LIVESTOCK AND LAND USE

IN

SOUTHERN GONGOLA STATE, NIGERIA

Final Report, Volume I: Executive Summary

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IN MEMORIAM

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David Bourn	-Environmental Biologist
William Campbell	-Computer Analysis and Mapping
Neil MacDonald	-Animal Production
Kevin Milligan	-Aerial Survey Co-ordinator
Derek Poate	-Economic Analyst
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William Wint	-Ecologist

EXECUTIVE SUMMARY

This volume constitutes an executive summary of Resource Inventory and Management's final report on Livestock and Land Use in Southern Gongola State, presented in volumes II and III. It sets out the background to the study, briefly describes its major findings, and outlines the regional livestock development strategies arising from them. It concludes with a brief examination of some of the financial aspects of the implementation of these strategies.

1. Objectives and Techniques.

As Nigeria's human population continues to grow, so does the demand for food, and there is consequently a need for both greater and more efficient agricultural production. The Federal Livestock Department (FLD) is charged with overall responsibility for the implementation and coordination of livestock development throughout Nigeria. To further these aims, the National Livestock Project Unit (NLPU), formerly the Livestock Project Unit (LPU), was established as a major implementation agency concerned with the identification, plannig, management and financing of a wide variety of livestock development projects.

The Toungo Block was chosen by NLPU as a region for a potential livestock development project and Resource Inventory and Management (RIM) was contracted to provide an assessment of its resources, the objectives of which were to:

1. Quantify and map the distribution of livestock populations;

2. Determine seasonal movement patterns;

3. Map the distribution of vegetation and land use, rangelands, water resources and ecological conditions;

4. Map the distribution of pastoral and arable communities;

5. Analyse the relationships between the seasonal distribution of people, livestock and land use;

6. Examine herd structure information and assess production levels;

7. Describe traditional modes of production;

8. Assess relations between pastoralists and arable farmers;

9. Assess major constraints/requirements of livestock production;

10. Interpret the results interms of regional development possibilities.

Although it has a considerable livestock population, the Toungo Block is one of the more inaccessible regions of Nigeria. To assess both human and livestock populations and their distributions simultaneously RIM adopted an innovative methodology combining aerial and ground surveys, with the ground investigations targetted using aerial survey data to focus efforts on areas of livestock concentration. The primary numerical data concerning the number and distribution of people and livestock, as well as broad-scale ecological and land use parameters, were collected by low level aerial survey in both wet and dry seasons. The methodology established by the International Livestock Centre for Africa (ILCA) aerial survey programme was expanded and adapted to meet the requirements of the study region.

A systematic grid sampling pattern was used, designed to promote flexibility in data analysis and presentation of results. As well as providing overall estimates of abundance, stratified data analysis permitted the estimation of population levels within a wide range of categories, including: land systems, vegetation types, river catchments, and administrative zones, as well as strata subsequently

identified as relevant by ground work after the aerial surveys had been completed.

The aim of the ground surveys was to collect information that was unavailable from the air - either socioeconomic factors affecting livestock production and its potential for development, or animal production parameters such as herd structure and dynamics. The findings were then correlated with the spatial distributions recorded from the air to produce regional extrapolations.

Options for development were identified, based on discussions with pastoralists about the problems of livestock production and their proposed solution. Mediated by both economic practicality and administrative feasibility, the relevance of these options was assessed, and the target populations quantified with respect to the aerial datasets.

RIM lays considerable emphasis on the presentation of information in a direct, visual manner and therefore many of the results are illustrated as computer generated maps, examples of which are contained in this volume.

2. The Study Region.

The Toungo Block occupies a total land area of some 43,900 square kilometers in southern Gongola State (Map1), and has a varied ecology with considerable agricultural potential. Much of it lies within the Sub-Humid Zone (SHZ), which is widely held to have a considerable capacity for livestock development.

The north-south rainfall gradient, typical of central Nigeria, is modified by the mountainous regions to the south and east. Annual means range from 1,250mm at Jalingo in the north to 2,000mm at Gembu in the south, on the Mambila Plateau, and to some 2,500mm at Abong in the lowlands to the west.

Water was widely available throughout the survey zone in both seasons. Even in the dry season, 48% of the grid squares contained open water,

and no grid cell was further than 15 kilometers from water. It should be noted that this situation contrasts with more arid pastoral zones elsewhere in the world, where access to water is often a limiting factor on animal production.

The principal vegetation types in the Toungo Block are closed canopy forest, open canopy woodland, savanna woodland and open grassland. An index of vegetation density was calculated for each grid cell based on the proportions of these categories of vegetation as seen from the air. Tree cover is noticeably thicker towards the south, on steeply dissected land and close to rivers and streams. Open grassland is confined to uplands and flood-plains, while the lowlands are mostly wooded savannas or savanna grasslands.

Much of the Toungo Block was found to be uncultivated, and even those regions that were farmed appeared to be only lightly cropped, the pattern of cultivation closely following that of arable farmer habitation (Map 2). Nowhere was the percentage of cultivation sufficiently high to limit livestock production levels.

