 to 3%.

The body weights of N'Dama males and steers at two government facilities are given in Table 5. The animals at Upper Ogun Ranch in Oyo State were maintained on natural pasture grazing, the males during 1960/61 and the steers from 1954 to 1956. At the NITR Substation at Vom, the animals were kept under natural grazing conditions with dry-season supplementation from 1966 to 1968. As previously mentioned, this substation is in a tsetse-free high-altitude zone.

At Upper Ogun Ranch, 604 steers were raised from birth to 40 months on natural pasture grazing without supplementation between 1957 and 1963. Their final weight averaged 283 $\pm$ 19 kg, with an average daily gain of 221 g (Steinbach and Balogun, 1973). Steers born during the early part of the rainy season (March - April) averaged a daily weight gain 14 g higher than those born during the dry season (December - January). Steers finished during the dry season averaged a daily weight gain 10 g higher than those finished during the rainy season, irrespective of their month of birth.

The Ministry of Agriculture and Natural Resources (1967) reports an average carcass weight of 127 kg for two-year-old N'Dama steers slaughtered at an average liveweight of 250 kg, giving a dressing out percentage of 51%.

Table 5. Body weights of N'Dama.

	Upper Ogun Ranch				NITR Substation at Vom			
	males		steers		males			
	n	kg	n	kg	n	kg	n	kg
Birth	305	18 ± 2	20	17	7	18 ± 3	9	16 ± 4
6 months	287	109 ± 17	20	85	10	95 ± 12	14	92 ± 14
12 months	232	164 ± 24	20	140	8	137 ± 14	12	125 ± 22
18 months	155	202 ± 24	20	183	6	192 ± 16	5	166 ± 22
24 months	103	246 ± 32	20	220				
36 months			20	262				
48 months	94	259 ± 36						

Sources: For males at Upper Ogun, Olutogun, 1976; for steers at Upper Ogun, Hill and Upton, 1964 and Dettmers and Hill, 1974; for Vom, Roberts and Gray, 1973a.

3.1.2.2 Productivity Index. Table 6 summarizes estimates of the main production traits required to build up a productivity index for N'Dama covering the total weight of one-year-old calf plus the liveweight equivalent of milk produced per 100 kg of cow maintained per year. This productivity index has been derived for two production environments, meat production under ranch conditions in a medium tsetse challenge area and meat production under station conditions with a high level of management in a tsetse-free area.

Table 6. N'Dama productivity indices.

Parameter	- Production Environment -	
	Ranch/medium challenge/meat	Station/tsetse free/meat
Cow viability (%)	99	100
Calving percentage	58	100
Calf viability to one year (%)	95	97
Calf weight at one year (kg)	156	131
Annual milked out yield (kg)	-	-
Productivity index[a] per cow per year (kg)	86.4	127.8
Cow weight (kg)	260	266
Productivity index[a] per 100 kg cow maintained per year (kg)	33.2	48.1

a. Total weight of one-year-old calf plus liveweight equivalent of milk produced.

Sources: For ranch environment, Olutogun, 1976; for station environment, Roberts and Gray, 1973a.

3.1.3 Keteku

The cattle most widely known as Keteku in Nigeria are also sometimes called Kataku, Ketari, Borgu, Borgawa or Kaiama. Mason (1951) and Faulkner and Epstein (1957) refer to this breed as a natural crossbred between Muturu and White Fulani Zebu, with some N'Dama blood. Gates (1952) and Olutogun (1976) consider the Keteku a cross between the Muturu and the White Fulani only, which seems more likely. As an extension of the large Borgou population in Benin, the Keteku seem to have been in western Nigeria for a long time and can be regarded as a native breed (see Figures 3.51 and 3.59, volume 1).

Faulkner and Epstein (1957) and Oyenuga (1967) give the following average weights and measurements for adult Keteku:

	weight (kg)	height at withers (cm)	body length (cm)	heart girth (cm)
females	295	113	130	153
males	330	115	143	166

In the drier northern parts of Kwara State, the Keteku are said to be larger and taller than they are further south. They are found in settled Fulani herds, in small village dairy schemes and on the government ranches. They tend to be docile under village conditions, but fairly wild under ranch conditions.

3.1.3.1 Performance Traits. The age of bulls at first service is around four years. The age at first calving averaged 47 months among 353 heifers kept at Upper Ogun Ranch from 1954 to 1974, and 38 months for another group of 214 heifers kept on the same ranch from 1958 to 1960. These ages are about the same as those reported for N'Dama heifers, but farmers in Kwara State generally consider the Keteku to be relatively late breeders. For example, one farmer reported culling N'Dama and Muturu heifers between 30 and 39 months if they were not pregnant, but waiting to cull Keteku heifers at 48 to 57 months, based on previous experience.

Calves are born throughout the year, with a slight peak during the dry season. Mean calving intervals of 578 days were recorded at Upper Ogun Ranch from a sample of 537 observations from 1954 to 1974. Among the 192 first intervals, the average was 673 days (Olutogun, 1976). Of 550 calving intervals reported by Claus (1976) from 1958 to 1969, the average length was 491 days.

At Upper Ogun Ranch, the mortality rates of Keteku, N'Dama and Keteku x N'Dama calves averaged 4.6% to weaning and total herd mortality averaged 2.2% from 1957 to 1975 (Olutogun, 1976).

Average Keteku body weights recorded at Upper Ogun Ranch are given in Table 7. The weights of males were recorded during 1960/61, and the birth weights of females were recorded from 1952 to 1973. The weights of steers were recorded from 1954 to 1956.

Table 7. Body weights of Keteku on natural pasture grazing at Upper Ogun Ranch.

	Males		Females		Steers	
	n	kg	n	kg	n	kg
Birth	220	18 ± 2	1 179	18	6	18
6 months	-	-	-	-	6	76
12 months	18	149 ± 19	5	131	6	142
18 months	10	174 ± 25	-	-	6	176
24 months	18	214 ± 28	-	-	6	214
36 months	-	-	-	-	6	256
48 months	28	273 ± 37	-	-		

Sources: For males and females, Olutogun, 1976; for steers, Hill and Upton, 1974.

Carcass weights of two-year-old Keteku steers slaughtered at an average liveweight of 274 kg averaged 127 kg, giving a dressing out percentage of 51% (Nigeria, Ministry of Agriculture and Natural Resources, 1967.

3.1.4 N'Dama x Keteku Crosses

N'Dama x Keteku crossbreeding has begun recently under government initiative and is assuming increasing importance on small commercial ranches in Kwara and Oyo States. Breeding and management are the same as for N'Dama.

3.1.4.1 Performance Traits. The age at first calving averaged 43 months among 372 heifers at Upper Ogun Ranch from 1952 to 1974, and an unnamed ranch recorded an average age at first calving of 39 months for 126 heifers from 1958 to 1968. Both groups were kept on natural pasture grazing. An average calving interval of 548 days was recorded from 969 observations at Upper Ogun Ranch, with an average of 615 for first intervals (Olutogun, 1976). On the unnamed ranch, an average calving interval of 472 days was recorded from 292 observations (Claus, 1976).

Table 8 gives average body weights for N'Dama x Keteku crossbreds on natural pasture grazing at Upper Ogun Ranch. The figures for males were obtained during 1960/61 and those for steers from 1954 to 1956.

Table 8. Body weights of N'Dama x Keteku crossbreds.

	Males		Steers	
	n	kg	n	kg
Birth	60	18 ± 2	12	17
6 months	-	-	12	79
12 months	66	145 ± 21	12	127
18 months	111	178 ± 22	12	173
24 months	31	204 ± 31	12	208
36 months	-	-	12	270
48 months	68	295 ± 28	-	-

Sources: For males, Olutogun, 1976; for steers, Hill and Upton, 1964.

3.2 DISEASE

IBAR (1978) listed cattle diseases found in Nigeria, though chiefly among the Zebu in the northern livestock areas, as follows: foot-and-mouth disease, rabies, contagious bovine pleuropneumonia (CBPP), anthrax, streptothricosis, anaplasmosis, piroplasmosis and trypanosomiasis. Rinderpest is under control, and lumpy skin disease was reported recently.

T. vivax is the most important pathogenic trypanosome found among cattle in Nigeria, followed by *T. congolense* and *T. brucei*. *T. theileri* is also found occasionally together with *T. vivax* or *T. congolense*. In the southern states, 90% of the trypanosomiasis among domestic cattle is caused by *T. vivax* (Esuruoso, 1973).

Muturu cattle generally do not receive any veterinary treatment, as diseases and premature mortality are uncommon. The most important cause of deaths among young stock is helminthiasis, and there have been sporadic outbreaks of anthrax, as reported by W. Ferguson (1966).

N'Dama kept on farms and ranches are vaccinated fairly regularly against the common diseases, and also dewormed and sprayed against ticks. Cases of heartwater, foot-and-mouth and piroplasmosis have been reported among N'Dama herds, and one five-year study of settled herds in the western states indicated a brucellosis infection rate of up to 60% (Esuruoso, 1973). Brucellosis is likely to be carried to other herds through the sale of N'Dama bulls to farmers. In general, no treatment is carried out against trypanosomiasis, though a few ranches and commercial farms are starting prophylactic programmes to avoid weight losses. Hill and Esuruoso (personal communication) have stressed the apparent high resistance of N'Dama to streptothricosis, anaplasmosis and babesiosis.

Olutogun (1976) mentions that Keteku are susceptible to streptothricosis, while N'Dama are not. Cases of heartwater and foot-and-mouth disease are reported among both Keteku and N'Dama, and a survey carried out on government ranches found brucellosis among both breeds (Esuruoso, 1973). Depending on the level of Zebu blood, the Keteku and more susceptible to traypanosomiasis than N'Dama or Muturu kept in the same areas.

The main disease problems among Zebu cattle in southern Nigeria are trypanosomiasis, streptothricosis, tick-borne diseases and helminthiasis.

3.3 HERD MANAGEMENT AND COMPOSITION

Three distinct herd management systems are found in Nigeria: village husbandry, commercial farming or ranching and transhumant husbandry.

3.3.1 Village Husbandry

According to the National Agriculture Sample Census (Nigeria, Federal Office of Statistics, 1977), only 0.3% of all rural households in western and south-

eastern Nigeria keep cattle, with an average of four animals per household and rarely over 10. Cattle herds are generally concentrated in a few villages, with neighbouring villages owning no cattle at all. In addition, veterinary officers in Kwara State mentioned a few private herds of 50 to 60 cattle.

These herds are generally composed of Muturu cattle, or Muturu x N'Dama crossbreds in the western states. They are kept together with West African Dwarf or Djallonké sheep and goats, mainly by agricultural people such as the Ibo, Tiv and Idomo in the east and the Egun and some of the Yoruba in the west. It is generally believed that the meat of humpless cattle tastes better than that of the Zebu, though they are never kept as a regular source of income or meat supply. They are principally used for ceremonies, particularly funerals. Manure is collected occasionally, but not on a regular basis.

The prices obtained for Muturu cattle are high: for adult females, N 350 to 340 (US $ 580 to 720) in Benue State in 1978 and N 250 to 350 (US $ 410 to 580) in Bendel State.

In Ogun, Oyo, Ondo and Kwara States, Muturu are often upgraded with N'Dama bulls to increase their size. This breeding programme is supported by the government (see Figure 3.65, volume 1).

Village cattle are rarely herded, except sometimes in the savanna areas by hired Fulani herdsmen during the cropping season. The cattle generally gather together for the night in an open place in the village, though they are sometimes tethered in family compounds or put in a small hut or kraal. When Muturu bulls are used, they usually come from the same village herd. The animals are grazed on roadside grass, natural pasture and fallows, and they are fed household wastes and crop residues. No mineral salts are given. The animals are not castrated or weaned systematically and they are rarely milked.

3.3.2 Commercial Farming or Ranching

This sector includes commercial farms and government breeding or multiplication ranches, generally keeping Keteku or N'Dama cattle.

The commercial farms carry out breeding operations, as well as short-term fattening of Keteku or White Fulani Zebu. Herds are usually 80 to 200 head and are mainly Keteku, though crossbreeding with N'Dama bulls is increasing. The animals are usually herded by hired Fulani herdsmen on natural pastures, often with some dry-season supplementation with fodder or crop residues. Mineral concentrates are usually given throughout the year. The breeding stock are usually housed at night, and the weaning and fattening stock kept in paddocks. The animals are usually weaned, castrated and sprayed against tick-borne diseases, and the Fulani herdsmen often practise milking.

The government ranches are mainly concerned with the multiplication of N'Dama cattle through the production of female breeding stock and improved bulls. The animals have generally been kept on fenced natural pastures, though

this system is increasingly being replaced by herding. They are weaned and sprayed regularly, though castration is rapidly being abandoned because of the demand for bulls.

Mineral licks are given throughout the year, and the animals are sometimes grazed on artificial pastures or given fodder or crop residues during the dry season. Officially, they are not milked. Herd compositions vary widely on different ranches.

3.3.3 Nomadic and Transhumant Husbandry

Seasonal transhumance is practised with Keteku cattle in the Guinean savanna zone, though most of the more nomadic herds are composed of White Fulani Zebu. The animals are treated against trypanosomiasis on a regular or occasional basis.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

4.1.1 Sheep

West African Dwarf sheep account for 17% of the national sheep population, and they are found further north than the trypanotolerant cattle breeds. Sheep in the drier northern parts of the tsetse zone tend to be taller and heavier than the sheep in the humid forest areas. The breed is described in chapter 3 of volume 1. Studies have been carried out at Ibadan and Ife University Farms, as reported by Dettmers and Hill (1974), Dettmers and Loosli (1974), Matthewman (1977), Dettmers, Igoche and Akinkuolie (1976), Ademosun (1973), Oyenuga (1967), Adu et al. (1974), Adeleye and Oguntona (1975) and Adebambo et al. (1974).

4.1.1.1 Performance Traits. Under village conditions, the age of rams at first service is usually from 1.5 to 2.0 years, and the average age of ewes at first lambing is the same. High prolificacy was recorded at Ibadan University Farm, with 8% triplets and 40 to 56% twins. Lambing intervals under village conditions are about one year, but they averaged 268 days at Ibadan University Farm (Dettmers and Hill, 1974).

Mortality under village conditions was recorded at about 15% up to weaning and 11% among adults, including deaths from traffic accidents (Matthewman, 1977). However, these figures are probably underestimates, due to the sampling method used. Milk production has been recorded over a 10-week lactation at 22 kg with 75% of the Agricultural Research Council (ARC) energy standard and 38 kg with the full ARC energy standard. This was calculated by weighing lambs before and after suckling and hand milking one day a week.

Body weights recorded from 1950 to 1959 and slaughter weights and dressing out percentages from 1973 and 1974 at Ibadan University Farm are given in Tables 9 and 10.

Table 9. Body weights of sheep at Ibadan University Farm.

	Females		Males	
	n	kg	n	kg
Birth	158	1.7	147	1.7
3 months	84	7	94	9
6 months	72	11	67	12
12 months	51	16	25	19
18 months	45	19	18	23
24 months	30	24	17	24
36 months	18	24	4	31

Source: Oyenuga, 1967.

Table 10. Slaughter weights and dressing out percentages of sheep at Ibadan University Farm.

	- A -			- B -				C
	Ewes	Ewes	Rams	Ewes	Rams	Ewes	Rams	Rams
Age (months)	24-48	60	15	5-6	5-6	12-14	12-14	9
Slaughter weight (kg)				9.8	9.4	16	25	24
Dressing out %	44	41	39	46[a]	46[a]	44[a]	44[a]	51
Type of fattening				*Cynodon nlensfuensis*+ 0.5 kg concentrate				

a. Hot carcass weights on the basis of liveweight after starving.

Sources: For A, Dettmers and Hill, 1974; for B, Adeleye and Oguntona, 1975; for C, Adebambo et al., 1974.

4.1.1.2 Index of Productivity. Table 11 summarizes estimates of the major production traits of sheep required to build up a productivity index based on the total weight of five-month-old lamb produced per 10 kg of ewe maintained per year. This productivity index has been derived for station conditions with low tsetse challenge and village conditions with medium tsetse challenge.

Table 11. Sheep productivity estimates.

Parameter	Station/low challenge	Village/medium challenge
Ewe viability (%)	90[a]	94
Lambing percentage	194	173
Lamb viability to one year (%)	85[a]	78
Lamb weight at five months (kg)	10.9	10
Productivity index[b] per ewe per year (kg)	18.9	13.9
Ewe weight (kg)	24	22
Productivity index[b] per 10 kg ewe maintained per year (kg)	7.9	6.3

a. Estimate.
b. Total weight of five-month lamb produced.

Sources: Information obtained on country visit; Matthewman, 1977.

4.1.2 Goats

The West African Dwarf goat, found in the study area, is described in chapter 3 of volume 1. Studies of this breed have been made by Mecha (1975), Sellers et al. (n.d.), Oluwasanmi et al. (1966), Matthewman (1977) and Ademosun (1973). (See Figures 3.77, 3.79 and 3.81, volume 1).

Oyenuga (1967) reports that West African Dwarf goats generally measure 40 to 50 cm at the shoulder and weigh 18 to 20 kg, while Matthewman (1977) reports that animals near Ibadan measure 40 to 60 cm at the shoulder and weigh 20 to 30 kg. Mecha (1975) measured a sample of 1 348 adult goats collected from several areas in the eastern and western states. He found that 6.2% measured less than 40 cm, with an average height of 37.3 cm, 67.5% measured 40 to 50 cm with an average height of 44.6 cm, and 26.3% measured more than 50 cm, with an average height of 53.1 cm.

There is no doubt that goats in the very humid areas of southern Nigeria tend to be smaller than those in the drier savanna areas further north. However, the goats in the northern parts of the study area could be influenced by crossbreeding with the Sahelian breeds.

4.1.2.1 Production Traits. Matthewman (1977) reports that the age of young males at first service is often under one year. The age at first kidding can be as low as 13 months on research stations and up to 18 months under village conditions. Kidding rates recorded in 1975/76 for two villages and in 1971/72 at the University of Ife, all in Oyo State, are given in Table 12.

Table 12. Kidding rates.

	Fashola Village	Jago Village	University of Ife
Mean kidding percentage (number kids per 100 kidding females)	159	151	-
Kidding % (1st parturition)	100	107	-
Kidding % (2nd parturition)	164	165	-
Kidding % (3rd parturition)	150	167	-
Kidding % (4/5/6th parturition)	200	200	-
Mean percentage single births	27	34	35
Mean percentage twin births	67	62	55
Mean percentage triplet births	6	5	10

Sources: For villages, Matthewman, 1977; for University of Ife, Ademosun, 1973.

Mecha (1975) reports that medium-sized goats are more prolific than dwarf goats. He found that the larger animals had shorter kidding intervals and gave birth to twins more frequently.

Matthewman (1977) recorded annual mortality rates of 15% up to weaning and 10 to 15% among adult animals in two villages near Ibadan, including deaths from road accidents. However, he emphasizes that these figures are underestimates, due to the sampling methods employed.

Weights of a sample of Dwarf goats which were stall fed and given minerals at the University of Ife in 1971/72 under zero grazing conditions are reported by Ademosun (1973) as follows (kg):

	Birth	2 months	3 months	4 months	6 months
females	1.4	5.0	6.0	6.5	8.0
males	1.6	5.0	7.0	7.0	9.0

Mba et al. (1974) carried out a three-week fattening trial with 12 castrated goats, 6 to 8 months old and weighing 7 to 15 kg at the outset. With urea as the source of nitrogen, the mean daily weight gain was 36 g, and with groundnut cake it was 31 g. Cold carcass dressing out percentages were 47% with urea and 49% with groundnut cake.

4.1.2.2 Index of Productivity. Table 13 summarizes estimates of the major production traits of goats required to build up a productivity index based on the total weight of five-month-old kid produced per 10 kg of female goat maintained per year. This productivity index has been derived for production under village conditions in a medium tsetse challenge area.

Table 13. Goat productivity estimates.

