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Livestock Production in Central Mali: The 'Mouton de Case' System of Smallholder Sheep Fattening

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SUMMARY

The 'Mouton de Case' is a small-scale stall-fed system of sheep fattening current in West Africa. Most fattened animals are males, kept for slaughter at the annual Moslem Feast of the Sacrifice (tabaski). *More than 25% of total annual offtake in local sheep flocks occurs in relation to this feast. In two local agropastoral sub-systems more farmers kept stall-fed sheep in an irrigated rice sub-system (39%) than in a rainfed millet sub-system (24%). Farmers in both systems fed approximately two animals. Supplementary feed is mainly cut grass and tree leaves and some agricultural by-products. Average daily gains of Mouton de Case were, at 117 g, almost twice those of extensively reared animals (60 g) of the same type.*

INTRODUCTION

Almost all West African animal husbandry is of an extensive nature. Occasionally, a few animals, particularly sheep, are kept under more intensive conditions. This smallholder fattening is generally known as the 'Mouton de Case' system and can be defined as one in which sheep are tethered or confined near the house of the owner and receive a supplement

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of good quality roughages and concentrates. The system uses male sheep in the main, these being selected out of the flock or specially bought for fattening over a relatively short period.

The system is most common where a high proportion of the population is devout Moslem, as one of the principal reasons for this fattening system is to have a sheep for slaughter (or for sale) at the annual Feast of the Sacrifice (known as *tabaski* throughout West Africa).

In spite of the supposed commonness of this system, it is often difficult to distinguish precisely between it and more extensive ones (Coulomb *et al.*, 1980). In Chad, Dumas (1977) felt that several problems needed to be overcome before a definition of Mouton de Case could be finalised.

The present study draws on material collected in central Mali over a period of 6 years and on an intensive study carried out during 1983.

MATERIALS AND METHODS

This study of Mouton de Case was undertaken in the Niono area (14°N 6°W) in central Mali. The climate is typically Sahelian semi-arid, characterised by a short rainy season and a short cool season, followed by a long hot one. The rainy season lasts from June until September, mean annual long-term rainfall being 570 mm although, in the last 15 years, this has been about 450 mm. Mean daily temperature varies from 25·8 °C in January to 34·7 °C in May. Sheep in this area are all hair sheep, mainly of the Sahel type, but there are admixtures of smaller and more compact sheep of the Forest-Savanna type (Fitzhugh & Bradford, 1983).

Long-term observations from 1978 to 1983 were undertaken in conjunction with other livestock production studies in the agro-pastoral system. These observations enabled data on comparative growth rates and on seasonality of offtake (sales and slaughter) to be obtained.

In June and July, 1983, intensive studies to obtain general information on numbers, management and feeding of Mouton de Case were made in a number of villages in two sub-systems of the sedentary agro-pastoral system. An agro-pastoral system is classified as one in which between 10 and 50% of total household revenue derives from livestock or livestock products (Wilson *et al.* 1983). Nine villages of cultivators, primarily Bambara, in the rainfed millet sub-system and six villages of settlers (*colons*) of the Office du Niger within the irrigated rice sub-system, were involved.

At the beginning of August, 1983 five villages (two millet and three rice) were selected for further intensive observations on the feeding of forty animals belonging to twenty-one owners. These animals were followed for periods varying from 1 to 6 weeks during which the amount and type of food offered and subsequently eaten were systematically recorded. An enquiry into costs, benefits, the motivation of owners and problems encountered was also carried out. Finally, a local market was visited on three successive weekly market days immediately prior to *tabaski* to establish price/weight/age relationships of sheep offered for sale.