The poor communications of the Toungo Block have contributed to its relatively low human population and slow economic growth. The construction of the new tarmac road from Wukari to Jalingo in the late 1970s has partly acted to reverse this trend. However, the escarpment road to the Mambila Plateau, the most important livestock producing region in the survey area, is impassable to all but four-wheel drive vehicle for much of the year. Recently awarded contracts for a number of major roads are likely to change this situation during the next two decades. Moreover, there are numerous bush roads in the lowlands, built to facilitate the trading of both cattle and surplus agricultural produce. However, these are usually only passable in the dry season.

Because of its general inaccessibility, there have never been comprehensive tsetse surveys of the entire area. The most recent information available from the Federal Department of Pest Control Services (FDPCS) indicates that the distribution of *Glossina morsitans*, arguably one of the most important vectors of cattle trypanosomiases, has altered significantly by comparison with published

maps and is now restricted to the Gashaka Game Reserve and a westward extension as far as Bali.

Survey work in the Toungo Block coincided with a major resurgence of rinderpest in Ganye and the Lowlands in 1983, and on the Mambila Plateau in 1984. Alleged total mortality was 33%, while rinderpest accounted for 60% of recorded deaths. The findings of the survey, relating to both numbers and distribution and pastoralist opinion, must be viewed in this context.

The principal domestic livestock in southern Gongola State are cattle, sheep, goats, pigs and horses. Cattle are mostly zebu, but there are some muturu, dwarf West African shorthorns, in the southwest, and zebu x muturu crosses to the south of Jalingo. The zebu cattle are divided into four breeds, the bodeeji (red Rahaji), daneeji (Banaji), gudali (Adamawa gudali) and bokolooji (Sokoto gudali). In both seasons the bodeeji cattle were almost exclusively confined to the Southern Uplands, while the 'white' breeds were restricted to the lowlands. These latter are reported to be more trypanotolerant than the bodeeji and better able to resist the effects drought and poor pasture. All types of muturu were also said to be trypanotolerant.

Goats, kept by arable farmers, are the black dwarf type in the south and red and white savanna breeds in the north. Sheep are kept by both arable farmers and pastoralists but are absent from the southern lowlands because of the high incidence of footrot. Pigs are kept only by Christian ethnic groups, such as the Tiv and the Jukun, and are bred for sale to the south. Horses are bred for riding and sale in the southern parts of the Mambila Plateau.

Despite its low population density compared with other regions of the Nigerian Middle Belt, there are at least forty ethnic groups in the Toungo Block. Almost all of these keep some form of livestock, but most of the cattle are in the hands of specialised pastoralists, the FulBe. Three modes of cattle production can be distinguished: nomadism, transhumance and mixed farming. Nomadism, the flexible movement of herds between pastures, is usually defined as a mode of production exclusive of arable farming. However, in the Toungo Block, many nomadic

FulBe farm regularly, although not always in the same place every year.

FulBe on both the Mambila Plateau and in the Ganye region are now settled pastoralists who practise transhumance, the annual movement of their stock from their home to dry-season pasture, usually in riverine areas. Transhumant pastoralists usually divide their herd, leaving most of the milking cows behind with part of the family, and taking the remainder to a nearby water source.

The present century has seen the transfer of cattle to certain arable farming groups, such as the Samba and the Mambila, who have obtained cattle both by working for the FulBe and by direct purchase of cattle on the open market. Mambila and Samba do not often go with their cattle on transhumance, but prefer to take their herds to local rivers. Although this trend points to the expansion of mixed farming throughout the region, ploughs have yet to be widely adopted, despite the efforts of the agricultural extension services.

The movement of pastoralists into the area has taken place over the course of this century. The grasslands of the Mambila, Fali, Falinga and Shebshi plateaux were prefentially settled because of their good pasture, low settlement density and relative freedom from disease. However, since 1960, the Benue Lowlands have been the main region for expansion. This process is still continuing, stimulated by the pressure on cattle owners in the arid zone from both the drought and increasing arable cultivation. The immigration of pastoralists has been paralleled by an expansion of Tiv commercial yam farmers from the south, and there has been considerable friction between the two because no basis for beneficial mutual interaction has yet been established.

The average number of cattle owned by an individual was about 200 head which is large compared with other regions of the Middle Belt (=46) and the arid zone of NIger (=17). This reflects widespread availabilty of water in the dry season with concomitant pasture and relatively little competition from arable farmers. A consequence of the limited numbers of arable farmers is that the market for dairy products is restricted, and thus prices are low. Profits from dairy products are not used to purchase cereal staples for subsistence, and therefore animals must be

sold to buy grain. An offtake of 10-20 animals per year is required to keep a family unit supplied with cereals. This does not reflect the size of the herd owned, but the subsistence needs of the owner.

Apart from domestic consumption, all cattle in the Toungo Block are sold for transportation to large markets in Igboland. Until 1981, most of these cattle were trekked overland as far as Abakalaki, a stressful journey that often resulted in the death of stock en route. However, recent growth of the road network has facilitated the entry of livestock trailers and now the majority of the stock is taken by truck. In view of the large numbers of livestock in the Toungo Block the official markets, tike, are sparsely distributed, particularly in the Benue Lowlands. One consequence of this is the growth of clandestine cattle-trading, a practice given considerable impetus by the closure of cattle-markets because of rinderpest. The activities of bush traders may be a major cause of the spread of rinderpest, as the traders travel from herd to herd in the bush.