Parameter	Production Environment Village/medium challenge
Female viability (%)	81
Kidding percentage	232
Kid viability to one year (%)	78
Kid weight at five months (kg)	7.5
Productivity index[a] per female goat per year (kg)	15.2
Female weight (kg)	19
Productivity index[a] per 10 kg female goat maintained per year (kg)	7.9

a. Total weight of five-month-old kid produced.

Source: Matthewman, 1977.

4.2 DISEASE

Disease is generally recognized as the major constraint on sheep and goat production in the humid zone. The most important diseases affecting small ruminants in Nigeria are *Peste des petits ruminants* (PPR), mycoplasmosis pasteurellosis, helminthiasis and ectoparasites (Sellers, 1978). IBAR (1978) also mentions blue tongue, sheep pox and contagious caprine pleuropneumonia.

4.3 FLOCK MANAGEMENT AND COMPOSITION

4.3.1 Sheep

According to the National Agriculture Sample Census carried out in 1974-75 (Nigeria, Federal Office of Statistics, 1977), between 5 and 10% of all rural households in the southern states keep sheep, usually from 4 to 13. The average composition of village flocks is given in Table 14 for four areas, all in Oyo State. At Fashola and Jago villages, the flocks were observed during 1975/76, at Uboma village during 1963/64 and at Eruha Village in 1974.

Matthewman (1977) concludes from his survey of two villages that 90% of the farmers who keep sheep view their flocks as an investment or a source of cash, and only 5% primarily as a source of food. Although adult sheep are slaughtered occasionally in the village for traditional ceremonies, 90% of the male lambs and 40% of the females are sold at local markets at weaning. The annual offtake of adult sheep, either for sale or for slaughter at home, is estimated at 19%. Similarly, Oluwasanmi et al. (1966) conclude that sheep are more important in the villages of eastern Nigeria as a source of income than as a family food supply.

Table 14. Average composition of sheep flocks in four villages (%).

	Fashola Village	Jago Village	Uboma Village	Eruha Village
Adult males (%)	8	0	-	17
Adult females (%)	63	67	-	47
Young (%)	24	33	-	33
All males (%)	-	-	18	-
All females (%)	-	-	82	-

Sources: For Fashola and Jago, Matthewman, 1977; for Uboma, Oluwasanmi et al., 1966; for Eruha, Sellers et al., n.d.

Sheep are not herded, but they are sometimes tethered during the cropping season. They graze on crop stubble, village pastures and along the roadsides and are often given maize stalks, bean husks, yam peelings or cassava. The cassava is sometimes bought especially for the sheep. In the eastern states, supplementation is less common. Sheep are not weaned or castrated systematically, and sheep manure is not collected. They are seldom housed, and in general are not valued as highly as goats.

4.3.2 Goats

The National Agriculture Sample Census (Nigeria, Federal Office of Statistics, 1977) indicates that a much higher proportion of households in the southern states keep goats than sheep. Household goat flocks usually consist of 2 to 7 animals. Percentages of households with goats and the average size of household flocks are given in Table 15 for the former states of the study area.

Table 15. Household goat flocks.

Former State	% of Households with Goats	Average Number of Goats Kept
Western	41	4.3
Mid-Western	42	6.2
Rivers	24	17.9
South East	50	5.6
East Central I	32	4.6
Lagos	43	3.0
Benue Plateau	61	6.5

Source: Nigeria, Federal Office of Statistics, 1977.

Typical compositions of the goat flocks in four villages of Oyo State are given in Table 16. The flocks in Fashola and Jago villages were observed during 1975/76, those in Uboma village during 1963/64 and those in Erowa village during the rainy season of 1974.

Table 16. Average composition of goat flocks in four villages (%).

	Fashola Village	Jago Village	Uboma Village	Eruwa Village
Adult males (%)	6	2	-	15
Adult females (%)	59	63	-	51
Young (%)	35	35	-	34
All Males (%)	-	-	25	-
All Females (%)	-	-	75	-

Sources: For Fashola and Jago, Matthewman, 1977; for Uboma, Oluwasanmi et al., 1966; for Eruwa, Sellers et al., n.d.

Among female goats in two villages observed by Matthewman (1977), 29 and 39% were not yet mature, 44 and 49% had kidded one or two times, 22 and 15% had kidded three or four times, and 5 and 4% had kidded five or six times.

Husbandry practises are very similar for goats as for sheep, though goats are much more widely kept. Goats, along with poultry, are by far the most important animal among households in the humid and semi-humid tsetse-infested areas.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

5.1.1 University of Ibadan

The location of the University of Ibadan in Oyo State is shown by o1 in Figure 1. The University Farm keeps about 300 N'Dama, White Fulani Zebu, German Black Pied, German Brown and crossbred cattle and about 300 Dwarf West African sheep on 25 ha, including 4 ha of artificial pastures. The Animal Science Department is carrying out a number of research projects covering:-

a. aspects of grazing and food intake on various pasture combinations with German Brown x N'Dama crossbreds,

b. supplement requirements for growth of N'Dama, White Fulani Zebu, German Brown, German Black Pied and N'Dama x German Brown crossbreds,

c. physiological analysis of the reproductive performance of N'Dama and Muturu at the Fashola Stock Farm,

d. revision of N'Dama body measurements,

e. growth rates for N'Dama on natural and artificial pastures, and

f. birthweights of N'Dama at Fashola Stock Farm.

In addition, the Faculty of Veterinary Medicine is working on the production of an antigen for *T. vivax* and plans to study trypanotolerance among N'Dama.

5.1.2 University of Ife

The University of Ife includes a University Farm where research work is carried out by the Animal Science Department. The location is shown by ○2 in Figure 1. There is a cattle herd of 115, made up of 85 N'Dama, 6 Muturu and 24 crossbreds among N'Dama, White Fulani Zebu and Muturu. The Goat Unit keeps 54 West African Dwarf goats, 23 mixed goats from Maiduguri in Bornu State in the north and 20 Saanen Dairy x West African Dwarf crossbreds. The Sheep Unit keeps 172 West African Dwarf sheep and 54 West African Dwarf x Permer crossbreds. The Permer breed in turn is a cross between Marino and Persian Blackhead.

Research work is underway on the preweaning performance of N'Dama at Upper Ogun Ranch and the production performance of N'Dama, N'Dama x White Fulani Zebu crossbreds and West African Dwarf sheep and goats at the University Farm.

5.1.3 University of Nigeria, Nsukka

Research work is being carried out by the Animal Science Department of the University of Nigeria, Nsukka on the growth and reproduction of N'Dama, Muturu and Boran cattle and the reproduction of local sheep and goats. The University Farm includes 67.5 ha of natural pasture, with another 18 ha to be fenced. As of April 1978, there were 128 N'Dama, 39 Muturu, 48 Boran and 6 White Fulani Zebu. The Sheep and Goat Unit included 80 West African Dwarf ewes and 30 West African Dwarf female goats. The location of the farm is shown by ○3 in Figure 1.

5.1.4 Nigerian Institute of Trypanosomiasis Research (NITR) Substation at Vom

The location of the Nigerian Institute of Trypanosomiasis Research (NITR) Substation at Vom is shown by ● 4 in Figure 1. The Institute itself is located at Kaduna (P.M.B. 2077), as shown by +5 in Figure 1.

At the Vom Substation, 47 N'Dama, 25 Muturu, 15 White Fulani Zebu and 6 White Fulani x N'Dama crossbreds are kept on 50 ha of natural pasture. The growth of N'Dama, Muturu and White Fulani Zebu is being studied under different feeding regimes with and without tsetse challenge. The growth of trypano-susceptible Yankasi sheep and Red Sokoto goats is also being studied with and without tsetse challenge. Birth records are kept of individual animals and body temperatures are recorded daily.

5.1.5 Tsetse and Trypanosomiasis Division of the Federal Livestock Department at Kaduna

The Tsetse and Trypanosomiasis Division of the Federal Livestock Department at Kaduna (P.M.B. 2012) carries out tsetse eradication projects throughout the country. This division is also in charge of tsetse infestation surveys and the identification of pathogenic trypanosomes. The location of the headquarters is shown by +6 in Figure 1.

5.1.6 Institute of Agricultural Research and Training of the University of Ife

The Agriculture Department of the University of Ife includes an Institute of Agricultural Research and Training at Moor Plantation near Ibadan. The location of the Institute is shown by ● 7 in Figure 1.

In 1975, the Institute purchased N'Dama, Keteku, Muturu and White Fulani Zebu cattle in order to carry out milking trials. Beef cattle trials have also been conducted, aimed mainly at identifying favourable grazing systems on natural pastures and suitable grass and legume combinations for artificial pastures.

5.1.7 ILCA Small Ruminants Programme

The ILCA Small Ruminants Programme (c/o IITA, P.M.B. 5320, Ibadan) was initiated in 1978 to investigate strategies for improving the productivity of sheep and goats through increased labour and capital inputs at the village level. More intensive management systems are compared on an experimental basis, as well as specific innovations introduced into traditional systems. The returns achieved are compared with those obtained from similar investments in crop production.

Experimental sites are located at Fashola in Oyo State and at Ikenne in Ogun State. The location of the programme's headquarters is shown by ● 8 in Figure 1.

5.1.8 National Animal Production Research Institute (NAPRI)

The National Animal Production Research Institute is located at Shika in Kaduna State, as shown by ● 9 in Figure 1. So far, only productivity studies of the Zebu breeds have been carried out, but the Institute plans to extend its research activities into southern Nigeria, focussing on the N'Dama and Muturu.

5.2 MULTIPLICATION HERDS

Fourteen important multiplication herds which work with trypanotolerant breeds in Nigeria are described in Table 15. In addition, a number of smaller government farms under the Ministry of Agriculture and Natural Resources carry out multiplication work with herds of less than 100 cattle. These farms are found at

Table 15. Multiplication herds.

Name	Upper Ogun Ranch	Fashola Stock Farm	Shaki Livestock Station	Ogboro Station	Ado-Ekiti Livestock Investigation Centre	Akunu Cattle Ranch	Oka-Ako Cattle Ranch
Location (and reference in Figure 1)	Ogun State ■ 10	Oyo State ■ 11	Oyo State ■ 12	Oyo State ■ 13	Ondo State ■ 14	Ondo State ■ 15	Ondo State ■ 16
Organization responsible	Western Livestock Company (Ibadan)	Ministry of Agriculture and Natural Resources (Ibadan)		Western Livestock Company (Ibadan)	Ministry of Agriculture and Natural Resources (Akure)	Western Livestock Company (Ibadan)	Western Livestock Company (Ibadan)
Size	10 000 ha	550 ha (mainly artificial pasture)	800 ha	8 000 ha under development	600 ha artificial and improved pastures	8 000 ha	11 250 ha under development
Breeds and numbers	3 180 N'Dama as of April 1978, 1 130 Keteku and crosses	420 N'Dama as of April 1978, 320 Keteku and crosses	280 N'Dama and crosses, 60 Keteku as of April 1978	140 N'Dama as of April 1978	315 N'Dama as of April 1978, 100 Keteku, 60 Muturu, 190 crosses, 50 Zebu and European cattle, 75 local sheep	1 740 N'Dama as of April 1978	410 N'Dama and N'Dama x Keteku crosses as of April 1978
Objectives	N'Dama multiplication, sale of breeding stock, commercial beef production. Data recording: individual records available.	N'Dama multiplication and sale of breeding stock. Individual records available.	Production of breeding stock. Individual records available.	N'Dama multiplication herd to be increased to 4 000 head. Individual records available.	Production of Keteku and N'Dama breeding stock. Plans to specialise in dairy cattle only. Individual records available.	N'Dama multiplication and production of breeding stock. Individual records available.	N'Dama multiplication herd to be increased to 5 000 head. Individual records available.
External aid	Development finance partly by IBRD Livestock Development Project loan			Development financed partly by IBRD Livestock Development Project loan		Development financed partly by IBRD Livestock Development Project loan	Development financed partly by IBRD Livestock Development Project loan

Table 15, cont.

Name	Pota Cattle Ranch	Igarra Cattle Ranch	Ezillo Nkalagu State Farm	Raav Livestock Investigation and Breeding Centre	Kaiama Livestock Station	Shao Livestock Station	Ubiadja Goat Farm
Location (and reference in Figure 1)	Lagos State ■ 17	Bendel State ■ 18	Anambra State ■ 19	Benue State ■ 20	Kwara State ■ 21	Kwara State ■ 22	Bendel State ■ 23
Organization responsible	Ministry of Agriculture and Natural Resources (Ikeja)	Benel Food Production Board (Benin City)	Agricultural Development Corporation (P.M.B. 1024, Enugu)	Ministry of Agriculture and Natural Resources (Maburdi)	Ministry of Agriculture and Natural Resources (Ilorin)	Ministry of Agriculture and Natural Resources (Ilorin)	Board of Food Production Corporation (Benin City)
Size	approx. 4 000 ha	1 600 ha	2 400 ha + 320 ha artificial pasture	5 400 ha under development	approx. 500 ha	approx. 400 ha	
Breeds and numbers	550 N'Dama as of April 1975, 170 Muturu and crosses	625 N'Dama as of May 1978, 60 Muturu, 20 Zebu and Keteku	225 N'Dama as of May 1978, 140 Muturu, 30 Wadara and crosses, 35 Kenana and crosses, 80 White Fulani Zebu and crosses	205 N'Dama as of April 1978	135 Keteku as of April 1978	95 N'Dama as of April 1978, 35 Keteku	150 West African Dwarf goats including crosses with northern breeds, 25 West African Dwarf sheep including crosses with northern breeds
Objectives	N'Dama multiplication, production of breeding bulls.	Multiplication and production of feeder stock. Individual records available (birth register).	Commercial beef production, multiplication of N'Dama, milk production (Kenana), crossbreeding experiments with Zebu, N'Dama and Muturu. Herd level records available.	N'Dama multiplication and production of breeding stock. Herd level records available.	Production of breeding stock. Herd level records available.	N'Dama multiplication and production of breeding stock. Herd level records available.	Multiplication flock to be increased. Flock level records available.
External aid							

Imara, Ikenne and Odeda in Ogun State, Osara in Kwara State and Bori, Yenagoa and Degema in Rivers State. There are also two government model farms at Ikoto-Efanga and Obio-Akfa in Cross Rivers State. All of these farms are working with N'Dama cattle.

5.3 DEVELOPMENT PROGRAMMES

The Third National Development Plan covers the period from 1975 to 1980 and includes an estimated total expenditure of N 344 046 191 (US $ 573 410 000) for the livestock sector, allocated through the state and federal governments. The greater part of these funds is directed towards projects to increase the productivity of the large Zebu stock in the country. Substantial funds are also allocated to the development of the dairy industry, based on imported exotic breeds (mainly Friesian, but also Brown Swiss) and their crosses with White Fulani Zebu. Zebu production and dairy enterprises based on exotic breeds are being developed in southern Nigeria, as well as in the north, on the basis of tsetse eradication in limited areas or prophylaxis and treatment for trypanosomiasis or a combination of both.

The only activities included in the Plan which focus entirely or mainly on trypanotolerant cattle in the tsetse areas concern the establishment or expansion of N'Dama herds on government farms and ranches. The total budgetary allocation is approximately N 13 693 000 (US $ 22 821 670), or 4% of all expenditure in the livestock sector. The policy on the development of sheep and goat production in the tsetse areas expressed in the Plan is to 'encourage research on the improvement of the indigenous breeds of sheep and goats through crossbreeding with suitable exotic breeds of high productivity'.

Other livestock development projects cover both trypanotolerant and trypano-susceptible livestock, making it difficult to specify the level of expenditures directed to each. The Nigeria Livestock Development Project, funded jointly by the World Bank (IBRD) for the period 1977 to 1989, is directed by the Livestock Project Unit at Kaduna, indicated by ◉ 24 in Figure 1. The project aims to improve Zebu production in the northern states and to establish fattening operations in Oyo and Ondo States based on Zebu stock. The provision of veterinary services is also included.

Five breeding or multiplication ranches are also being established or developed under this project in the southern states, aimed at increasing the production of N'Dama and N'Dama x Keteku slaughter stock and N'Dama breeding stock. These are directed by the Western Livestock Company at Ibadan (P.M.B. 5435), with headquarters shown by ▲ 25 in Figure 1. Two new ranches have been started, Ogboro and Oke Ako, and a third, Meko, is still in the planning stage, while two existing ranches, Upper Orun in Oyo State and Akunu in Ondo State, are being further developed.

Finally, a feasibility study was initiated in April 1978, with funding from the World Bank, for an integrated rural development project in Benue State called the Ayangba Agricultural Development Project. This project includes the improvement and expansion of veterinary services, aimed at both trypanotolerant and trypano-susceptible cattle, and the improvement of local West African Dwarf goats at the Idah Goat Farm through crossbreeding with exotic breeds or stock from northern Nigeria.

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CHAPTER 14

CAMEROON

1. BACKGROUND

The United Republic of Cameroon lies on the west coast of Africa, with Nigeria to the west, Chad and Central African Republic to the east and Congo, Gabon and Equatorial Guinea to the south. The country is divided into seven provinces, with its capital at Yaoundé. Northwest and Southwest Provinces comprise the English-speaking former West Cameroon, while the other five provinces comprise the French-speaking former East Cameroon. Each province is divided into several departments, which are sub-divided into arrondissements and further into districts. The administrative boundaries are shown in Figure 1.

The Ministry of Animal Breeding and Industries includes a Direction of Veterinary Services and a Direction of Animal Production and has offices at the provincial and departmental levels. North Province is divided into two Secteurs Provinciaux d'Elevage , North Livestock Sector, with headquarters at Maroua, and Centre Livestock Sector, with headquarters at Ngaoundéré, which includes the Adamawa Plateau. This division has been made because this province accounts for 2.2 million cattle, or 75% of the national herd.

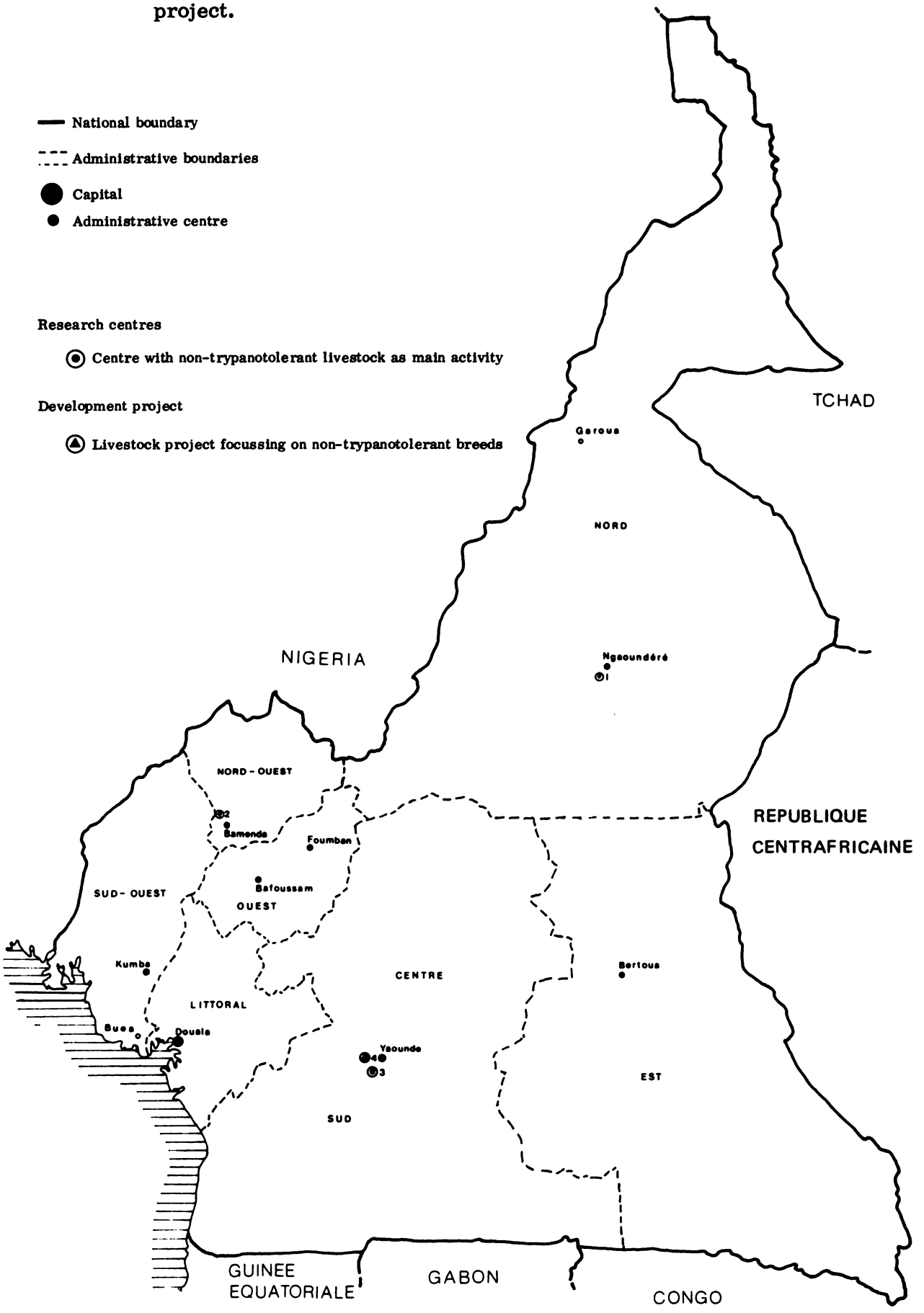
Basic data for the country as a whole are given in Table 1.