RESULTS

Ownership patterns

A total of 159 households was visited in the rice sub-system and 148 in the millet sub-system. Of these, 39·0 and 24·3 %, respectively kept Mouton de

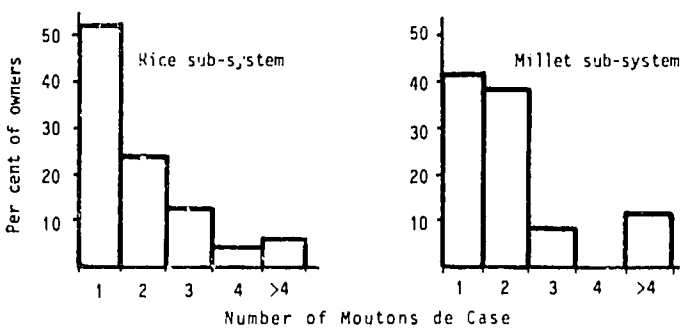

Fig. 1. Ownership patterns of Moutons de Case in the rice and millet sub-systems.

Case. The average number kept per owning household was 1·98 in the rice sub-system and 2·19 in the millet sub-system although, as can be seen from Fig. 1, more owners in the latter sub-system kept 2 sheep. Significant positive relationships existed between the keeping of Mouton de Case and all cattle in the rice sub-system. There were no significant correlations between the keeping of Mouton de Case and all cattle in the millet sub-system nor total sheep kept in either sub-system.

Management

Not all animals under the system are totally confined, this fact in part leading to the difficulty of defining the system adequately. Of all sheep, 27·8 % were not continuously tied up, there being no significant difference in this respect between rice and millet villages.

A proportion of sheep is kept for breeding rather than slaughter although these (thirty-seven out of thirty-nine) are almost all females. The reasons for this particular practice were not clear. A breakdown of confined animals by sex is given in Table 1. For male sheep of known age 62 % were aged under 15 months, 28 % were 15–21 months, 8 % were 21–27 months and 2 % were 27–33 months. None had complete permanent dentition and none were therefore aged more than 33 months. There were no significant differences between systems in sex or age distribution.

TABLE 1
Percentage Distribution of all Confined Sheep by Sex

Sex	*Sub-system*	
	Rice	*Millet*
Male, entire	79·9	72·9
Male, castrate	4·9	1·4
Female	15·4	25·7

In the rice sub-system, 56·7 % were being fattened for sale and 40·3 % for home slaughter. In the millet sub-system, the respective figures were 78·1 % and 19·6 %. A majority of animals were said to be destined for slaughter at the current year's feast.

More sheep were bought in the rice sub-system (76·4 %) than in the millet sub-system (38·0 %). Conversely, less sheep were born in the flock in the rice sub-system (23·6 %) than in the millet sub-system (50·7 %). Owners in the latter sub-system were unable to state the method of entry of 11·3 % of their confined animals.

The most common period of confinement (taken across both sub-systems and excluding animals confined for less than 1 month) was 4–6 months, this accounting for about 35 % of all animals. There were, however, significantly more sheep (24·0 %) confined for 7–9 months in the

rice sub-system than in the millet sub-system (9·8%) while 39·4% had been confined in the millet sub-system for longer than 12 months as against 8·7% in the rice sub-system.

Feeding

Varieties and sources of food

A wide variety of green fodder roughages and crop by-products was fed to the sheep. Seasonal availability is obviously a major factor in what foods are fed at any given period. However, the system has the greatest effect on the type of food fed.

Table 2 summarises, for each system, questionnaire responses on the agricultural by-products and salt offered by sixty-two owners with a hundred and twenty-three sheep in the rice sub-system and thirty-six owners with seventy-nine sheep in the millet sub-system. Rice products and cotton seed were fed by a significantly greater number of owners in the rice than in the millet sub-system. More rice owners fed sweet potato haulm although this difference was not significant. Millet, cowpea and

TABLE 2

Percentage of Owners Offering Different Types of Feed to Moutons de Case in the Rice and Millet Sub-systems and Percentage of Owners Offering Who Buy the Products