Livestock poulation estimates and macro-economic indicators are summarized in in Table 1. Ground investigations demonstrated that the majority of cattle and pastoral sheep are resident throughout the year and that the survey area also includes a substantial poulation of sheep and goats belonging to arable farmers. The total cattle population of the survey area fell from 686,700 to 596,700 between the two surveys. This population is valued at 300-350 million Naira, with a combined annual production of meat and milk worth some 80-90 million Naira.

The total goat population was estimated to be 846,000 and was closely associated with the arable farmer population. It was particularly concentrated in the northeast of the survey region around Ganye. The pastoral sheep population varied from 57,200 to 66,500 according to season, and was widely dispersed. The value of small ruminants within the Toungo Block was approximately 50 million Naira, bringing the total livestock valuation to 350-400 million Naira.

The seasonal drop in cattle numbers apparently contradicts the assumption that the SHZ provides only dry season grazing for migratory

TABLE 1. MACRO ECONOMIC KEY INDICATORS FOR LIVESTOCK IN SOUTHERN GONGOLA STATE.

Indicator	Wet Season@	Zonal@	Dry Season@
Total Land Area (sq. km.)		43,875	
Total Cattle Population	686,700		596,700
Value (million Naira)	349		303
Overall Cattle Density/sq.km.	15.7		13.6
Effective Cattle Density/sq.km. *	22.7		19.7
Herd** Structure			
% Males			37.6
% Females			62.4
% Calves less than 1 yr.			22.0
Total Number of Herds**	3690		3208
Mean Herd** Size		186	
Median Herd** Size (Mambila)		35	
Mean Herd** Size (Mambila)		248	
Median Herd** Size (Ganye)		75	
Mean Herd** Size (Ganye)		45	
Mean Annual Offtake (at 10%)	68,670		59,670
Live Weight (tonnes)	23,819		20,698
Liveweight Value (million Naira)	53		46
Carcass Weight at 50% (tonnes)	11,909		10,349
Annual Milk Production (tonnes)	41,500		36,000
Value of Milk Production (million Naira)	41.5		36
Pastoral Sheep Population	57,200		66,500
Value of Sheep Population (million Naira)	22.9		26.8
Goat Population		846,000	
Value of Goat Population (million Naira)		25.4	

@ Seasonal population levels and densities from text. As estimates of values for annual parameters depends on which season's figures are used, both are given to indicate range. Some of the parameters do not vary with season.

* Taking into account the proportion of land suitable for cattle.

** Herd defined as number of cattle owned by an individual, as opposed to managed in a grazing unit.

cattle from further south. However, ground investigations suggested that 1983/84 must be regarded as atypical because of the rindrpest epidemic. Pastoralists who previously migrated from the semi-arid zone every dry season, returning north in the wet, remained in the Benue Lowlands in order to avoid the epidemic by isolating themselves in remote bush areas. In view of the dynamic situation in the Toungo Block this change in movement patterns is likely to become a permanent feature of its pastoral production systems.

The cattle distribution changed little with season, being concentrated in three regions: the Mambila Plateau, the Ganye Lowlands and the Benue Lowlands. This reflects the self-contained nature of many of the cattle production systems within the Toungo Block. Map 3 illustrates the distribution of the dry season cattle population recorded by the aerial survey. Cattle were concentrated in regions immediately adjacent to the lower reaches of the Taraba rivers, and along the Benue; on the Mambila Plateau; and to the northeast around the town of Ganye. There was a noticeable concentration of cattle in a triangular region north of Suntai; ground investigations showed that this was a temporary migration to exploit the newly flushed grass in the region.

In the wet season cattle were more dispersed, a response to the widespread availability of pasture, and the favoured grassy uplands of Mambila, Fali and Falinga plateaux supported very heavy densities of cattle.

As shown in Table 2 the overall maximum cattle density of 15.7 cattle per square kilometer (6.4 hectares per head) is well below the probable carrying capacity of the zone as a whole. However, this apparent potential for increase in cattle population levels should be qualified in the light of a variety of environmental factors. The most important of these were: topography, game reserve status, distance from open dry season water, arable habitation density, and the density of vegetation. These were integrated to provide an index of land suitability illustrated in Map 4. If the proportion of land deemed unsuitable for cattle is eliminated, the effective zonal cattle density would become 23 head per square kilometer (4 hectares per head), and the potential for increase thereby much reduced.

TABLE 2. ABUNDANCE AND DENSITIES OF LIVESTOCK, BY CATTLE SYSTEM**.