Table 1. Background data for Cameroon.

Area	475 000 km^2
Latitude	2^o - 13^o N
Longitude	9^o - 16^o E
Population	
number	7 600 000
density	16/km^2
Livestock numbers	
cattle	2 917 000
sheep and goats	3 653 000

Sources: For population, OAU, 1978; for livestock numbers, Cameroon, Ministry of Animal Breeding and Industries, 1977.

Figure 1. Administrative divisions and location of research centres and development project.



The southern part of the country has a forest climate with two rainy seasons, from March to June and from August to November. The annual rainfall is between 1 500 and 4 000 mm. Moving north, the climate changes to Guinean, then Sahelo-Sudanian and to Sahelian in the extreme north. There is one rainy season from April to October in the Guinean zone, becoming shorter in the north - from May to October in the Sahelo-Sudanian zone and from June to September in the Sahelian zone. Annual rainfall is 1 400 to 1 700 mm in the Guinean zone, 800 to 1 400 mm in the Sahelo-Sudanian zone and around 600 in the Sahelian zone.

According to the OAU/STRC tsetse distribution map (1977), tsetse is widespread throughout the country except in the area north of Garoua and in certain high-altitude areas on the Adamawa Plateau and in the west and southwest. Figure 2 shows the approximate boundaries of the infested areas.

G. tachinoides and *G. morsitans* are found on the Adamawa Plateau just to the north, while *G. tachinoides* is found further north in the valley of the Benoue River and its tributaries and in parts of the Logone River valley. *G. fusca*, *G. fuscipes* and *G. palpalis* are chiefly found south of the Adamawa Plateau, while *G. tabaniformis*, *G. nigrofusca*, *G. pallicera* and *G. caliginea* are found in the forest zone.

The Adamawa Plateau, at over 1 000 m, used to be considered free of tsetse, but in fact is heavily infested with *G. morsitans submorsitans* (Boutrais, 1974; Eyidi, 1971). The OAU/STRC map indicates that more than half of the plateau is infested. For this reason, Fulani and Mbororo Zebu herds have been removed from vast areas of pasture, particularly in the northwestern part of the plateau. A special tsetse eradication campaign was initiated in 1976/77 in this area as part of the national livestock development project (Banser, 1977).

A number of eradication campaigns have also been undertaken against *G. tachinoides* in North Livestock Sector. These campaigns have been carried out in the Benoué, Logone and Moyokebbi valleys and towards the Nigerian border around Mayotiel (Eyidi, 1971; Gruvel, Fernagut and Simeon, 1970; Gruvel, Troncy and Tibayrenc, 1970).

2. LIVESTOCK NUMBERS AND DISTRIBUTION

Official estimates of the livestock population in the seven provinces are given in Table 2 for 1977.

2.1 CATTLE

Table 2 shows that 75.4% of the national herd is found in North Province. Another 16.6% is found in West and Northwest Provinces, which include high-altitude pasture

Table 2. Livestock numbers and distribution in 1977.

Provinces and Capitals	Cattle - Number	Cattle - % of National Total	Cattle - Estimated Humpless Cattle Population	Sheep & Goats - Number	Sheep & Goats - % of National Total
North					
North Livestock Sector (Maroua)	1 100 000	37.7	5 000 - 6 000[a]	1 500 000	41.2
Centre Livestock Sector (Ngaoundéré)	1 100 000	37.7	negligible	350 000	9.6
West (Bafoussam)	126 000	4.3	<1 000[b]	750 000	20.5
Northwest (Bamenda)	360 000	12.3		200 000	5.5
Southwest (Buea)	5 000	0.2		20 000	0.3
Littoral (Douala)	250			200 000	5.5
Centre South (Yaoundé)	70 000	2.4	<1 000[c]	500 000	13.7
East (Bertoua)	156 000	5.4		133 400	3.7
Total	2 917 250	100.0	6 000 - 8 000	3 653 400	100.0

a. Found in two pockets maintained by the Kapsiki and Doayo people.
b. Bakosi and Muturu in two isolated pockets and a few N'Dama. c. A few N'Dama.

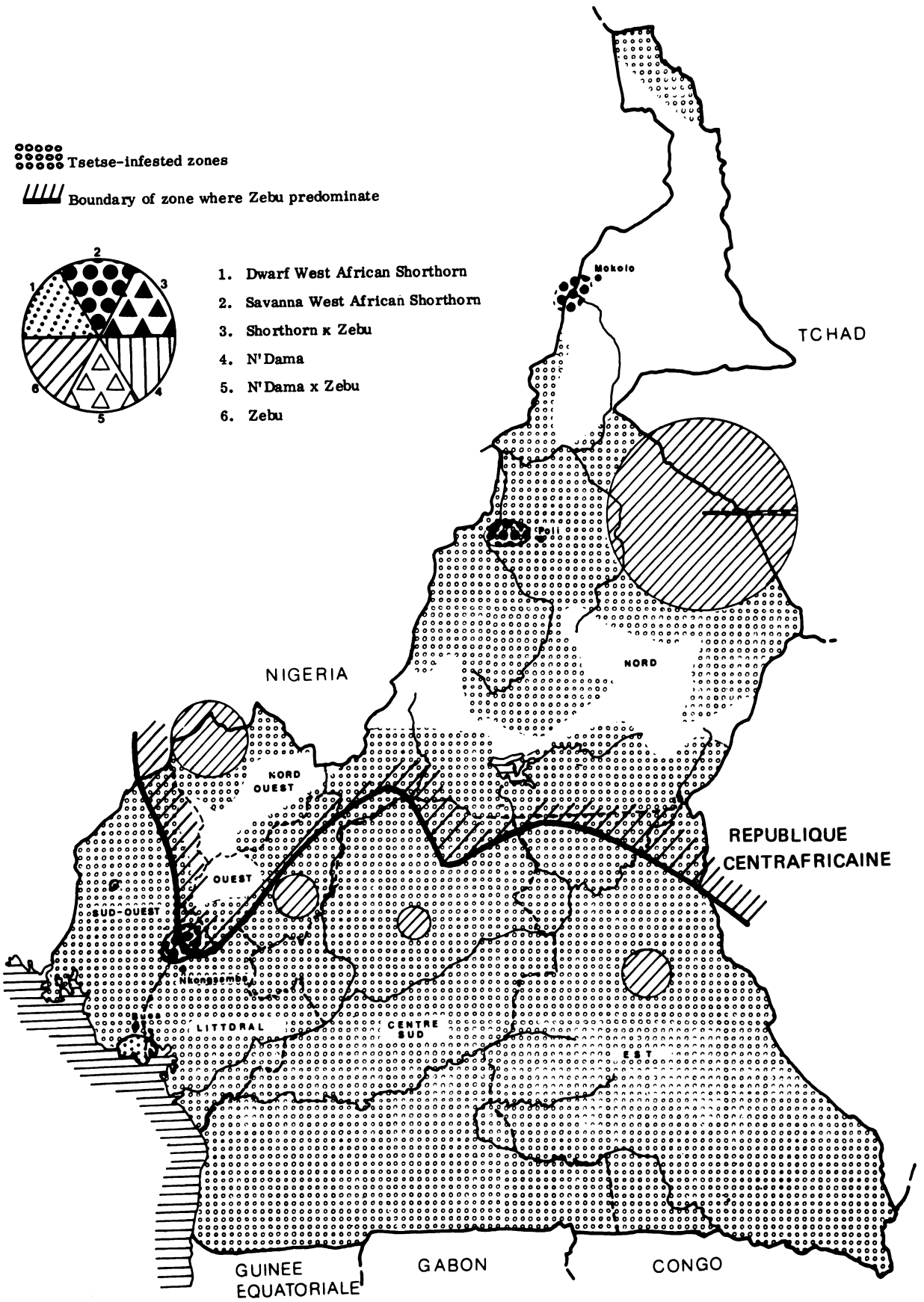
Source: Ministry of Animal Breeding and Industries.

lands extending to the Adamaoua Plateau. The cattle in these provinces, which together constitute 92% of the national herd, are generally Fulani or Mbororo Zebu kept in the areas which are free of tsetse or only lightly infested. In the highland areas, such as the Manengouba Mountains near Nkongsambia, settled Zebu herds can be found as far south as the fifth parallel. Dry-season transhumance is practised in Centre South and East Provinces, which account for 8% of the national herd. There are also a few cattle in relatively settled herds just south of the Adamawa Plateau, near Yoko in Centre South Province and near Garoua-Boulai in East Province. These are also Zebu cattle, often of the Mbororo breed.

The distribution of cattle in Cameroon thus appears paradoxical: although more than 80% of the country seems to be infested with tsetse, more than 99% of the national herd is made up of non-trypanotolerant Zebu cattle.

A number of factors at least partly explain the presence of Zebu cattle in the tsetse-infested areas. For one thing, in some areas the tsetse challenge is slight and only seasonal. Cameroon has a high-altitude region, called the Cameroon Dorsal, which starts with Mount Cameroon in the southwest and extends to the Adamawa Plateau. These highland areas have a very light tsetse infestation or none at all, and they serve as a seasonal retreat for transhumant Zebu herds, allowing them to take advantage of pastures at other times which are only seasonally infested. In addition,

Figure 2. Cattle numbers and breed distribution.



Zebu cattle are given chemo-prophylactic treatment for trypanosomiasis on a large scale in Cameroon, which allows them to survive in lightly infested areas. Finally, the government has carried out intensive tsetse eradication programmes around the country, most recently in Adamawa.

These factors explain, at least in part, how the Zebu herds in Cameroon are able to survive. They do not indicate why so little use has been made of the trypanotolerant breeds.

2.2 SHEEP AND GOATS

Table 2 shows that 50.8% of the sheep and goats in Cameroon are found in North Province and another 26% in West and Northwest Provinces. Southwest, Littoral, Centre South and East Provinces, all of which are infested with tsetse, account for 853 400 sheep and goats, or 23.2% of the national flock,with 500 000 of these in Centre South Province.

No figures are available by species, but Vallerand and Branckaert (1975) suggest there are three goats for every two sheep in Cameroon. It is possible to estimate the sheep and goat populations in the four southern provinces using this formula, as shown in Table 3.

Table 3. Estimated sheep and goat populations in the southern provinces.

Province	Sheep	Goats
Centre South	200 000	300 000
Littoral	80 000	120 000
East	80 000	120 000
Southwest	8 000	12 000

Source: Compiled by the authors.

3. CATTLE

3.1 BREED DESCRIPTION

There are very few trypanotolerant cattle in Cameroon and very little information on their numbers or characters. Five groups were identified during the country visit, as shown in Figure 2. There are Kapsiki, or Kirdi, cattle in very localized herds in North Province around Mokolo. There are also very localized herds of Doayo, or Namshi, cattle in North Province towards Poli. In Southwest Province, there are localized herds of Bakosi cattle around Bangem and 'Muturu'

cattle towards Buea and Victoria. Finally, small numbers of N'Dama have been introduced in Cameroon and are widely scattered in several provinces.

3.1.1 Kapsiki or Kirdi

The Kapsiki people keep humpless cattle in the Mandara Hills (1 000 m) along the Nigerian border in Margui-Wandala Department of North Province, between Mokolo and Bourrah. Apparently there are very few herds on the Nigerian side of the border. This area is a fairly uneven plateau where tsetse infestation is likely to be very light, if it exists at all.

The Kapsiki are classified among the 'Kirdi', a general term used by the Fulani for non-Moslem pagans. They are traditionally cattle owners, and cattle play an important role in their customs and ceremonies.

The cattle they keep are a humpless type, similar to other Savanna West African Shorthorn populations such as the Baoulé and Ghana Shorthorn. They are rather small, measuring 1.00 to 1.10 m at withers, with horns of medium length (20 to 40 cm) and usually a black or black-and-white coat (see Figure 3.41, volume 1). Transhumant Zebu herds are also brought into the area during the dry season, and some Zebu or crossbred bulls were seen with Kapsiki herds during the field visits. Traces of crossbreeding can be seen, such as the relatively long horns on some animals.

The Director of North Livestock Sector has estimated the number of cattle in the Mandara Hills as follows (personal communication):

	1975-76	1976-77	1977-78
Mokolo area	3 042	5 036	7 186
Bourrah area	1 056	1 046	1 241
Total	4 098	6 082	8 427

These herds are stable or even expanding, but they include an increasing number of Zebus. The number of relatively pure Kapsiki is probably around 3 000.

3.1.1.1 Performance Traits. No precise records of performance are available, but the Kapsiki are known to be fairly prolific, but not early maturing. Their longevity is excellent. Measurements were made of ten animals at Roumsiki, in the heart of the Kapsiki area, as presented in Table 4.

Nothing is known about the trypanotolerance of these cattle, as the area where they are found is apparently free of tsetse.

3.1.1.2 Management. Individual households generally own only five to ten cattle, or sometimes fewer. These are brought together in village herds, tended by

Table 4. Measurements of adult Kapsiki cattle.

	6 Adult Cows	4 Adult Bulls and Oxen
Height at withers (cm)	100-109	105-110
Heart girth (cm)	130-145	148-160
Scapulo - ischial length (cm)	115-132	135-145
Estimated weight (kg)	170	200

Source: Information from country visit.

children. They are herded together in the grazing areas during the day and penned together at night, or sent back to the households to be penned in their compounds. They are never milked and have only recently started to be used as draught animals.

Cattle play an important role in traditional Kapsiki society. They are not exploited commercially, but are used for dowries and slaughtered for special feasts. At least one animal must be slaughtered for a funeral, and the hide used to wrap the body.

Other so-called Kirdi groups in northern Cameroon, such as the Mafa or Meri, kept humpless cattle in the past. These animals have completely disappeared for various reasons, such as population movements towards the mountains, lack of grazing land, or absorption by other breeds. These groups still sometimes keep a 'boeuf de case', one animal slaughtered every four years at Mere on special occasions, but this tends to be a Zebu bought from the Fulani.

3.1.2 Doayo (or Namshi)

The Doayo people, pejoratively called Namshi (or Namji) by the Fulani, keep humpless cattle in a small area on the northwestern foothills (500 to 900 m) of Poli Mountain, in Bénoué in Garoua Department of North Province. This area is infested with tsetse, probably the *G. morsitans* or *G. tachinoides* species. The people are traditional cattle keepers, and cattle play an important role in their social and cultural life.

The appearance of the Doayo varies widely, but observation of several typical herds in the field indicates that they should be classified as a Savanna West African Shorthorn breed, such as the Baoulé. Epstein's (1971) classification of the Doayo as a longhorn breed cannot be sustained. These are small cattle, measuring only 97 to 110 cm at withers, with mainly uniform black, black-and-white or spotted black coats, though brown or spotted brown coats also occur (see Figure 3.42, volume 1). Crossbreeding with Zebu has been fairly extensive and a number of N'Dama have also been introduced into the area for crossbreeding.

3.1.2.1 Performance Traits. Doayo cattle appear to be prolific, early maturing and of excellent longevity. Two herds were studied for some time at Poli and at Finyole, and first calving was found to be at around three years with a calving interval of about one year. Average measurements for ten typical animals are given in Table 5.

Table 5. Measurements of adult Doayo cattle.

	6 Cows	4 Oxen
Height at withers (cm)	97 - 106	100 - 110
Heart girth (cm)	125 - 140	140 - 159
Scapulo-ischial length (cm)	110 - 130	125 - 145
Estimated weight (kg)	150	180 - 210

Source: Information from country visit.

3.1.2.2 Management. The animals belonging to each household are herded together by herdsmen from the village. They are never milked, and the use of draught oxen has only recently been introduced.

The cattle are not exploited commercially, but are kept for social and religious purposes. Several animals are usually slaughtered at a funeral, depending on the importance of the deceased, and the skins are used to wrap the body.

Doayo cattle are without doubt trypanotolerant. They maintain condition well during the dry season, but tradition prevents the expansion of the herds. The population is stable or decreasing, and the breed is increasingly threatened by crossbreeding.

3.1.3 Bakosi

Information on Bakosi cattle was collected either during the country visit or has been drawn from Ejédépang-Kogé (1978). The Bakosi people are found in southwestern Cameroon, west of Nkongsamba on the border between Southwest and Littoral Provinces. Their cattle-rearing areas, however, seem to be limited to the northeastern part of their territory, on the western slopes of Mount Manangouba in the Bangem Arrondissement of Southwest Province. It is a high-altitude area with a very humid climate, including both forest and savanna vegetation. The level of tsetse infestation is not fully known, but there are probably no tsetse in the higher-altitude areas and varying degrees of infestation in the forests.

The Bakosi people are traditionally cattle keepers. According to legend, Ngoe, the ancestor of the Bakosi, found cattle and began keeping them in herds.

The Bakosi cattle are said to be descendants of the forest antelope or of a cross between the antelope and the dwarf forest buffalo.

The Bakosi cattle are of the shorthorn type, about 110 cm at withers like the Kapsiki. Coats vary from black to white, but more than half are brown or black (see Figure 3.43, volume 1). There are more Mbororo Zebu in this area than there are humpless cattle, and crossbreeding is fairly common.

There are no official estimates of the size of the Bakosi cattle population, but most sources suggest that there are several hundred. Ejédépang-Kogé (1978) counted 60 cows, which is obviously a minimum. This breed is disappearing, due to the increasing cultivation of commercial crops such as coffee. The same situation has been observed among cattle of neighbouring groups such as the Bamiléké.

The Bakosi cattle seem to be becoming smaller and less fertile, due to isolation and inbreeding. The calving interval is from 18 to 24 months.

These cattle are neither herded nor milked. One animal may have several owners, with each person said to own one or more legs.

3.1.4 'Muturu' of Cameroon

There are a few 'Muturu' cattle in Cameroon, probably a few hundred at the most, at the foot of Mount Cameroon between Buea and Victoria in Southwest Province. The local name for this breed is 'Bakweri', or they may be called 'Muturu' as in Nigeria. It is not clear whether these animals have been in the area for some time or whether they were introduced from Nigeria fairly recently.

The 'Muturu' seem to be typical Dwarf West African Shorthorn. Adult cows measure 95 to 100 cm at withers, and the horns are short or sometimes rudimentary (see Figure 3.39, volume 1). They are sometimes kept on palm plantations where they graze a legume which grows under the palm trees, *kudzu* or *Pueraria phaseolides*.

3.1.5 N'Dama

A few N'Dama were introduced into Cameroon in 1960, and the herd was multiplied at Kounden Station in the Bamoun area of Foumban Department, West Province. This station is free of tsetse, and the N'Dama in Cameroon have generally been distributed in tsetse-free zones.

There are probably fewer than 1 000 N'Dama in all, scattered around the country on government stations and farms, on missions and on private farms. Small numbers are found in Poli and Mbé in North Province, in Nkolbisson, Obala and Ntui in Centre South Province and in Batouri and Bétare in East Province.