Type of feed	*Percentage of owners offering*		*Percentage of those offering who buy*	
	Rice sub-system ($n = 62$)	*Millet sub-system* ($n = 36$)	*Rice sub-system* ($n = 62$)	*Millet sub-system* ($n = 36$)
Rice (*Oryza sativa*)				
Straw	27·4	0·0	0·0	0·0
Grain	27·4	0·0	5·9	0·0
Bran	88·7	17·7	40·0	100·0
Millet (*Pennisetum typhoides*)				
Grain	24·2	77·8	53·3	10·7
Bran	54·8	94·4	44·1	5·9
Cotton (*Gossypium hirsutum*) seeds	16·1	5·6	100·0	100·0
Cowpea (*Vigna sinensis*) haulm	45·2	75·0	3·6	0·0
Groundnut (*Arachis hypogea*) haulm	17·7	75·0	0·0	0·0
Sweet Potato (*Ipomea batatas*) haulm	51·6	36·1	0·0	0·0
Salt	67·7	83·3	100·0	100·0

groundnut products were fed by a significantly greater number of millet- than of rice-growing owners. The percentage of owners offering salt did not differ significantly between systems.

With the general exception of salt and cotton seed, most other products are home produced. Exceptions to this general statement are that millet farmers who feed rice bran all have to buy it and a proportion of rice farmers who feed millet products also need to buy those. These figures should, nonetheless, be viewed with circumspection as food is not bought entirely for Mouton de Case and the feeding of it to them is often to the detriment of the work oxen for which much of it is primarily destined.

Food of non-agricultural origin was also provided in both sub-systems although in a much wider variety in the rice sub-system than in the millet one. In the rice sub-system, in addition to grass, the leaves of a locally grown *Ipomea* sp. were most commonly fed, followed by those of *Khaya senegalensis* (an introduced shade and timber tree whose leaves are not selected on the tree by free-ranging animals) and *Pterocarpus lucens*. Nine species of leaves were identified in the rice sub-system and there are undoubtedly others. In the millet sub-system, *Pterocarpus lucens* was the unique non-agricultural food offered. All food in this category was cut

TABLE 3

Mean Daily Food Intake, Over a 1-Week Period, of Animals in the Two Systems

Food type	*Average intake (kg) per day*			
	Rice sub-system (n = 9)		*Millet sub-system (n = 10)*	
	Per head	*Per kg$^{0.75}$**	*Per head*	*Per kg$^{0.75}$**
Roughage (total)	2·53 ± 1·23	0·22 ± 0·11	2·35 ± 1·38	0·18 ± 0·11
Grass	0·63 ± 0·83	0·06 ± 0·08	–	–
Leaves 1†	0·32 ± 0·47	0·03 ± 0·04	–	–
Leaves 2†	1·35 ± 1·49	0·11 ± 0·13	–	–
Leaves 3†	0·17 ± 0·19	0·01 ± 0·02	2·33 ± 1·38	0·18 ± 0·11
Other leaves	0·04 ± 0·09			
Rice bran	0·09 ± 0·16	0·01 ± 0·01	0·04 ± 0·08	[illegible] ± [illegible]
Millet bran	–	–	0·52 ± 0·33	0·04 ± 0·62
Millet grain	–	–	0·06 ± 0·08	0·01 ± 0·01

* Per kg$^{0.75}$ = per kilogram metabolic liveweight.

† Leaves 1-*Khaya senegalensis*; 2-*Ipomea* sp.; 3-*Pterocarpus lucens*.

and carted by family labour although there is an active commercial trade in most of these items in the Niono urban centre.

Intake studies

Two separate quantitative studies were carried out to determine intake: one in two villages in each sub-system for a period of a week in each (Table 3) and a longer term study over a 6-week period in another rice village (Table 4).

TABLE 4

Mean Daily Food Intake of Eleven Animals Over a 6-Week Period in One Village in the Rice Sub-system

Food type	*Average intake (kg) per day*	
	Per animal	*Per kg$^{0.75}$**
Roughage (total)	3·14 ± 1·13	0·29 ± 0·09
Grass	0·83 ± 0·68	0·09 ± 0·09
Leaves 1†	0·46 ± 0·40	0·04 ± 0·03
Leaves 2†	1·14 ± 1·48	0·09 ± 0·13
Leaves 3†	0·27 ± 0·25	0·03 ± 0·02
Other leaves	0·46 ± 0·17	0·05 ± 0·02
Concentrates (total)	0·36 ± 0·41	0·03 ± 0·03
Rice bran	0·09 ± 0·18	0·01 ± 0·02
Maize bran	0·02 ± 0·03	–
Millet bran	0·23 ± 0·41	0·02 ± 0·03
Cotton seed	0·02 ± 0·02	–

* Per kg$^{0.75}$ = per kilogram metabolic liveweight.

