The financing and staffing of livestock services in sub-Saharan Africa: A cross-country analysis

Working Document No. 16

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October 1991

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LED

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The objectives of the LED are:

1. To heighten the awareness in African governments and in other organisations of the importance of livestock policy issues.
2. To collate in an easily assimilable form what is already known about policy issues and to present it to policy makers.
3. To carry out research of its own (including that commissioned from consultants) on priority livestock policy issues and to present the results to policy makers.

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 Working paper numbers 1–10 appear under the ILCA/LPU working paper series, which has now been renamed as the LED working documents series.

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Acknowledgements

Many people have contributed to this study. Foremost among these is Stephen Sandford, Head of the Livestock Economics Division and Co-ordinator of the Livestock Policy and Resource Use Thrust at ILCA. Stephen's ready willingness to offer guidance, advice and support, and his untiring quest for clarity are rare attributes which we at LED seem to have taken for granted. I personally greatly value his ability to inspire when one often hits the doldrums.

Other colleagues in LED have offered valuable advice and constructive comments. These included John McIntire, Gil Rodriguez, Jr. and Valentin von Massow. The late Tibebu Deribe collated information from a large number of documents containing figures in small print with his unforgettable perseverance to work under often difficult conditions. Berhanu Anteneh did a lot of the work in computer data entry and the subsequent innumerable regression runs for the analyses. Almaz Zewdie did all the typing and word-processing on the countless occasions on which I needed to make revisions on many drafts.

I wish to record my sincere gratitude to the many officials and staff of the Ministries of Agriculture or Livestock Development, and particularly those of their Veterinary Departments, in Botswana, Ethiopia, Kenya, Lesotho, Malawi, Swaziland, Tanzania and Zimbabwe. I owe a great deal to them for having generously shared their valuable time in discussion and facilitated or supported my access to information in their files and archives.

I also express my sincere appreciation to the management and staff of IEMVT who provided access to their data base and most significantly the IEMVT reports on West and Central Africa. My particular thanks go to Dr. A. Provost, and Dr. Tacher respectively former and present directors of the institute as well as Mr. F. Giovannetti then Head of IEMVT's Documentation Services. My thanks also go to the staff of the Animal Production and Health Division of FAO, particularly to Dr. W. Ferguson, a former staff member of the division, who provided very helpful comments and encouragement.

Finally, I wish to express my gratitude to Tim Williams of ILCA's Semi-arid Research Site in Niamey, Niger for his very useful and considered comments on the earlier version of the report. Partly due to time constraints, I have not been able to take some of his comments into full account.

The views expressed here are those of the author who remains solely responsible for any errors or omissions.

1. Introduction

In Africa, governments played and still play a very dominant role in the provision of livestock services, particularly animal health services. Prior to independence colonial governments ran livestock services strictly as a function of their veterinary personnel. Disease control was a major objective. Specific direct and indirect taxes imposed on the indigenous livestock keeping population supplemented government revenue from which expenditure for services were met.

After independence the majority of African countries have largely followed the same pattern with central government services taking the responsibility for disease control initially and for other services (animal husbandry, livestock research etc.) subsequently. Since domestic resources after independence remained inadequate, many countries have relied a great deal on external funding to control contagious diseases of economic importance. Projects, such as the JP15 campaign against rinderpest during the 1960s and 1970s, were major examples of such externally supported animal health programmes. Much of the external assistance was obtained from ax-colonial powers and multilateral funding institutions.

Such patterns of funding have had adverse long-term results, although at the initial stage they appeared to have succeeded in their objective. A dramatic illustration of this is provided by what seems to have happened in the control of rinderpest and other similar contagious animal diseases. Only a few years after external assistance under JP15 was phased out, the diseases reappeared in those very same countries which were supposed to have controlled them. Several years passed before the concerned African governments could succeed in launching another externally assisted campaign. The Pan-African Rinderpest Campaign (PARC) got off the ground in 1985 mainly with EEC assistance.

There could be several causes attributed to this rather traumatic situation. For example, political instability, in several African countries has made it impossible for central government to provide the services or even to give priority to agricultural production at all. A major reason for the reappearance of rinderpest in many of the countries is governments' inability to mobilise sufficient *domestic* resources and to structure their expenditure in order to maintain such services. Concern has been raised by donors and international organisations regarding what is called the "recurrent cost problem". Many reports following the JP15 campaign state that the infrastructure which was laid down during the campaign has been irreversibly run down for lack of maintenance; staff assigned to the task have become unable to reach areas where disease outbreaks occur because transport vehicles are no longer serviceable or because no fuel is available to run them. In several instances, payment of salaries for staff in the field is overdue by several months or is irregularly made.

More recent reports suggest that treatment drugs are not available for distribution; that there are acute shortages of semen in long-established AI services; that dips have gone out of use, or that acaricide strength in dips is not up to standard because they cannot be replenished. As a consequence a large contingent of staff are being paid for providing little or no service. In some cases although service recipients were perfectly prepared to pay for drugs, vaccines, AI or dipping services if they were made available, subsidies were perpetuated for other than economic reasons. These are policy and management 'problems and not merely ones related to the absolute

availability of funds. Managers of livestock services in many African countries have recently started to recognize these financing and staffing issues. Often, policymakers would like to compare the situation in their own' country with that of other countries facing more or less similar problems. ILCA itself considers the financing problem an important policy component in livestock development in Africa. Donors and international financing agencies give serious attention to the financing and restructuring of livestock services in sub-Saharan Africa as part of the policy adjustment process required for continued assistance to the agricultural sector (see de Haan and Nissen, 1985). In brief, looking into these policy issues is considered an important and justifiable research topic.

The original objectives of the research project were [1]:

i. to examine how livestock services are financed in different African countries;
ii. to analyse the factors which seem to determine the present pattern of government recurrent expenditure and staffing;
iii. to analyse the relationship between policy instruments employed by governments (as reflected in the above pattern) and the quantity and quality of services provided;
iv. to draw the implications for policy from the findings of the study.

1. Lack of appropriate cross-section or time-series data for the countries covered in this study rendered infeasible the analysis planned under objective (iii). The specific methodological and data problems encountered in trying to do this analysis are discussed as part of Appendix I. Case studies which were planned to complement the cross-country study and provide more in-depth analysis of the impact of funding and staffing policies could not be undertaken due to time and cost constraints.

The discussions and analyses regarding the financing and staffing of livestock services in this report are to a very large extent based on data for the 1970s. These data are relatively old and certain changes are bound to have taken place since then. However, we do not believe that such changes which have occurred will substantially affect the main findings and conclusions of our study. We discuss the post-1970s situation in the body of the report and provide supporting evidence for those countries with available data.

Chapter 2 describes the past pattern of expenditure and staffing for a number of countries for which data were collected. The data relate mainly to the 1970s.

Chapter 3 discusses this pattern in terms of the major components i.e. staff and non-staff categories of total recurrent expenditure. Chapter 4 discusses sources of funding, particularly illustrating the extent to which non-income based government revenue and service fees and charges could meet recurrent costs of livestock services. Chapter 5 briefly looks at the evolution of livestock expenditure and staffing since the end of the 1970s based on data available from other more recent studies. Chapter 6 presents an analysis of the factors which seem to have determined the pattern of government recurrent expenditure and staffing. Chapter 7 summarises our findings and conclusions and attempts to draw the implications for policy and future research. A brief discussion of data collection methods, country coverage and data availability problems as well as the statistical methods and packages used for the analysis is presented in Appendix I.

2. Past patterns of government expenditure and staffing

This chapter examines how livestock services are financed and staffed in different African countries and describes their past patterns. In discussing these patterns it would be useful to have an overall picture of the degree of importance livestock output had in the agricultural economies of the countries included in the study. Further, an examination of data showing the equivalent share that recurrent budgetary expenditures have in the value of livestock output could give rough indication of how different countries view livestock's importance. The first two sections of the chapter briefly present these aspects. The third section of the chapter discusses past trends in the amount of government recurrent expenditure on livestock services referred to as livestock recurrent expenditure or LRE in most parts of the report – for up to 22 countries. The fourth section of the chapter deals with the past patterns of staffing (numbers, categories and intensity) of livestock services. Individual countries are grouped into regional, environmental and other categories to help us detect and compare differences, if any, within and between such groups.

The importance of livestock output

The first two columns of Table 1 present data which show the proportion of agricultural GDP in total GDP and that of livestock GDP in agricultural GDP. As we can see, in two-fifths of the countries for which data were available (21), livestock GDP (LGDP) contributed an average 25% to agricultural GDP (AGDP). In two-thirds of these countries, agriculture contributed over 30% to total GDP.

The average contribution of livestock to agricultural GDP for the 13 West and Central African countries is 19% while that for the 8 East and Southern African countries is 30%. Livestock production is thus an important activity in the agricultural economy of these countries. Despite a higher overall average contribution of agriculture to total GDP, livestock's contribution to agricultural GDP in the West and Central African countries is much lower than in the East and Southern African countries. This is mainly attributable to the greater prevalence of tsetse and trypanosomiasis which has put relatively severe limitations on livestock production in the former region.

The share of livestock recurrent expenditure in livestock GDP

The third column in Table 1 shows data on the share of recurrent budgetary expenditure in the value of livestock output (LGDP) for 18 countries for which data were available. On average these 18 countries spent the equivalent of about 3% of livestock GDP to meet the recurrent costs of livestock services. In West and Central Africa, this share ranged between 1 and 17%, while in the East and Southern African countries this ranged between 0.2 and 18%.

Amount and growth of livestock recurrent expenditure

Estimates and calculations based on official expenditure data in many sub-Saharan African countries in the 1970s provide evidence that governments allocated to disease control and animal health activities over 70% of the total recurrent expenditure on livestock services (SEDES, 1975; IEMVT, 1980; de Haan and Nissen, 1985). They concentrated on large-scale vaccination campaigns against the major epizootic diseases (rinderpest, CBPP etc.) tsetse and/or trypanosomiasis control programs, and in some cases tick control, as well as treatments against internal parasites.

Annex Table A 1 presents data on total recurrent expenditure (in US$ at 1975 constant prices) for 22 countries during the period 1970/71 – 1978/79. The map (Figure 1) at the end of Appendix I shows the countries covered. Annex Table A 2 presents the growth rates in this expenditure by country. Growth rates are calculated on the basis of the amounts and periods shown in Table A 1. Annex Tables A 3 and A 4 provide expenditures and growth rates per TLU[1] by taking into account the size and growth rate of the ruminant livestock population for each country.

1. TLU (tropical livestock units) represents ruminant livestock units (excluding camels) of 250 kg liveweight. The conversion rates applied to the different ruminant species are: cattle = 0.7, sheep and goats = 0.1.

Table 1. *Shares of agricultural GDP (AGDP) in total GDP, of livestock output (LGDP) in AGDP and of recurrent expenditure in LGDP, by region – 1978/79 (in 1975 constant prices)*

Region and Country	AGDP/Total GDP	LGDP/AGDP	LRE/LGDP
West and Central Africa	Percent		
Benin	38	12	1.8
Burkina Faso	42	29	1.4
Cameroon	31	10	..
CAR*	38	8	1.2
Chad	49	39	..
Côte d'Ivoire	22	3	16.6
Gambia	39	21	5.9
Mali	37	36	..
Mauritania	35	95	3.8
Niger	57	29	1.0

Senegal	22	29	2.3
Sierra Leone	45	7	2.9
Togo	24	11	2.4
Average	36	19	–
East and Southern Africa			
Ethiopia	45	33	0.2
Kenya	28	40	5.0
Lesotho	36	58	4.5
Malawi	37	6	10.0
Swaziland	25	16	18.2
Tanzania	40	24	3.0
Zambia	13	37	5.0
Zimbabwe	21	33	4.0
Average	31	30	–

* CAR = Central African Republic
LGDP = Livestock GDP
AGDP = Agricultural GDP
LRE = Recurrent expenditure on livestock services or livestock recurrent expenditure

Sources: Jahnke (1982); Anteneh (1983; 1985 and unpublished data for Ethiopia, Lesotho and Swaziland) and World Bank (1981)

From Tables A 1 and A 2 it is clear that total recurrent livestock expenditure over the periods considered increased in real terms in all countries except Botswana and Zimbabwe. In respect of expenditure per TLU, all countries except Botswana, the Central African Republic (CAR), Zambia and Kenya showed an increase. In CAR and Zambia, the livestock populations increased at a faster rate than total recurrent expenditure. In Botswana, the livestock population increased while expenditure declined. In Zimbabwe, the livestock population declined at a faster rate than the decline in real recurrent livestock expenditure, particularly after 1974/75. In almost all other cases where substantial increases in expenditure per TLU occurred, the growth rates resulted from a reduced or a more slowly growing livestock population.

Chad, Mali, Mauritania and Niger suffered serious losses in their livestock populations due to the Sahelian drought of the 1970s. Except for Senegal, the Sahelian countries including the above four also started with a low base of expenditure per TLU at the beginning of the periods considered, so that relatively small absolute changes were reflected in growth rates much higher than most other countries. This is particularly true for Chad and Mali, for which data are available only up to 1975/76 and 1974/75 respectively.

Consistent and continuous data to give an overall picture of total expenditure per TLU and growth in livestock population are only available for 18 countries. Table 2 presents real expenditure per TLU and growth rates for 18 countries.

Table 2. *Growth rate in expenditure per TLU and in TLU numbers: 18 countries*

	Mean	SD	Minimum	Maximum
Expenditure per TLU (US$) [a]	2.12	2.17	0.06	8.40
Real average growth rate (% p.a.) [b]	8.15	10.24	–6.60	31.60
TLU growth rates (% p.a.) [b]	1.99	2.29	–2.50	6.10

a. 1978/79 in 1975 constant prices
b. 1970/71 – 1978/79.

Total recurrent expenditure per TLU seems to have been more than adequate. In extensive studies on recurrent expenditure on animal health in Sahelian West Africa in the 1970s, IEMVT (1980) concluded that US$ 0.75 – US$ 1.00 per TLU was adequate to meet the recurrent costs of livestock services. Five of the 7 countries studied by IEMVT are part of the 18 countries considered here.

Recurrent livestock expenditure by region, language, zone and size of livestock population

We now turn to explore briefly the patterns of expenditure exhibited by geographical, political, zonal, and livestock population size groups. At this stage it would be appropriate to explain the rationale for classification of countries into one or another category used in the comparisons.

Classification of countries by geographical region (i.e. West, Central, East and Southern) could provide a basis of comparison between groups of neighbouring countries facing problems which actually or potentially affect their region. Such problems (e.g. transmission of communicable diseases) could arise from the proximity of these countries and the relatively easy movement of animals across national boundaries thus influencing their expenditure pattern. Regional groupings of this sort could also reflect patterns of expenditure influenced by common policies designed to provide some minimum standard of services, particularly in the prevention or control of animal diseases.

In Africa, colonial powers have left their mark on the way succeeding independent national governments deal with administrative and policy matters. The classification by francophone and anglophone groups (the two languages relevant to the countries under review) is meant to reflect different styles of policy-making and management as well as different processes of problem perception and skill acquisition. For example, it is reported that francophone countries give greater emphasis to their veterinarians acquiring animal husbandry techniques than do anglophone countries. In another respect, budget documents of anglophone countries provide much more detailed information on expenditure components than do their francophone counterparts.

Geographical regions encompass a great diversity of environmental conditions which more than anything else influence the distribution of livestock populations in Africa. The pattern of livestock recurrent expenditure according to a classification based on ecological zones is likely to provide a stronger basis for comparison as to whether absolute levels of expenditure reflect the economic importance of livestock.

The major criterion for classification by ecological zone is the length of growing days — the arid/semi-arid (ASA) zone has up to 180 growing days and the non-ASA group up to 270 days. The non-ASA zone includes highland areas whose classification criterion is altitude rather than length of growing days (see Jahnke, 1982). About two-thirds of the 18 countries considered here are multi-zoned i.e. they have land areas both in the ASA and non-ASA zones. For the purpose of this report, we have further classified countries as falling into one or the other of the two broad ecological categories by the proportion of the livestock population found in a particular zone being greater than 50%. For example, Kenya where about 80% of the land area is in the arid/semi-arid (ASA) zone but 60% of the ruminant livestock population is in the non-ASA zone is classified as part of the non-ASA zone.