Cattle System		Cattle No.	Cattle /sq km	Cattle % White	Goats* No.	Goats* /sq km	Sheep No.	Sheep /sq km
Ganye I	Wet	34800	16.4	83			1300	0.6
	Dry	33100	15.6	82	237200	111.6	2200	1.0
Shebshi III	Wet	37700	8.6	85			1000	0.2
	Dry	9700	2.2	83	40700	9.3	1100	0.2
Mambila II	Wet	301800	67.4	15			7700	1.7
	Dry	167200	37.4	12	99400	22.2	21000	4.7
Fali IV	Wet	11100	9.0	100			300	0.3
	Dry	5600	4.6	92	700	0.6	700	0.6
Falinga V	Wet	8600	4.5	54			300	0.2
	Dry	7100	3.7	40	0	0	1600	0.8
Kam/Serti	Wet	5500	2.1	85			200	0.5
VIII/XII	Dry	11400	4.3	77	45000	17.1	500	0.2
Wase-Jalingo	Wet	79600	11.3	85			1100	0.2
VI	Dry	185800	26.3	94	97700	13.8	22800	3.2
Suntai VII	Wet	125200	21.6	81			1700	0.3
	Dry	106300	18.3	97	203100	35.0	10500	1.8
Takum IX	Wet	29200	32.5	91			400	0.4
	Dry	18800	20.9	96	64200	71.3	2000	2.2
Wukari X	Wet	3200	27.1	100			40	0.3
	Dry	20800	166.3	99+	26400	210.9	2300	18.1
Development Region* **								
Ganye	Wet	72500	11.1	79			2300	0.4
Lowlands	Dry	42900	6.6	82	278000	42.6	3200	0.5
Southern	Wet	325200	34.0	20			8300	0.8
Uplands	Dry	184300	19.3	17	107300	11.2	23400	2.4
Benue	Wet	239000	16.4	84			3300	0.2
Lowlands	Dry	338700	23.2	95	429300	29.4	37900	2.6

* Goats densities assumed to be aseasonal (see text).
** Cattle system as described in text.
*** Development Region as described in text.

No carrying capacity studies in ecological regions comparable to the Toungo Block have ever been undertaken. If a widely used, but optimistic, figure of 2 hectares per head is adopted then the survey zone could support an overall increase of 27 animals per square kilometer. This potential doubling of the cattle population to some 1.5 million head would raise its value to 6-700 million Naira (at current prices) with a potential offtake of milk and meat worth approximately 160-200 million Naira. A more conservative projection is likely to be some 3-4 hectares per head, which would permit an increase of some 20% above current densities. Map 3, however shows that in reality the cattle are very unevenly distributed throughout the survey zone, and that the Mambila Plateau in particular already supports an effective cattle population in excess of the carrying capacity mentioned above (1.9 hectares per head in the dry season, falling to 1.1 in the wet season). This argues that the only significant region for expansion and relocation of cattle is within the lowlands of the survey zone.

Investigation of the interaction of variables recorded by the surveys were possible through customized statistical packages. Cattle densities related closely to cultivation levels, reflecting the interdependence of farmers and pastoralists. Cattle and goat populations were plotted against vegetation density, which indicated that goats were at greatest densities in regions of medium vegetation, whereas cattle and pastoral sheep were most numerous in grasslands and open savanna,

In the dry season 80% of the cattle were congregated near the courses of major rivers. In both seasons, cattle numbers and densities were highest close to major roads, ranging from 17.5 to 22.5 head per square kilometer. In both seasons, 90% of the cattle were within 20 kilometers of a town of significant size. Mambila Local Government Area (LGA) was the most densely populated, and in both seasons Bali and Mambila LGAs together included more than 70% of the cattle population. Stratified relations between tsetse distribution and cattle populations were not made because present information suggests that G. morsitans is confined to the Gashaka Game Reserve and its westward extension, a region that is generally devoid of cattle.

Indirect assessments of the human population were made using simplified categories of housetype, distinguishing arable dwellings, agro-pastoralists, pastoralists and nomadic pastoralists. The numbers of arable habitations (527,200) and agro-pastoralist structures (13,400) did not vary seasonally. The patterns or arable habitation correlated closely with the line of newly built roads, suggesting that their construction tends to channel the immigration and settlement of arable farmers. Agro-pastoralists (cattle-corrals with associated crops) were concentrated on the Mambila Plateau and around Ganye, corresponding to the presence of arable farmers with cattle and settled pastoralists.

The numbers of habitations representing the other types of pastoral production all fell slightly beteen the wet and dry season. Overall results suggest that all types of pastoralist form some 5% of the total human population, and that between a third and a half live in permanent dwellings. Average cattle holdings are about 30 cattle per pastoral house and 2 sheep, with 1-2 goats per arable dwelling.

Animal production parameters reflected the usual ecological conditions in the Toungo Block. Proportions of males in cattle herds were higher than almost anywhere else in West Africa (42% on Mambila and 33% in the Ganye Region). Age at first calving, average calving intervals were 56.5 and 17 months respectively, while the calving percentage was 52%.

3 Livestock Production Systems.

The circulation of the majority of the cattle within discrete geographical areas allows for the definition of Cattle Systems. Eleven of these are partly within, or immediately adjacent to, the study area. These Cattle Systems contain 93% of all the cattle recorded by the aerial survey. The numbers of cattle within these systems are shown in Table 2. Ths systems were recombined into Development Regions, to reflect the principal areas of cattle concentration recorded by the aerial survey. These Development Regions are: the Ganye Region; the Southern Uplands including Mambila, Fali and Falinga plateaux; and the Benue Lowlands, including the valleys of the Taraba and Donga.

The Ganye Region includes both the Shebshi grasslands and the Ganye Lowlands. The region is depopulating, attributable either to its isolation from the main commercial axes of Gongola State or to the increase in tsetse fly. Relations between the local Samba people and the FulBe are good and a large number of FulBe have settled there on a permanent basis, managing herds through transhumance.