Efforts to introduce N'Dama cattle in Cameroon have never been followed up: as of the end of 1977, there were no development programmes in the country including an N'Dama component. According to the Ministry of Animal Breeding and Industries, the multiplication herd at Kounden Station and most of the settled herds throughout the country have disappared.

3.2 DISEASE

There is very little precise information about diseases among humpless cattle in Cameroon because the efforts of the Veterinary Services are aimed exclusively at the Zebu herds, which are more numerous and which require a variety of veterinary treatments. The humpless cattle seem to be well adapted to their environment and resistant to most diseases. The only treatment they seem to have received is vaccinations over the past few years. In the Doayo area, there are traditional accounts of periodic epidemics, probably of rinderpest or contagious bovine pleuropneumonia (CBPP), and most animals now seem to be vaccinated against these diseases. Trypanosomiasis does not seem to be a serious problem.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

The sheep and goats of southern Cameroon seem to be of the typical Djallonké or West African Dwarf type. The sheep on the Adamawa Plateau are of this type, but tend to be larger, while in the extreme north the sheep are intermediate between the Djallonké and the Sahelian types.

Sheep and goats are found throughout the country, particularly in the villages of the humid forest areas in the south. They seem to be very well adapted to diverse ecological conditions, from the humid forests to the high-altitude zones.

4.1.1 Sheep

The West African Dwarf sheep in Cameroon vary widely in appearance. Epstein (1971) describes three types, one with a tan coat and black belly, as well as the typical black and black-and-white. In fact, there is only one type of sheep in southern Cameroon, but with variable coat colour. Mason carried out a survey of 397 sheep in Centre South Province in 1977, and reported coat colours as shown in Table 6.

4.1.1.1 Performance Traits. Vallerand and Branckaert (1975) report performance traits of sheep at Nkolbisson Station in Centre South Province near Yaoundé. Among 85 ewes, the average age at first lambing was 17 months from 1966 to 1977

Table 6. Coat colours of sheep in Centre South Province.

Colour	Number	% of Total
Black	150	37.8
Black-and-white	131	33.0
White	18	4.5
Tan with black belly	41	10.3
Tan with black belly and white patches	15	3.8
Other tricolours	6	1.5
Tan	2	0.5
Tan-and-white	25	6.3
Light tan-and-white	7	1.8
Tan-and-black	2	0.5
Total	397	100.0

Source: Information from country visit.

and prolificacy was 117% from 1966 to 1974. The lambing interval averaged 8 months, not including 10 to 11% of the intervals which were over 13 months.

Birth weights averaged 2.3 kg for female single births and 2.5 for males. Among twins, the birth weights averaged 1.8 kg for females and 2.0 for males. Daily weight gains from birth to 30 days averaged 115 g for single births and 85 g for twins at the station from 1965 to 1969, compared with an average of 80 g on small farms. From 1970 to 1973, daily weight gains at the station averaged 134 g for single births and 112 g for twins. Daily weight gains from 30 to 150 days at the station with supplementary feeding were 57 to 79 g for females and 64 to 85 g for males, compared with 45 g for females and 52 g for males on small farms. The rate of weight gain at the station depended on the type of concentrates fed, as did the age at which the animals reached 20 kg. This varied from 8.5 to 10.9 months for females and from 7.3 to 9.6 months for males. Slaughter weights varied from 18 to 28 kg and dressing out percentages (hot carcass) from 44.5 to 53.5%.

4.1.1.2 Index of Productivity. Table 7 summarizes estimates of the major production traits required to build up a productivity index based on the total weight of five-month-old lamb produced per 10 kg of ewe maintained per year. This productivity index has been derived for production under station conditions in a very low tsetse challenge area.

4.1.2 Goats

According to Branckaert and Vallerand (1969), adult goats in Cameroon average 45 cm height at withers and weights average 18 kg for females and 20 kg for males. They are generally black or black-and-white.

Table 7. Sheep productivity estimates.

Parameter	Production Environment Station/very low challenge
Ewe viability (%)	95[a]
Lambing percentage	175
Lamb viability to one year (%)	80
Lamb weight at five months (kg)	13
Productivity index[b] per ewe per year (kg)	18.7
Ewe weight (kg)	25
Productivity index[b] per 10 kg ewe maintained per year (kg)	7.5

a. Estimate.
b. Total weight of five-month-old lamb produced.

Source: Information from country visit.

4.2 DISEASE

Respiratory diseases, toxicosis and maternal agalactia are the principal causes of death among sheep and goats in Cameroon, according to Vallerand and Branckaert (1975).

4.3 MANAGEMENT AND FLOCK COMPOSITION

The typical composition of sheep flocks in southern Cameroon kept under village conditions is 40% adult ewes, 4% adult rams, 30% lambs under eight months and 26% lambs over eight months (Vallerand and Branckaert, 1975). Sheep and goats generally roam freely near the village during the day, returning at night when they are sometimes kept in a special hut. Sheep are slaughtered on special occasions and are sometimes given away or sold. According to Vallerand and Branckaert (1975), 35% of the sheep offtake is consumed at home, 25% is given to visitors, 20% is sold and another 20% is given as dowries.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH

Three research stations in Cameroon are described in Table 8. Most of the research work carried out in the country is on non-trypanotolerant livestock, however.

Table 8. Research centres.

Name	Wakwa Station (B.P. 65, Ngaoundéré)	Bambui Station	Nkolbisson Farm
Location (and reference in Figure 1)	Ngaoundéré ⊙1	Northwest of Pamenda ⊙2	Yaoundé ⊙3
Organization responsible	Headquarters of the Institut de Recherche Zootechnique (IRZ) under the Office Nationale de la Recherche Scientifique et Technique (ONAREST)	IRZ	Département de Zootechnie of the Ecole Nationale Supérieure d'Agriculture, Yaoundé University
Breeds and numbers	About 1 800 cattle	About 500 cattle	50 cattle: 20 N'Dama and 10 Brown Swiss cows. About 40 ewes (some crosses with Romanov).
Objectives	Selection of Fulani Zebu of the Adamawa type. Crossbreeding Brahman x Fulani Zebu to produce Wakwa. Milking herds composed of Holstein and various crossbreeds. Research on pasture and forage crops.	Meat programme with Zebus. Dairy herds of Holstein and Jersey. Research on pasture land.	This farm is mainly a demonstration farm for the students of ENSA. Programmes are actually very limited due to the lack of space. The farm could be moved to Dschang (Western Province), which would allow development of a milk herd in particular.
External aid	France		

5.2 DEVELOPMENT PROJECTS

The main livestock development project is being carried out by the Société de Développement des Productions Animales (SODEPA) which comes under the Ministry of Animal Breeding and Industries. The headquarters are at Yaoundé (B.P. 1410), shown by ❹ 4 in Figure 1.

This project involves the development of three ranches and construction of two abbatoirs. Traditional farmers are also given credit and other assistance and training is carried out. The project is not especially concerned with the trypanotolerant breeds, but includes a special mission concerned with tsetse eradication. Assistance is provided by the World Bank and GTZ.

A Study of the Development of Livestock in the North Cameroon was carried out in 1975-76, with assistance from USAID and FAO, covering North Province except Adamawa. This study included a tsetse eradication component, but no work was carried out on trypanotolerant cattle.

Finally, a cattle production scheme is projected in the SOCAPALM palm tree plantations at M'Bongo and Ezéka. A study of this project was carried out by SEDES (Tyc et. al., 1977).

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CHAPTER 15

CENTRAL AFRICAN REPUBLIC

1. BACKGROUND

The Central African Republic is a landlocked country in the middle of the African continent, bordered by Cameroon to the west, Chad to the north, Sudan to the east and Congo and Zaire to the south. The country is divided into 14 Prefectures, with its capital at Bangui, as shown in Figure 1.

The Service de l'Elevage is part of the Ministère de l'Agriculture, de l'Elevage, des Eaux et Forêts, de la Chasse, de la Pêche et du Tourisme. The Service is meant to provide technical and veterinary services to livestock raisers and to manage government ranches and métayage operations. There is also a Société d'Etat de Gestion des Abattoirs under the same ministry, as well as a Bureau d'Etudes et de Coordination (BEC) concerned with the study of agricultural projects and general problems of agricultural development.

In fact, the Service de l'Elevage does not operate at present, as it lacks the necessary financial and material resources. Technical and health support for the Zebu herd is provided by the FAO/UNDP development project, with headquarters at Bouar, and the EDF project centred at Bambari.

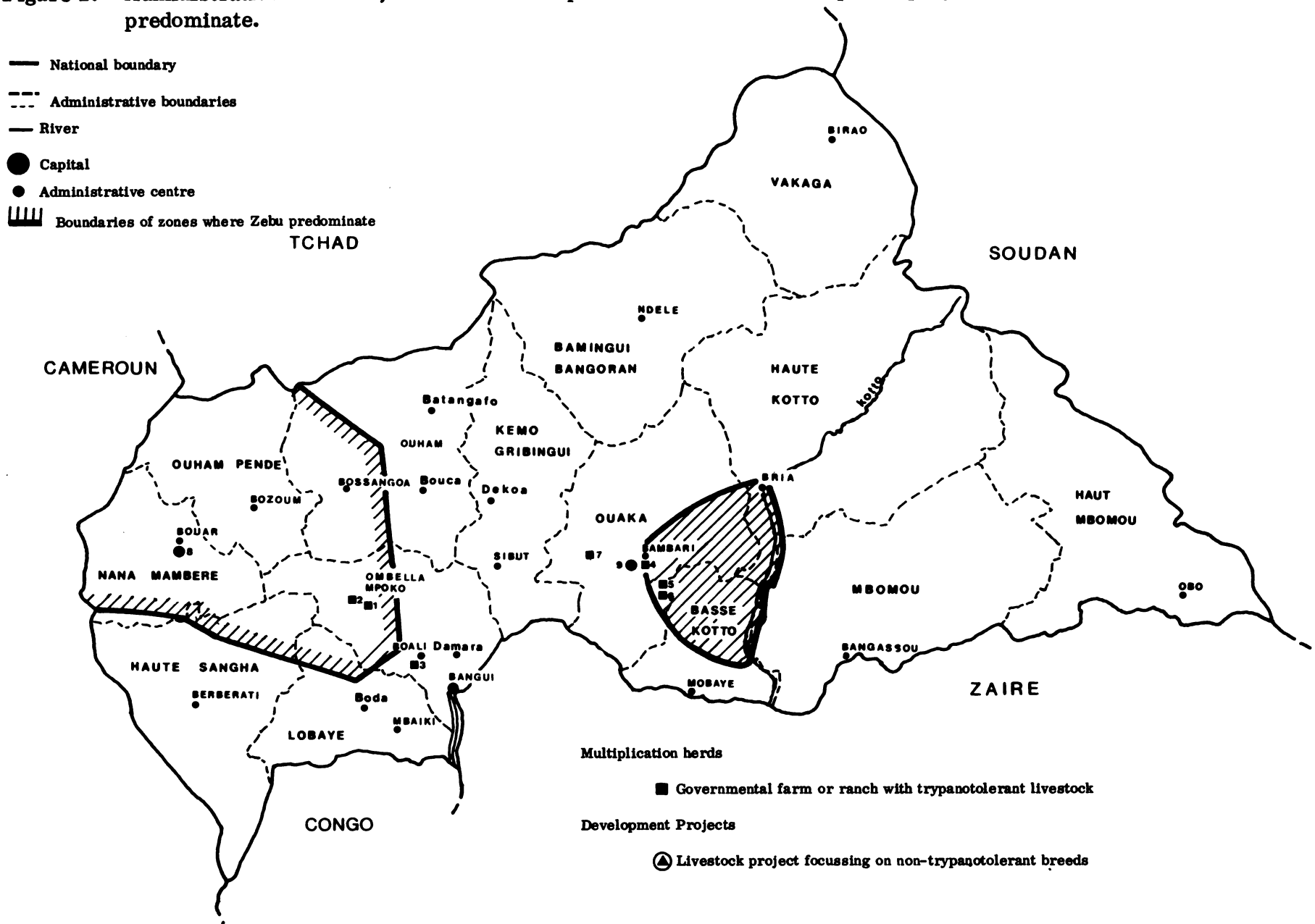
Basic data for the country as a whole are given in Table 1.

Table 1. Background data for Central African Republic.

Area	623 000 km^2
Latitude	3^o - 11^o N
Longitude	14^o - 28^o E
Population	
number	1 827 000
density	2.9/km^2
Livestock numbers	
cattle	850 000 to 1 115 000
sheep	64 000[a] or 76 000[b]
goats	650 000[a] or 506 000[b]

Sources: For population, OAU, 1978; for cattle numbers, national estimates for 1978; for sheep and goats, a. UDEAC et al., 1976, b. FAO, 1978.

Figure 1. Administrative divisions, location of multiplication herds and development projects, and zones where Zebu predominate.



Three climatic zones can be distinguished in the country: a dense forest zone in the south with a humid tropical climate and annual rainfall averaging 1 800 mm, a central Guinean savanna zone with annual rainfall averaging 1 400 mm, and a sub-Sahelian zone in the north with grassy savannas and annual rainfall averaging 1 200 mm.

According to the OAU/STRC tsetse distribution map (1977), the region northwest of Bouar is free of tsetse. This is a continuation of the Adamawa Plateau of Cameroon with an altitude of over 1 000 m. The region southeast of Bambari has recently been freed of tsetse as the result of an eradication campaign. The rest of the country is infested, but the tsetse, especially *G. fuscipes*, are generally concentrated in the forest galleries, leaving wide areas of savanna tsetse free.

According to Bertucat (1965), the northeastern part of the country is infested with *G. tachinoides*, *G. morsitans* and *G. fuscipes*, the central area with *G. morsitans* and *G. fuscipes* and the southern area with *G. fuscipes*. Two localized eradication campaigns were carried out in the 1960s, in the Baboua area west of Bouar and along the Topia River east of Carnot, to make it possible for cattle to cross there. The area between Boda and Berberati and the triangular zone between Bouca, Damora, Sibut and Dekoa are heavily infested and thus unsuitable for Zebu, even on a temporary basis. In the eastern part of the country, the areas around N'Délé and east of the Kotto River are also heavily infested. Attempts to drive Mbororo cattle into these regions in 1954, and again in 1963, led to heavy losses and had to be abandoned.

There has been no recent large-scale study of tsetse infestation in the Central African Republic. A World Bank livestock project in the western part of the country, now in the planning stage, will include such a study.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

2.1 CATTLE

Most of the cattle in the Central African Republic are Mbororo Zebu. The Mbororo people began migrating into the country with their herds around the ning of the century from northern Cameroon, western Chad, eastern Niger and the extreme north of Nigeria and settled in the highlands west of Bouar which are free of tsetse. From there, they have slowly moved down towards the south and southeast where the pastures are richer. More recently, the same movement towards the south has occurred further east, in the Bambari area. Between 1960 and 1978, these movements increased and the number of Mbororo Zebu in the country doubled.

These animals are concentrated in two livestock regions. To the west in the highlands around Bouar, there are about 650 000 to 800 000 Mbororo Zebu, including 150 000 further south up to 60 km from Bangui. To the east, there are 200 000 to

300 000 animals in the area east of Bambari.

The movement of these animals into tsetse-infested areas can be explained by several factors: a shortage of grazing further north due to drought and increased agricultural settlement, the availability of pastures with particularly low livestock and wildlife populations, and a reduction of the tsetse challenge due to low rainfall and low humidity associated with the Sahelian droughts. The Mbororo have also developed strategies to minimize the risk of trypanosomiasis by grazing on the open highlands where tsetse infestation is light, watering and crossing rivers only at night or after fires, avoiding particularly heavily infested areas during the rainy season and using trypanocidal drugs. However, in spite of these precautions, there is a risk that the incidence of trypanosomiasis is increasing due to increasing animal numbers and the incorrect use of drugs, and it is feared that the Mbororo herds may be forced to withdraw to the north. The most serious consequence of the increase in cattle numbers and the breakdown of the traditional transhumance system however, is rapid pasture degradation due to overgrazing and anarchistic burning, leading to denuded pastures in the highlands and bush invasion in the savanna areas.

The indigenous peoples of the Central African Republic did not keep cattle at all until the late 1950s. At that time Baoulé and N'Dama began to be imported by the government and basic breeding herds were distributed to the villages under the métayage system described in chapter 3 of volume 1. As of 1969, there were 18 700 Baoulé, 800 N'Dama and a number of N'Dama x Mbororo crossbreds.

2.1.1 Baoulé

The Baoulé were imported from Ivory Coast and Upper Volta between 1955 and 1969. Their distribution under the métayage system is shown in Table 2 as of 1969. At that time, the total Baoulé population was 18 700, but this has decreased and is now probably closer to 15 000.

The cattle kept under métayage throughout the country increased from 7 620 in 1965 to 15 150 in 1969. The population then remained fairly stable until 1974, but since then it seems to have decreased. In the Bossembélé area for example, there were 1 945 cattle in village métayage herds and on redistribution stations in 1974, and only 640 in 1977. In the Bambari area, there were 4 350 in 1974 and only 3 970 in 1977.

It is difficult to know how much of this decline in cattle numbers is real and how much is due to censusing problems. However, there are several factors which could explain the decline. For one thing, cattle which are not supervised cause damage to crops and are then killed or injured by farmers. For example, in 1974 in the Bossembélé area 67 of the 123 cattle deaths reported were caused by arrows or spears and another 20 were due to road accidents. Livestock owners who come before traditional tribunals are also often required to pay heavy fines in the form of cattle. In addition, the Service de l'Elevage, which has been inoperative for several years, is the only official marketing channel for the sale of métayage cattle. The official selling price for cattle was fixed in 1969 and is now about 50% below the

market price. These factors explain the widespread illegal sale and slaughter of animals which has reached alarming proportions and the number of failures recorded among the métayage operations.

Table 2. Distribution of Baoulé cattle under the métayage system, 1969.

Préfecture	Number of Participants	Number of Cattle
Nana Mambéré	158[a]	1 938
Haute Sangha	95	990
Ouhamoendé	113[a]	1 312
Ouham	128	1 508
Ombella-Mpoko	103	2 157
Lobayé	24	306
Kemo Gribingui	74	931
Bamingui-Bangoran	2	54
Ouaka	205[a]	2 996
Basse-Kotto	104	1 334
Mbomou	102	824
Haut-Mbomou	28	267
Haute-Kotto	34	503
Vakaga	-	-
Total under Métayage	1 170	15 150

a. Including métayages with N'Dama and N'Dama x Zebu crossbreds.

Source: Central African Empire, Bureau d'Etudes et de Coordination, 1977.

2.1.2 N'Dama

N'Dama were imported from Zaire and Ivory Coast between 1952 and 1954 and again between 1965 and 1969. They are kept on government ranches at Boali, Bambari, Tambia and Bokolobo and in villages under the métayage system in the Boali and Bambari areas. There is little information available on these animals, but it seems that their numbers have been decreasing recently due to excessive slaughtering on the ranches.

2.1.3 N'Dama x Mbororo Zebu

During the 1960s, N'Dama x Mbororo crossbreeding experiments were initiated at Bokolobo Ranch in the eastern livestock region (see Figure 3.67, volume 1) and a number of N'Dama bulls were distributed to the Mbororo pastoralists. The objectives were to produce draught animals for the farming population which were larger than the N'Dama but had a certain level of trypanotolerance, and also to interest the Mbororo breeders in the advantages of crossbreeding. The introduction of crossbred draught oxen was fairly successful, but this programme came to a halt in 1970 due to the problems of the Service de l'Elevage.

At the outset, the Mbororo showed little interest in the trypanotolerant breeds or their crosses because they were smaller than their Zebu cattle and were poor walkers. However, as the Mbororo have settled in regions where they could observe Baoulé and N'Dama herds for some time, they have been impressed with the good condition of these animals. Renewed efforts to crossbreed with the N'Dama, which are more highly regarded than the Baoulé because of their conformation and their adaptability to herding, would likely meet with a favourable response. At present, the number of crossbreds is estimated at 1 500 to 2 000.