Classification of countries by size of the livestock population is done on the basis of whether their livestock population, measured in terms of TLU, is more or less than one million.

Table 3 below provides the relevant information on the amount of real expenditure per TLU and the respective growth rates for 18 countries.

Table 3. *Amount and real growth rate of expenditure per TLU by different groupings.*[a]

Groupings	Amount[b]		Annual Growth Rate[b]	
	US$		% p.a.	
	Mean	SD	Mean	SD
West and Central Africa (10)	1.95	2.31	10.46	11.41
East and Southern Africa (8)	2.34	1.96	5.26	7.61
Francophone (8)	1.98	2.56	7.69	9.96
Anglophone (10)	2.24	1.76	8.52	10.40
ASA[c] (8)	1.61	1.05	9.59	13.48
Non-ASA (10)	2.53	2.68	7.00	6.34
TLU < 1 mill. (9)	2.91	2.64	9.83	10.17
TLU > 1 mill. (9)	1.33	1.10	6.47	10.02

a. Figures in brackets represent number of countries in each group
b. Amount is for 1978/79. Growth rates are for period 1970/711978/79
c. ASA = arid/semi-arid zone

Sources: Anteneh (1983; 1985 and unpublished data for Ethiopia; Lesotho and Swaziland); FAO Production Yearbooks (several years); Jahnke (1982).

As we see in Table 3 the intra-group variations are quite high. An analysis of variance (ANOVA) test was performed using the above categorical variables (region, zone, etc.). The ANOVA tests failed to reveal significant differences in the amount and growth rate of expenditure per TLU, most probably attributable to the small number of cases considered. The grouping by TLU population size yielded results with the highest significance (an F ratio close to a significance level of 10%), indicating this to be a potentially important element in explaining differences in expenditure patterns among countries

The amounts of recurrent expenditure per TLU for the West and Central African (WCA) countries, the francophone group and the countries classified in the arid/semi-arid zone were lower than their corresponding counterparts. All of the francophone as well as 5 out of the 8 ASA countries are in the West and Central Africa region. The variation around the mean expenditure per TLU within the ASA group is, however, markedly lower than that of the WCA countries. This is probably a reflection of the closer similarity of production systems irrespective of regional groupings. Those countries with a livestock population of less than one million spent

more than those countries with a larger livestock population. Only 4 out of the 9 countries with a livestock population of less than one million were in the WCA region.

The growth rates in real expenditure per TLU for countries in the WCA region as well as in the ASA zone and for those with a livestock population of less than one million were higher than for their corresponding counterparts. The WCA countries started from a lower base than those in the East and Southern Africa region, and partly as a consequence of this, growth rates were much higher in the former.

It has not been possible to make more definitive comparisons of expenditure made in the arid/semi-arid (ASA) zone of individual countries due to lack of expenditure information at country level. Across countries, however, the majority of pastoral producers are usually found within this zone. Given the large share of the ASA zone in African livestock production, the relatively low amount of expenditure per TLU governments allocated in this zone would seem to point to the disproportionately low attention pastoralists are getting in terms of funding the livestock services they require. An important qualification to the preceding statement is that there is a lower incidence of diseases in the drier areas probably leading to a lower need for expenditure to control them. We will further examine these aspects at a later stage. On the other hand, the lowest growth rates in the ruminant livestock population were recorded for the countries in the ASA zone (Annex Table A 15). This could be partly explained by the occurrence of drought to which the arid zone is particularly vulnerable.

Within the non-ASA category, 7 of the 9 countries with small livestock populations are found in the humid and subhumid zones. In these zones, the average livestock holding per caput is relatively low and opportunities for expanding the absolute size of this population as well as the average holding per caput seem to be the greatest. *Prima facie* the high expenditure per TLU shown for the non-ASA group in Table 3 thus seems to be justified. The high expenditure is also most likely to be a reflection of the greater prevalence of diseases in the wetter zones.

Staff numbers, categories and proportions

Annex Table A 5 presents information on the number of staff of different categories in 15 countries for which data are available over a number of selected years. Due to the difficulty encountered in several cases in categorising middle- and low-level staff separately the two classes have been merged and designated as auxiliary personnel (AP). High-level staff include all graduate veterinarians and above. From Table A 5 one can see that, except in a few cases, the numbers of both high-level staff (HL) and auxiliary personnel increased during the period. The increase in the number of auxiliary personnel has, however, been higher in most cases.

Livestock to staff ratios

The increase or decrease in the absolute number of staff does not mean much unless it is seen in relation to the livestock population which the staff are expected to deal with. Annex Table A 6 presents data on the number of livestock per total staff (i.e. per staff member of all categories combined), per high-level staff (HL), and per auxiliary personnel (AP). In most countries fairly dramatic decreases took place in the number of livestock units per high-level staff between

1970/71 and 1978/79. This can partly be explained by the decline in the livestock population during the period, particularly in the Sahelian countries. However, except for some countries (e.g. Burkina Faso where the number of staff decreased while TLU numbers increased and Ethiopia where both staff and TLU numbers increased), the number of livestock units per total staff has tended to decline in most countries.

While the above data provide an overall indication of the development of staffing patterns in many African countries, the ratio between staff and livestock numbers differs between production systems. For example, in the pastoral/transhumant production systems of the Sahelian countries, it has been estimated that 240,000 and 35–40,000 TLU per high-level staff and auxiliary personnel respectively is an acceptable ratio (GTZ/SEDES, 1977). And most of the countries in this category seem to do better than these ratios by a large margin, given the narrow range of and relatively simple functions they perform (see below).

Ratios of high-level staff to auxiliary personnel

Staffing ratios as a measure of the effectiveness of services must also consider whether an appropriate balance is kept between the numbers of different categories of staff. High-level staff need to be supported by a sufficient number of auxiliary personnel to translate plans into field action and to deliver services to the ultimate beneficiaries. Conversely, large contingents of auxiliary personnel need the guidance and supervision of high-level staff in adequate numbers in order to be able to devote sufficient time and effort for this purpose as well as to carry out field functions which could not be delegated to less professionally qualified personnel. Annex Table A 7 presents data on staff ratios calculated from the data of Annex Table A 5.

Experience from Sahelian West Africa suggests that a ratio of 15 auxiliary personnel to each high-level staff is appropriate (GTZ/SEDES, 1977). In the great majority of the countries in this category the ratio figures had fallen below that by 1978/79. In 10 (7 in WCA) of the 15 countries considered here, the number of high-level staff increased relatively faster than that of auxiliary personnel (Annex Table A 7). This also has to be seen in the framework of the range and complexity of functions that staff, particularly high-level staff, perform.

Determinant factors in staff intensity levels

The West African experience referred to above mainly relates to the staffing of animal health services in the arid/semi-arid countries of the Sahel in the mid-1970s. These countries have characteristics quite different from those found in the wetter zones of Africa. In considering staffing ratios at any one point in time or their pattern of change over time, one must thus keep in mind that the appropriateness of staff intensities (i.e. TLU per staff as well as staff proportions) is determined by several factors. We must at least take the following into account:

i. the geographical distribution and density of the livestock population;
ii. the livestock production system (e.g. nomadic, transhumant, sedentary) in which the services are provided;
iii. the size of the individual herds with which staff have to deal;

iv. the range of functions or improvements carried out by the different classes or categories of staff; and perhaps also
v. the training "philosophy" of individual countries or group of countries in respect of different classes of livestock staff.

The range of staff functions

The range of functions (iv) and the training "philosophy" (v) would seem to be within relatively easy reach of policy-makers to influence. Let us first try to give a boundary to the range of functions and their influence on staff intensity. In this context, a line of argument provided by Sandford (1983) is used to distinguish three levels of functions for the purpose of estimating intensities and proportions of different staff classes:

a. where high-level staff are primarily concerned with visual diagnosis in the field, mass vaccinations against epizootic diseases, and quarantine control, a ratio of a high-level (HL) staff to 20–30 auxiliary personnel (AP) would be appropriate. The corresponding staff intensity would be about 1 HL: 200,000 TLU and 1 AP: 7,000 –10,000 TLU;
b. where the range of functions consists of more sophisticated diagnosis, preventive medicine on a herd/flock basis combined with some simple advisory work to livestock owners, ratios of 1 HL: 10 AP and 1 HL: 10–30,000 TLU would be more appropriate;
c. where high-level staff are expected to carry out a full range of services including, for example, AI and the treatment of individual animals, ratios of 1 HL: 3–5 AP and 1 HL: 5000 TLU would appear to be necessary.

It is extremely difficult to categorise countries into groups possessing some similarity in the patterns of staffing solely using the classification of the range of functions discussed above. However, judging from the data of Annex Tables A 6 and A 7 and assuming that they reflect shifts in the range of functions, we detect a pattern in which the functions carried out by high-level staff appear to have become more wide-ranging and more complex in most of the countries considered here.[2] On the other hand, the ratios largely remain within the lower range of functions indicated in (a) above.

2. "The wider the range [of functions and the more complex these are], obviously the less stock can one member of staff deal with... [and] the fewer the junior staff that a senior official can supervise and the greater the direct role in dealing with livestock that he will have to play" (Sandford, 1983, p. 178).

Recent proposals to enlarge the number and the role of auxiliary staff relative to a given number of livestock units and to an increasing number of high-level staff seem to support this general tendency (see CTA, 1985a and 1985b for some proposals put forward by African heads of livestock services).

Livestock density, production system and herd size

The other listed factors which influence staff intensity and staff proportions can do so either independently for a given level of staff functions or indirectly through their effect on the range of functions. In principle, the lower the livestock density (i.e. the more sparsely populated an area), the larger the number of animal health and husbandry staff required to deliver the services "in a

given period of time or for a given distance traveled" (Sandford, 1983), irrespective of the range of functions. In such cases, the number of livestock units with which each staff has to deal at any one time will also be larger. In general, one would expect low average livestock density and large average herd sizes to be characteristic of the dry areas of the arid/semi-arid zone (see Jahnke, 1982). The large herd sizes are accounted for by the greater extent of human dependence on livestock in such areas. This is further reinforced by seasonal and localised concentration of livestock at watering points during the dry season (Sandford, 1983). Such concentration moderates the high staff intensity which may be expected to be required in sparsely populated regions.

Furthermore, in terms of staffing and the range of staff functions, the drier areas tend to be given much less attention compared to areas with a higher potential. Sandford (1983) provides three plausible reasons. First, pastoralists, who mostly occupy these areas, have low political influence in most countries and consequently are accorded low priority in terms of being provided with adequate levels of staff and services. Second, the range of economically viable improvements which one can introduce into these areas has in general been much narrower. Third, these areas hold relatively more camels, sheep and goats which in general do not get as much attention as cattle and for which, in any case, there have been fewer improvements developed and available worth including in any package of services. Obviously, these additional factors could lead to relatively low staffing intensities in the drier areas of the arid and semi-arid zones.

By deduction, one would draw a contrasting picture of the less dry or more humid areas. Here we would expect to find higher livestock densities (see Jahnke, 1982) associated with agro-pastoral/sedentary production systems consisting of smaller herd sizes. These characteristics would entail a wider range of staff functions and are likely to be reflected in higher staff intensity - i.e. a smaller number of TLU per staff of all categories as well as a smaller number of auxiliary personnel per high-level staff. Let us see what the picture in this regard looks like in the drier represented by the countries in the arid/semi-arid category and the more humid zones (represented by the countries in all the other zones). Table 4 presents the available data by three different zones.

Partly due to the small number of countries in the sample, and perhaps also due to the way the zonal classification was constructed, we get a mixed picture from Table 4. As regards the ratio of TLU numbers to total staff, the difference between the arid/semi-arid and the subhumid/humid countries matches our expectation of higher staffing intensity in the latter i.e. there are fewer TLU per staff in the wetter zone. However, the average number of TLU per total staff for the countries in the highland zone is about one-third higher. This most probably reflects the relatively extensive dry areas in Ethiopia and Kenya which contain considerable portions of the total livestock population - 33% and 40% respectively. The ratio of auxiliary personnel to high-level staff (AP per HL) was expected to be lower — i.e. a smaller number of AP per HL staff in the wetter zones. The results which we get from the data in Table 4 do not match this expectation. This is perhaps a situation resulting more from what we earlier referred to as the "training philosophy, of the individual countries than from the other characteristics which influence staff intensity. It is notable that the countries in the drier zones, which tend to rely more heavily on auxiliary personnel to deal with their pastoral production systems, show a smaller number of auxiliary personnel per high-level staff.

Table 4. *Staff intensity by ecological zone – 1978/79*

	TLU			AP per HL
	per HL	per AP	per total staff	
	(000 head)			(numbers)
Arid/semi-arid				
Botswana	60	6	6	10
Burkina Faso	145	13	12	11
Mauritania	312	10	9	32
Niger	93	9	8	10
Senegal	15	4	3	3
Average[a]	47	7	6	6
Subhumid/humid				
Benin	36	4	4	8
Cameroon	84	5	5	15
CAR	65	3	3	24
Malawi	39	2	2	23
Swaziland	40	2	2	23
Togo	25	3	3	9
Average[a]	53	3	3	16
Highland				
Ethiopia	196	27	24	7
Kenya	35	3	3	10
Lesotho	48	3	3	17
Average[a]	80	9	8	9

a. Weighted by the proportion, for each country, of TLU in each group in the case of TLU per HL, AP or total staff, and the proportion, for each country, of HL in the case of AP per HL.

Sources: Anteneh (1983; 1985; and unpublished data for Ethiopia, Lesotho and Swaziland); FAO Production Yearbooks (several years) for TLU data.

3. Structure of expenditure

So far we dealt with the overall pattern of expenditure and staffing of livestock services largely in terms of the absolute availability of government funds and staff to these services. In this chapter, we discuss the pattern of two major categories which make up total government recurrent expenditure on livestock services. We first describe the trend in the staff and non-staff categories of expenditure in terms of their average level and relative ratios in 1978/79 and their annual growth rates during 1970/71 – 1978/79. We further examine the possible causes for the decline in the growth rate of non-staff expenditure as well as present a picture of what expenditure categories make up the non-staff expenditure category.

Trends in staff and non-staff expenditure

The issue of the allocation of funds between the staff and non-staff categories of expenditure has become critically important in the effective provision of agricultural and livestock services. The general picture is that in many sub-Saharan African countries staff expenditures have been absorbing an ever-increasing share of the total budget. Annex Table A 8 presents information on the absolute amounts allocated to the staff (SE) and non-staff (NSE) categories of expenditure in 20 countries for which data are available. Annex Table A 9 shows the average annual rate of change in the two categories of expenditure. We can see that in most countries the relative share of staff costs in the total budget increased substantially during the 1970s, although at different rates. Table 5 below provides a summary for 18 countries by geographical region.

Table 5. *Staff costs: Changes in relative share of staff expenditure (1970s).*

Ranges of Chance[a]	West and Central Africa	East and Southern Africa
Increase	Number of countries	
< 10%	4	1
10–20%	3	–
> 20%	2	4
Decrease	1	3

a. Percentage figures calculated from marginal change in percentage share of staff costs divided by base year figure multiplied by 100 (e.g. a change in the percentage share of staff costs from 40% at base year to 50% at the latest year considered would mean an increase of 25%).

Source: Anteneh (1983, 1985 and unpublished data for Ethiopia, Lesotho, and Swaziland).

Table 6 further presents data on the average staff to non-staff expenditure ratio as well as the average annual growth rates of the staff and non-staff categories of expenditure. We could obtain complete and continuous data only for 16 countries.

From Tables 5 and 6 it becomes evident that most of the expenditure has been allocated to meet fast increasing staff costs. In 1978/79, on average the 18 countries incurred 4 units of money for every unit of non-staff costs or about 80% of total expenditure was made to meet staff salaries and allowances. Overall, non-staff expenditures during the 1970s increased by less than half the average rate for staff expenditures.