† Leaves 1-*Khaya senegalensis*; 2-*Ipomea* sp.; 3-*Pterocarpus lucens*.

GROWTH AND WEIGHTS

[illegible] of Moutons de Case born in the flocks in the long-term study was recorded from just after birth to age 40 weeks. A comparison of the growth of these animals with that of the general curve of extensively reared animals is shown in Fig. 2. These are pooled results of animals born at various times of year in each of the years of the long-term study. Average daily gain for Moutons de Case was, at 117·1 g/day,

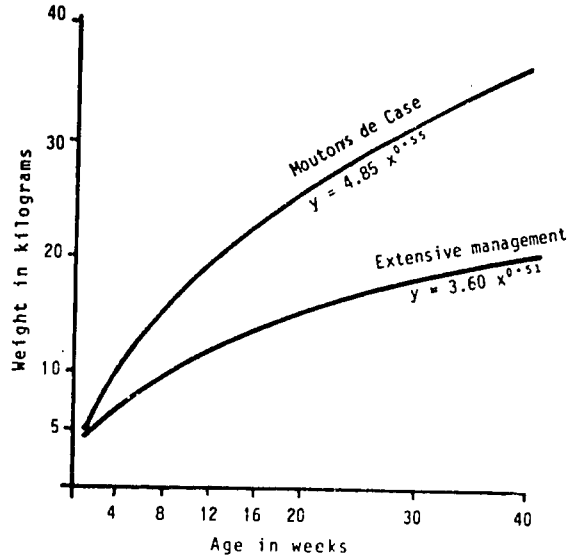

Fig. 2. Comparative growth curves for Moutons de Case and extensively reared sheep to 40 weeks of age.

almost exactly twice the ADG of 59·6 g/day for extensively reared sheep. A paired *t*-test on weights at specific ages showed highly significant differences between the growth rates: at ages from approximately 32 weeks to maturity, as can be seen from Table 5, Moutons de Case maintained their superiority in weight although the weights of extensively reared sheep approached those of intensively fed ones at mature ages.

TABLE 5

Weight (kg) for Age Data for Moutons de Case and Extensively Reared Sheep

Age		*Moutons de Case**				*Extensively reared*†
Dentition	*Absolute*	$\bar{x}$	*Standard deviation*	*Range*	*n*	$\bar{x}$
Temporary	< 15 months ($\bar{x}$ = 32 weeks)	32·4	10·6	15·0–61·0	32	18·3
Permanent						
1 pair	15–21 months	38·0	9·5	20·6–55·0	40	27·3
2 pairs	22–27 months	40·2	8·4	25·0–60·0	131	31·5
3 pairs	28–33 months	53·5	9·2	44·0–75·0	12	34·8
4 pairs	> 33 months	52·9	9·0	47·0–63·6	3	44·8

* From short-term survey supplemented by market animals.

† General growth curve from long-term studies.

MARKETING

Effects of *tabaski* on annual sale and slaughter patterns

Total offtake in a number of flocks of both sheep and goats was recorded over a period of almost 6 years. Figure 3 shows the general effect of the *tabaski* festival on offtake, calculated by months for each year. The broader, flatter peak extending over 2 months in 1982 is due to the festival date occurring near the end of September, the calculation by decades appearing to put some offtake in October. The inset to Fig. 3 shows offtake at the *tabaski* period by 10-day periods for each of the years 1979 to 1983 and allows the actual date of the festival to be accurately calculated for each year, these being 1 November, 20 October, 9 October, 28 September and 18 September.