The Southern Upands is the principal cattle producing region of the Toungo Block, and the Mambila Plateau alone supports over 300,000 cattle in the wet season (Table 2). This is certainly overstocked, and many regions of the Plateau suffer from severe gully and sheet erosion, and replacement of pasture with poorer species. A consequence is that if the rains are late, as in 1983, a certain percentage of the animals remaining on the Plateau will die from starvation or malnutrition.

The Benue Lowlands constitutes the north-western portion of the study area and is less territorially coherent than the other developoment regions. It is the only region to contain a substantial proportion ofnomadic pastoralists. Its settlement by cattle owners has taken place since 1950 and is still in progress. Cattle in the Benue Lowlands are almost exclusively white breeds, which are reputedly more hardy.

At all major loci of cattle concentration in the survey zone, pastoralists were requested to rank the major constraints on cattle production (Table 3) and to suggest their preferred remedies. The rinderpest epidemic dominated their responses, closely followed by the spraying of the lowlands to control tsetse. The general request for strengthening the present veterinary services emerged clearly from all tabulations of the data. Diseases such as liver-fluke and blackquarter accounted for some additional mortality, but pastoralists emphasised that these were of minor significance in comparison to rinderpest and trypanosomiasis.

The second major constraint on livestock can be summarised as land rights. On the Mambila Plateau and in parts of the Benue Lowlands, this was expressed as friction with the local arable farmers. In some places, where FulBe only visit a region for part of the year, they suggested the reservation of regions of preferred pasture where

TABLE 3. RANKED PROBLEMS OF CATTLE PRODUCTION EXPERIENCED BY STOCK OWNERS.

TOPIC	TOTAL	DEVELOPMENT REGION		
		LOWLANDS	GANYE	MAMBILA
1. Rinderpest	26574	14949 (1)	4466 (1)	7159 (1)
2. Other Disease	20464	11377 (3)	3079 (3)	6008 (2)
3. Tsetse	18371	13078 (2)	3993 (2)	1300 (2)
4. Farmer Grazier Conflict	12661	8974 (4)	1200 (7)	2487 (6)
5. Land Tenure	10693	6163 (5)	175 (11)	4355 (3)
6. Dry Season Fodder	3214	0	1210 (6)	2004 (7)
7. Theft	3211	0	400 (9)	2811 (5)
8. Pasture Degradation	3136	0	0	3136 (4)
9. Credit	2962	356 (8)	2156 (4)	450 (10)
10. Water Access	2689	1861 (6)	0	828 (9)
11. Bush Fires	2633	1507 (7)	881 (8)	245 (12)
12. Water Shortage	1468	8 (9)	1460 (5)	0
13. Access Roads	381	6 (10)	300 (10)	75 (13)
14. Salt	330	0	0	330 (11)

Figures in brackets represent Regional Rankings.

The figures were calculated by ranking the ranked preferences of cattle-owners expressed in meetings and during interviews, and assigning them numbers from 11 to 1 in terms of decreasing significance. These numbers were then weighted by multiplying them with the numbers actually present at the meeting.

Topics not discussed in text are:

a) Bush fires. Pastoralists complain that arable farmers set light to crop residues and dry grass without first consulting them.

b) Water access. Pastoralists complain that arable farmers cultivate established stock drinking-points without permission.

c) Salt. Salt or potash used to be provided for cattle on the Mambila Plateau but this supply has ceased.

immigrating arable farmers would be prohibited from settling. However, on the Mambila Plateau, livestock owners were seeking a Certificate of Occupancy, but few pastoralists had any knowledge about the methods used to acquire these certificates.

Additional requests mentioned were regulated access to watering points, the supply of subsidised dry-season fodder, fencing, salt troughs, dams (on the northern edge of the survey zone) and better protection from stock theft, a serious problem only on the Mambila Plateau. Unlike elsewhere in the pastoral zone, cattle-owners are wealthy enough to make a substantial financial contribution to interventions they consider to their advantage.

4. Identification, Implementation and Costs of Development Options

Arising from the major concerns of pastoralists shown in Table 3 are a number of development options, both existing and novel. Existing options are derived from those currently in use in the region or put forward in the Second Livestock Development Plan prepared by NLPU. The novel options derive from the pastoralists' own suggestions and address the percieved constraints on livestock production in the Toungo Block. However, because of the unusual characteristics of the survey zone, (abundant water and pasture, and a recent rinderpest epidemic) they should not be taken as necessarily relevant to other regions of Nigeria, or as the province of any specific livestock agency.

The regional applicability of each option is determined by considering three types of information: socio-economic factors; abundance and distributions of the livestock; and selection of core aerial survey grids identified as satisfying criteria specific to each possible option.

4.1 Existing Options.

Existing NLPU credit packages include Grazing Reserves, Smallholder Credit, Mixed Farmer and Settled Pastoralist Models. These were adapted to meet the particular conditions prevailing in the Toungo Block.

a) Grazing Reserves. Apart from conventional Grazing Reserves, established with substantial capital investment, pastoralists also requested the reservation of land to prevent the encroachment of arable farmers on their grazing areas. Grazing Reserves were therefore divided into two types: I - Model Grazing Reserves, and II - Grazing Refuges. The structure of the Type I Reserve is more suited to the arid zone, including as it does fodder banks and water, and therefore, only two grids conformed to the selection criteria. Type II Grazing Refuges, have a more general applicability, and 55 grids qualified as suitable. Apart from a cluster on the Mambila Plateau, the majority were in the valley of the Benue and Taraba rivers, corresponding closely to the sites requested by the pastoralists.