Table 6. *Ratio and growth rates of staff and non-staff expenditure: 16 countries.*

	Mean	SD	Minimum	Maximum
Staff to non-staff expenditure ratio[a]	4.21	5.06	0.41	19.4
Growth rate (% p.a.)[b]				
- staff expenditure	9.20	18.28	–10.30	37.28
- non-staff expenditure	4.43	14.66	–33.45	39.39

a. 1978/79. Units of staff expenditure per unit of non-staff expenditure
b. 1970/71– 78/79. Expenditure is in US$ at 1975 constant prices.

Sources: Same as Table 5.

Table 7 presents a summary picture of the amount and growth rates of staff expenditure employing the regional, zonal etc. classification used previously.

Table 7. *Amount and growth rate of staff expenditure per TLU.*

	Amount[a]		Growth Race[b]	
	US$		% p.a.	
Grouping	Mean	SD	Mean	SD
WCA (9)	1.46	1.79	11.29	13.57
ESA (7)	1.42	1.33	6.53	9.78
Francophone (7)	1.61	2.04	9.66	13.50
Anglophone (9)	1.31	1.21	8.86	11.24

ASA (8)	1.00	0.68	11.46	14.58
Non-ASA (8)	1.89	2.07	6.95	8.91
TLU < 1 mill. (8)	2.05	1.97	9.78	11.54
TLU > 1 mill. (8)	0.84	0.74	8.64	12.97

a. Amount refers to 1978/79; US$ in 1975 constant prices
b. Period is 1970/71-1978/79

Source: Same as Table 3 in the text.

Table 8 presents similar information for non-staff expenditure. The figures in brackets in both Tables 7 and 8 represent the number of countries in each group. Data for 1978/79 for both staff and non-staff expenditures are not available for Benin in West and Central Africa (WCA) and Tanzania in East and Southern Africa (ESA).

Table 8. *Amount and growth rate of non-staff expenditure per TLU.*

	Amount		Growth Rate	
	US$		% p.a.	
Grouping	Mean	SD	Mean	SD
WCA (9)	0.60	0.69	6.80	18.55
ESA (7)	1.11	0.76	1.37	5.45
Francophone (7)	0.52	0.73	0.86	15.62
Anglophone (9)	1.07	0.70	7.20	13.15
ASA (8)	0.61	0.50	7.50	14.56
Non-ASA (8)	1.04	0.91	1.35	14.03
TLU < 1 mill. (8)	1.11	0.85	6.28	18.80
TLU > 1 mill. (8)	0.54	0.54	2.58	8.22

See notes under Table 7 regarding reference periods and source of data.

Possible causes for declining non-staff expenditures

Several reasons could have given rise to the increase in the share of staff costs or, conversely, to the decline in shares of non-staff expenditure. First, allocations to meet non-staff costs could decline in absolute and real terms like they did in CAR, and Zambia (see Annex Table A 8). This

was most probably caused by governments cutting down non-staff allocations when faced with an overall tight budget. In most cases, adjusting the salary payroll downwards while maintaining the existing level of non-staff expenditure is not a politically feasible option. The livestock sector could have been more severely affected by cuts in non-staff expenditure budgets due to the longer time it takes for expected benefits to accrue from services of a non-emergency nature.

Second, staff costs could increase at a much faster rate than non-staff expenditures such as had happened, for example, in Benin, Mauritania or Senegal. This probably occurred as a result of salary increments of existing staff and/or an increase in the number of staff being recruited for the services. It was not possible to separate the effect of one or the other of these causes from the available data.

Thirdly, where both staff and non-staff expenditures decline in absolute terms, the latter could have done so at a faster rate resulting in a reduced share in the total budget (e.g. Zimbabwe). As we can see from Annex Table A 8, there are very few cases where total amounts of real expenditure to meet staff costs declined consistently throughout the period considered, although some notable fluctuations occurred in some countries (e.g. CAR and Togo). The percent share of the total recurrent livestock budget going to staff expenditures increased or remained at about the same level as at the beginning of the period in all countries (including CAR and Togo) except in Botswana, Ethiopia, Gambia, and Malawi. This can be seen from Annex Table A 10 which shows the percentage share of staff expenditure in the total livestock recurrent expenditure during the 1970s.

In all the last 5 countries mentioned above, the amount of non-staff expenditure on average increased at a higher rate than that of staff expenditure. In Ethiopia, where availability of recruitable staff should have been relatively easier, the general freeze on wages and salaries imposed by the government since 1974 has probably contributed to the slower growth rate of staff expenditures. In Gambia, the phenomenal growth of both categories of expenditure between 1970/71 and 1978/79 can only be attributed to the low base at which it started, although it has a livestock population comparable in size to Sierra Leone. In Sierra Leone and Malawi, it looks probable that a combination of manpower shortages and a deliberate policy of keeping a small contingent of staff who could get around more quickly with the appropriate operational support prompted the government to allow non-staff expenditures to increase faster. Both Malawi and Sierra Leone are relatively small countries in terms of land area as well as human and livestock populations but rural population density is high. In the case of Botswana, staff expenditure in real terms declined by about 30% between 1970/71 and 1978/79. In Botswana, where the land area and the size of the livestock population are both large but the human population is small, shortage of available manpower would have encouraged the increase of both the absolute amount of non-staff expenditure and its share in the total livestock recurrent budget.

Fourthly, where considerable fluctuations or declines in staff expenditure occurred, one additional factor that could partly explain this situation is the possible replacement by nationals of directly contracted and highly paid expatriate staff. This is likely to have occurred in many countries as part of government policy to keep staff costs low or to keep them from increasing fast. Lack of data does not allow us to determine the extent to which this has taken place in

quantitative terms although one could observe indigenisation of service staff occurring in several African counties.[1]

1. There is a strong indication in Chad and CAR that, since 1971, expatriates have been replaced by national staff. For example, in Chad the number of national veterinary doctors increased from zero in 1970 to 14 in 1977, while the number of expatriates declined from 11 in 1976 to 7 in 1977 (IEMVT 1980). Some of these expatriates were provided through technical assistance programmes, but the reduction in their number could also have meant a reduction in the associated local costs borne by the recipient government.

Finally, in those countries where the amount and share of non-staff expenditure increased, this could have resulted from rising fuel costs for transport or from higher prices of veterinary requisites or similar inputs without the quantity of services being affected. Although these price-related factors, especially fuel costs, should have affected all the countries, few of them could afford to continue allocating finance (including foreign exchange) to purchase higher cost inputs to even maintain the services at the previous level. Again, we could not determine the portion of the increase in non-staff costs attributable to these price-related factors.

Environment as a determinant of staff to non-staff expenditure ratios

The ratio of staff to non-staff costs could be affected by the environment. For example, different livestock densities and disease incidences give rise to different cost structures in animal health services. If we were to look at the staff to non-staff expenditure ratios under different environments, it may be possible to detect a similar (different) pattern within (between) environmental groups. Table 9 provides more detailed figures for countries grouped by ecological zone. This time we use ratios of non-staff to staff expenditure.

What the figures shown in Table 9 tell us is the amount of non-staff expenditure made for every unit of money spent for staff salaries and wages. For example, in Burkina Faso one could say CFA 13 were spent to meet non-staff costs for every CFA 100 spent to meet staff costs in 1970/71. The corresponding figure in 1978/79 is CFA 10 for every CFA 100. In the context of Table 9, a figure of less than 1 would mean that staff expenditure take a larger portion of the total livestock recurrent expenditure while the reverse is true for figures of more than 1. The ratio figures in Table 9 were calculated from data given in Annex Table A 8.

The 1972/73 weighted average ratio for the 10 countries classified under the arid/semi-arid (ASA) zone is about 0.96 while that of the 7 countries in the humid/subhumid zone is 0.58. A comparable figure could not be calculated for the countries in the highland zone. Considering the different livestock densities in the two zones, the figures indicate that non-staff costs are higher, relative to the staff category, in the ASA zone than in the humid/subhumid areas. In this regard, a major item in the non-staff expenditure category would be transport costs incurred in order to reach a more mobile or scattered livestock population. No data are available for all countries to determine what proportion of the non-staff expenditure transport and other costs constitute. Later in the chapter, we will provide information on apparent trends regarding this aspect for those countries with available data.

Looking at the figures in Table 9 above and Table A 10 in the annex, the declining proportion of non-staff expenditure in most of the countries reviewed clearly indicates that livestock services

faced severe operating constraints. In order to gain more insight into the adequacy of budgetary allocations to non-staff expenditures, we further looked into the financial (non-staff) resources at the disposal of livestock services staff in the different countries. Annex Table A 11 presents data for selected years, on the amount of yearly non-staff expenditure (NSE) per staff of all categories as well as NSE per TLU. Data covering more than one of the three selected years are available only for 13 countries.

Components of non-staff expenditure (NSE)

This section briefly looks at the main components of non-staff expenditure on livestock services.

Within the non-staff category of expenditure, transport and travel costs, and expenditure on veterinary requisites, such as drugs, vaccines, sera and semen are two crucial groups of items in the provision of services. Table 10 presents information on these components of NSE in some East and Southern African countries where data over a period of selected years are available. It was not possible to determine what proportions of the changes in the percentage shares of the components involved were brought about by variations in either the quantity or the price or a combination of both. However, one can say that the proportion allocated to the two components of non-staff expenditure (i.e. transport and veterinary inputs) increased in almost all the countries of East and Southern Africa.

Table 9. *Non-staff to staff expenditure ratios[a] by ecological zone.*

Zone/Country	70/71	72/73	74/75	76/77	78/79
Arid/semi-arid					
Botswana	1.22	1.22	1.86	1.70	2.12
Burkina Faso	0.13	0.16	0.12	0.10	0.10
Chad	0.43	0.27	0.18	..	..
Gambia	0.25	0.31	0.28	0.33	0.43
Mali	1.08	1.27	0.47	..	..
Mauritania	1.13	0.41	..	0.49	0.39
Niger	0.82	0.79	0.67	0.70	0.64
Senegal	0.33	0.35	0.20	0.18	0.18[b]
Zambia	2.70	2.03	1.50	1.17[b]	1.00
Zimbabwe	1.04[c]	1.27	..	0.75	0.85
Average[d]	1.13	0.96	0.66	0.70	0.67
Subhumid/humid					
Benin	0.25	0.28	0.23	..	..
CAR	0.59[c]	0.43	0.62	0.50	0.05
Côte d'Ivoire	0.39	0.43	0.35	0.45	0.35

Malawi	0.96	1.17	1.22	2.12	1.22
Sierra Leone	1.13	1.33	3.16	2.46	2.45
Swaziland	0.92[c]	0.85	0.61	0.59	0.54
Togo	0.10	0.07	0.06	0.14	0.09
Average[d]	0.56	0.58	0.49	0.70	0.52
Highland					
Ethiopia	0.18	0.18	0.21	0.23	0.30
Kenya	..	..	1.56	1.08	1.44
Lesotho	0.67[c]	0.67	0.72	0.67	0.47

a. See text for explanation of calculation and interpretation

b. 1977/78

c. 1971/72

d. Weighted by the proportion, for each country, of the total amount of staff expenditure in each zone.

".." data not available

Sources: Anteneh (1983; 1985; and unpublished data for Ethiopia, Lesotho and Swaziland).

In Botswana and Malawi self-contained disease control campaigns are treated as a separate activity from that of veterinary services proper. In such cases, all cost components — i.e. transport, veterinary requisites and other non-staff expenditure items — are accounted for under that heading. As a consequence, the relative share of the transport and travel component would definitely be understated in such cases.

Table 10. *Main components of non-staff expenditure (NSE).*

	1970/71			1974/75			1978/79			1981/82		
	Percent share in total NSE											
Country	TR	VR	ONSE	TR	VR	ONSE	TR	VR	ONSE	TR	VR	ONSE
Botswana	37	31[a]	32	29	32	39	8	51	41	9	54	37
Kenya	..	..	..	20	7	73	40	6	54	49	12	39
Lesotho	36	..[b]	64[c]	35	15	50[d]	31	7	62	41	2	57
Malawi	14	6	80	28	8	64	42	7	51	37	14[a]	49
Swaziland	16	..[b]	84[c]	..	..	..	49	..[b]	51	51	..[b]	49
Tanzania	3	20	77	2	24	74	4	44	52	4	64	32
Zambia	14	25	61	16	37	47	17	28	55	16	21	63
Zimbabwe	36	10	54 [c]	..	..	..	50	20	30	57	19	24

TR = Transport and travel including per diems

VR = Veterinary requisites mainly consisting of drugs, vaccines, sera, semen and directly related consumables (e.g. drug administration gear)

ONSE = Other non-staff expenditure including mainly casual labour

".." = Data not available

a. VR includes disease control campaign expenditure with no breakdown by components for all years for Botswana and for 1981/82 for Malawi

b. VR included in ONSE

c. 1971/72 for all components

d. 1975/76 for all components

e. 1980/81 for all components

Source: Anteneh (1985).

4. Sources of financing

Sources of financing here mainly relate to domestic sources, although external funding including grants, loans and technical assistance, does play an important source of financing for many of the countries considered (see Anteneh, 1983 and 1985). Domestic sources further relate to fiscal instruments used by governments to raise general revenue from the livestock sector irrespective of whether such revenue is wholly available to the financing of the sector. Indirect taxes on external and internal trade in livestock and livestock products are normally treated as part of the central government revenue. Even where user-specific charges are imposed and collected, there is no assurance that these get to be directly allocated to the funding of livestock services. There is also no way of determining what proportion of the amounts collected are recycled. At this stage, a brief presentation of the available information on sources of finance will help in appreciating the absolute level of funds raised from the livestock sector as well as the relative (potential) contribution of livestock-related revenue to meeting the financing requirements of the services.

Livestock-related revenue

As noted elsewhere (Anteneh, 1983 and 1985), we use the term "livestock-related revenue" to denote all government revenue raised from taxes (other than income or profit taxes from livestock production activities) and other charges. There is a marked difference between West and Central (WCA) on the one hand, and East and Southern African (ESA) countries on the other, as to the way these revenues are treated. Most WCA countries, prior to the drought in the 1970s, raised revenue from the livestock sector through both direct and indirect taxation. Direct taxes in the form of livestock head taxes have either been suspended or discontinued since the drought and most of those countries considered here seem to have shifted to sources based on indirect taxes and charges.

The type of taxes and charges applicable to livestock in the 13 WCA countries has been reported in Anteneh (1983, Annex Table E). French-speaking countries in West and Central Africa have basically similar instruments through which they raise livestock -related revenue. These include external and internal trade taxes, licensing fees and user charges. There is a multiplicity of taxation instruments employed and a wide diversity of conditions under which these are applied (e.g. concessions to different reciprocal groupings such as CEAO, EEC-associated countries, etc.). Beyond that the lack of data on the volume and value of trade and on the number of producers or animals affected under the different categories make it difficult to provide the total amounts of taxes and charges raised in most of these countries. In general, however, substantial amounts seem to have been raised from indirect taxation sources, even after allowing for uncontrolled trade in animals or evasions by livestock traders. Just to give some order of magnitude, the information provided for the 3 countries in Table 11 shows that taxes on live animal exports alone constituted an important proportion of the livestock budget in the early 1970s. Mali, Mauritania and Niger are important livestock exporting countries. Although no data are available to determine the contribution of total livestock-related revenue to agricultural revenue, particularly that not generated from income or profit taxes, there is no doubt that, as a whole, taxes, fees and other charges on livestock in combination form an important source of tax revenue.

In all three countries, livestock export taxes declined substantially after 1971/72. Supplies of live animals did certainly decline as a result of the drought in the early 1970s and this was probably a major cause for the decrease in export tax revenue. The three Sahelian countries are major suppliers to the meat importing countries of the coastal states of West Africa. The latter have shifted to non-Sahelian and non-African sources of supply as a consequence of the drought-induced shortages and the instability of Sahelian supplies. Additionally, competition from non-Sahelian sources (including EEC subsidized beef supplies) could have exerted a downward pressure on export prices on which ad valorem taxes are based.