The offtake in the 10-day period in which *tabaski* fell (mostly slaughter) and in the two preceding 10-day periods (mostly sales) was 28·0 %, 30·5 %, 22·7 % and 22·6 % of total annual offtake in the years 1979 to 1982. In 1978, the offtake in the corresponding three decades, for a much smaller total sample, was 27·9 %.

Weight and price structure of marketed animals

There is some evidence from Table 6 that weights of marketed Moutons de Case were heavier in 1983 than in 1980. The available data show a significant reduction of animals marketed in the 20–30 kg range in 1983

TABLE 6

Liveweight at Marketing of Moutons de Case in 1980 and 1983

Weight class (kg)	*1980* Number	%	*Weight (kg)* $\bar{x}$	± *standard deviation*	*1983* Number	%	*Weight (kg)* $\bar{x}$	± *standard deviation*
10–20	2	2·9	17·8	0·8	2	1·8	15·5	0·7
20–30	19	27·1	25·4	3·2	6	5·4	25·6	3·6
30–40	28	40·0	33·8	3·0	38	33·9	35·4	2·6
40–50	15	21·4	41·4	6·7	44	39·3	43·8	2·7
50–60	5	7·1	52·0	2·3	17	15·2	53·5	2·8
>60	1	1·4	(70·0)		5	4·5	64·8	6·6
Overall	70	100·0	35·0	9·9	112	100·0	41·9	9·8