   Grazing Refuges, initially without such infrastructure, would require only a relatively small capital outlay, to gazette them and delineate the boundaries. Such refugia constitute potential sites for eventual implementation of NLPU's Settled Pastoralist Model which, of the three models considered, realizes the largest incremental net benefit (N1821) after five years. Infrastructural development would be envisaged to occur gradually, perhaps in conjunction with financial investment from the pastoralists, to make the sites more attractive for year-round settlement.

b) Smallholder Credit. NLPU already operates a credit scheme in parts of Gongola State for cattle and sheep fattening. Livestock owners are generally enthusiastic for such loans, and they could be expanded to the limits of the infrastructural ability to administer them. Additional types of loans are also possible; a goat loan depending on the rise in prices of goats at Christmas; a Small Ruminant Seasonal Loan (SRSL), that takes advantage of the rise in price of small ruminants in locations visited only

seasonally by FulBe pastoralists; a trypanotolerant cattle loan, either to fatten muturu cattle in regions of high tsetse challenge, or to raise Ndama in accordance with the Eastern Ndama Breeder Model. The cycle of Smallholder Cattle Fattening operates within a single year, the expected incremental net benefit being N 260.

c) Mixed Farmer. This involves loans for improved nutrition and increased milk production to arable farmers with an initial herd of 15 cattle and up to 20 sheep or goats. The incremental net benefit of this package after five years is negative. Moreover, the only potential candidates for such a loan would be the Samba and Mambila farmers who have taken up cattle-rearing. However, such farmers place no emphasis on dairy production, and furthermore are unwilling to limit their herd to 15 animals, but hope to build up to a viable herd of 60+ and adopt FulBe management practices. Indeed many Samba owners send their herds away with FulBe on transhumance at present.

d) Land Tenure. Throughout the Toungo Block, one of the most consistent demands of pastoralists was the establishment of a just procedure for obtaining rights to land. On the Mambila Plateau, where friction between FulBe and Mambila farmers is extreme, this is framed in terms of the obtaining of C of O, whereas in the lowlands, the provision of Grazing Refuges as outlined above would meet the present needs of pastoralists. Advice to stockowners on their rights and procedures, as well as the provision of arbitration, could well come within the compass of the new Landuse Planning Section envisaged by NLPU for the second phase.

e) Tsetse and Trypanosomiasis Control. Although tsetse control is the province of FDPCS, the extension of settled pastoralism into the SHZ depends on a close integration of the two agencies. The establishment of the schemes outlined above would provide some opportunities for the initiation and monitoring of tsetse control operations. A logical place to begin would be in the regions north and west of the *G. morsitans* belt, to prevent its extension beyond that area.

4.2 Novel Options.

Table 3 lists some constraints on animal production, for example theft, that fall outside the powers of a livestock agency. Several other factors must be taken into account when evaluating the following options. The ground surveys indicated that for a livestock development project to be administered successfully within southern Gongola State it should include important commercial centres such as Takum and Wukari, although these are not strictly within the survey zone. Due to the constraints of time, manpower and resources, NLPU has not yet been able to cover some parts of southern Gongola State, though the office recently opened at Jalingo will make its services available to a greater number of stock owners in the lowlands area.

It will be apparent that many of the suggestions set out below require relatively low amounts of credit and higher levels of technical supervision. This pattern derives from the overall findings of the survey that the quantity and quality of animals brought to market do not reflect its present potential.

a) Information and Advisory Services. During discussions with livestock owners it frequently emerged that they were unaware of the government services available to them, such as the procedure for obtaining C of O, and lacked the knowledge to use them. In combination with their inadequate knowledge of the causes, pathology and modes of transmission of the most economically important stock diseases, this suggests that a simple but effective information service to pastoralists would have a considerable impact in alleviating many of the problems associated with livestock production.

An information service, if successful, could eventually be extended to cover not only the dissemination of information in relation to more general aspects of livestock production, but also the collection and transfer of data concerning local issues. Cattle owners close to towns could be reached directly through well publicised offices, but those in more remote regions could

be reached by taking advantage of the ubiquitous radio-cassettes, through radio broadcasts and teaching cassettes.

b) Strengthening of Veterinary Services. Officials of the veterinary service regularly stated that problems of communication and a lack of transport, fridges and drugs prevented them from offering an adequate service to livestock owners. NLPU could assist in the provision of both infrastructure to improve drug storage, the keeping of regional inoculation records and of additional labour to help the veterinary programmes. The direct sale of proprietary medicines to herd-owners might act to prevent supply bottle-necks from causing unnecessary stock losses. Aerial survey data showed that 65-80% of all cattle within the Toungo Block were within 20 kilometers of major roads, depending on season. In view of this, a mobile veterinary service, travelling regularly on well publicised routes, could satisfy these requirements.

c) Additional Options. A number of further options, although less urgent for livestock owners, should be considered in the context of the long term development of the Toungo Block.