Table 11. *Revenue from duties on live animal exports.*[a]

Country	1970	1971	1972	1973	1974
	in millions current CFA and percent				
Mali					
Revenue	170	182	150	115	93
Livestock budget	137	154	148	142	174
Revenue/budget (%)	124	118	101	81	53
Mauritania					
Revenue	18	10	21	26	22
Livestock budget	140	163	174	157	135
Revenue/budget (%)	14	6	12	16	16
Niger					
Revenue[b]	127	178	223	213	165
Livestock budget	262	270	281	302	328
Revenue/budget (%)	48	66	79	70	50

a. Based on export duty rates per head of livestock (cattle and sheep/goats only) and on the total number of officially recorded exports

b. Includes a small proportion (< 7%) of taxes on meat exports

Sources: Revenue calculations based on export figures and duty rates reported in GTZ/SEDES (1976); Anteneh (1983) for livestock budget data.

Data on the amount of livestock-related government revenue for East and Southern African countries are again scant. During the 1970s livestock head taxes were not used to raise revenue in any of the reviewed countries in the region. For other revenue types, only data for Botswana, Ethiopia, Lesotho, Swaziland and Tanzania-are available from official publications. The revenues are raised from livestock-based external and internal trade taxes, fees and other charges. Table 12 below presents data on such government revenue for selected years and compares the respective livestock budgets to the livestock-related revenues raised.

Tables 11 and 12 show that in many of the important livestock countries livestock-related revenue contributed the equivalent of no less than one-third of the recurrent livestock budget. The case of Ethiopia makes it quite evident that livestock services which seem to be underfunded and understaffed could benefit from a larger allocation from these sources. It is not of course realistic to talk about allocating all livestock-related revenue to livestock services but it may be so in regard to user fees directly related to the provision of services. We now turn to considering this aspect.

Table 12. *Livestock-related revenue and government recurrent livestock budgets in some East and Southern African countries (national currencies in current prices).*

Country	1970/71	1972/73	1974/75	1976/77	1978/79	1980/81
Botswana (000 Pula)						
Revenue	315	358	622	1056	1226	1357
Livestock budget	1155	1277	2567	2623	3794	8499
Revenue/budget (%)	27	28	24	40	32	16
Ethiopia (000 Birr)						
Revenue	4205	5976	4092	4474	5929	6592
Livestock budget	1982	2768	3142	3376	3570	1160
Revenue/budget (%)	212	216	130	132	166	568
Lesotho (000 Maloti)						
Revenue	233[a]	256	208	332	386	352
Livestock budget	278[a]	280	346	827	1546	2293
Revenue/budget (%)	84	91	60	40	25	15
Swaziland (000 Emalangeni)						
Revenue	118[a]	100	90	105	107	73
Livestock budget	654[b]	648	831	1175	2486	2980
Revenue/budget (%)	18	15	11	9	4	2
Tanzania (000 Tsh) [b]						
Revenue	5190	..	4398	6110	15989	33161[c]
Livestock budget	29169	..	23686	25262	90234	96142[c]
Revenue/budget (%)	18		19	24	18	34

a. 1971/72

b. Data up to and including 1976/77 are only for central government while figures for 1978/79 and 1980/81 include regional budgets and revenues

c. 1981/82

".." = Data not available

Sources: Anteneh (1985; and unpublished data for Ethiopia, Lesotho and Swaziland).

Livestock services revenue (LSR)

The term livestock services revenue (LSR) is used to denote government revenue mainly from user fees and charges (including sale of inputs such as drugs, vaccines, etc.) as well as, in some cases, revenue generated from the sale of produce from service-related activities such as livestock research stations. They exclude livestock head taxes, trade taxes etc. imposed by governments. Much of the quantitative data in this regard are presently available only for the East and Southern African (ESA) countries and have been reported in Anteneh (1985) for six countries.

Funds raised by this means, particularly from user fees and charges, are a source of finance to which managers of livestock services can lay a legitimate claim. Such a claim can be envisaged in one of two ways. When the livestock service departments themselves can collect and utilize such funds to defray their operating costs in whole or in part, the claim is direct and unequivocal — the authority and responsibility for the expenditure rests with the departments. Where funds so raised and collected by the departments have by law to revert to the central treasury, the authority to allocate the funds to the services rests with central government. The claims in the latter case are indirect but still legitimate, because funds are made up of user-specific revenues raised in the exclusive domain of services offered by the departments which, however, do not have the authority to allocate or spend them.

It would thus seem reasonable to compare the performance of different countries in this respect not only to see the extent to which such revenues contribute to expenditure but also as a reflection of government policy on cost recovery. Table 13 presents information on the proportion of livestock recurrent expenditure covered by livestock services revenue over a period of years.

Table 13. *Livestock services revenue (LSR) as a proportion of LRE and NSE in some East and Southern African countries.*

	1970/71		1972/73		1974/75		1976/77		1978/79	
	Percent share in									
Country	LRE	NSE	LRE	NSE	LRE	NSE	LRE	NSE	LRE	NSE
Botswana	2	3	4	8	6	10	18	28	19	28
Ethiopia	18	118	8	55	7	41	13	70	10	45
Kenya	..	..	..	..	26	42	39	74	14	24
Lesotho[a]	15	39	23	56	16	38	20	45	13	40
Malawi	34	69	32	59	45	82	34	49	24	44
Swaziland[a]	14	29	11	25	7	17	7	20	4	10
Tanzania[b]	10	20	..	..	7	12	23	41	18	26
Zambia	1	1	..	..	1	1	2	2	2	2

LSR = Revenue from veterinary service fees, sale of drugs, etc. plus sale of produce
LRE = Recurrent expenditure on livestock services or livestock recurrent expenditure
NSE = Non-staff expenditure
".." = Data not available

a. Data for 1970/71 are from 1971/72

b. Percent shares calculated exclude revenue collected (LSR) and expenditures made by regional administrations.

Source: Anteneh (1985, and unpublished data for Ethiopia, Lesotho and Swaziland).

Except for Botswana where the proportion of livestock services revenue in both LRE and NSE has steadily increased, all other countries' percentage figures show generally (and in cases like Ethiopia, sharply) declining trends. Despite this, the figures for most countries (excluding Tanzania whose data tend to be particularly unreliable) show that livestock services revenues represent an important proportion of the non-staff expenditures in particular.

Changes over time in the proportion of expenditure generated from livestock services revenue (LSR) could have occurred as a result of the fluctuations in the absolute level of total recurrent and non-staff expenditure on livestock services and in revenue amounts. A comparison of the real growth rates of the three values (i.e. LSR, LRE and NSE) should partially explain the extent to which the different countries have made an effort (both in terms of policy making and implementation) to recover costs in the face of increasing real costs of government services. In Table 14 below these comparisons are made on a per TLU basis to further capture the effect of changes in the livestock population over time.

Table 14. *Annual growth rates of LSR, NSE and LRE per TLU (1975 constant prices*).

	Annual growth rates (%): 1970/71 – 1978/79		
Country	LSR	NSE	LRE
Botswana	23.8	– 4.0	– 6.6
Ethiopia	– 2.2	10.9	5.2
Kenya[a]	– 14.3	– 0.8	0.0
Lesotho[b]	13.6	12.3	15.9
Malawi	– 0.4	5.5	4.0
Swaziland[b]	– 2.5	11.4	16.6
Zambia	6.	– 6.8	– 2.3

LSR = Revenue from veterinary service fees, sale of drugs, etc. plus sale of produce
LRE = Recurrent expenditure on livestock services or livestock recurrent expenditure
NSE = Non-staff expenditure

a. 1974/75 - 1978/79
b. 1971/72 - 1978/79

Source: Anteneh (1985) and Annex Tables A 3, A 4, and A 10.

It is known that AI and dipping services in Kenya have been heavily subsidized (see FAO 1981; CTA, 1985). In Swaziland, dipping chemicals have been provided free to producers during the 1970s (CTA, 1985). On the other hand, most of the veterinary requisites for treatment are directly or indirectly paid for by users in Botswana (e.g. through the livestock advisory centres). In Lesotho, an established revolving fund caters to livestock producers who require animal health and husbandry inputs. It is clear from Tables 13 and 14 how these differing policies have affected the pattern of growth in LSR and the proportion of total livestock recurrent expenditure and its non-staff category which it has been possible to recover by charging for certain services. Other things being equal, where the real cost of services is increasing, there is very little economic or financial justification for increasing the level of subsidy to the services. This is particularly true for those livestock services from which benefits exclusively accrue to the producers.

There is, however, one qualification we need to make considering the practical realities of policy-making in most of Africa. In earlier discussions, we have dealt with the structure of expenditure in terms of the proportion taken up by the staff and non-staff categories. Probably one of the important reasons why staff expenditures could not be adjusted downwards in the face of absolutely necessary budget cuts is that most governments have been unable or unwilling to make a corresponding adjustment in the level of staffing. As a consequence, budget cuts have instead inevitably resulted in severe reductions in the non-staff categories of expenditure. In view of this, it could be argued that cost recovery policy should aim to charge users only for that part of expenditure on which governments themselves are willing or able to exercise control in the first instance. In such cases staff costs which producers have no power to influence would have to be borne by the treasury regardless of whether the service provided is user-specific and benefits producers individually.

5. Recurrent expenditure and staffing of livestock services in the 1980s

As stated in the introductory chapter, here we briefly discuss how recurrent expenditure and staffing of livestock services have evolved since the end of the 1970s. Comparative data for some countries on some of the more important variables of expenditure and staffing are presented in Annex Tables B 1 to B 6. These data will provide the basis for a general assessment of whether changes which have taken place in the 1980s would materially affect our analyses. The data for the mid-1980s are drawn from a recent follow-up study carried out by World Bank staff (de Haan and Bekure, 1989). At the end of the chapter we briefly review and summarize the initial experience with reforms reported in the study. Besides providing a picture of what has taken place in respect of the reform initiatives started before or since the end of the 1970s, this would also serve as an input in the discussion about policy implications at the end of the report. The World Bank study acknowledges that findings from our research project reported here and earlier have substantively contributed to the formulation of the reform initiatives.

The amount of expenditure

Annex Table B 1 presents data on livestock recurrent expenditure per TLU in 1978/79 and 1985/87 for 13 countries for which corresponding data are also available from de Haan and Bekure (1989). The 1985/87 data are given in 1980 prices. Exchange rate adjustments have affected mid-1980s expenditure levels in Kenya, Tanzania and Zambia. CFA zone West and Central African countries were less affected by such adjustments (de Haan and Bekure, 1989 p. 34). High inflation seems to have affected the levels in Mauritania, Niger, Zambia and Tanzania. Inflation rates during 1973–83 in Burkina Faso, Botswana, Cameroon, CAR and Côte d'Ivoire have been lower (World Bank, 1986) than the average increases in expenditure levels between 1978/79 and 1985–87; the figures for the latter year are calculated in 1980 prices, while 1978/79 figures are in 1975 prices. Between 1978/79 and 1985/87 livestock populations grew quite fast in Niger and Zambia.

In nominal terms, livestock recurrent expenditure levels overall are higher in 1985–87 than in 1978/79. As in 1978/79 (see Chapter 6) the richer countries (Botswana, Cameroon, Côte d'Ivoire) continue to spend more on livestock services than the poorer ones both in nominal and real terms (de Haan and Bekure, 1989).

The composition of livestock recurrent expenditure

Annex Table B 2 shows the share of staff expenditure (salaries and allowances) in total livestock expenditure for 10 countries for which again corresponding data are available. While the overall average figure for the share of staff expenditure remains at about the same level (70%), we note that, in fact, in Botswana, Burkina Faso, Kenya and Zambia there have been sharp increases in this share. The report by de Haan and Bekure (1989) states that if Côte d'Ivoire was excluded from the West Africa region the average staff to non-staff expenditure ratio worsens to 75/25 (p.

35). It is further worth noting the particular situation in Kenya, Zambia and Mauritania. In the former two countries, the share of staff expenditure in total livestock recurrent expenditure increased while the amount of expenditure in 1985-87 (1980 prices) was actually lower than in 1978/79. This share remained constant in Mauritania.

Annex Table B 3 shows that the amount of non-staff expenditure per staff (i.e. the non-salary operating funds available to each staff of all categories) has declined since 1978/79 in 5 out of 7 countries for which comparable data are available. The 1985–87 figures are again in 1980 prices implying that, if taken at 1975 constant prices, the decline is likely to be much sharper.

In our analysis of 1978/79 data, we postulate that the high share of staff salaries and allowances contribute to the deterioration of livestock services by denying staff operating funds for transport and inputs. This has continued to hold true for the 1980s.

Staff numbers, proportions and staff intensity

Annex Tables B 4 through B 6 present data related to the total number of staff and staff intensities for 10 countries in the two periods under consideration. The total number of staff of all categories has increased in all countries reaching about double the overall number in 1978/79 (Annex Table B 4). Again, although overall increases in the number of high-level staff were higher than that of auxiliary personnel, growth in the former was stronger in the West and Central African countries. In the East and Southern African countries larger increases occurred in the number of auxiliary personnel (de Haan and Bekure, 1989 p. 33).

Annex Tables B 5 and B 6 present comparative data on livestock to staff, and high-level staff to auxiliary personnel ratios in 1978/79 and 1985/87. These ratios represent what we called staff intensity in Chapter 2. Staff intensity is higher where the average number of TLU each staff member deals with or the average number of auxiliary personnel each high-level staff supervises decrease. The reverse is true for lower staff intensities.

As we see in Annex Table B 5 staff intensity relative to livestock numbers handled by staff of all categories has substantially increased in 1985/87 in almost all the countries considered. Staff intensity relative to the number of auxiliary personnel supervised by high-level staff increased in 6 out of 9 countries. As noted earlier, because increases in the number of high-level staff between 1978/79 and 1985/87 were larger in the West and Central African countries, the increase in staff intensity was much sharper there than in the East and Southern African countries.

Despite the fact that staffing intensity already exceeded recommended levels in the framework of the range and complexity of functions prevailing in the 1970s, governments have continued to employ staff in ever greater numbers to serve in the livestock services. This has tended to increase the erosion of non-staff expenditures available to the services. In another respect, the overall greater number of high-level staff in the mid-1980s should theoretically indicate a shift from extensive to intensive functions which may favourably affect yield per animal or per herd. The low share of non-staff expenditure still remains a crucial problem.

Initial experiences with reforms

Against the background of deteriorating public services and an increasing demand for livestock services,[1] particularly veterinary care, de Haan and Bekure (1989) provide information on the initial experiences with the reforms which have taken place in the past 10 years. As it stands, external donors (World Bank, EEC, FAC, GTZ and ODA), who dominate the funding of livestock development in Africa, played a prominent role in the consideration of such reforms by attaching strong conditionalities to project/program loans or grants. The following covered the most common areas of reforms (de Haan and Bekure, 1989):

(a) increased liberalization of drug importation, distribution and administration;

(b) progressive privatization of veterinary services at professional veterinarian, middle-level and auxiliary staff and producer levels;

(c) increased cost recovery by government services in the transition period to privatization for those activities which will remain in the public domain in the longer term.

(d) rationalization of the cost structure of government services and functions in the framework of the reforms under (a)-(c) above.

1. de Haan and Bekure (1989) put forward the following points to explain the causes for the increased demand:

a. Increased awareness of traditional herders of the benefits of veterinary care, particularly after the resurgence of rinderpest, and their willingness to pay for good services;

b. Widespread ownership of and investment in livestock by nontraditional livestock keepers (e.g. crop farmers, civil servants and traders) who are much more dependent on outside assistance for veterinary care than traditional herders;

c. Increased movement of relatively large livestock populations from areas with relatively low disease challenge (arid and semi-arid zone) to the more humid areas with higher disease incidence (including animal trypanosomiasis) and animal health control requirements;

d. More favourable livestock: veterinary input price (mainly drugs) ratios at national or regional level making veterinary care more affordable by all classes of livestock producers.