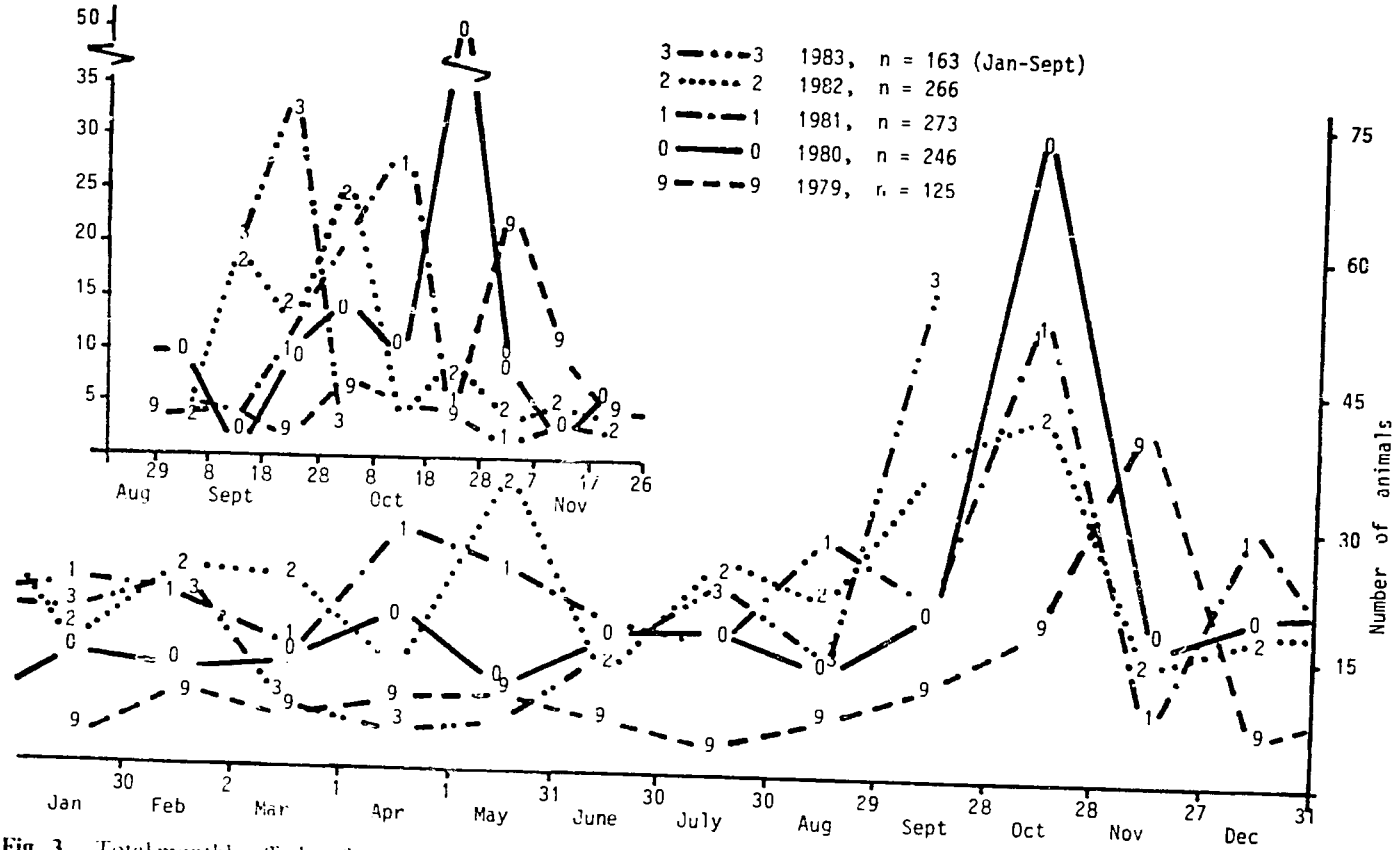

Fig. 3. Total monthly offtake of sheep and goats in studied flocks during long-term observations. (Inset: Offtake by 10-day periods at *tabaski*).

TABLE 7
Niono Market Sale Prices (MF × 10^3)* of Moutons de Case in 1980 and Sale and Asking Prices in 1983

Weight class (kg)	*1980 Sale price* $\bar{x}$	*standard deviation*	*1983 Sale price* $\bar{x}$	*standard deviation*	*Asking price* $\bar{x}$	*standard deviation*
10–20	19·0	5·7	—	—	11·2	1·8
20–30	21·2	5·5	15·0	2·1	23·3	2·9
30–40	25·0	5·5	26·5	5·4	33·2	7·5
40–50	32·8	6·0	39·4	8·7	48·6	12·9
50–60	47·7	11·4	47·1	2·9	60·2	10·0
> 60	(90.0)				88·8	20·2
Overall	28·1	12·0	33·3	10·4	48·0	20·0

* 1 US $ = 790 Malian francs at 30 September 1983.

compared with 1980 and a significant increase in animals in the 40–50 kg range, as well as in the 50–60 kg range.

Further evidence that heavier weights were preferred can be found in Table 7 which compares prices paid in 1980 with those paid in 1983 for the same weight classes. The weighted average sale prices of all animals rose by some 9% in the 3-year period.

DISCUSSION AND CONCLUSIONS

The Mouton de Case has a small but important rôle in the smallholder agro-pastoral system of this area and of West Africa generally. The level of production of animal proteins can be considerably increased by smallholder fattening schemes. For individual owners a small supplementary income can be gained. In addition to their rôle of investment and insurance, they have important social and religious connotations. Where owned by women, they contribute to their independence and help to improve their social position within the household.

The smallholder fattening system is not exclusively related to wealth in rural communities although, in general, the better off an agro-pastoralist, the more likely he is to keep Moutons de Case. The more favourable conditions on irrigated lands in terms of feed availability (and, in the case

of the Office du Niger, the availability of credit for other purposes) enable a greater percentage of farmers to invest in sheep for fattening. However, the fall-off in the percentage of farmers with large numbers of oxen in the rice sub-systems who keep Moutons de Case is probably due to their reluctance to invest labour in this activity, preferring to buy sheep for slaughter when they require them.

The relative wealth of rice farmers compared with millet ones can also explain why slaughter in this sub-system is more prevalent than in the millet sub-system. In the millet sub-system the income from the sale of a fat sheep is a valuable addition to the annual cash flow. The higher percentage of animals born in the millet sub-system, as opposed to those bought, is also an indicator of the paucity of available cash. The higher number of sheep kept for periods longer than 12 months in the millet sub-system may also be related to the lack of cash insofar as the sheep are an insurance against long-term crop failure. In the rice sub-system, some crop is assured every year and other sources of income (including credit) are more easily available. Long-term confinement in the millet area may, however, be related to a slower growth rate, with sheep not attaining weights up to farmers' expectations at the required time.