2.2 SHEEP AND GOATS

The distribution of sheep and goats in 11 of the Préfectures of the Central African Republic is given in Table 3 as of 1975.

Table 3. Distribution of sheep and goats, 1975.

Prefecture	Sheep	Goats
Ombella-Mpoko	1 859	31 983
Lobaye	1 671	23 263
Haute Sangha	3 536	20 283
Nana Mambéré	6 514	49 750
Ouham Pendé	7 112	94 720
Ouham	3 134	173 382
Kemo Gribingui	-	51 063
Ouaka	28 818	107 628
Basse Kotto	9 261	63 958
M'Bomou	561	17 310
Haute Kotto	1 081	16 810
Total	63 547	650 150

Source: UDEAC et al., 1976.

3. CATTLE

3.1 BREED DESCRIPTIONS

No distinction can be made between Baoulé and N'Dama in terms of their health conditions, fecundity or resistance to disease, particularly to trypanosomiasis. Both breeds have adapted quickly to their new environment.

3.1.1 Baoulé

The Baoulé in Central African Empire tend to be larger than in their areas of origin in Ivory Coast (see Figure 3.36, volume 1). This can be explained by a more favourable environment and husbandry system. Between 1965 and 1969, the calving rate was estimated at 66 to 70%. The mortality rate was 20% for calves, 7% for one- to two-year-olds and 4% for adult cows. Losses among adult males were about 10%, mostly due to illegal slaughter.

Table 4 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf produced per 100 kg of cow maintained per year. This productivity index has been derived for meat production under village conditions in a medium tsetse challenge area.

Table 4. Baoulé productivity estimates.

Parameter	Production Environment Village/medium challenge/meat
Cow viability (%)	96
Calving percentage	68
Calf viability to one year (%)	80
Calf weight at one year (kg)	90
Annual milked out yield (kg)	-
Productivity index[a] per cow per year (kg)	50.0
Cow weight (kg)	190
Productivity index[a] per 100 kg cow maintained per year (kg)	26.3

a. Total weight of one-year-old calf produced.

Source: Lacrouts et al., 1967.

3.1.2 N'Dama

The early métayage operations in Central African Empire did not include N'Dama because they are larger than the Baoulé and their temperament was considered more difficult. However, the N'Dama now observed under métayage conditions appear manageable and well adapted. At Grimari, for example, herds of 60 are tended by one herdsman and penned at night with no problems.

3.2 DISEASES

Trypanosomiasis in the Central African Republic is due chiefly to *T. vivax* and *T. congolense*. The Baoulé and N'Dama herds have not received any veterinary attention for the past eight years. However, their good condition is

emphasized by observers throughout the country. Losses are mainly due to helminthiasis among calves, to pasteurellosis, blackquarter and rickettsiosis. In the eastern area, mucosal disease is also common. Tuberculosis is transmitted from the Mbororo Zebu herds and brucellosis is also present, but the incidence of these two diseases is unknown.

3.3 HUSBANDRY SYSTEMS

3.3.1 Métayage

Métayage operations were introduced in Central African Republic during the 1950s (see Desrotour et al., 1967; Desrotour and Renard, 1969). Villagers were encouraged to build up small herds of cattle for commercial offtake and also for home consumption, particularly in connection with traditional ceremonies. Each participating family received a basic breeding herd of 1 bull and 5 to 10 heifers from the government distribution centres. They agreed to provide one family member to tend the animals during the day and to build a pen to keep them at night. They also agreed to provide minerals and not to introduce other animals into the herd without the agreement of the Service de l'Elevage. They were to repay the government's initial investment through the natural expansion of their herds by returning the same number of animals they had received, all at least 18 months old, within five years (see Figure 3.38, volume 1).

In practice, cattle kept under métayage are often left to roam freely during the day and are not provided with any night shelter or mineral supplementation. The cows are not milked. They have not been dipped or sprayed or received any veterinary attention for the past eight years. These herds tend to be viewed with hostility by neighbouring farmers and the participants are often forced to slaughter their animals.

The average size of a métayage herd is about 12. As of 1974, the average herd composition was 36.9% adult females and 7.2% adult males, 32.5% female calves up to two years and 23.4% male calves, making a total of 69.4% females and 30.6% males. It is estimated that about 50% of the original métayage herds have failed to expand or have even decreased. However, some métayage herds have been very successful. For example, at Kidjigra near Bambari, a herd which consisted of 3 heifers and 1 bull in 1957 has now grown to 200 animals, without any further purchases and allowing for the sale or slaughter of a number of males.

3.3.2 Ranching

Government ranches operate on a fairly small scale with N'Dama herds of 60 to 250. Management is very simple: all the animals are kept together in one herd, servicing and weaning are not controlled and castration is rare. However, the animals are dipped regularly and receive mineral supplementation. The system of fenced pastures initiated earlier has been abandoned, and the herds are now tended by Mbororo herdsmen who do not follow any pasture management system. The number of animals has diminished considerably due to excessive slaughtering.

3.3.3 Draught Oxen

The use of oxen for ploughing was introduced in the cotton region in the north using Mbororo and Arab Zebu. During the 1960s, experiments were carried out using N'Dama, Baoulé and N'Dama x Mbororo crossbreds as draught animals in the Bossembélé and Bambari areas, with assistance from the French Fonds d'Aide et de Cooperation (FAC). The crossbreds were the most successful, as the Baoulé and N'Dama were considered too light to work on heavy soils with the implements available (see Figures 3.22 and 3.46, volume 1).

At present, there are about 100 pairs of oxen in the Bambari area, more than half Mbororo or Arab Zebu. However, N'Dama and Baoulé oxen are now more favoured because of their resistance to disease. Yet overall, the use of oxen is decreasing in the area, despite the support of the Christian missions, due to the absence of the government livestock service.

The oxen are usually worked for three hours ploughing in the early morning and then led out to pasture where they are herded or tied. Towards the end of the afternoon they do some lighter draught work and are then put in night pens and fed on crop residues. Losses are high, approaching 50% for the country as a whole, mainly due to poor management, and in particular poor feeding and overwork. Farmers have shown an interest in draught animals, but the government training centres have almost disappeared.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

The sheep and goats in Central African Republic are of the West African Dwarf type. The sheep are usually black-and-white. Some crossbreeding has been observed with the Mbororo sheep, which is a Djallonké Savanna type. The crossbreds are often white and have longer legs. The goats are black or black-and-white, but brown goats with a black line on the back are also common.

Little information is available on diseases among sheep and goats, but the most important problem seems to be helminthiasis.

The management system for sheep and goats is comparable to that in similar parts of Africa. The animals are left to roam freely and are not given any mineral supplementation or shelter at night. Goats are generally valued more highly than sheep. They are reared for sale and for slaughter during traditional ceremonies, rather than as a regular source of home consumption.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

5.1 RESEARCH CENTRES

The only research centre in operation is the Institut Pasteur at Bangui, which carries out research on ticks and tick-borne diseases. It also carried out a study recently on tsetse infestation in the Topia area near Carnot.

5.2 MULTIPLICATION HERDS

The ranches with multiplication herds are described in Table 5. There is little information available, but apparently these operations are decreasing. There is no important livestock centre for sheep and goats.

5.3 DEVELOPMENT PROJECTS

Two livestock projects are concerned with the Mbororo Zebu: the FAO/UNDP project aimed at strengthening animal health services in the eastern region, 'Renforcement des Services de Santé Animale dans la Zone Occidentale', with headquarters at Bouar (B.P. 183) as shown by ◓ 8 in Figure 1, and the EDF project 'Aménagement et Assainissement d'une Zone d'Elevage dans la Région de Bambari', with headquarters at Bambari (c/o FED, B.P. 1298, Bangui) as shown by ◓ 9 in Figure 1. An extension of the EDF project was envisaged, including the reorganization of the N'Dama ranches in the eastern area, but, as of April 1978, this component seemed to have been dropped.

A World Bank project, 'Développement de l'Elevage Traditionnel dans la Zone Occidentale', is now under study. This project should continue the work of the FAO project with Mbororo Zebu. In addition, it includes suggestions for the reorganization of the Service d'Elevage and studies of tsetse infestation.

The only project directly concerned with trypanotolerant cattle is the 'Projet de Relance pour le Développement de l'Elevage Bovin Baoulé'. This is being studied by the Bureau d'Etudes et de Coordination of the Ministère de l'Agriculture, de l'Elevage, des Eaux et Forêts, de la Chasse, de la Pêche et du Tourisme, but the necessary financial support has not yet been made available. There is no project concerned with sheep and goats.

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Table 5. Multiplication herds.

Name	Station de Redistribution de Bossembélé	Station de Redistribution de Doumie	Ranch N'Dama de Boali	Station de Bambari	Station de Bokolobo	Station de Tambia	Centre de Multiplication Semenciere Grimari
Location (and reference to Figure 1)	Préfecture of Ombella Mpoko ■ 1	Préfecture of Ombella Mpoko ■ 2	Préfecture of Ombella-Mpoko 50 km from Bangui, on road to Bouar ■ 3	Préfecture of Ouaka ■ 4	Préfecture of Ouaka Bambari - Alindao road ■ 5	Préfecture of Basse-Kotto on Bambari - Alindao road ■ 6	Préfecture of Ouaka ■ 7
Organization responsible (address)	Service de l'Elevage (c/o Ministère de l'Agriculture, Bangui)	Service de l'Elevage	Service de l'Elevage	Service de l'Elevage	Service de l'Elevage	Service de l'Elevage	Ministere de l'Agriculture and FAO
Size	± 400 ha	± 400 ha	± 800 ha	± 300 ha	± 800 ha	± 1 000 ha	± 100 ha
Breeds and numbers	135 Baoulé as of February 1978	138 Baoulé as of February 1978	127 N'Dama as of February 1978	62 N'Dama as of March 1978	88 N'Dama with traces of Mboro-ro blood as of March 1978	80 N'Dama as of March 1978	75 N'Dama in two herds
Objectives	Gathering and distributing breeding stock for métayage		Production of breeding stock	Production of breeding stock	Production of breeding stock	Production of breeding stock	Manure production, demonstration at the College Technique d' Agriculture de Grimari situated at the Centre

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CHAPTER 16

GABON

1. BACKGROUND

The Republic of Gabon on the west coast of Africa is bordered by Equatorial Guinea and Cameroon to the north and Congo to the east and south. The country is divided into nine administrative regions, with its capital at Libreville, as shown in Figure 1.

The Direction de l'Elevage et des Industries Animales comes under the Ministère de l'Agriculture, de l'Elevage et du Développement Rural, with headquarters at Libreville. It is composed of zootechnical, veterinary and animal industry divisions, with responsibility for animal health controls, quality control of livestock products and the 'diffusion and application of the means of production' in the livestock sector. The Office Gabonais d'Amélioration et de Production de Viande (OGAPROV) in the same ministry is responsible for the improvement and development of cattle, sheep and goat production. At the local level, the country is divided into seven livestock regions, with one or more offices in each.

Basic data for the country as a whole are given in Table 1.

Table 1. Background data for Gabon.

Area	267 700 km^2
Latitude	2° 45' N - 3° 50' S
Longitude	8° 45' E - 14° 30' E
Population	
number	544 000
density	2.03/km^2
Livestock numbers	
cattle	3 200
sheep	47 000
goats	52 000

Sources: For population, OAU, 1978; for cattle numbers, information from country visit; for sheep and goats, Gabon, Direction de l'Elevage et des Industries Animales, 1975.

Figure 1. Administrative divisions and location of multiplication herds.

Gabon has a Guinean forest climate, with annual rainfall varying from 1 600 mm in the south to 3 000 mm around Libreville. The country is almost entirely covered with humid tropical forest.

The OAU/STRC tsetse distribution map (1977) shows that the entire country is infested with *G. palpalis*, *G. tabaniformis* and *G. haningtoni*. A study carried out by IEMVT (1974) in the Okouma, Mounana and Yéyé highlands northwest of Franceville also found evidence of *G. palpalis* infestation.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

The distribution of cattle, sheep and goats in the nine administrative regions is shown in Table 2.

Table 2. Livestock distribution, 1975.

Region	Cattle	Sheep	Goats
Estuaire	53	4 000	4 000
Haut-Ogooué	1 700	3 000	4 000
Moyen-Ogooué	-	4 500	5 000
Ngounie	340	10 000	11 000
Nyanga	151	5 500	6 000
Ogooué-Ivindo	24	4 000	5 000
Ogooué-Lolo	21	3 500	3 000
Ogooué-Maritime	-	1 500	3 000
Wolou-Ntem	138	11 000	11 000
Total	2 427	47 000	52 000

Source: Gabon, Direction de l'Elevage et des Industries Animales, 1975.

Cattle were not kept in Gabon until 1945, when trypanotolerant animals began to be imported on a small scale. The few non-trypanotolerant cattle in the country were imported in the 1970s. Although the 1975 census showed only 2 427 cattle, this number has probably risen to 3 000 or 3 500 due to the recent development of ranches in Haut-Ogooué.

Sheep and goats are widely kept throughout the country, though sheep are more numerous in the coastal areas. The populations shown in Table 2 must be regarded as estimates due to the difficulties involved in making an accurate census.

3. CATTLE

3.1 BREED DESCRIPTION

Lagune cattle were imported into Gabon in 1945, 1948, 1957 and 1958, mainly from Zaire, and smaller numbers of Baoulé were imported from Ivory Coast, beginning in 1956. Both these breeds have been introduced at the village level through métayage operations. They are no longer distinguished in Gabon - both are usually called Baoulé. They are found mainly in the north and in Ngounie and Nyanga Regions (see Figures 3.30 and 3.32, volume 1).

N'Dama were first introduced on the government farm at Tchibanga in 1962, imported from Congo by the former Société Gabonaise d'Elevage. More recently, other animals have been imported from Zaire and Senegal, now totalling about 1 900. They are found mainly on the ranches at Franceville and Okouma in Haut-Ogooué Region and on the Tchibanga farm in Nyanga Region. These animals are of the Guinean or Senegalese type, depending on their area of origin.

3.2 DISEASE

Among cattle in village herds, the most important disease problem is gastro-intestinal helminthiasis. On the ranches, disease problems are not serious, except for brucellosis on the ranch at Okouma, which is now coming under control. All the cattle on this ranch are vaccinated against anthrax, blackleg, pasteurellosis, vibriosis and clamidiosis. The ranches at Okouma and Franceville are located on plateaux where tsetse infestation is very low, but animals in poor condition are treated with trypanocidal, as well as anthelmintic, drugs. Trypanosomiasis is caused by *T. vivax* and *T. congolense*.

3.3 HERD MANAGEMENT AND COMPOSITION

3.3.1 Village Herds

Village cattle are exclusively of the Lagune-Baoulé type. They are kept in herds of 7 to 12, roaming freely during the day and penned at night. They are seldom given mineral supplements and are not sprayed against ticks. The farmers also rarely call upon the livestock service for veterinary care. Numbers have not increased due to excessive slaughtering. These cattle were originally given to Gabonese farmers under the métayage system, but it seems that they are being sold to immigrants from Cameroon who keep them under the same conditions for commercial purposes.

3.3.2 Extensive Ranching

Extensive ranching is practised on the presidential ranch at Franceville and the Tchibanga farm with N'Dama cattle grazing on natural savanna at a stocking

rate of 5 ha/head. The cattle originating from Zaire are kept on fenced pastures and the cattle from Senegal are herded, often by Fulani herdsmen. The herds are not divided by age or by sex, but the cattle are given mineral supplements and are sprayed against ticks twice a month. The cow are sometimes milked by the Fulani herdsmen.

3.3.3 Intensive Ranching

Intensive ranching is practised at Okouma on fenced artificial *Stylosanthes* pasture. The herds are grazed on a rotational system, with water troughs in every pasture. The cattle are N'Dama, Nguni imported recently from Swaziland and crosses between the two. They are given mineral supplements and each one is marked with an individual number, sprayed every week and weighed every month.

One bull is kept for every 15 heifers or 25 cows, with a mating season from November to February. Heifers are mated first at two years, and bulls are first put into service at four years. Calves are weaned between 6 and 8 months, and the males are castrated at 15 months.

4. SHEEP AND GOATS

4.1 BREED DESCRIPTION

The sheep and goats in Gabon are of the West African Dwarf type. Most of the sheep are black-and-white, but up to 30 or 40% have a tan back and black belly, particularly in the coastal areas. Goats are usually black or black-and-white, but brown goats with a black line along the back are also common.

4.2 DISEASE

The most serious disease problem, both in village flocks and on the ranches, is helminthiasis. On the Franceville and Okouma ranches, a vaccination programme is planned against anthrax, blackleg, enterotoxaemia, clamidiosis, brucellosis and *Colynebacteridium ovis* infestation.

4.3 FLOCK MANAGEMENT AND COMPOSITION

Village flocks vary from 5 to 80, according to the size of the village. Management practices are similar to those in other areas of tropical Africa. The sheep, in particular, are kept for home consumption and for traditional ceremonies.

On the ranches, the sheep and goats are marked with individual numbers and weighed monthly. During the day, the sheep at Franceville are grazed on fenced natural savanna pastures and those at Okouma on fenced artificial pastures. At night, they are kept in pens with solid walls.

Table 3. Multiplication herds.

Name	Ranch Présidentiel de Franceville	Ranch d'Okouma	Bergerie de Franceville	Ferme de Tchibanga	Station de Ntourn
Location (and reference in Figure 1)	Haut-Ogooué Region ■ 1	Haut-Ogooué Region 20 km northwest of Monda ■ 2	Haut-Ogooué Region ■ 3	Nyanga Region ■ 4	Estuaire Region 50 km east of Libreville ■ 5
Organization responsible	Office of the President (Libreville)	OGAPROV (B.P. 245, Moanda)	Ministère de l'Agriculture, de l'Elevage et du Développement Rural and OGAPROV	Direction de l'Elevage et des Industries Animales (B.P. 136, Libreville)	Ministère de l'Agriculture, de l'Elevage et du Développement Rural and FAO
Size	5 500 ha natural savanna	12 000 ha available, 600 ha of artificial pastures in use	300 ha natural savanna	100 ha	
Breeds and numbers	1 100 N'Dama cattle as of February 1978	As of March 1978, 850 cattle, including 377 N'Dama, 163 Nguni and 310 N'Dama x Nguni; 90 Dorper x Kirdi ewes, 20 Dorper ewes; 60 Boer x local goats.	250 crossbred Dorper x Kirdi ewes as of March 1978	35 N'Dama cattle as of March 1978	53 Lagune cattle as of March 1978
Objectives	Production of beef and breeding animals	Development of the ranch and settlement of Gabonese farmers with crossbred cattle. Selection and multiplication of improved sheep and goats.	Production of improved animals	Beef production	Manure production

5. RESEARCH AND DEVELOPMENT ACTIVITIES

There are no research institutes or stations in Gabon working with the trypanotolerant breeds. The multiplication herds in the country are described in Table 3. The herds and flocks at the Okouma ranch are still being developed, and a cattle herd of 10 000 head is envisaged. There are plans to develop a kind of métayage system using N'Dama x Nguni crossbreds on artificial pastures.

The government also plans to establish two more extensive ranches in the Nyanga valley and in the Ogooué valley north of Moanda: 25 000 N'Dama would be kept at Nyanga and 12 000 at Ogooué. Preliminary studies have been completed and financial support is now being sought.

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CHAPTER 17

CONGO

1. BACKGROUND

The People's Republic of the Congo stretches northward from the west coast of Africa, with Gabon to the west, Cameroon and Central African Republic to the north, Zaire to the east and south and Angola to the south. The country is divided into nine regions, plus the capital at Brazzaville.

The Service de la Production Animale et de Médecine Vétérinaire (B.P. 83, Brazzaville) is attached to the Direction Générale des Services Agricoles et Zootechniques within the Ministère de l'Economie Rurale. The Service is responsible for livestock development throughout the country through regional veterinary offices and state farms and ranches. In addition, two ranches, at Louamba and Massangui, are managed by the Société Nationale d'Elevage (SONEL), a parastatal agency within the Ministère de l'Economie Rurale.

Basic data for the country are given in Table 1.

Table 1. Background data for Congo.