The paper by de Haan and Bekure (1989) looked at about 23-25 countries in sub-Saharan Africa. While it is too early to assess the impact of these reforms — most were introduced in the late 1970s or early 1980s — initial indications are reported to be encouraging.

i. Liberalization of drug imports and distribution (i.e. transfer of responsibility to the private sector) has resulted in increased drug availability in several countries. Drug distribution by producer groups has been particularly encouraging.
ii. Privatization at the professional level has been confronted by incentive problems. These arise from such factors as unfair competition from free or highly subsidized government services, uncertainty in the availability of drugs and equipment and perceived poor financial returns in pastoral areas. Generous incentives for this group are envisaged for future introduction.

Progress in privatization of veterinary services at the nonprofessional and producer levels is reported to be encouraging, particularly where integration of non-professional staff with producer groups could be achieved.

iii. Cost recovery policy is the most widely introduced reform in sub-Saharan African veterinary services. Fifteen of the 25 countries covered have by 1988 instituted full cost recovery for non-compulsory vaccinations (e.g. anthrax, blackleg, pasteurellosis, theiluric diseases). In compulsory vaccinations about 75% (19) of the countries provide free services, only 6 countries charging full cost. Seventeen countries charge full cost for drugs but surprisingly fewer countries (only 7 out of 25) have a policy of full cost recovery for clinical interventions by government veterinary services.

The introduction of cost recovery is justified on the grounds that it would reverse the deterioration of services by reducing the budgetary burden on government without adversely affecting the demand for certain services in the longer term by "a willing-to-pay" clientele. Initial experiences with cost recovery reform in 2 countries (Kenya and CAR) suggest that it is also justified on efficiency and equity grounds - - greater availability of the services overall and greater access to them by poorer livestock producers (de Haan and Bekure 1989). Cost recovery and recycling of funds collected through user fees offer additional efficiency gains. User fees directly link cost and revenue as well as motivate staff to collect and users to pay the fees resulting in less erratic budgetary allocations and in more sustainable services rendered. In 1988 about one-third of the 25 countries covered recycled revenue back to livestock services (de Haan and Bekure 1989).

There is as yet no strong evidence that reforms to rationalize government services in order for them to concentrate on the provision of purely public goods such as research, extension and health inspection activities have taken off the ground. In regard to balancing the salary and non-salary cost structure, the discussions presented earlier in this chapter support that the trends and patterns evident in the 1970s have largely continued into the 1980s, despite the initial experiences summarized above. Thus as far as government services are concerned, the subsequent analyses we present based on 1970s data are still largely relevant.

6. Factors influencing the patterns of expenditure and staffing

In this chapter we examine the factors which are likely to be determinant of the patterns and trends of recurrent expenditure on and staffing of livestock services discussed in the preceding chapters. In Chapter 2 we showed that, overall, livestock production is an important economic activity in the countries we consider. The agricultural sector is dominant in these economies. In the first section of this chapter we take this a step further and try to gauge the importance governments attach to livestock services relative to the services covering the whole agricultural sector in terms of the respective recurrent expenditures allocated by governments. The subsequent sections present an analysis of how different determinant factors affect the relative level and the absolute amount of recurrent expenditure on livestock services. Linear regression analysis based on cross-sectional data is used to estimate the coefficients. In the most part, we only report and discuss those results with significant outcomes, although we considered numerous other variables (about 7 dependent and 28 independent) in the analysis.

Recurrent expenditure on livestock in recurrent expenditure on all agricultural services

Share of livestock recurrent expenditure in total recurrent agricultural budgets

We examined the expenditure patterns in connection with the share of livestock recurrent expenditure (LRE) in recurrent expenditure on all agricultural services (ARE). We also compare the respective growth rates of LRE and ARE over the years. Data on recurrent expenditure on all agricultural services are only available for 12 countries. Tables 15 and 16 below present information respectively on shares and growth rates for 6 West and Central and 6 East and Southern African countries.

The data in Table 15 are provided for three selected years spaced in such a way as to enable us to capture as much of the available information as possible and present a comparison over similar periods of time. The last two columns of the table consist of the percentage shares of livestock and agriculture in agricultural and total GDP respectively. In this respect, one can see that in 1978/79, most governments put into livestock services a considerably lower proportion of their agricultural budgets than what livestock contributed to agriculture in these essentially agriculture-based economies. The 6 East and Southern African countries allocated to livestock recurrent expenditure much larger percentage shares of their respective recurrent budgets on all agricultural services compared to the 6 West and Central African countries (Table 15).

Table 15 presents data on the share of livestock recurrent expenditure (LRE) in total agricultural recurrent expenditure (ARE) over time. We see that this share, although already rather low at the start of the period, has further declined in about half of the countries considered. This reflects the fact shown, in Table 16, that in these countries recurrent government expenditure on livestock services actually decreased (Botswana) or increased at a slower rate (Chad, Gambia, Niger, Ethiopia and Malawi) than expenditure on all agricultural services. Obviously the varying length of the periods over which annual growth rates are calculated could make a difference, but lack of data have made it impossible to use identical periods for all countries. Gambia and Niger in West and Central Africa and Ethiopia in East and Southern Africa show growth rates in agricultural

recurrent expenditure (ARE) substantially larger than that for livestock (LRE). Niger and Ethiopia have large ruminant livestock populations.

Table 15. *Percent share of recurrent livestock expenditure in recurrent agricultural expenditure, by region.*

Region and County	IRE/ARE			LGDP/AGDP	AGDP/Total GDP
	Percent				
	72/73	75/76	78/79	78/79	78/79
West and Central Africa					
Burkina Faso	15	18.3	16.2	29	42
Cameroon	..	9.4	13.7	10	31
Chad	3.6	4.0	..	37	49
Gambia	11.6	3.7	3.2[a]	21	39
Niger	..	16.0	7.9	29	57
Sierra Leone	2.7[b]	3.1	4.9	7	45
East and Southern Africa					
Botswana	48.0	55.0	44.0	..	21
Ethiopia	27.2	21.8	10.8	33	45
Kenya	..	32.0	34.0	40	28
Lesotho	22.1	27.2	27.8	58	..
Malawi	24.0	23.0	21.0	6	37
Swaziland	43.9	75.3	47.5	16	25

LRE = Livestock recurrent expenditure
ARE = Recurrent expenditure on all agricultural services
Total GDP = Total Gross Domestic Product
".." = Data not available
a. 1977/78
b. 1973/74

Sources: As in Table 1.

Table 16. *Annual growth in livestock and agricultural recurrent expenditure, by region (1975 constant prices).*

West and Central Africa			
Country	Period	LRE	ARE
Burkina Faso	1972/73–1978/79	2.5	1.2
Cameroon	1975/76–1978/79	12.3	–0.8
Chad	1971/72–1975/76	22.3	27.4
Gambia	1972/73–1977/78	38.1	78.7
Niger	1975/76–1978/79	11.1	40.6
Sierra Leone	1973/74–1978/79	19.9	6.4
East and Southern Africa			
Botswana	1970/71–1978/79	–0.4	1.9
Ethiopia	1970/71–1978/79	5.5	16.5
Kenya	1974/75–1978/79	8.1	7.3
Lesotho	1970/71–1978/79	15.1	11.9
Malawi	1970/71–1978/79	9.8	13.3
Swaziland	1971/72–1978/79	17.3	15.6

Sources: Calculations based on data in Anteneh (1983; 1985 and unpublished data for Ethiopia, Lesotho and Swaziland).

The "R" ratio

On a more normative scale, we tried to construct a quantitative indicator to show whether governments allocate recurrent expenditure to the extent that they ought to have done. This is the coefficient resulting from the percentage share of recurrent expenditure on all agricultural services (ARE) in agricultural GDP (AGDP) divided by the percentage share of livestock recurrent expenditure (LRE) in livestock GDP (LGDP). We designate this as the "R" coefficient for the sake of brevity (see formula in footnote to Table 17 below). The ratio is meant to measure the "appropriateness" of livestock recurrent expenditure levels relative to the levels of recurrent expenditure on all agricultural services.[1]

1. A more detailed explanation of the background and rationale for using the measure are given in Anteneh (1983 and 1985).

Table 17 presents the results of the calculated ratios for countries grouped by ecological zone. Data are available for only 15 out of a possible 22 countries.

Table 17. *Relative ratios of expenditure to output by ecological zone.*

Arid/semi-arid	"R"[a]	Subhumid/humid	"R"	Highland	"R"
Burkina Faso	0.63	Cameroon	1.43	Ethiopia	3.33
Gambia	0.25	Côte d'Ivoire	3.33	Kenya	1.25
Mauritania	0.36	Malawi	3.33	Lesotho	2.50
Niger	0.26	Sierra Leone	0.77		
Zambia	0.20	Swaziland	0.31		
Zimbabwe	0.29	Tanzania	2.01		

a "R" calculated from the following:

$$R = \frac{\text{Agricultural recurrent expenditure (ARE)} \div \text{Agricultural GDP (AGDP)}}{\text{Livestock recurrent expenditure (LRE)} \div \text{Livestock GDP (LGDP)}}$$

Source: Anteneh (1983; 1985 and unpublished data for Ethiopia, Lesotho and Swaziland).

A ratio of less than 1 would mean that the countries are spending disproportionately less than the apparent contribution of livestock to agricultural output would indicate. The reverse will be true for a ratio of more than 1. This ratio could, of course, only be interpreted within the framework of the general level of government financial support to the agricultural sector. From Table 17 we can say that those countries in the arid/semi-arid zone on the whole tend to spend disproportionately less while those in the other zones tend to spend more.2

2. The arid and semi-arid zones hold about 57% and the humid zone about 6% of the total ruminant livestock population in sub-Saharan Africa. The balance (37%) is distributed about equally between the sub-humid and highland zones (Jahnke 1982). Countries' classification into the different zones is determined by whether more than 50% of the total ruminant livestock population (expressed in TLU) is found in a particular zone.

Analysis of the factors determining the patterns of recurrent expenditure and staffing

The level and amount of recurrent expenditure

We now turn to the more formal analysis of the relationships between recurrent expenditure and the different factors likely to be determinant of the pattern of livestock recurrent expenditure (LRE).

Simple linear regression models based on the ordinary least squares (OLS) method were mostly used to carry out the analyses. The exercise explored relationships between groups of dependent and independent variables (about 8 and 28 in each group respectively). However, in the most part of this section, we only report and discuss those relationships with significant outcomes.

In many instances, multiple regressions involving independent variables added stepwise were also tested. Most of these were dropped either because of serious collinearity problems or because of severe instability in the sign and the absolute value of the resulting coefficients.

All data used in this section are cross-sectional with the number of observations varying according to data availability from the countries considered in the study. Data with either absolute or relative values were used. Percent share values, particularly for the dependent variables, try to measure the relative weight of livestock recurrent expenditure within either the general level of government recurrent financial support to the agricultural sector or its equivalent value in the value of livestock output (LGDP).

We explain the reasons for using the different independent variables as we go through the analysis for each dependent variable. The subsections are formed on the basis of the dependent variables. In the first two subsections which follow, we tried to see if the tendencies indicated by the data presented in the preceding section would show significant relationships across countries.

Share of livestock recurrent expenditure in agricultural recurrent expenditure (LRE/ARE)

The dependent variable here - - the share of livestock recurrent expenditure in recurrent expenditure on all agricultural services - measures the relative weight governments attach to supporting the livestock sub-sector. The contribution (in percent) of livestock GDP in agricultural GDP (LGDP/AGDP) was used as the independent variable in a regression analysis to determine its influence on livestock's share in the government's agricultural budget (IRE/ARE). The hypothesis is that the degree of importance of livestock in agriculture would be determinant of the allocation of government recurrent budgets to livestock as a proportion of recurrent expenditure on all agricultural services. In other words, it would be expected that the higher (lower) the LGDP/AGDP proportion the higher (lower) IRE/ARE proportional values. Simple linear regressions for 19 countries, for which data were available, failed to show significant results.

Two other independent variables were used to explain the IRE/ARE variable — namely average income per caput (GNPC) and the percent of land area infested by tsetse (TTI). The hypothesis underlying the use of these independent variables is as follows.

In regard to GNPC, the income elasticity of demand for livestock products being high (see Jahnke 1982; von Massow 1989; de Montgolfier-Kouevi and Vlavonou 1983), countries with higher income per caput would prefer to spend more on the consumption of animal products. In order for livestock production to be able to meet the greater demand in the richer countries, governments would allocate expenditures to support livestock services which promote increased production. In short, it is expected that the richer a country, the larger the share of the government's agricultural recurrent budget (ARE) allocated to livestock recurrent expenditure (LRE).

Tsetse infestation and trypanosomiasis are major impediments to livestock production in many African countries where vast areas are excluded from exploitation. One might expect for countries with a high tsetse infestation to allocate a relatively larger share of agricultural recurrent expenditure (ARE) either to eradicate or control tsetse flies, or to control trypanosomiasis or to promote the expansion of trypanotolerant breeds or to undertake a combination of these measures. In brief, our initial hypothesis was that the higher the proportion of tsetse infestation the larger the share of LRE in ARE (LRE/ARE).

The results of the linear regression are as shown in Table 18. Data for LRE/ARE were only available for 12 countries. The raw data for TTI are presented in Annex Table A 12.

Over 70% of the total variation in the share of recurrent expenditure on all agricultural services (LRE/ARE) is significantly explained by the level of GNP per caput (GNPC) and the proportion of tsetse infested land area (TTI). The positive sign of the GNPC coefficient meets our initial expectation. The negative sign of the TTI coefficient is rather unexpected. There could be several reasons for this.

Table 18. Regression estimates for the share of real livestock recurrent expenditure in recurrent expenditure on all agricultural services (LRE/ARE).

Independent variable	Est. Coeff.	SE of Coeff.
Intercept	12.06	7.69
GNP_C	0.04	0.01***
TTI	– 0.16	0.07**

$R^2 = 0.71$

F = 10.85

N = 12

*** significant at the 1% level

** significant at the 5% level

Where

LRE/ARE = the share of livestock recurrent expenditure in recurrent expenditure on all agricultural services, 1978/79

GNP_C = the average annual income per caput in 1978/79

TTI = the percent of total land area infested by tsetse flies - 1978/79

Although 7 out of the 10 countries in our sample (20) with high tsetse infestation (> 50%) were relatively poor (GNP< $350), there is no overall significant correlation between GNP per caput and TTI and the correlation coefficient is negative. So it does not follow that highly tsetse-infested countries spend less than those with low tsetse infestation because they are also poorer.

In 6 out of the 12 countries for which data were used in the analysis, tsetse infestation exceeded 50% (range 65-100%) of the land area while on average livestock output formed about 18% (6-33%) of agricultural GDP. In the remaining 6 countries tsetse infestation was below 50% (range 0-46%) and livestock GDP contributed an average 43% (range 16-80%) to agricultural GDP. In most of the highly tsetse infested countries the size of the livestock sector is relatively small. Tsetse eradication, particularly by means of vegetation clearing and/or chemical spraying, involves high initial costs while there is a high degree of risk in re-infestation as experienced by many countries in the past. These factors in combination could have induced such countries to give greater emphasis to allocating recurrent expenditure budgets to agricultural services other than those supporting the livestock sector. In this regard, newer and less costly methods of tsetse or trypanosomiasis control have yet to be realised. In other respects, efforts to select and breed trypanotolerant animals would appear to have been at too an early stage, at the end of the 1970s, to have influenced the shift of resources to livestock services in the tsetse-infested countries.

Livestock recurrent expenditure per TLU (LRE/TLU)

In the preceding discussion, the share of livestock recurrent expenditure in agricultural recurrent expenditure (IRE/ARE) represented a relative value. We now use as the dependent variable the amount of livestock recurrent expenditure per TLU (LRE/TLU) in 1978/79 denominated in US$ at 1975 constant prices. Out of 7 explanatory variables considered, only that of annual average income per caput (GNPC) yielded a significant result as shown in Table 19. The rationale for using GNPC as an independent variable has been explained earlier. Livestock recurrent expenditure per TLU data (1978/79) for 18 countries were used in the analysis.