Access to water sources and drinking points is the cause of considerable friction between farmers and graziers in both the Benue Lowlands and on the Mambila Plateau. Regulated access to water, would be a simple method of eliminating this point of contention.

Ploughs are hardly used in the Toungo Block but the density of agropastoralists in its northern regions suggests that there should be no inherent barrier to their adoption. More readily available local stocks and simple demonstrations to livestock owners would probably suffice to make them familiar with the concept.

The increasing price of stake and wire fencing has meant that pastoralists wishing to settle and enclose their land are unable to afford the materials. Research on an appropriate type of live fencing could provide a low cost alternative solution.

Officially regulated cattle markets and banks for depositing the proceeds of livestock sales are sparse throughout the Toungo Block. The establishment of additional markets would assist in monitoring both the health of livestock and the volume of trade. Improved banking services would provide a degree of security and might encourage pastoralists to diversify their spending and stimulate other sections of the economy rather than investing all their capital in livestock.

Road Construction. The movement of cattle from the Toungo Block to the major urban cattle markets is subject to a number of bottle-necks that increase the price of meat to the eventual consumer. Roads to the major producing areas are frequently cut in the wet season, when sales are highest, and thus cattle have to be trekked long distances to loading points. The construction of all weather earth roads into these areas, as a joint venture with the communities they are intended to serve, would reduce losses and increase the amount of meat on the open market.

4.3 Regional Identification of Development Options

In order to plan for the effective implementation of the existing and novel options it is necessary to identify sites from which livestock development can be most effectively administered. The first criterion for the choice of such sites or Livestock Development Foci (LDFs) was that they have substantial numbers of cattle within a radius of 30 kilometers. In addition, they had to be reasonably accessible by road, and if possible to make use of existing structures belonging to livestock or agricultural extension services. A total of nine LDFs were chosen, at Jalingo, Bantaji, Gembu, Ganye, Bali, Sabon Gida, Mararaba, Nguroje and Mbamnga. Table 4 summarizes the numbers of livestock, dwellings and environmental features relevant to these sites and sets out the most relevant development options, derived from a combination of air and ground survey data.

TABLE 4. LIVESTOCK, DWELLINGS AND ENVIRONMENT WITHIN 30 KM OF PROPOSED LDFs. WITH PRIORITY DEVELOPMENT OPTIONS.

LDF Location*		JAL	BANT	GEMB	GANY	BALI	SGID	MARA	NGUR	MBAM
Implem level		1	2	2	2,3	3	3	3	3	3
Devel Region**		-	BL	SU	GL	BL	BL	BL	SU	SU
LIVESTOCK										
Cattle No	W	1675	104100	261400	59900	24100	70700	55200	184500	226500
	D	15600	74400	145800	26900	15700	78100	26400	108400	138000
Sheep No.	W	600	9800	9400	6500	800	11800	2700	8300	6400
	D	2700	10700	17000	6100	60	11200	1200	12300	13300
Goat No.		33600	223600	90300	250500	51900	54400	86800	44300	123000
DWELLINGS										
Arable No.		30800	105900	80700	105700	29100	31100	38400	84900	73200
Past. No.	W	1100	4900	6000	2100	1000	1400	2200	5400	5810
	D	1000	3300	12300	3100	1200	2300	800	9200	10600
ENVIRONMENTAL										
mean % Cult.		14.0	6.6	11.3	10.2	2.4	6.0	3.7	9.8	12.6
% grids with Water (D)		44	42	88	48	35	27	43	94	90
DEVELOPMENT OPTION:					PRIORITY					
Information/Advice			+	+	+	+	+	+	+	+
Vetinerary assistance			+	+	+	+	+	+	+	+
Grazing Reserves			+				+	+		
Crop Residues					+					
Range Management					+					
Credit										
Sheep			+		+					
Goats					+			+		
Muturu						+		+		
Zebu			+	+	+				+	+
Land Tenure				+					+	+
Tsetse Control					+	+				
Banking						+				
Markets							+			
Roads				+					+	+

* Jal = Jalingo, Bant = Bantaji, Gemb = Gembu, Gany = Ganye, Sgid = Sabon Gida, Mara = Mararaba, Ngur = Nguroje, Mbam = Mbamnga.

** Development Regions as defined in text: BL = Benue Lowlands, GL = Ganye Lowlands, SU = Southern Uplands.

W = Wet Season D = Dry season

LDFs are also classified according to implementation level. According to the finance available, it was considered that development efforts be concentrated either at a single LDF for the whole survey area; or at three LDFs, one for each Development Region; or at six sites which would suffice to reach some two-thirds of the cattle population in the survey zone.