Area	342 000 km^2
Latitude	3^o 40' N - 5^o S
Longitude	11^o 10' E - 18^o 40' E
Population	
number	1 360 000
density	4/km^2
Livestock numbers	
cattle	43 300
sheep	42 000
goats	84 000

Sources: For population, OAU, 1978; for cattle numbers, Congo, Service de la Production Animale et de Médecine Vétérinaire, 1977; for sheep and goat numbers, UDEAC et al., 1976.

Congo has a humid climate with two rainy seasons. Approximately 65% of the country is covered with dense forests or mangrove swamps, including Lékoumou, Sangha and Likouala Regions, the northern and eastern parts of Cuvette Region, the northern part of Niari Region and the northeastern part of Kouilou Region. The rest of the country consists of Guinean savanna. Annual rainfall varies from 1 200 mm in the south to more than 1 800 mm in the north. More than 75% of the population lives in the southern area, between Brazzaville and Pointe-Noire, mainly concentrated on the savannas. (See Figure 1).

According to Baco (1965) and the OAU/STRC tsetse distribution map (1977), the entire country is infested with tsetse. Sangha, Likouala and Cuvette Regions in the north and Plateau Region are infested mainly with *G. fuscipes* and the southern area with *G. palpalis*. Another survey is now being undertaken by a medical team sponsored by ORSTOM, to revise the information available on tsetse distribution and bring it up to date.

2. LIVESTOCK NUMBERS AND DISTRIBUTION

The distribution of cattle throughout the nine regions is shown in Table 2. These are all trypanotolerant cattle, originally imported in the 1950s.

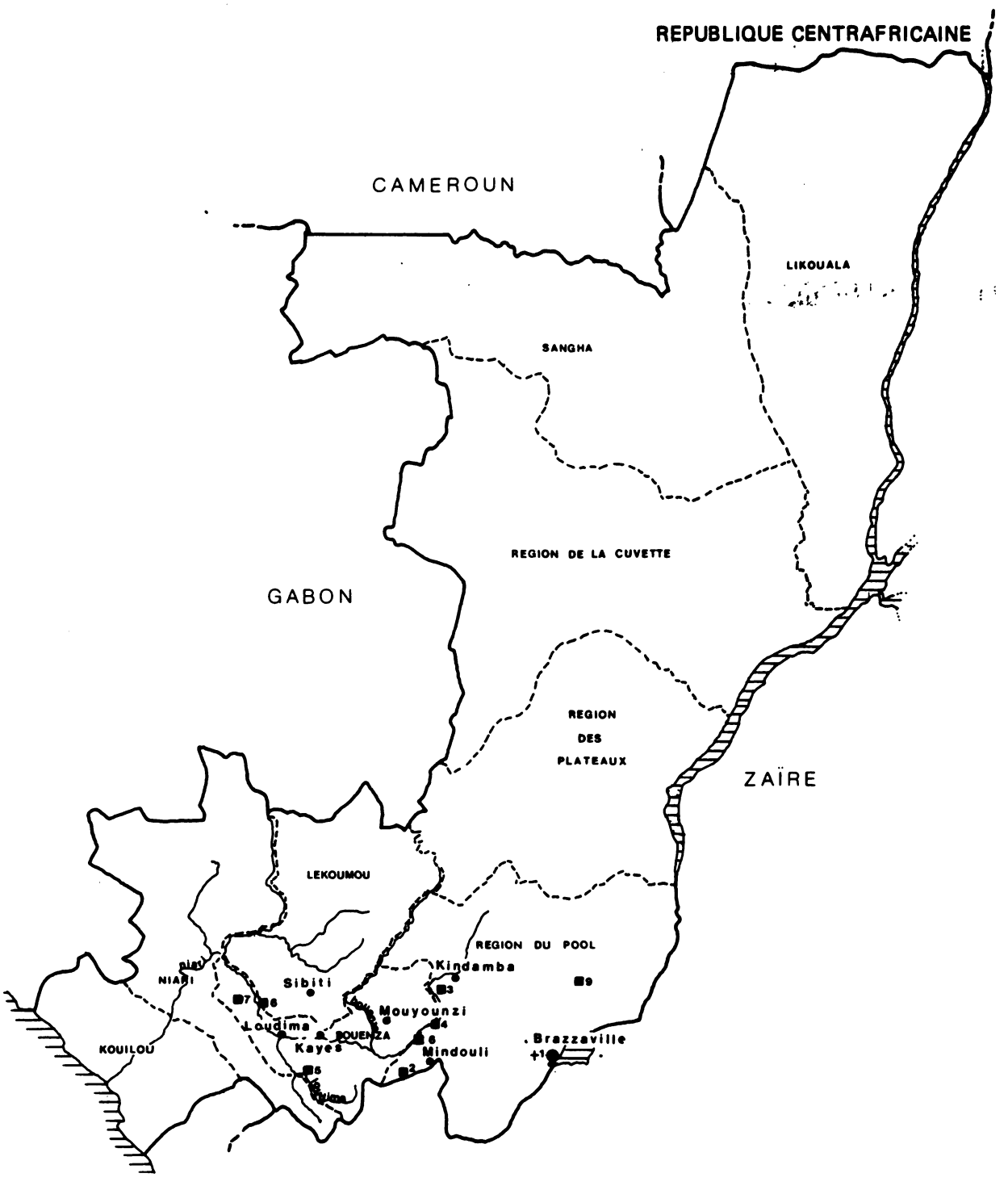
Table 2. Distribution of cattle.

Region	Government Farms or Ranches	Private Farms or Ranches	Total
Kouilou	-	-	-
Niari	-	5 341	5 341
Lekoumou	-	3 430	3 430
Bouenza	18 274	10 316	28 590
Pool-Brazzaville	4 165	1 262	5 427
Plateaux	23	49	72
Cuvette	-	172	172
Sangha	142	80	222
Likouala	22	-	22
Total	22 626	20 650	43 276

Source: Congo, Service de la Production Animale et de Médecine Vétérinaire, 1977.

Given the difficulties of enumerating cattle on private holdings, it is possible that the figures obtained by the regional veterinary offices for private farms and

Figure 1. **Administrative divisions, location of research centre and multiplication herds.**



ranches are underestimates. For example, some estimate that the number of cattle on private holdings in the Pool-Brazzaville Region is closer to 4 500.

Of the national total, 98% are found in the savanna areas, including the valleys of the Bouenza and Loudima Rivers as well as the Niari River and its tributaries, and the forest area around Sibiti in the southern part of Lékoumou Region. It is estimated that 75% of these cattle are N'Dama, with the rest mainly Lagune. About 450 Zebu and Zebu x N'Dama were imported from 1945 to 1950, but these have all disappeared or were absorbed by the N'Dama.

The 1977 report of the Service de la Production Animale et de Médecine Vétérinaire included a census of the sheep and goat population, giving totals of 8 800 sheep and 4 600 goats. Again, these figures are underestimates. UDEAC et al. (1978) reported that there were 42 000 sheep and 84 000 goats in 1973, which is more accurate. Sheep and goats are found in every village throughout the country. The goat population is larger in general, but sheep are more numerous in the coastal area.

3. CATTLE

3.1 BREED DESCRIPTION

3.1.1 N'Dama

A few N'Dama were imported before 1949, and then between 1949 and 1955 about 2 520 were imported from Guinea. Again between 1967 and 1976, about 210 N'Dama were imported from Guinea, 1 650 from Senegal and 1 100 from Zaire. Most of these animals are of the classical Guinean type, with fawn to brown coats, sometimes spotted on the belly, and lyre-shaped horns (see Figure 3.23, volume 1). N'Dama of the Senegalese type, with slender bodies and lighter coats, are also found.

About 65% of the N'Dama in Congo are kept on government ranches, and the others by small farmers. They are concentrated in the savanna areas, in the southern parts of Niari, Bouenza and Pool-Brazzaville Regions, and in the forests of Lekoumou Region.

3.1.2 Lagune

Between 1949 and 1959, about 930 Lagune cattle were imported from Benin. During the same period, a few Baoulé were imported from Ivory Coast, but these have been absorbed by the Lagune. The Lagune cattle in Congo are kept exclusively in village herds, distributed throughout the same savanna and forest areas as the N'Dama. They are similar to the Lagune cattle of Benin. There has also been some crossbreeding for several years with N'Dama.

3.2 DISEASE

The main disease problems are rickettsiosis, piroplasmosis and gastro-intestinal helminthiasis, and mineral deficiencies are also found, especially in village herds. Brucellosis was recently identified at the Dihessé Ranch, where it affected 37% of the females in the herd. Trypanosomiasis is caused by *T. vivax* and *T. congolense*. No systematic treatment is carried out, but disease incidence is low, mortality is relatively rare and birth rates are at an acceptable level.

3.3 HERD MANAGEMENT AND COMPOSITION

3.3.1 Village Herds

Cattle have been introduced at the village level through métayage operations initiated during the 1950s. Herds are generally from 10 to 20 head. The cattle usually roam freely during the day, but are sometimes penned at night. They are not given supplements and seldom receive veterinary attention. Animals are slaughtered for traditional ceremonies, but there is no commercial offtake.

In addition to these village herds, a number of individuals, such as shopkeepers and civil servants, have begun investing in cattle herds as a commercial undertaking in response to high meat prices. These herds generally consist of 50 to 100 head. They are herded on fenced pastures and receive some mineral supplements, but the general level of management is poor: weaning is not controlled, males are not castrated and the animals receive little veterinary attention.

3.3.2 Government Ranches

Government ranches for N'Dama cattle were first established in 1950, based on the ranching system practised in Zaire.

Herd management problems have occurred, and at present these ranches are being reorganized. The cattle are watered at the rivers and are kept on fenced natural savanna pastures, which are now being subdivided in order to separate the herds according to age and sex. Firebreaks are constructed at the beginning of the dry season to prevent accidental fires. The animals are given supplementary potassium salt and are generally dipped every two weeks. They are weaned at six months, and castration is being introduced, along with dehorning, at one year. Slaughter cattle are sold when they reach 200 kg and breeding stock is culled at about 12 years. The cattle are branded with individual numbers.

4. SHEEP AND GOATS

All the sheep and goats in the country are of the West African Dwarf type. Most of the sheep are black-and-white, but sheep with tan backs and black bellies

are also common, especially in the coastal areas (see Figure 3.70, volume 1). Goats are usually black or black-and-white, but animals with brown coats and a black line along the back are common.

No information is available on the performance of sheep and goats under village conditions. Birth rates among sheep at Odkiba farm, where difficult health problems have been encountered, averaged 110% in 1977, and the mortality rate averaged 32%.

Sheep and goats are affected by helminthiasis, mineral deficiencies, mastitis and heartwater, but no information is available on the relative importance of these problems.

Village sheep and goats receive very little attention. They are allowed to roam freely during the day and are not provided with shelter, mineral supplementation or veterinary care. They are slaughtered during traditional ceremonies or are occasionally sold.

Two government farms have also started keeping sheep. At Odziba, the sheep are kept on fenced savanna pasture, lambs are weaned at four months and the males are castrated at one month. At the army farm at Kibélémoussia, the weaning and castration policy has not yet been defined. However, experience on this farm has indicated the importance of providing shelter. Since a clean, well-aerated wooden shelter was built for the flock, the annual mortality rate has dropped from 30 to less than 10%.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

The Laboratoire Vétérinaire de Brazzaville (shown by +1 in Figure 1) was established in 1977 with technical assistance from the USSR. The staff are currently identifying the animal diseases observed on the government ranches and making estimates of their importance.

The most important multiplication herds in the country are listed in Table 3. In addition to these, there are smaller government breeding centres at Etoro in Plateaux Region, at Mokeko near Ouesso in Sangha Region, at Mankoussou farm in Pool Region and at the farm of the Société Cotonnière du Congo in Bouenza Region.

There are a few private commercial cattle ranches in Bouenza Region, but these are decreasing. The Socama ranch at Madingou has approximately 500 N'Dama and the ranch of the Bouenza monastery keeps approximately 300 N'Dama. The ranch of M. Joffre has approximately 30 N'Dama and that of M. Merle des Isles 120; the rest of their herds were sold to the government ranch at Dihessé.

Table 3. Multiplication herds.

Name	Mpassa Farm	APN Farm	Louila Ranch	Louboulou Ranch	Office du Ranch de la Dihesse	Louamba Ranch	Massangui Ranch	Ferme Ovine d'Odziba
Location (and reference in Figure 1)	20 km from Minduli, Pool Region ■ 2	Kibelemoussia, 20 km from Kindamba, Pool Region ■ 3	30 km from Minduli, Pool Region ■ 4	Near Loudima, Bouenza Region ■ 6	Near Loudima, Bouenza Region ■ 7	20 km from Kayie, Bouenza Region ■ 5	Near Mouyoundzi, Bouenza Region ■ 8	North of Brazzaville, Pool Region ■ 9
Organization responsible (address)	Ministère de l'Economie Rurale	Armée Populaire Nationale	Ministère de l'Economie Rurale, Ministère du Plan		Ministère de l'Economie Rurale	SONEL (Société Nationale d'Elevage) (B.P. 81, Lutete)		Ministère de l'Economie Rurale
Size	16 000 ha fenced, 2 800 ha in use	300 ha	13 000 ha available, 5 200 ha in use	11 000 ha available, 8 000 ha in use	64 000 ha available, 6 000 ha in use	12 000 ha fenced, 8 000 ha in use	12 800 ha	1 000 ha
Breeds and numbers	700 N'Dama	240 N'Dama, 150 local sheep	2 700 N'Dama	2 750 N'Dama	3 530 N'Dama	6 000 N'Dama	7 000 N'Dama	310 local sheep (195 ewes), 30 Karakul
Objectives	Herd development	Meat production	Herd development to 5 000 head. Production of beef and breeding stock.		Herd development to 5 000 head. Production of beef and breeding stock.	Production of beef and breeding stock.		Flock development to 3 000 head. Production of meat and breeding stock.
Remarks	Since 1978, animals are marked with an individual number. Monthly weighing is planned.		Changes in herds are recorded by category of animal and age groups.		Individual reproduction records are kept.	Recording of changes within herds. Animals are branded with individual numbers.		
External aid			Financial support from EDF; technical assistance J. van Lancker Co.		Financial support from World Bank and France; technical assistance from IEMVT			
Period			March 1978 - March 1982		Ending in 1978			

Besides managing the government ranches and farms, the Service de la Production Animale et de Médecine Vétérinaire has recently initiated two development activities. First, in order to extend métayage operations in the country, the animals already allocated under the métayage system are being identified and where appropriate recovered. This operation has met with difficulties due to the lack of transport in the rural areas and the negative reactions of the villagers. The cattle involved are mainly Lagune plus some N'Dama. Second, extension work is being undertaken at the village level in order to introduce tick control measures. Neither of these projects requires external funding.

A UNDP/Congolese Government project 68/507, entitled 'Rural Development of the Pool and Koukouya Plateau Region' is financed also by Switzerland and FAC (France). During the second phase of this project, from 1974 to 1978, it was planned to count and mark all the cattle kept on the Mpassa farm and the cattle, sheep and goats in the villages of the area, but this effort met with substantial practical difficulties and now seems to have been abandoned. Preliminary tests have been carried out for trypanosomiasis which suggest that the infection rate is substantial. Tests for tuberculosis have also been carried out, but none of the test results are yet available.

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CHAPTER 18

ZAIRE

1. BACKGROUND

The Republic of Zaire lies in central Africa with a narrow outlet on the west coast. The country is bordered by Cabinda and Congo to the west, Central African Republic and Sudan to the north, Uganda, Rwanda, Burundi and Tanzania to the east, Zambia to the southeast and Angola to the south. It is divided into 9 regions, including the capital at Kinshasa, with 23 subregions.

The Service de Santé et Production Animales, under the Commissariat à l'Agriculture, operates through regional and subregional offices with responsibility for animal health and technical assistance to livestock raisers. The Office National de Développement de l'Elevage (ONDE), also under the Commissariat à l'Agriculture, is responsible for the management of government ranches and farms, veterinary laboratories and livestock development projects.

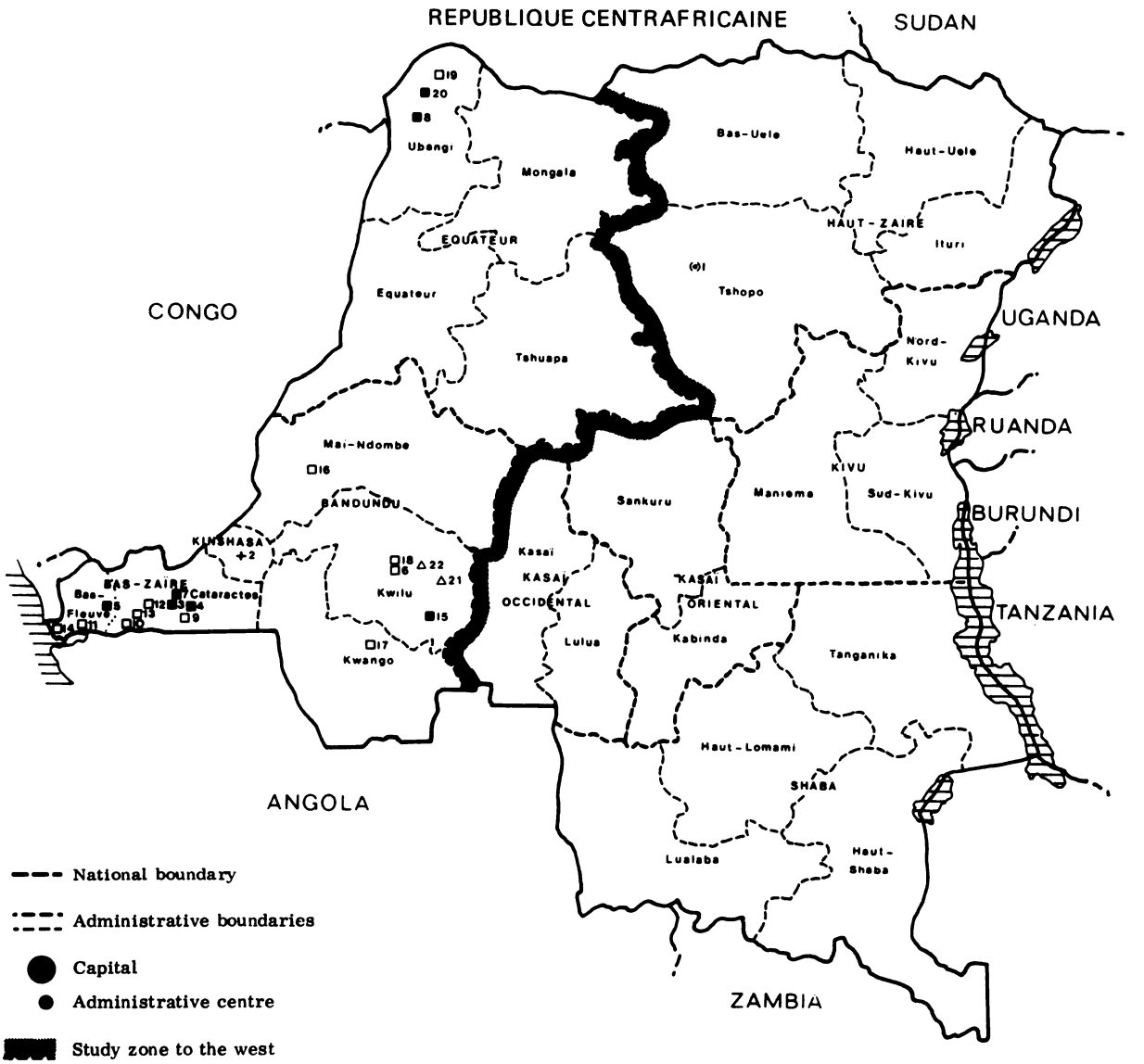
The study area includes the Bas-Zaire, Bandundu and Equateur Regions. Basic data for the country as a whole and for the study area are given in Table 1.

Table 1. Background data for Zaire.