Table 19. *Linear regression estimates for real livestock recurrent expenditure per TLU (LRE/TLU).*

Independent variable	Estimated coefficient	SE of coeff.
Intercept	– 0.847	0.763
GNP_C	0.007	0.002***

$R^2 = 0.56$

F = 12.25

N = 18

*** significant at the 1% level

Where

LRE/TLU = livestock recurrent expenditure per TLU in 1978/79 (1975 $US)

GNP_C = 1980 annual real income per caput in US$.

Over 50% of the total variation in livestock recurrent expenditure per TLU (LRE/TLU) is explained by the level of GNP per caput. At any one point in time richer countries allocate more to recurrent expenditure per TLU.

Livestock recurrent expenditure per caput (LREC)

Poorer countries are more likely to have a relatively underdeveloped infrastructure such as roads. In these situations, reaching animals kept by a large number of independent herdowners who may also be scattered over extensive areas (e.g. countries in the arid zone) would entail high distribution costs and preclude large portions of the livestock populations from getting services at all. This may partly explain the lower absolute level of expenditure per TLU in the poorer countries, in addition to their problem of not having sufficient funds on hand. On the other hand, even in situations where poor infrastructure does not present a constraint, government livestock departments may prefer to provide services on a herd rather than on a per animal basis for technical as well as economic reasons. On this basis, we examined if livestock recurrent expenditure calculated on a herd basis is differently determined from expenditure per TLU.

The size distribution of herds kept by livestock holding households or persons are bound to vary greatly among the different countries. Due to the lack of such data, we use livestock recurrent expenditure per caput of the agricultural population (LREC) as a proxy to expenditure per herd to carry out our analysis. The raw data for LREC are shown in Annex Table A 13.

We examined several independent variables, including income per caput (GNPC), likely to explain the amount of expenditure per caput of the agricultural population (LREC). GNPC does not significantly explain LREC. The proportion of animal protein in total protein consumption (AP/TP) provided significant results as shown in Table 20. The raw data for AP/TP are presented in Annex Table A 14.

Table 20. The influence of animal protein consumption and tsetse infestation on real recurrent expenditure per caput (LREC).

Dependent variable	Independent Variable		Test Statistics		
	Intercept	Other	R^2	F	DF
LRE_C	– 1.813	0.142 AP/TP	0.45	13.02	16
	(1.861)	(3.641)			
LRE_C	2.661	–0.025 TTI	0.27	6.04	16

	(4.026)	(2.50)			

Where AP/TP = the proportion of animal protein consumption in total protein consumption in 1978/79.

Where TTI = the proportion of the total land area infested by tsetse.

Numbers in parenthesis are t statistics.

Ten out of the 18 countries in the sample have average per capita incomes exceeding US$ 350 per year. The share of animal protein in total protein consumption in most of these countries exceeds 20%.

It would appear that governments are ready to spend more (per caput or per herd) on livestock services to maintain or increase the consumption of animal products. Livestock products offer a highly concentrated source of nutrients and are thus especially valued as efficient sources of protein.

One other likely explanatory variable we examined in relation to the amount of livestock recurrent expenditure per caput was the proportion of the total land area infested by tsetse (TTI). The data were drawn from Jahnke (1982). In the regression analysis run, across the 18 countries included, LREC is negatively and significantly affected by TTI (Table 20). The TTI coefficient for LRE/TLU was negative and insignificant. Due to unavailability of data for earlier periods on the extent of tsetse infestation, we could not test the relationship between changes in livestock recurrent expenditure and TTI as was possible to do for the GNP and AP/TP variables.

One could underestimate the value of the above analysis on the grounds that in highly tsetse infested countries livestock recurrent expenditure per caput (LREC) would be low for the obvious reason that there are very few livestock or a few people keeping livestock. However, in the first instance one needs to point out that the LREC variable is based on the total agricultural population and not on the livestock keeping population alone. One would thus anticipate that high tsetse infestation would induce governments to spend more in order to open up new areas for increased livestock production as part of overall agricultural expansion. However, the analysis of the available data does not bear this out. In a regression run separately for those countries with more than 50% of their land area infested by tsetse, LREC was not significantly explained by TTI, although the sign of the coefficient turns positive. The TTI coefficient for those countries with less than 50% tsetse infestation is equally insignificant but its sign remains negative.

We cannot get very far by discussing the implications of these insignificant results, but it is obvious that the explanation of the level of livestock recurrent expenditure has little to do with tsetse infestation per se. The results are perhaps indicative of the need for more intensive research into cost-effective methods of tsetse control or trypanosomiasis treatment or trypanotolerant breed multiplication for governments to justify increased expenditure in tsetse infested areas.

Growth rate of livestock expenditure per TLU (d (LRE/TLU))

In a more dynamic setting, we now examine how growth rates in expenditure per TLU (dependent variable) are affected. The independent variables used are changes in income per caput (d (GNPC)), in the share of animal protein in total protein consumption (d (AP/TP)), and in the size of the total livestock population (d (TLU)). Growth rates in GNPC and AP/TP do not significantly explain inter-country differences in the growth rate of the amount of recurrent expenditure per TLU (d (LRE/TLU)). Prima facie it appears that governments did not take into account changes in the above factors (i.e. d (GNPC), d (AP/TP)) in budgeting for livestock recurrent expenditure over the years. From another perspective, given the greater readiness of richer countries to spend more on livestock services at a given point in time (Table 19), it could mean that higher income thresholds are necessary before income growth can positively and significantly affect changes in livestock recurrent expenditure.

Changes over time in the size of the livestock population (d (TLU)) are significantly but negatively related to growth rates in recurrent expenditure per TLU (d (LRE/TLU)). The regression results are shown in Table 21. The raw data for d (TLU) are given in Annex Table A 15.

Table 21. Linear regression estimates for the growth of real livestock recurrent expenditure per TLU (d(LRE/TLU)).

Independent var.	Estimated coeff.	SE of coeff.
Intercept	13.264	2.776***
d (TLU)	–2.564	0.913***

$R^2 = 0.33$

F = 7.88

N = 18

*** significant at the 1% level

Where

d (LRE/TLU) = average annual growth rate in real livestock recurrent expenditure during 1970/71-78/79

d (TLU) = annual growth rate in total livestock population during 1970/71-78/79.

As shown earlier both livestock recurrent expenditure per TLU and the TLU populations have increased over the period in consideration, although at differing rates (Table 2). Cost economies must partly explain the negative relationship in Table 21 - denser livestock populations mean savings in costs of travel and transmission of health care information to livestock producers. Further, expenditure allocations are much more affected by macro-economic situations such as the financial and monetary health of countries which may take little account of livestock population increases as a criterion.

The number of TLU per high-level staff (TLU/HL)

In Chapter 2 we described the overall pattern and trend of staffing in different countries in terms of staff intensity (measured by the number of TLU per total staff of all categories and per staff of different categories). Here we examine how staff intensities may have been determined.

Among several considered, only one independent variable, the percent of the total livestock population formed by cattle (CTLtlu), significantly explained one of the measures of staff intensity - - the number of TLUs per high-level staff (TLU/HL). In most countries government livestock services pay much greater attention to cattle than to other species. So the higher the CTLtlu value the greater the staff intensity (i.e. the smaller the number of TLUs each staff handles). The regression results are summarized in Table 22. The raw data for CTLtlu are presented in Annex Table A 16.

Table 22. Linear regression estimates for the number of TLU per staff of the high-level category (TLU/HL).

Independent var.	Estimated coeff.	SE of coeff.
Intercept	338.996	94.226***
CTL_{tlu}	– 3.269	1.218***

$R^2 = 0.36$

F = 7.21

N = 15

*** significant at the 1% level

Where

TLU/HL = the number of TLU (000 head) per high-level staff (HL) in 1978/79.

CTL_{tlu} = the percent of the total livestock population formed by cattle in 1978/79.

Non-staff expenditure

As discussed earlier in the report, the amount of real recurrent expenditure on livestock services (LRE) increased in most countries. We also found out that the portion of this expenditure made to meet personnel costs (staff salaries and allowances) increased at a faster rate than the non-staff category of expenditure (NSE) as well as total LRE (Tables 2 and 6).

Also as discussed earlier, in tight budgetary situations government allocation policy tends to affect adversely non-staff expenditure levels. As a consequence, the allocation of an insufficient amount and share of non-staff expenditure has been a crucial factor in the generally deteriorating livestock services of most African countries. Three dependent variables were considered: the amount of non-staff expenditure per TLU (NSE/TLU), the amount of non-staff expenditure made available per staff of all categories (NSE/staff), and the share of non-staff expenditure in total

livestock recurrent expenditure (NSE/LRE). An increase in the amount of total recurrent expenditure does not always result in an increased non-salary expenditure per TLU or per staff, or in an increased share of such expenditure in total livestock recurrent expenditure.

Livestock recurrent expenditure per TLU (LRE/TLU) significantly explained NSE/TLU as shown in Table 23. LRE/TLU is the closest quantitative indicator of government budgetary allocation policy in this respect.

Table 23. Linear regression estimates for real non-staff recurrent expenditure per TLU (NSE/TLU).

Independent variable	Est. coefficient	SE of coefficient
Intercept	0.127	0.113
LRE/TLU	0.309	0.038***

$R^2 = 0.80$

$F = 66.5$

$N = 19$

*** significant at the 1% level

Where NSE/TLU = non-staff recurrent expenditure per TLU in US$ at 1975 constant prices.

The LRE/TLU coefficient was also significant in the case of NSE/staff ($p < 0.05$); about 33% of the total variation was explained by the regression (Table 24).

The NSE/staff variable (data available for 13 countries) was significantly explained by the combined variables of the average livestock holding per caput of the agricultural population (TLUp) and LRE/TLU. The results are summarized in Table 24. The raw data for TLUp are shown in Annex Table A 17.

Table 24. Regression estimates for real non-staff recurrent expenditure per staff of all categories (NSE/staff).

Independent variable	Est. coefficient	SE of coefficient
Intercept	251.832	708.400
TLU_p	1471.406	453.332***
LRE/TLU	660.216	246.743**

$R^2 = 0.67$

$F_{2,11}$ (0.01) 10.35

$N = 13$

** significant at the 5% level

*** significant at the 1% level

Where

NSE/staff = non-salary recurrent expenditure made available per staff of all categories (i.e. high-level staff plus auxiliary personnel) in US$ at 1975 constant prices.

TLUp = the average livestock holding (in TLU) per caput of the agricultural population.

It would seem that the larger the average size of livestock holding per caput (expressed in TLU) the higher the amount of funds made available to staff for meeting the required costs of travel and material inputs.

Let us sum up the discussion in Chapter 6.

a) The more descriptive part of the chapter revealed that:
b) In 1978/79 most governments of the countries considered in the study allocated a disproportionately low share of their agriculture budgets to livestock recurrent expenditure than what livestock contributed to agricultural output.
c) In particular, those countries in the arid/semi-arid zones tended to spend proportionately less on livestock than the latter's apparent contribution to agriculture. The equivalent share of livestock recurrent expenditure in livestock output (LGDP) was higher for the countries in the humid and sub-humid zones which have relatively small livestock populations in terms of TLU.
d) On a regional basis, the West and Central African countries committed to livestock recurrent expenditure a proportion of the value of their livestock output (LGDP) considerably lower than that of the East and Southern African countries.
e) Four out of the 6 countries, where average annual growth in recurrent expenditure on all agricultural services substantially exceeded that of livestock recurrent expenditure, accounted for almost 25% of the livestock population in sub-Saharan Africa.
f) The formal regression analysis using cross-section data revealed that:
g) Average annual GNP per caput and the percent of the total land area which is tsetse infested significantly (but respectively positively and negatively) explain the share of real livestock recurrent expenditure in recurrent expenditure on all agricultural services.
h) Average annual GNP per caput positively and significantly explains the amount of real livestock recurrent expenditure per TLU.
i) The proportion of total protein consumed in the form of protein of animal origin and the percent of land area which is tsetse infested explain significantly (but respectively positively and negatively) the amount of real livestock recurrent expenditure per caput of the agricultural population.
j) The average annual growth in real livestock recurrent expenditure per TLU and the average annual growth in the livestock population are negatively and significantly related. On the other hand, annual average growth rates in GNP per caput and the proportion of animal protein in total protein consumption do not significantly explain the average annual growth in real livestock recurrent expenditure per TLU.

k) The percent of the livestock population formed by cattle significantly and negatively explains the number of TLU handled by each high-level staff.
l) The amount of real livestock recurrent expenditure per TLU and the average livestock holding (in TLU) per caput of the agricultural population positively and significantly explain the amount of real non-staff recurrent expenditure per TLU.

7. Conclusion and implications for policy and further research

Summary of findings

The preceding discussions on past patterns of expenditure and on the factors influencing these patterns have provided information on the quantity of services mostly in money terms. Analysis of the data available on staff numbers and categories also provided insight into the quantity of services in non-monetary terms. Staff to non-staff expenditure ratios as well as staff intensities (relative to livestock populations and between high-level and auxiliary personnel) have further provided some useful information on the factors which probably influenced inter-country differences in the quality of services. In addition, the analyses of the factors affecting the amount of expenditure, staffing intensity and the major categories of livestock recurrent expenditure have examined some relationships which could have resulted from conscious government policy.

Let us recapitulate the main findings of the report.

a. Past patterns of recurrent expenditure and staffing

- Livestock production is an important activity in sub-Saharan African countries whose economies are essentially agriculture based. At the end of the 1970s livestock output contributed on average about 25% of agricultural GDP in the 22 countries considered.
- African governments play a dominant role in the provision and funding of livestock services which generally put the greatest emphasis on disease control and animal health.
- During the 1960s and 1970s African governments were heavily dependent on external sources for funding major disease control and animal health programs and services. Inadequate domestic resource mobilization and insufficient restructuring of recurrent expenditure led to the resurgence of major epizootic diseases such as rinderpest, once external support was withdrawn.
- In the 1970s domestic funding of recurrent expenditure on livestock services constituted the equivalent of 3% of livestock GDP in the 22 countries.
- The amount of government real livestock recurrent expenditure per TLU increased during the 1970s.
- The real growth rate of staff expenditure was about double that of non-staff expenditure; at the end of the 1970s over 70% of total livestock recurrent expenditure was being made for staff salaries and allowances. Data from the mid-1980s show that the share of staff expenditure in total recurrent expenditure decreased in only one-third of the countries; the overall average share remains above 70%.
- The number of staff including all categories (i.e. both high-level and auxiliary personnel) increased during the 1970s. This trend has generally continued in the 1980s. Staff intensity — both in terms of declining TLU numbers per staff of all categories and of the declining number of auxiliary personnel per staff of the high-level category — increased since the end of the 1970s in most countries.

b. Sources of financing

- Livestock taxes (generally based on internal and external trade taxes) and charges form an important source of government general revenues particularly in those countries with important livestock sectors. Some data available for a limited number of countries indicate that such revenues represented on average 33% of livestock recurrent budgets during the 1970s.
- In the mid-1970s revenues generated by direct service-linked user fees and charges represented a relatively high proportion of the livestock recurrent (total and non-staff) budgets of most East and Southern African countries. By the end of the 1970s this proportion has declined but still represented at least 25% of non-staff expenditure in the important livestock countries of the region.

c. Determinant factors of expenditure and staffing

- Countries where more than 50% of their total livestock population is found in the arid/semi-arid zone and those others where livestock's contribution to agricultural GDP is important (> 20%) put into livestock services a disproportionately low share of their total recurrent expenditure on all agricultural services.
- Richer countries, countries with larger average herd sizes per caput of the agricultural population, and countries with a higher share of animal protein in total protein consumption, spent more per TLU or per herd on livestock services. Richer countries also spent a higher proportion of their agricultural recurrent expenditure on livestock services. Countries with larger average herd sizes spent more per head of staff of all categories.
- Annual growth rates (70/71 – 78/79) of GNP per caput and of the percent share of animal protein in total protein consumption could not significantly explain growth in livestock recurrent expenditure per TLU. The relationship between growth in the number of livestock (expressed in TLU) and growth in livestock recurrent expenditure per TLU (dependent variable) was significant but negative.