The individual sites with their regionally specific options are described briefly below. It must be emphasised that the provision of information and strengthened veterinary services are assumed to be of paramount importance in all LDFs, and so are not included for each specific site.

a) Jalingo. Although Jalingo is north of the survey zone proper its accessibility and the presence of an NLPU office make it a suitable choice. Since only a small proportion of the region around the LDF was actually surveyed, insufficient information is available to identify specific livestock development options. Rather, this site is envisaged as one which might act as a trial centre from which innovative development strategies could be instigated and monitored. Livestock officers could use their mobility to cover an area larger than the notional 30 kilometers radius.

b) Bantaji. The priority loans in Bantaji are for cattle and sheep, since these are present in large numbers, and are easily marketed, because of the new road. Competition between farmers and pastoralists suggests that this would be a good location for a trial grazing refuge. As there are no existing buildings that could be used a Livestock Service Centre would have to be purpose-built.

c) Gembu. The priorities for Gembu are loans for cattle and legal and advisory services relating particularly to land tenure. Access remains a problem, although it may be eased in the future by the construction of new roads. The presence of an NLPU office, as well as offices of other livestock departments would make Gembu a suitable choice.

d) Ganye. The Ganye region is small and territorially discrete with a network of roads making access easy. The shortage of water and the use of crop residues as dry season fodder suggests that this would be a good site for experimental trials with fodder banks and range management. FDPCS has offices at Ganye, and therefore joint trials in tsetse monitoring and control could be undertaken. Loans would be appropriate for all species of livestock except pigs.

e) Bali. Bali is the nodal point for the region with the greatest potential for the expansion of livestock. As this LDF is adjacent to the westward extension of the *G. morsitans* belt, it would be an effective base for tsetse control and monitoring. The prevalence of tsetse, as perceived by the pastoralists, makes the year round presence of zebu impossible, so loans could be used to establish trypanotolerant cattle breeds. Pigs and goats, but not sheep, could be the subject of loans. Bali is an important intermediate point for the trade cattle coming from the whole eastern region of the Toungo Block, and the development of a banking service geared to the needs of the livestock trade should be a high priority.

f) Sabon Gida. This town was only established after the completion of the Wukari-Jalingo road in 1979 and its rapid growth confirms its central location as an important focus for the trade in both livestock and agricultural produce. As at Bantaji, grazing refugia and markets should be formally established to assist in the monitoring of both commerce and animal health.

g) Mararaba. Mararaba resembles Bali, in that it is a potential focus for livestock expansion. Banking, markets, improved access and tsetse monitoring are therefore priorities. It would also be an appropriate centre for the gazetting and administration of a grazing refuge. Goats and trypanotolerant cattle should form the focus of loans. There is no pre-existing governement infrastructure but the presence of a CRCN agricultural development project there would provide detailed background information.

h) Nguroje. Nguroje resembles Gembu; cattle loans, land tenure arbitration, fencing and construction of access roads are priorities. The facilties of the FLD Livestock Service Centre there could be adapted to the needs identified by this study.

i) Mbamnga. Mbamnga is the least accessible site recommended as an LDF. However, it gives access to a cattle population only exceeded by that surrounding Gembu, and therefore providing services to those stockowners should be considered a priority. Loans should be aimed at cattle while intervention would be directed to land tenure problems and fencing.

4.4 Implementation.

The degree to which these development options are implemented will depend on the level of funding available. This will determine the number of LDFs which receive attention, as well as the number of options implemented at each focus. At any one LDF, it would be possible to utilise and extend the existing facilities, if available, or else to construct a purpose-built Livestock Service Centre.

Two mechanisms designed to implement the development options are considered here:

1. A low cost Livestock Extension Centre (LEC), analogous to an LSC of the type currently supported by NLPU, but using existing government offices or rented accomodation, at a range of locations intended to maximise contact with pastoralists. An LEC would be organised on a modular basis, each module consisting of a Veterinary or Livestock Assistant, two Inoculators and a labourer with equipment and supplies. They would be responsible for supervising a predetermined number of technical models and giving extension advice, and could, for example, administer either 75 Settled Pastoralist Schemes, or 75 Mixed Farming Loans or 100 Cattle Fattening Loans.

The number of modules comprising each LEC would range from one to three, according to local needs and resources and the size of the target population. The total LEC capital and operating costs over five years would be N86,025 for one module, N145,525 for two modules and N327,775 for three modules. These totals exclude project overhead costs and should thus be regarded as purely illustrative, as in practice the work of such a centre would be a mixture of all three plus additional extension work.

2. A Pilot Extension Project (PEP) charged with the responsibility for investigating the application of both the existing and novel options outlined above, and in particular: animal health; information services; advice and arbitration of land rights issues; credit supervision; and evaluation of project impact. It would be staffed by graduates filling the positions of Information Officer, Veterinary Officer and Livestock Superintendent, each equipped with four-wheel drive vehicles. Its work would be adapted to the needs of livestock owners within its immediate area and it would also be expected to co-operate with other research and extension agencies such as the ILCA Sub-Humid Programme and the FAO Grazing Reserve Team.

The benefits from such an investment are envisaged to be increased production levels resulting from reduced livestock mortality through improved health; increased settlement arising from improved security of tenure; and enhanced offtake derived from increasing cattle numbers and greater knowledge of more efficient husbandry techniques. The total capital and operating cost of such a Pilot Extension Project over a five year period would be in the order of N350,000.

Although many of the returns on such an investment cannot be adequately quantified at this stage, such an expenditure represents only 0.1% of the estimated value of the total livestock assets in the survey zone, or 0.3% of the estimated offtake of meat and milk. Even with a modest resultant increase in production and population levels, such expenditure would seem to be well justified.