The need to cut fodder in the wet season and conserve it for the dry season may be an inhibitor to intensive management in the millet sub-system. Owners who do practise intensive management feed a relatively greater quantity, as well as a wider variety, of home produced, as opposed to bought, agricultural by-products. This should be compared with the rice sub-system where wild gathered foods are prevalent and available generally throughout the year.

While cash outlay is thus reduced to a minimum in the millet sub-system, intensive management does have some additional depressive effects. These are not always as obvious as diversion of labour. For example, in one village, the keeping of Moutons de Case was not popular because owners said that carrying food for them by donkey diverted these from supplying household water.

The food intake studies emphasise the *ad hoc* nature of the feeding regime. There are clear-cut differences between sub-systems but no rational basis of feeding appears to be adopted by owners. The data provided on intake should therefore be considered as indicative of the wide variations in foods and amounts fed, the large standard deviations showing that the calculation of average amounts is not a very useful exercise at present for Moutons de Case. Nonetheless, there are very real

benefits to feeding in this way, as comparative growth curves for intensively- and extensively-managed animals show. The combination of a better feed supply, lower energy expenditure in food searching and a probably lower stress from diseases and parasites allow a better expression of the genetic ability for growth than is normally seen in Sahel sheep.

Although weight is obviously an important criterion in the value of a Mouton de Case, it is not the only one. Colour and horn size and shape also contribute to the price paid or received. Entire male sheep are preferred for the religious festival (which explains the preponderance of males kept for fattening), followed by castrates and then females. The slaughter of goats, although by no means uncommon, confers a lesser standing. The overall effect of *tabaski* on the pattern of offtake has been clearly shown. Demand at this time forces up prices of all animals but particularly of the more prestigious animals in the medium–heavy weight classes. There is, however, as can be seen from the divergence in the 'asking'–'paid' prices for 1983, some difference of opinion between sellers and buyers as to the value of animals as weights increase beyond 50 kg. Only the very exceptional buyer is prepared to pay exponentially for increased weight above this level. The high asking price and the heavier weight of animals offered for sale in 1983 were possibly a result of farmers' expectations of higher grain prices as a result of poor rainfall in this season. If this is the case, it again underlines the rôle of animals in agro-pastoral systems as a form of insurance.

Intensive fattening of sheep by smallholders is a minor component of agro-pastoral systems in West Africa. The main constraints to its expansion appear to be low cash availability, the drain on labour if large numbers are kept and, particularly in the rainfed millet sub-system, the lack of available feed in the dry season. These factors are, to some extent, counter-balanced by the social and religious values accumulated as a result of owning or slaughtering a fine animal and the cash value which can be obtained by sale at a time when other sources of income may be limited or non-existent.

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Improving Aerial Counts of Maasai Livestock

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SUMMARY

The methods used for low-level aerial census in Africa, which have been developed by wildlife biologists, were adapted to suit an agricultural research team counting pastoral livestock. The study area in Kenyan Maasailand was small by aerial survey standards (3510 km²). It was further sub-divided into a northern (870 km²) and southern (2640 km²) census zone because of differences in ecology and stage of development between the Group Ranches in the north and south.

The design of each survey was a compromise between the need to count nomadic livestock, which is best done by stratified random sampling, and the need to relate spatial and temporal variations in animal density to the natural resources of the area using unstratified systematic sampling. A basic pattern of systematic reconnaissance flights was adopted with flight lines aligned with the UTM grid, to maintain compatibility with surveys by other scientists, but in this case at a closer transect spacing of 2·5 km. Stratified systematic sampling was then applied to the southern census zone when there was prior knowledge, either from ground truth or preliminary aerial reconnaissance, of areas devoid of livestock. The flying time was then concentrated over the strata or sample zones containing livestock. The northern zone was too small to stratify except to the extent of total counting livestock at watering points. Both forms of stratification improved the precision of the population estimate compared with that

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