- Countries with high tsetse infestation and countries with high growth rates in their livestock population spent less per herd and per TLU respectively. The share of livestock recurrent expenditure in recurrent expenditure on all agricultural services was negatively and significantly affected by the proportion of tsetse infestation.
- In terms of staffing, high-level staff intensities per TLU were significantly greater — i.e. the number of TLU handled per staff of this category is smaller — where cattle form a higher proportion of the total livestock population.

Policy implications

Livestock policy objectives in the different countries of Africa tend to be very similar and generally address the following broad aspects:

- self-sufficiency goals: to increase the supply of domestic livestock products to meet all the requirements of domestic consumers;
- increased income and equity goals: for producers engaged in the livestock sector, particularly those usually referred to as "traditional" producers;
- nutritional goals: to meet national requirements of animal protein;

- increased foreign exchange earnings: from the export of live animals and/or livestock products;
- optimal resource use goals: related to sustainable and more stable production and consumption of animal products for present and future generations.

African governments have used a variety of policy instruments to support the achievement of most of these objectives. Budgetary allocations through which governments invest in direct livestock production or research as well as run portfolio livestock services represent one set of such instruments. Other instruments which are most common include price (including both output and input support policies), trade, marketing, credit and land tenure policies. Government budgetary decisions on the level and manner of funding the recurrent costs of livestock services are policy instruments with which African governments have had the longest experience. Yet, until recently very little has been done to investigate how recurrent budget allocations to and staffing of livestock services have evolved over time and what may have been the important determinant factors in their evolution. This study has dealt with these aspects to the extent that available aggregate data permit.

As the objectives listed on page 3 show, we had also envisaged assessing the effect of policy (as reflected by the past patterns of expenditure and staffing) on the quantity and quality of livestock services. This would have further led to an analysis of the relationship between policy and livestock output. For the reasons explained in the appendix dealing with methodological issues, with the aggregate data we have on hand, it has not been possible to do an analysis which, in this respect, could be sufficiently credible. The need to do further research and collect data which will enable a more plausible quantitative analysis of such relationships is discussed later in this chapter.

We now examine the policy implications of some of our findings.

a. Increased availability of non-staff expenditure

A key finding is that, in the majority of the countries, staff expenditures continue to take the major, and in many cases a growing, share of the livestock recurrent budgets. This has left an inadequate level of funding for non-staff expenditures and contributed to the deterioration of livestock services. Poor African countries face major financial problems constraining their overall ability to allocate resources to livestock services, but some specific policy-generated causes have become apparent for the persistence of the above situation. The following could be readily identified.

i. open-ended policies of training and employment of veterinary staff have resulted in large increases in the number of staff, inflating the salary budget;
ii. cost-free or subsidized provision of services of a private good nature has partly contributed to governments' inability to allocate adequate budgets for non-salary operating expenditures;
iii. where direct service-related charges are imposed, governments' unwillingness to earmark or recycle such specific revenues has further aggravated the shortage of funds;
iv. there has generally been a greater readiness on the part of governments to cut non-staff budgets when faced with financial austerities.

With the increasing demand for services, the continued pursuit of such policies has increased the budgetary burden on governments and is becoming untenable The need for the re-examination of policies to lessen the budgetary burden as well as to expand the resource base to fund adequate services is imperative.

The options which become readily apparent include the following:

i. to reduce the number of staff employed in the livestock services so as to release funds for additional non-staff expenditures.
ii. to increase fund availability for non-staff expenditures from new or other sources of government revenue. These options assume that the responsibility for direct service administration remains within the government machinery.
iii. to shift all the cost burden of certain types of services to the direct beneficiaries and at the same time take outside the government machinery the related responsibility for service administration.

(i) Reduction in staff numbers

The underlying argument for the first option, (i) above, is that there exists an excessive number of staff as indicated by the ratios (staff intensities) of total staff to livestock numbers and of high-level staff to auxiliary personnel. However, as discussed before, these ratios cannot be assessed independently of the type of functions which staff are expected to perform in order to determine whether staff numbers are excessive or not.

In the 1970s and 1980s, African countries put great emphasis on the control of the major epizootic diseases which involved mass vaccination campaigns that can be largely categorised as 'extensive' in the range and complexity of the staff functions required. As we saw in Chapter 2, where the services are geared to supporting or promoting more productivity-enhancing activities, staff functions will become more wide-ranging and more complex and staff intensities will be higher. This means that a larger number of total staff relative to the size of TLU population and a larger number of high-level staff relative to the number of auxiliary personnel will be required. For example, taking the higher levels of intensity indicated for staff functions in Chapter 2 (p. 18), increases of the order of 2 to 5 times the existing number of staff could be required to meet intensity levels of 1 high-level staff to 5000 TLU and 1 auxiliary personnel to 1500 TLU. Where African livestock services need to do more than 'livestock preservation' (i.e. disease control) activities (World Bank, 1986a), the option of reducing existing staff numbers can only serve as a very short-term solution. Staff reductions would limit the capacity of these services to undertake the required productivity enhancing activities in the longer term.

Secondly, even if the existing 'extensive' level of functions were assumed to continue and excessive staff numbers were recognized as an issue needing immediate decision, staff reductions pose political problems. African policy makers are generally very reluctant to take such decisions because they are politically too sensitive and entail real and high social costs in the short-run. So the wide acceptability of this option in Africa would also seem to be highly doubtful.

The discussion above points to the need for governments to find alternative measures to increase the availability of funds to meet non-staff expenditures and/or aim to lessen the budgetary burden on their central treasuries.

(ii) New sources or transfers of revenue

Cost recovery

Charging users for the cost of services provided – cost recovery – meets the above two objectives simultaneously. Cost recovery not only serves as a source of new revenue but also shifts the cost burden to users or beneficiaries, although the responsibility for direct service administration remains within the government machinery. Cost recovery is essentially applicable to those services which directly and exclusively benefit users, namely services which are defined as a private good. AI and clinical treatments of individual animals are typical examples of services whose costs can justifiably be charged to users.

The evidence available shows that in Africa there is a growing willingness on the part of users or beneficiaries to pay for services, including even those defined as a public good (de Haan and Bekure 1989). This holds a good prospect for the successful application of this policy instrument and other similar measures such as privatised services. However, a number of issues need to be addressed for governments to build on this willingness and establish cost recovery schemes which serve as efficient as well as sustainable sources of funding to the livestock services.

First, one needs to consider the level at which charges are to be set. While it will be ideal to charge economic costs, problems partly related to government accounting systems may not make this practicable. However, it will be highly desirable that cost recovery schemes aim to charge for all the financial costs incurred in providing user-specific services — i.e. all variable costs should be charged for. In the 1970s, many countries in Africa provided free or subsidized services even for those which exclusively and directly benefit users, for reasons which are rarely explicitly spelt out but probably include the following:

- promotional objectives — where governments wish to encourage the adoption of a particular technology by all potential users or a specific class of producers such as smallholders (e.g. AI in Kenya, dipping services in East and Southern Africa).
- ability-to-pay arguments, which are partly-connected to promotion, but also emphasize issues of equitable distribution of services to the poorer sector of a country's livestock keeping population.
- ease of administration which avoids additional effort for the collection of service charges and the concomitant requirement for control including leakages.
- in cases where the service administration is not properly organised or structured, collection costs may be too high to justify the establishment or running of cost recovery schemes.

While most of the above could prove to be plausible, the important point is that the purpose for which these type of services are being provided free or at subsidized costs be identified and explicitly recognized in policy decisions. Policy-makers also need to recognize that permanent subsidies to services which confer direct and exclusive benefits to individual users are extremely difficult to justify on economic efficiency grounds [1]. The argument often used for providing free

or subsidized services is that this will enable poor producers to have access to such services. There is some evidence to show that this in fact has had the opposite effect, particularly in a limited (service) supply and noncompetitive situation characterizing wholly government supported services. Leonard (1977) cites examples where small producers were obliged to "pay" for presumably free services and the wealthy producers take a disproportionate share of "free" services.

1. A detailed discussion on whether to charge or not for services as well as on the options to achieve full-cost recovery can be found in Anteneh (1984b).

Secondly, funds generated through cost recovery schemes must be made available to the services and not diverted to other uses. Otherwise the whole purpose of establishing cost recovery schemes to create new sources of revenue or lessen the governments' budgetary burden imposed specifically by these services will be defeated. User fees or charges, which should be the important element in cost recovery schemes, establish a direct and legitimate link between services rendered and revenues generated. And if governments, by diverting such revenues, in effect weaken the schemes, the rationale for creating them to provide sustainable sources of funding to the livestock services becomes inoperational.

Earmarking other livestock-related revenue

Another means of broadening the revenue base is earmarking livestock-related taxes (e.g. through a specific livestock market tax, or surcharges on veterinary inputs, or a percentage of revenues generated by livestock-related import taxes).

This is usually seen as a supplement to cost recovery schemes and is justified on the grounds that it would offer a more stable and sustainable flow of funds than erratic government budgets can do (de Haan and Bekure, 1989). However, the stability and sustainability issue is arguable. This is mainly because there is likely to be a greater propensity for governments to reappropriate such earmarked revenues than they would user fees whenever faced by cash crises.

In the strict economic sense, earmarking revenues to livestock or other government services needs to be justified in terms of their opportunity cost. In other words, the net benefits to be generated from allocating such funds, say to livestock services, should be comparable or higher than those from the next best alternative use. Even with such justification, earmarking could subsequently introduce rigidities which could result in the inefficient allocation of resources. Leonard (1985) cites an example of a government service in Kenya, which had accumulated earmarked funds much beyond its requirements, using the funds for operations with little relevance to the service.

In the light of such problems, it may be more realistic to view earmarked tax revenues as sources of fund injections to provide seed money or to cover transitional subsidies for newly established cost recovery schemes or for the promotion of private sector veterinary care.

The gist of the preceding discussion is that government-run livestock services could become more effective if policy enables them to mobilize part of the resources required to meet non-staff expenditures. Whether this is to be done by reducing staff numbers or by creating sources of

service-related revenue or additional allocations from livestock-related taxes, the need for staff (with their numbers maintained or reduced) to be more productively utilized is intrinsic to the argument. Further, the earlier argument that staff reductions will not present a long-term solution is based on the future need for staff functions to be directed toward providing more intensive service activities. In brief, staff are generally underemployed. And just making more operating funds available without reorienting African livestock services to become more broad-based will not be a complete solution.

The underlying reasons for this situation include the following:

a. Control or prevention of animal diseases is a predominant activity in African livestock services. Furthermore, mass vaccination campaigns against the major epizootic diseases, which tend to be seasonal or to be triggered by emergency outbreaks probably constitute the major activities. Staff are consequently underutilized in off-seasons or when no major disease outbreaks occur.
b. In terms of numbers, veterinarians and veterinary technicians, who mostly tend to concentrate on disease control or prevention to the relative neglect of more production geared activities, dominate the livestock services.
c. As was indicated in Chapter 6, high-level staff in particular tend to pay greater attention to cattle relative to small ruminants. Small ruminants are as productive if not more productive on a per TLU basis (Jahnke 1982). Improved facilities and greater policy attention to these species would help the maintenance of productive staff.
d. African livestock services have also paid relatively little attention to crop/livestock interactions. This is an aspect which has increasingly been recognized as important in most African mixed farming systems and demands wide-ranging staff functions.

Policy directed at reorienting the training of livestock services staff to be able to cope with such demands and diversified activities will need to be given greater attention. Where more "intensive" staff functions require additional personnel into the government services, careful assessment of the necessary balance between staff and non-staff expenditures in relation to what staff can or cannot do should precede new recruitment.

(iii) Privatization of veterinary services

The other option government policies need to consider is private veterinary care and shift the cost burden to beneficiaries as well as responsibility of service administration to the private sector. Cost recovery and privatization schemes need not be mutually exclusive. They can be simultaneously promoted depending on the type of services which are transferred to the private sector and the type of the clientele to be served. Private practitioners naturally move into the curative and individual care market which are mainly services of a private good nature. Private practice tends to concentrate in urban and pert-urban areas and on commercial livestock producers. However, the ability of private practice to break into the African veterinary care market would greatly depend on government policy ensuring fair pricing and competition.

Private veterinary care encompasses not only that provided by professional practitioners but also by so-called paraprofessionals, including lower level technicians and auxiliaries. By the end of the 1970s only few countries in sub-Saharan Africa could claim formally sanctioned private veterinary services. In regard to organisational form, private service can be given by individuals

as well as cooperatives or non-government organisations. In the 1980s, African policy makers seem to have taken the privatisation alternative seriously (see de Haan and Bekure, 1989).

One reason for the slow development of private veterinary practice in sub-Saharan Africa is the unfair competition from subsidized public services. Thus a pre-requisite for their successful introduction is in part a government policy supporting the setting of economic rates for user fees. With government support, national veterinary associations can also play a very useful role in setting technical standards for professional or paraprofessional entrants into the private veterinary care market.

b. External initiatives, dependence and regional cooperation

As we have seen in the preceding discussion, external donors have featured as important participants in African efforts to improve livestock services (JP 15 in the 1960s and 1970s, Pan-African Rinderpest Campaign in the 1980s and many of the donors involved in the reforms discussed in Chapter 5). Because of the conspicuous role played by many donors, one cannot help feel that reforms tend to be "imposed" from outside. External pressure in the past had resulted in the neglect of small or agropastoral producers in favour of commercial or large-scale ranching. Scarce government resources were funnelled away from portfolio activities into self-contained complex livestock projects and when failure occurred, a wholesale donor disaffection with African livestock development set in. Current policy reforms, including that of the funding and organisation of livestock services, are an outcome of at least two decades of frustration. As a result some reform proposals, although acceptable in principle, may tend to be rather extreme and would generate a cautious response from African policy makers and implementers.

Donor proposals backing privatisation generally offer attractive incentive packages to induce the private sector in Africa to enter the livestock services market. The World Bank proposals in particular are exceptionally attractive and present prospective private practitioners with almost risk-free business (see de Haan and Bekure 1989) [2]. Ideological considerations also seem to be dominant. Bothersome questions about resource allocation efficiency and equity (e.g. vis-a-vis private sector incentives outside the livestock sector) will need to be addressed in regard to many of these proposals. In such circumstances policy analysts would also need to examine whether the efficiency considerations of privatisation offer real advantages over government-run cost recovery schemes. The degree of sustainability of such incentives after external assistance is withdrawn could also be a contentious issue.

2. This includes the following:

(a) Financial support in the form of credits, sometimes supplemented by grants in the form of a six month to one year initial stocks of drugs for those leaving Government service;

(b) Assurances that Government will continue to pay a partial salary in those areas where livestock density is too low to provide an adequate income;

(c) Assurances that Government will subcontract services, (vaccination, meat inspection, dip supervision, artificial insemination) at remunerative rates to the private practitioners;

(d) Transfer of facilities and transport to the private practitioner, who then pays only for their maintenance and operation (CAR);

(e) Assurances that Government will stop all curative and noncompulsory preventive interventions in a certain area, as and when a private individual establishes himself in that area or the designation of a pilot area where public livestock services will stop at a certain date all non-public sector functions, to avoid all unfair competition from the public sector; and

(f) Provision of a one- to two-year leave of absence for Government employees to test the feasibility of private activities, without losing the security of income, should the test fail.

The package has most vigorously been pursued in francophone West and Central African countries.

Source: de Haan and Bekure (1989).