	Whole Country	Study Area
Area	2 345 000	763 000
Latitude	5^{o} N - 13^{o} 15' S	5^{o} N - 8^{o} S
Longitude	12^{o} 16' E - 31^{o} 15' E	12^{o} 16' E - 21^{o} E
Population		
number	25 389 000	9 500 000
density	10.8/km^2	12.4/km^2
Livestock numbers		
cattle	1 079 000	281 000
sheep	762 000	171 000
goats	2 216 000	818 000

Sources: For population, OAU, 1978; for livestock numbers, Zaire, Division de la Statistique, 1977b.

Figure 1. Administrative divisions, boundary of study zone, location of research centres, multiplication herds and development projects.



Research centres

✚ Laboratory working on trypanotolerance and/or trypanosomiasis

(●) Centre with trypanotolerant livestock as subsidiary activity

Multiplication herds

■ Governmental farm or ranch with trypanotolerant livestock

□ Private farm or ranch with trypanotolerant livestock

Development projects

△ Agricultural project with trypanotolerant livestock component

The central basin and the Bas-Fleuve Subregion of the Bas-Zaire Region, together comprising 48% of the country, are covered with forest. The rest of Bas-Zaire Region, Bandundu Region except for the area north of the Kasai River, and the northern part of Equateur Region are composed of Guinean savannas. Annual rainfall in the study zone varies from 1 400 mm in the south up to 2 000 mm near the Equator and back down to 1 600 mm in the north. There are two rainy seasons, but in the north and especially in the centre of the study zone the seasons are not well marked and rain frequently occurs in the dry seasons.

According to the OAU/STRC tsetse distribution map (1977) and the ECA/FAO/OAU livestock development study (1973), the entire country is infested with tsetse except for the southern part of Shaba Region and a narrow strip on the eastern border of Kivu Region. Evans and Niemegeers (1955) also found that an area along Lake Tanganyika and another along Kwango River in the southern part of Bandundu Region were free of tsetse. This second area, located in the study zone, still seems to be tsetse free.

G. palpalis is found in all the infested area, *G. fusca* in the central basin and the north, *G. tabaniformis* in the central basin and *G. morsitans* in the southeast. However, the tsetse infestation on the southeastern plateaux is considered very light. A new study of tsetse infestation by medical teams is now underway, covering the most heavily infested regions - Bas-Zaire, Bandundu, Equateur, the western part of Haut-Zaire and the northern parts of Kasai Occidental and Kasai Oriental.

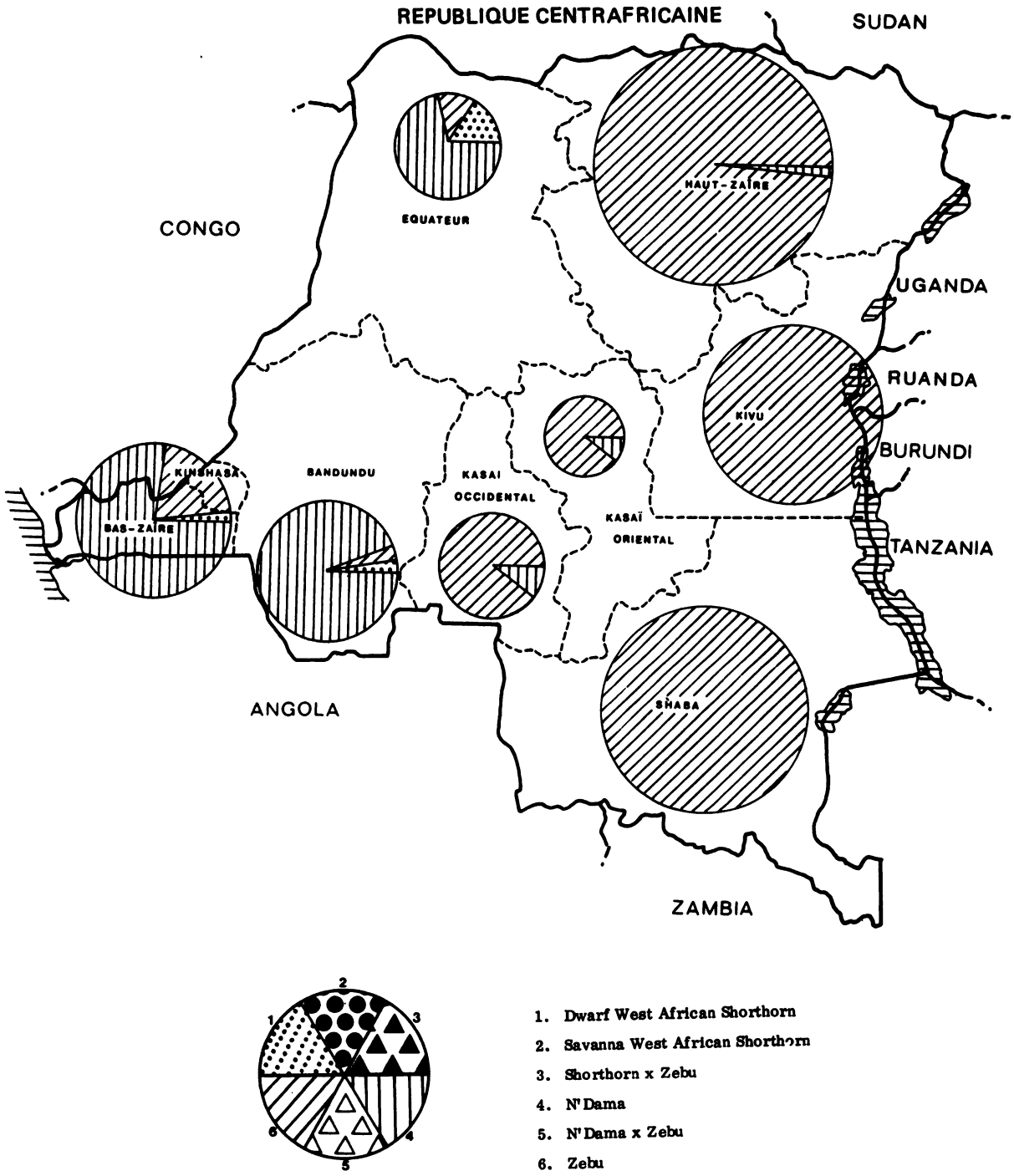
2. LIVESTOCK NUMBERS AND DISTRIBUTION

The distribution of cattle, sheep and goats among the nine regions is shown in Table 2. The livestock population is concentrated in the eastern and southeastern highlands, with 70% of the cattle, 75% of the sheep and 57% of the goats in Haut-Zaire, Kivu and Shaba Regions.

In the study zone, more than 85% of the cattle population are trypanotolerant. It is generally estimated that there are only 10 000 to 15 000 trypanotolerant cattle outside these three regions, or even less according to SEDES (1975). As of 1976, the three regions accounted for 281 000 cattle, or 26% of the national total, 171 500 sheep, 22% of the national total, and 818 000 goats, 37% of the national total, as shown in Table 2.

The entire cattle population of the study area was originally imported. The first cattle brought in were Barotse from Angola, beginning in 1889, but these have disappeared, at least as a pure breed. Some Barotse influence can be seen in the Mateba (see Figure 3.59, volume 1) and in the so-called Kisantu (see Figure 3.60, volume 1), an N'Dama x Angola crossbred which is now disappearing.

Figure 2. Cattle numbers.



1. Dwarf West African Shorthorn
2. Savanna West African Shorthorn
3. Shorthorn x Zebu
4. N'Dama
5. N'Dama x Zebu
6. Zebu

Table 2. Livestock distribution by regions.

	Area (km^2)	Cattle ('000)	Sheep ('000)	Goats ('000)
Kinshasa	9 965	13.3	0.7	20.0
Bas-Zaire	53 920	110.9	56.1	109.7
Bandundu	295 658	99.8	104.2	581.0
Equateur	403 293	57.2	10.5	99.4
Haut-Zaire	503 239	305.9	107.9	483.7
Kivu	256 662	171.7	249.0	502.0
Shaba	496 965	230.8	173.9	168.1
Kasai Oriental	168 216	32.8	37.7	123.6
Kasai Occidental	156 967	56.2	22.0	128.5
Total	2 344 885	1 078.6	762.0	2 216.0

Source: Zaire, Division de la Statistique, 1977b.

Lagune cattle, called Dahomey in Zaire, were first imported from Benin in 1904 (Mortelmans and Kageruka, 1976). There are now about 13 000 to 15 000, found mainly under village conditions in the forest areas in Mayumbé in Bas-Zaire Region, in Kwilu in Bandundu Region and around Lisala and Bumba in Equateur Region. Many farmers are trying to increase the size of their animals by cross-breeding their Lagune herds with N'Dama, and for this reason the Lagune is slowly disappearing as a pure breed.

N'Dama were first imported into Zaire from Guinea in 1920. They were kept on commercial farms and ranches in Bas-Zaire and then distributed in Bandundu and Equateur Regions. N'Dama are very popular in Zaire, and their numbers are increasing, both on commercial ranches and in the villages. There are now between 235 000 and 245 000 in the country as a whole.

Table 3 gives the distribution of the main cattle breeds in the three regions of the study area. Figure 2 shows the distribution of the main breeds throughout the country, while Figure 3 shows the distribution of the trypanotolerant breeds within the study area and the effective boundary between Zebu and trypanotolerant types.

The boundaries of the study area are based on the distribution of trypanotolerant cattle breeds, and are less relevant for trypanotolerant sheep and goats. In fact, large numbers of Djallonké sheep and goats are found outside the study area. As Table 1 indicates, there are about 171 000 sheep and 818 000 goats in the study area. However, there are about 610 000 trypanotolerant sheep and 1 773 000 trypanotolerant goats in the country as a whole.

Figure 3. Cattle breed distribution and forest areas.

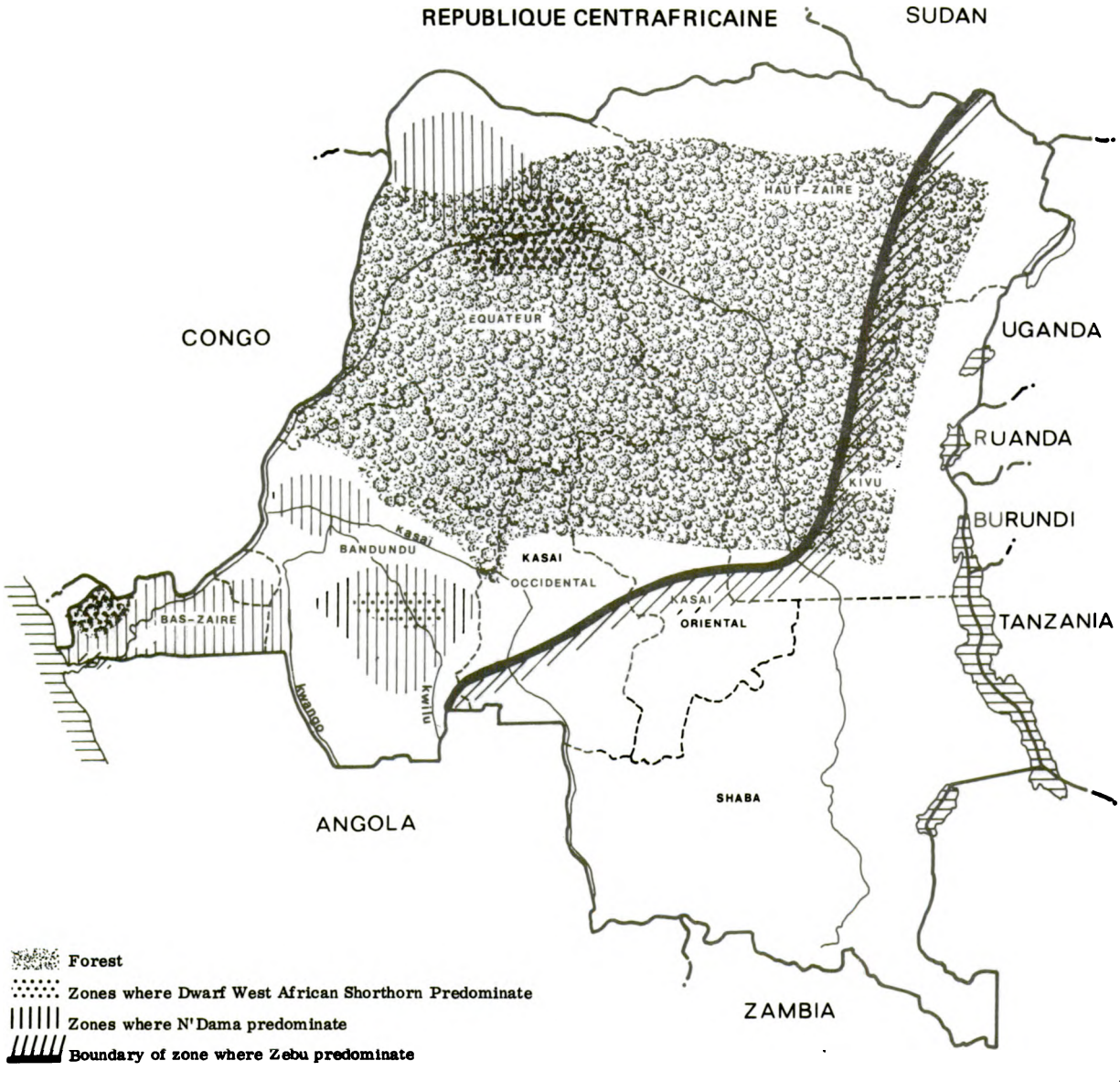


Table 3. Distribution of trypanotolerant cattle breeds by region, 1976 estimates.

	Bas-Zaire plus Kinshasa	Bandundu	Equateur
Lagune	2 000	3 000	8 000 - 10 000
N'Dama + crossbreds	95 000	92 000	40 000
Mateba + crossbreds	26 000	-	-
Others		4 000[a]	7 000[b]

a. Mainly crossbred N'Dama x Angola and some Africander.

b. Mainly Ituri (Small Eastern African Zebu) kept on ranches under intensive chemoprophylaxis or curative treatment.

Source: Information from country visit.

3. CATTLE

3.1 BREED DESCRIPTION

3.1.1 Lagune or Dahomey

The Lagune cattle in Zaire were originally imported from Benin, and resemble the Lagune type described in chapter 3 of volume 1. Little information is available about this breed in Zaire. Mortelmans and Kageruka (1976) report average heights of 95 to 105 cm at withers (see Figure 3.28, volume 1). Adult cows in good condition weigh between 150 and 200 kg and adult bulls from 200 to 300 kg and sometimes more. There is general agreement on the hardiness and fertility of the breed.

Table 4 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf produced per 100 kg of cow maintained per year. This productivity index has been derived for meat production under village conditions in a medium tsetse challenge area.

3.1.2 N'Dama

The N'Dama in Zaire are found mainly in Bas-Zaire Region. They were originally imported from the Fouta Djallon area of Guinea, and have been kept as a pure breed and also crossed with Lagune, Barotsé, Angola and Africander cattle imported earlier. Back crossing to N'Dama was initiated as early as 1930. Since World War II, purebred N'Dama have been raised on large commercial ranches, subject to uniquely stringent selection criteria.

Table 4. Lagune productivity estimates.

Parameter	Production Environment Village/medium challenge/meat
Cow viability (%)	98[a]
Calving percentage	40
Calf viability to one year (%)	85[a]
Calf weight at one year (kg)	80
Productivity index[b] per cow per year (kg)	27.2
Cow weight (kg)	160
Productivity index[b] per 100 kg cow maintained per year (kg)	17.0

a. Estimate.
b. Total weight of one-year-old calf produced.

Sources: Estimates from Gimbi Research Station and Mortelmans and Kageruka, 1976.

The N'Dama in Zaire are basically of the Guinean type, though a little heavier and with better characteristics for meat production (see Figures 3.24, 3.25 and 3.26, volume 1). Their coats are generally fawn, sometimes with white spots on the belly. The males have red heads and necks. They graze during the hottest hours of the day without seeking shade. Animals kept under extensive ranching conditions in fenced pastures tend to have a nervous disposition.

3.1.2.1 Performance Traits. On the ranches, the age of bulls at first service is three years and heifers are first mated between 18 and 30 months. The calving rate under extensive ranching conditions is 75 to 80%, including only calves alive two weeks after birth when they are recorded. Under more intensive conditions, the calving rate is as high as 100%, for instance on the Diocèse de Kikwit ranch with 1 300 head.

Mortality rates are generally very low. For example, on Kolo Ranch overall mortality is 1.0 to 1.5%, including animals missing and accidental deaths but not deaths of calves under two weeks old.

Milk production is estimated at 700 to 800 kg per lactation (ECA/FAO/OAU, 1973). Body weights of animals kept under grazing conditions on natural savanna without supplementary feed are given in Table 5. Weights were recorded at Kolo Ranch at the end of the dry season; the 3- and 4-year-old animals are generally 25 kg heavier during the rains.

Average adult weights of N'Dama at three different locations are given in Table 6.

Table 5. Body weights of N'Dama at various ages (kg).

Age in months	Birth	7 (weaning)	12	18	24	36	48
Females - Mvuazi Station	19	120	127	156	203	241	-
Steers - Kolo ranch	29(2 weeks)	116	139	176	207	280	331

Sources: Mortelmans and Kageruka, 1976; Risopoulos, 1966; and for Kolo, information from country visit.

Table 6. Body weights of adult N'Dama (kg).

	Mvuazi Station	Gimbi Station	Kolo Ranch
Females	290	300 - 325	290 - 300
Males	456	400	430 - 450

Sources: For Mvuazi, Risopoulos, 1966; for Gimbi, Mortelmans and Kageruka, 1976; for Kolo, information from country visit.

On ranches with meat production operations, oxen are slaughtered between three and four years at a liveweight varying from 320 to 360 kg. No special fattening programme is carried out. The dressing out percentage for animals on natural savanna varies from 50 to 55%.

3.1.2.2 Index of Productivity. Table 7 summarizes estimates of the main production traits required to build up a productivity index covering the total weight of one-year-old calf produced per 100 kg of cow maintained per year. This productivity index has been derived for four production environments: meat production under village conditions in a high tsetse challenge area at Idiofa in Bandundu Region, meat production under ranch conditions in a high challenge area at N'Djokélé in Bandundu Region, and meat production under ranch conditions in two low challenge areas at Kikwit in Bandundu Region and Kolo in Bas-Zaire Region.

3.1.3 Mateba

Angola cattle were first introduced on Mateba Island in the mouth of the Zaire River, near Boma, in 1889 as a food supply for the workers on the Matadi-Kinshasa railway line. At the turn of the century, crossbreeding was introduced with imported Devon, Hereford and Africander cattle, and Devon were reintroduced

Table 7. N'Dama productivity estimates.

Parameter	Productivity - Environment - Village/high challenge/meat	Ranch/high challenge/meat	Ranch/low challenge/meat	Ranch/low challenge/meat
Cow viability (%)	98	99	99	99
Calving percentage	60	65	80	100
Calf viability to one year (kg)	70	90	98	95
Calf weight at one year (kg)	110	130	140	140
Productivity index[b] per cow per year (kg)	46.2	76.1	110.3	133.5
Cow weight (kg)	220[a]	250	270	270
Production index[b] per 100 kg cow maintained per per year (kg)	21.0	30.4	40.9	49.5

a. Estimate.

b. Total weight of one-year-old calf produced.

Source: Information from country visit.

in 1948. By now, the Mateba breed has stabilized, and is very homogeneous in appearance (see Figure 3.60, volume 1).

Today, about 9 000 pure Mateba are kept by the Grands Elevages Company on Mateba Island and the adjoining river banks in an area which is apparently free of trypanosomiasis. They have adapted remarkably well to an unusual environment, wading in pastures covered with river water enriched by alluvium and grazing on so-called 'floating' grass which is rich in all the necessary mineral elements. Adult cows weigh more than 400 kg, adult bulls 600 kg and 4-year-old oxen 500 kg. The Mateba are not considered as trypanotolerant as the N'Dama or the Lagune.

Mateba have been introduced in the savanna areas of Bas-Zaire, where they have adapted less successfully, affected by trypanosomiasis, the drier conditions and less abundant food supply. They have been crossbred to produce animals which are half and three-quarters N'Dama, but the crossbreds suffer with different intensities from the same health problems and also seem to develop skin diseases in the savanna environment. The company now plans to increase all crossbreds to three-quarters N'Dama in an effort to produce animals which will be more successful outside their original environment. There are about 18 000 crossbreds in the Cataractes Subregion of Bas-Zaire and another 3 400 on a ranch of the Kasai Company at Pinanga in Kasai Occidental.

3.2 DISEASE

The health situation among trypanotolerant cattle in the study area is generally good, except for mineral deficiencies which are very important in certain

locations. Trypanosomiasis is caused chiefly by *T. vivax* and *T. congolense*. N'Dama and Lagune cattle are not treated systematically for trypanosomiasis, but animals showing a rapid weight loss are dosed with Berenil and some ranches in heavily infested areas plan to give preventive treatment to week-old calves. Non-trypanotolerant cattle are subject to regular blood tests and veterinary treatment.

The incidence of several common diseases is lower in Zaire than in other comparable areas in Africa. Relatively important diseases include salmonellosis and necrobacillosis among the infectious diseases, as well as tick fevers, particularly piroplasmosis. Parasitic diseases are also relatively important, particularly helminthiasis, especially among herds which are kept enclosed at night and those fed *Stylosanthes*, which tends to carry parasites because it cannot be burnt. The non-trypanotolerant cattle and their crossbreds, on the other hand, are very susceptible to skin diseases, particularly to streptothricosis.

3.3 MANAGEMENT SYSTEMS

Cattle in the study zone are kept under two management systems: extensive commercial ranching (see Figure 3.24, volume 1) and village production under the métayage system (see Figure 3.21, volume 1).

3.3.1 Village Cattle Production Under Métayage

Cattle rearing is not traditional in Zaire, but was introduced at the village level at the beginning of the century through the métayage system (see chapter 3 of volume 1). Métayage operations have been developed on a large scale by the government, as well as by religious and commercial organizations. Originally, only Lagune cattle were raised under the métayage system, but since the 1950s N'Dama and N'Dama x Lagune crosses (see Figure 3.21, volume 1) have been used.

Herds under métayage are grazed on fenced pastures and penned at night. They receive mineral salts and health measures are carried out, such as spraying. The number of applicants to participate in métayage systems is much greater than the capacity of the existing centres to supply the basic breeding herds.

The original métayage herds, composed chiefly of Lagune cattle in Equateur Region and the Bas-Fleuve Subregion of Bandundu, tend to receive much less attention. They roam freely during the day and are only slaughtered for traditional ceremonies or sold when there is a special financial need.

3.3.2 Ranching

Originally, all N'Dama cattle introduced into the study area were kept on ranches, and 66% of the cattle in the area were still on ranches as of 1970. Since that time, an increasing proportion has been introduced into villages through métayage operations and onto small farms. This trend has been most pronounced in Bandundu Region, where, by 1976, less than 45% of the cattle were still on commercial ranches.

Herds of N'Dama, Mateba, Ituri Zebu and Angolan crossbreds are kept on ranches. The ranching system, as described in chapter 3 of volume 1, is based on natural savanna grazing, except at Mpaka in Ubangi Subregion. Cattle are generally herded in Bandundu and Equateur Regions, while in Bas-Zaire they are often kept on fenced pastures. Ranches keep from 1 000 to 25 000 head, with carrying capacities ranging from 2 to 5 ha per head. Where pastures are fenced, the cattle graze day and night; where herdsmen are used, the animals are kept in night paddocks or pens.

The animals are separated by sex, and by age as well if the size of the ranch permits. Breeding herds of mature cows generally include 4 to 5% bulls, while breeding herds of heifers include 7% bulls. The young, are usually branded and dehorned before three months but animals are only marked individually in selection herds and on the smaller ranches. They are castrated at seven months and weaned at eight months. They usually receive mineral supplements with anthelmintics in the form of salt licks. Both the animals which are herded and those on fenced pastures are generally watered once a day around noon at rivers, ponds or reservoirs. They are dipped or sprayed two to four times a month, at these times they receive some veterinary attention. For those animals on fenced pastures, these occasions are generally the only contact with people.

The offtake rate on the large ranches varies from 18 to 24%. Steers are usually slaughtered between three and four years and extra heifers are sold at two years. Breeding stock are culled at 10 or 11 years.

The pastures consist mainly of *Hyparrhenia diplandra* or *H. gracilis*, quickly becomes woody when it flowers and loses its nutritive value. Firebreaks are constructed and pastures are burnt off once a year to stimulate regrowth of new grass. Burning of dry-season pastures takes place at the beginning of the dry season or as soon as possible towards the end of the wet season, depending on whether the soils are light or heavy. Wet-season pastures are burnt during the rains.

Seasonal pasture burning has a number of advantages. The costs are low and, in addition to stimulating regrowth of the *Hyparrhenia*, burning reduces the population of tsetse flies, ticks and other insects and larvae, controls the growth of shrubs and disperses wild animals. Production based on artificial pastures, on the other hand, has never been economically feasible due to low meat prices, which were only 24 Makuta (US $ 0.22) per kg liveweight in 1975 for first quality.

This type of ranching system is being extended with modifications to small commercial farms owned by individuals such as shopkeepers and civil servants. Generally, herds of 50 to 150 are kept.

4. SHEEP AND GOATS

Most of the sheep and goats in Zaire are of the West African Dwarf breeds, though there is some crossbreeding with the East African breeds in the eastern part

of the country. The sheep are usually black-and-white. The goats are black or black-and-white, though brown goats with a black line down the back are also common.

There is little information available on diseases, though parasitic diseases seem to be important, as well as mineral deficiencies, especially among sheep.

Management is similar to that observed in other comparable regions of Africa. The flocks roam freely during the day and no shelter is provided at night. They receive no mineral supplementation or veterinary attention.

5. RESEARCH AND DEVELOPMENT ACTIVITIES

The headquarters of the Institut National pour l'Etude et le Recherche Agronomique (INERA, B.P. 2037, Kinshasa I) is at Yangambi in Haut-Zaire Region (Ref (●) 1 in Figure 1), and most of the research carried out is on crop farming. However, the Institute maintains several stations in the study area with herds of N'Dama and Lagune cattle which are used in métayage operations.

The Laboratoire Vétérinaire de Kinshasa (B.P. 8842, Kinshasa, ref +2 in Figure 1) is responsible for vaccine and antigen production and is well equipped to carry out research on trypanosomiasis. In addition, the Université Nationale du Zaire (UNAZA) carries out research on methods for detecting and diagnosing trypanosomiasis, mainly in cattle, with assistance from Belgium.

Métayage centres are described in Table 8 and government and commercial ranches in Table 9.

Four development projects are being carried out or planned in the study area. The Progrès Populaire d'Idiofa was initiated in 1960 by the Diocèse of Idiofa in Kwilu Subregion of Bandundu Region (B.P. 8251, Kinshasa I, △ 21 in Figure 1). This integrated rural development project included in its 1974-79 development plan extension operations for small-scale and large-scale farms, construction of a veterinary laboratory, the development of a rural handicrafts industry and other types of training. The project also includes a métayage operation with 4 500 N'Dama cattle distributed among 260 villages and another 2 000 N'Dama in 8 breeding herds. The project is financed by the Diocèse of Idiofa, the Belgian government and a German Christian organization, Misereor.

Another agricultural programme, sponsored by the protestant church, is also being carried out in Kwilu Subregion (△ 22 in Figure 1). This programme was launched in 1964 and includes a métayage operation with about 500 N'Dama cattle, along with technical and veterinary assistance for farmers. Sheep and goat production is also encouraged.

At the end of 1977, the Société Financière de Développement (SOFIDE) allocated funds for the establishment of a private goat farm. This will be located in Bas-Zaire Region.

Table 8. Métayage centres.

Name	Groupement d'Economie Rurale (GER)	Station de Mvuazi	Station de Gimbi	Metayage du Bureau Diocesain de Developpement
Location (and reference in Figure 1)	B.P. 128, Mbanza Ngungu, Cataractes, Bas-Zaire Region ■ 3	Cataractes, Bas-Zaire Region ■ 4	Bas Fleuve, Bas-Zaire Region ■ 5	B.P. 144, Kikwit, Kwitu Bandundu Region □ 6
Organization responsible and address	Commissariat a l'Agriculture (B.P. 7537, Kinshasa)	INERA	INERA (B.P., 76, Matadi)	Diocese de Kikwit
Size	-	1 000 ha	1 000 ha	-
Breeds and numbers	1 090 N'Dama in 5 reproduction herds and 3 340 in 182 métayage operations as of August 1978	100 $\frac{3}{4}$ N'Dama x $\frac{1}{4}$ Red Sindi crosses, 350 N'Dama in the station reproduction herd; 300 in 20 métayage operations, as of November 1978; 100 Djallonké sheep at the station	80 Lagune, 150 N'Dama, 85 crossbreds at the station, 50 Lagune, 40 N'Dama in metayage operations	150 N'Dama x Lagune crosses in reproduction herd, 200 in métayage operations
Objectives	Expansion of métayage system.	Development of métayage operations with sheep and cattle.	Development of métayage operations.	Development of métayage with a reproduction herd of 400.

Note: These centres keep monthly records of animal numbers by category.

Table 9. Government and commercial ranches.

Name	Inkisi Ranch	Lola Ranch	Kolo Ranch	PEK Ranches	Mateba Ranches, Secteur de Mateba et Kanga	Mateba Ranches, Secteur de Kiasundua	Mateba Ranches, Secteur de Yuku, km 110
Location (and reference in Figure 1)	Cataractes, Bas-Zaire Region ■ 7	North of Gemena, Ubangi, Equateur Region ■ 8	Kolo Fuma, Cataractes, Bas-Zaire Region □ 9	Kitobola, Lovo, Cataractes, Bas-Zaire Region □10	Mateba island and Zaire river banks near Boma, Bas Fleuve, Bas-Zaire Region □ 11	Malanga, Cataractes Bas-Zaire Region □ 12	Yuku, Cataractes, Bas-Zaire Region □ 13
Organization responsible and address	Commissariat à l'Agriculture (B. P. 7537, Kinshasa)	Commissariat à l'Agriculture	J. van Lancker Co. (B. P. 199, Kinshasa)	J. van Lancker Co.	Cultures et Elevages au Zaire (CELZA)	CELZA	CELZA
Size	-	60 000 ha	50 000 ha	20 000 ha	Island: 7 000 ha Banks: 20 000 ha	35 000 ha	20 000 ha
Breeds and numbers	1 000 N'Dama	7 000 N'Dama	22 500 N'Dama	9 000 N'Dama	9 000 Mateba, 4 000 N'Dama x Mateba crosses	9 000 N'Dama x Mateba crosses	4 000 N'Dama x Mateba crosses
Objectives	Developing ranch aims to reach 20 000 head on 50 000 ha and provide cattle for meat production and breeding stock.	Production of beef and breeding stock. Developing ranch aims to reach 20 000 cattle, plus sheep and pig production.	Commercial ranch for production of beef and breeding stock.			Absorption of Mateba by crossbreeding with N'Dama.	
External aid	Rumania	Belgian government 1973-83					
Comments			Records kept on individual animals in 400-hd selected breeding herds. Herd recording by category and age group.		The Mateba ranches were in the process of reverting to the Grands Elevage Company.		

Table 9, cont.

Name	Donga Zola Ranch	Gungu Ranch (B.P. 32, Kikwit)	N'Djokélé Ranch	Elevage de la Kalombi (B.P. 69, Kikwit)	Elevage du Diocése de Kikwit	Lombo Ranch (B.P. 69, Kikwit)	Mpaka Ranch
Location (and reference in Figure 1)	Moanda, Bas Fleuve, Bas-Zaire Region □ 14	Kwilu, Bas-Zaire Region ■ 15	Near Mushie, Mai-Ndombe, Bandundu Region □ 16	Near Feshi, Kwango, Bandundu Region □ 17	Kwilu, Bandundu Region □ 18	North of Gemena, Equateur Region □ 19	Ubangi, Equateur Region ■ 20
Organization responsible and address	private	Office Nationale de Développement de l'Elevage (ONDE)	J. van Lancker Co. (B.P. 199, Kinshasa)	private	Diocèse de Kikwit (B.P. 144, Kikwit)	Plantations Lever au Zaire (PLZ, B.P. 8611, Kinshasa)	CELZA
Size	2 500 ha	2 500 ha	100 000 ha available 30 000 ha grazed	5 000 ha	4 000 ha	75 000 ha available 22 000 ha grazed	75 000 ha available 25 000 ha grazed
Breeds and numbers	1 600 N'Dama x Lagune crossbreds	400 N'Dama, 500 Zebu, Africander and N'Dama crossbreds	12 000 N'Dama	1 400 crossbreds, N'Dama dominant with Angola and Zebu blood	1 300 crossbreds - N'Dama dominant with traces of Lagune, Africander and Angola	7 000 N'Dama, 2 000 Ituri Zebu and Ituri x N'Dama crossbreds	12 500 N'Dama x Ituri Zebu x Africander crossbreds
Objectives	Commercial ranch	Commercial ranch	Commercial ranch	Commercial ranch	Production of beef and breeding stock	Mainly meat supply	Mainly meat supply
Comments	Records kept of changes in herds by category of animals and age groups			Individual records kept	Reproduction data, individual records kept	Recording of changes in herd by category of animals and age groups	Recording of herd development
	Absorption by cross-breeding towards N'Dama		Individual records started recently for selection herds. Ranch to be developed to 30 000 head by 1984	Ranch to be developed to 5 000 head by 1982		Ranch to be developed to 15 000 head	Ranch to be developed to 20 000 head

Finally, the 11-year Integrated Agricultural Development Project of Kwango-Kwilu has been proposed by the Office Nationale de Développement de l'Elevage (ONDE, B.P. 8839, Kinshasa) for the southern part of Bandundu Region. The study for this project was completed in 1977. It is planned to encourage the production of poultry, cattle, sheep and goats and to develop a meat marketing system. The project is to include three components: the Service de Santé et Production Animales will be reorganized with a professional training and extension component, five medium-sized ranches will be established with herds of 3 000 to 4 000 each, and an abattoir will be constructed at Kikwit. Financing is now being sought.

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LIST OF ACRONYMS

AGCD	Agence Générale de Coopération au Développement (Belgium)
AHPD	Animal Health and Production Department (The Gambia)
ARC	Agricultural Research Council (United Kingdom)
AVB	Société pour l'Aménagement de la Valée du Bandama (Ivory Coast)
AVV	Aménagement des Vallées des Voltas (Upper Volta)
BDPA	Bureau pour le Développement de la Production Agricole (France)
BEC	Bureau d'Etudes et de Coordination (Central African Republic)
BOAD	Banque Ouest Africaine de Développement
CAES	Central Agricultural Experimental Station (Liberia)
CARDER	Centre d'Action Régionale pour le Développement Rural (Benin)
CBPP	contagious bovine pleuropneumonia
CELZA	Cultures et Elevages au Zaire (Zaire)
CERTT	Centre d'Elevage et de Recherche sur la Trypanosomiase et la Trypanotolérance (Togo)
CFDT	Compagnie Francaise pour le Développement des Fibres Textiles (France)
CIDR	Comité International pour la Développement Rural (Upper Volta)
CIDT	Compagnie Ivoirienne des Textiles (Ivory Coast)
CNRA	Comité National de la Recherche Agronomique (Mali)
CNRZ	Centre National de Recherches Zootechniques (Mali)
CRTA	Centre de Recherches sur les Trypanosomiases Animales (Upper Volta)
CRZ	Centre de Recherches Zootechniques (Ivory Coast)
DANIDA	Danish International Development Authority (Denmark)
DGRST	Direction Générale de la Recherche Scientifique et Technique (Senegal)
ECA	Economic Commission for Africa (United Nations)
EDF	European Development Fund
EEC	European Economic Community
ELAT	Ecole de Lutte Anti-Tsetse (Upper Volta)
ENSA	Ecole Nationale Supérieure d'Agriculture (Yaoundé University) (Cameroon)

FAC	Fonds d'Aide et de Coopération (France)
FAO	Food and Agriculture Organization (United Nations)
GER	Groupement d'Economie Rurale (Zaire)
GTZ	Geselleschaft für Technische Zusammenarbeit (German Fed. Rep.)
IBAR	Inter-African Bureau for Animal Resources
IBRD	International Bank for Reconstruction and Development (World Bank)
IDESSA	Institut des Savanes (Ivory Coast)
IEMVT	Institut d'Elevage et de Médecine Vétérinaire des Pays Tropicaux (France)
IER	Institut d'Economie Rurale (Mali)
IITA	International Institute of Tropical Agriculture
ILCA	International Livestock Centre for Africa
ILRAD	International Laboratory for Research on Animal Diseases
INERA	Institut National pour l'Etude et le Recherche Agronomique (Zaire)
INRAF	Institut National de Recherches Agronomiques de Foulaya (Guinea)
IRAT	Institut de Recherches Agronomiques Tropicales et des Cultures Vivières (Upper Volta)
IRHO	Institut de Recherches pour les Huiles et Oléagineux (France)
IRZ	Institut de Recherche Zootechnique (Cameroon)
ISRA	Institut Sénégalais de Recherches Agronomiques (Senegal)
LAC	Liberian Agricultural Company (Liberia)
MAPE	Ministère des Aménagements, Pêche et Elevage (Guinea)
MDR	Ministère du Développement Rural (Guinea)
NAPRI	National Animal Production Research Institute (Nigeria)
NIADP	Northern Integrated Agricultural Development Project (Sierra Leone)
NITR	Nigerian Institute of Trypanosomiasis Research (Nigeria)
OAU	Organization of African Unity
OCCGE	Organisation Commune de Contrôle des Grandes Endémies (Upper Volta)
OGAPROV	Office Gabonais d'Amélioration et de Production de Viande (Gabon)
OMBEVI	Office Malien du Bétail et de la Viande (Mali)
ONAREST	Office National de la Recherche Scientifique et Technique (Cameroon)
ONDE	Office National de Développement de l'Elevage (Zaire)
ONDY	Operation N'Dama Yanfolila (Mali)

ONERA	Office National de l'Exploitation des Ressources Animales (Upper Volta)
ORD	Office Régional de Développement (Upper Volta)
ORSTOM	Office de la Recherche Scientifique et Technique d'Outer-Mer (France)
PEOV	Projet Elevage Ouest-Volta (Upper Volta)
PPR	peste des petits ruminants
PRO-DE-BO	Développement de l'Elevage Bovin pour la Culture Attelée (Togo)
SATEC	Société d'Assistance Technique et de Conseil (France)
SCET	Société Centrale pour l'Equipment du Territoire (France)
SEDES	Société d'Etudes et de Développement Economique et Sociale (France)
SOBEPALH	Société Béninoise de Palmeraies à Huile (Benin)
SOCAPALM	Société Camerounaise de Palmeraies (Cameroon)
SODEFITEX	Société de Développement des Fibres Textiles (Senegal)
SODEPA	Société de Développement des Productions Animales (Cameroon)
SODEPALM	Société pour le Développement du Palmier à Huile (Ivory Coast)
SODEPRA	Société de Développement des Productions Animales (Ivory Coast)
SODERA	Société de Développement des Ressources Animales (Benin)
SODEVA	Société de Développement et de Vulgarisation Agricole (Senegal)
SOFIDE	Société Financière de Développement (Zaire)
SOMIVAC	Société de Mise en Valeur de la Casamance (Senegal)
SONEL	Société National d'Elevage (Congo)
SORAD	Société Régionale d'Aménagement et de Développement (Togo)
STRC	Scientific and Technical Research Commission (Organization of African Unity)
UDEAC	Union Douanière des Etats de l'Afrique Centrale
UNAZA	Université Nationale du Zaire (Zaire)
UNDP	United Nations Development Programme
USAID	United States Agency for International Development (United States)
USSR	Union of Soviet Socialist Republics
WAS	West African Shorthorn
WHO	World Health Organization (United Nations)
WIP	Wirtschafts- und Infrastructur Plannungsgesellschaft (German Fed. Rep.)

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