In some cases the problem may emerge from too many participants crowding out the African policy makers role. For example, it is generally accepted that the expected impact on livestock output of solving the tsetse and trypanosomiasis problem in Africa is quite large. Thus the involvement of numerous international organisations (e.g. FAO, EEC, ILCA, ILRAD), almost all African governments (where the problem is prominent), as well as several drug manufacturers can in principle be warranted. However, African policy-makers need to play a greater role in minimizing potential conflicts which can probably emerge from the diverse interests pursued by the external organisations as well as individual countries. One could only wish that the Inter-African Bureau for Animal Resources of the Organization of African Unity (OAU/IBAR) can take a more active role in coordinating African policy in this regard (Anteneh, 1989). OAU/IBAR itself recently announced plans to get involved in the multiplication of trypanotolerant cattle (see OAU/IBAR, 1988).

Financially strapped countries naturally tend to create overdependence on external funding and reform initiatives. This had its cost as witnessed by the almost total collapse in many African countries of animal health services after external financial or other assistance projects were phased out. There is a serious need to look for available alternatives.

In this respect, African governments generally tend either to underestimate the value of inter-country or *regional cooperation* as a real alternative or to overplay its purely political aspect. One generally tends to overlook that the causes for deteriorating livestock services over time have partly had their roots in the lack of willingness to see regional cooperation in its technical and economic perspective. For example, the control or eradication of certain important livestock diseases seem to offer practical and manageable areas of cooperation, probably more realistically achievable than other areas of cooperative endeavour in the livestock sector. African policy-makers recognize that many livestock diseases of national economic importance know no political boundaries. It is opportune to take such regional cooperation much more seriously than has been the case so far. Apart from demonstrating the existence of political goodwill among neighbouring countries, potenial economic and financial benefits could be gained in terms of lower costs and more efficient use of human and natural resources.

Implications for further research

a. Recurrent expenditure and livestock output

One of our main findings showed that many countries put into livestock services a share of their recurrent agricultural expenditure which was disproportionately low in comparison to the apparent contribution of livestock to agricultural output. At the same time, however, real livestock recurrent expenditure increased during the 1970s. The overall implication would seem to lead to suggestions that governments should put a still higher share of their agricultural budget into livestock services on the assumption that livestock recurrent expenditure and livestock output are positively related. As explained elsewhere (Appendix I), we found results which are quite different and then ones for which we could not provide a credible explanation.

The present technical difficulty encountered in trying to establish a credible relationship between recurrent expenditure and livestock output does not mean that in reality there is no relationship at all. It rather means that we need to do some further research to identify and quantify the variables considered as the plausible determinants in this relationship.

Funding and policy reform proposals being put forward (see earlier discussion) ultimately aim to affect livestock productivity positively, but experience on the ground is limited so far. These proposals therefore rely heavily on more theoretical considerations, although experiences outside Africa have induced donors to promote some aspects - (e.g. see GTZ "Basic Animal Health Service in Northeast Thailand" where it is reported that a successful pilot farmer self-help program based on cost recovery has been implemented and expanded). In any case, it is important to do further field research to obtain more precise measures on the impact of financing and staffing policy on output and productivity. Most of such research is best done by national organisations once a widely applicable methodology is developed.

International research centres will have comparative advantage in methodology development based on multi-location case studies. For example ILCA plans to sponsor research on the effectiveness of different ways of organising animal health services through a series of case studies which will also involve African researchers. The studies will compare results of re-organisation in one area (e.g. which has started implementing cost recovery or privatisation proposals) with unchanged situations in similar conditions in each case country. Such a study, although leaning more toward organizational aspects, will not only help develop a methodology, but will also be able to provide insight into the real effect of reforms proposed by donors. This in turn will have implications on the extent of the future acceptance of such reforms by African policy-makers.

b. User charges and economic efficiency and equity

Despite its macro-economic orientation, it is hoped that this report has given enough indication of the areas needing further investigation. In another paper, the author had tried to indicate some of the specific areas requiring further research (Anteneh, 1984b). These included the need to establish empirically the effect different methods of recurrent funding of livestock services have on economic efficiency and equity as well as to answer the question of the desirable level of user fees or charges. The determination of optimal rates for user fees where such charges can

reasonably be imposed is a fertile area of research by national institutions. Questions of efficiency as well as of equity are closely related to such determination and can only be rationally addressed in this framework. For instance, the more precise identification of the cost components of such rates would provide a better basis for policy-makers to determine the nature and desirable level of subsidies, should these be found necessary for strategic or equity reasons.

Appendix I. Data collection and analysis methods

Country coverage and data sources

The report covers up to 22 countries in the West, Central, East and Southern regions of sub-Saharan Africa (see map at the end of this appendix). Lack of data in many cases reduced this number to less than 22 while most of the analytic part (Chapter 6 in particular) only includes a maximum of 18 countries.

By far the largest part of the information on expenditure and staffing was collected, collated or compiled from secondary sources. Official publications including government budget documents as well as unpublished reports consisted the most important category of these sources. For the West and Central African countries, the major sources of data were IEMVT, GTZ and SEDES reports, particularly for the francophone group of countries in those regions. These reports consisted conveniently compiled multi-country as well single country reports which included the relevant data we were looking for. Thirteen of the 22 countries are in West and Central Africa.

For East and Southern Africa, most of the data were extracted from different government publications covering several years. The author visited all the 9 countries included in the report in order to access the information sources and, in most cases, also to interview the appropriate government officials concerned with the management of livestock services.

Most of the macro-level data, such as livestock population data, were obtained from FAO production yearbooks. FAO reports including some mission reports provided useful specific data for some countries which would have not been easily available elsewhere – e.g. livestock GDP estimates. World Bank data provided the major source of information on expenditure and staffing in the post-1970s period.

Data availability and quality

Inevitably there would be questions relating to the quality of the data (in terms of their accuracy, reliability or consistency etc.) from most of these sources. There are indeed problems which give rise to such a questions. For example, FAO figures on livestock populations for the same year show considerable variations from one production yearbook to another. Production figures are even less reliable. FAO data are based on national statistics on which little control can be exercised. It would also present a huge task to explain the variations. Regarding budgetary data, in many African countries we had to settle for estimates rather than actual expenditures or the number of staff. There was also no way to discover if the margin between initial estimates and actuals over the years has remained constant or was subject to sharp fluctuations. Many reports containing actual expenditures were either inaccessible or did not provide details of data to the same degree as the initial allocations. In some countries the budget allocations showed sharp increases or declines with insufficient or no explanation about the underlying events which caused them. As a result we were in some instances left to speculate about probable causes.

Policy studies in the livestock sector are of recent origin. Many of the areas we try to tackle at ILCA have been uncharted before, and data availability and quality problems are not unexpected. While future improvement in this area will depend more critically on the role African national organisations are prepared to play, we must start to break new ground in terms of providing cross-country information and analyses from the best available data. If we remain inactive while we await high quality data to be available, some of the important policy issues affecting the livestock sector will remain totally unexplored. The very act of being able to collate available information on the recurrent funding and staffing of livestock services and the conclusions we try to draw should give some impetus to correct deficiencies which do exist in this area.

Analysis methods and problems encountered

Apart from the descriptive statistics presented (in the form of simple tables, percentage distributions, means, standard deviations etc.) two main analytic techniques were employed to test significant relationships between different variables. The analysis of variance (ANOVA) was used to initially test if there are significant differences between and within several categories — region, language, ecological zone and size of livestock population. Simple and multiple regressions were used to analyse cross-sectional data in most cases. Statistical packages including SIGSTAT, SPSS and SAS were used to run the regressions.

Although a number of hypotheses to be tested were developed at the initiation of the study, finance theory had very little to offer in determining the variables to be treated in this particular investigation. The exploratory phase thus used up an important portion of the total time required for the analysis. In this connection, as mentioned in the introduction and several other parts of the report, we encountered particular problems in attempting to estimate the effects of funding policy on livestock output. These problems stemmed from:

a. The questionable reliability of some of the dependent variables we use as a proxy to livestock output.
b. The indirect nature of the relationship between the expenditure variables (independent) and output variables (dependent) for which we have data available;
c. The lack of alternative data which could have given more direct estimates of the effect of the quantity and quality of livestock services on livestock output.

Let us briefly explain what the analysis attempted to do as a background. In the absence of better information for output data, we used the rate of growth in livestock numbers and beef and milk yield indices (expressed as indices of 1983 over 1970) to represent output. Yield data were obtained from FAO documents. The mean rate of growth in real livestock recurrent expenditure per TLU was used to represent government funding policy assuming that it closely reflects an aggregate expression of such policy over the time period considered (1970/71–1978/79). The results obtained were at first sight interesting.

- The rate of growth in livestock recurrent expenditure explained 33% of the total variation in the growth of livestock numbers, and the estimated coefficient was significant ($p \leq 0.01$) but negative;

- The rate of growth in livestock recurrent expenditure again explained only about 33% of the total variation in beef and milk yield indices and the coefficients were significant ($p \leq 0.01$); in this case, however, the signs of the coefficients were positive.

These results give the impression that African livestock services during the 1970s were more concerned with funding activities which were aimed at positively affecting yield (-or productivity) than livestock numbers. There are a number of problems with this. First is the reliability of the yield data. The FAO yield data for sub-Saharan Africa are mostly obtained from dividing an estimated total output by the number of slaughtered animals or milking cows. Yield figures are thus not independently determined and the total output and the numbers (i.e. slaughtered animals or milking cows) data are country or FAO estimates with questionable reliability. Secondly even if we were to assume that the yield data are reliable and show average positive changes over the period considered, the evidence available' does not seem to support the results of the yield and expenditure relationship. As we saw in Chapter 2, a major portion (over 70%) of recurrent expenditure or livestock services by African countries was incurred for disease control and prevention activities whose main aim is to reduce mortality. Furthermore, recent studies provide plausible evidence that the major portion of the estimated increase in African livestock output resulted from increased numbers rather than increased yields (Anteneh, 1984a and Anteneh et al, 1988).

The negative relationship between growth in total livestock numbers and in recurrent expenditure does not, in this particular case, mean that livestock numbers declined in absolute terms across all countries – only 4 out of 18 countries showed negative growth. It means that on average the size of the livestock population was growing at a slower rate than recurrent expenditure per TLU. So, while the above negative relationship may be surprising, it need not be unexpected. This can be interpreted to mean that the ultimate effect on output does not occur because expenditure increases but because such expenditure is used to put in place the required quantity and quality of services which directly impact on production. Money allocated through government budgets for expenditure by the services, like other financial instruments, is not a direct input itself but one which confers a claim on real resources. Thus, its effect on output can only be indirectly measured by the quantity and quality of services which it is used to acquire. This leads us to the third set of problems.

If the data were available, the quantity of services could be estimated by using, among possible others, the following as dependent variables:

- number of annual vaccinations or treatments carried out over the years;
- number of artificial inseminations administered;
- number of days livestock services staff spend visiting livestock producers;
- number of 'interventions' per working day.

In a similar vein, the *quality* of services provided could be measured by:

- the timeliness of 'interventions' (e.g. the length of time it takes between disease outbreaks and actual vaccinations or between request and action);
- the convenience to producers (e.g. distance from service centres);

- the cost-effectiveness of services - e.g. the ratio of 'distribution' (staff salaries, transport) to 'material' (drugs, vaccines etc.) costs.
- the proportion of vaccine doses actually used versus the number issued;
- the number or frequency of disease outbreaks reported;
- the number of AI doses per conception.

However, adequate data are either not available for most of these across all countries for cross-sectional analysis or are not available on a continuous basis over sufficiently long periods to do statistically acceptable time-series analyses. Hence the need to do more field research at country level to get more credible analyses and results.

Annexes

Table A 1. Recurrent expenditure on livestock services: 1970/71–1978/79 (000 US$ in 1975 prices)[1]

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
Benin	406	445	441	576	608	..	..	..	..
Botswana	3172	2570	2094	2478	3643	3347	2584	3401	3064
Burkina Faso	441	432	458	463	371	522	544	546	532
Cameroon	..	..	..	..	2405	3083	3345	3429	4368
CAR	136	275	270	258	210	212	181	177	184
Chad	558	444	525	612	866	994	..	..	..
Côte d'Ivoire	1910	2119	2402	..	3736	3621	4074	4686	5726
Ethiopia	869	990	1271	1429	1503	1478	1335	1111	1329
Gambia	40	63	77	82	114	121	283	387	466
Kenya	..	..	..	..	11890	12120	9611	9643	16250
Lesotho	..	532	519	543	491	822	970	1366	1423
Malawi	917	892	1091	1211	1093	1144	1511	1731	1940
Mali	458	533	554	702	..	..	..	..	..
Mauritania	984	2552	2838	3534	..	4086	4479	4178	4915
Niger	907	978	1088	1137	1306	1420	1538	1736	1948
Senegal	1617	2000	2184	2147	2256	2409	2382	2890	..
Sierra Leone	145	165	198	195	333	355	429	500	483
Swaziland	..	989	890	959	1179	1252	1518	2508	3207
Tanzania[2]	4876	6705	2249	2300	9148	9862	8109	8704	8952
Togo	167	161	234	245	224	167	138	178	254

Zambia	4556	4356	4432	4353	4474	..	4623	4286	4856
Zimbabwe	..	6361	7108	..	..	..	6108	5610	3195

".." = data not available

1. For 5 countries (Cameroon, CAR, Gambia, Mali and Niger) average annual rates of inflation provided in World Bank (1986b) were used to deflate expenditure figures.
2. Data for 1970/71–73/74 are only central government expenditures, i.e. excluding regional expenditure

Sources: Anteneh (1983; 1985) and unpublished data for Ethiopia, Lesotho and Swaziland (1986).

Table A 2. Growth in total recurrent expenditure on livestock services[1] (percent change per year)

Country	Period	Annual Growth Rate[2] % p.a.
Benin	70/71–77/78	6.48
Botswana	70/71–78/79	– 0.43
Burkina Faso	70/71–78/79	2.37
Cameroon	74/75–78/79	16.09
CAR	70/71–78/79	3.85
Chad	70/71–75/76	12.24
Côte d'Ivoire	70/71–78/79	14.27
Ethiopia	70/71–78/79	5.45
Gambia	70/71– 78/79	35.92
Kenya	74/75– 78/79	8.12
Lesotho	70/71–78/79	15.09
Malawi	70/71– 78/79	9.82
Mali	70/71–74/75	11.27
Mauritania	70/71–78/79	23.74
Niger	70/71–78/79	10.03

Senegal	70/71– 78/79	8.65
Sierra Leone	70/71–78/79	16.23
Swaziland	71/72–78/79	17.33
Tanzania	70/71– 78/79	7.89
Togo	70/71–78/79	5.38
Zambia	70/71–78/79	0.80
Zimbabwe	71/72–78/79	– 9.37

1. Based on absolute values of expenditure calculated in US$ at 1975 constant prices.

2. Calculated by taking end values.

Table A 3. Recurrent expenditure on livestock services (US$/TLU[1] in 1975 constant prices)[2]

Country	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79
Benin	0.71	0.64	0.70	0.89	0.93	0.78	0.74	0.89	..
Botswana	2.38	1.79	1.33	1.50	2.26	2.08	1.47	1.69	1.38
Burkina Faso	0.20	0.20	0.26	0.34	0.27	0.32	0.32	0.24	0.23
Cameroon	..	..	..	..	1.14	1.38	1.42	1.38	1.68
CAR	0.35	0.71	0.71	0.61	0.44	0.43	0.35	0.27	0.22
Chad	0.16	0.13	0.10	0.25	0.32	0.33	..	..	..
Côte d'Ivoire	4.29	4.44	4.83	..	6.77	6.06	6.32	7.05	8.40
Ethiopia	0.04	0.05	0.06	0.07	0.07	0.07	0.06	0.05	0.06
Gambia	0.21	0.31	0.37	0.38	0.50	0.52	1.24	1.67	1.89
Kenya	..	..	..	..	2.00	2.01	1.60	1.40	2.00
Lesotho	..	0.87	0.90	0.92	0.79	1.27	1.62	2.49	2.45
Malawi	2.29	1.93	2.32	2.51	2.40	2.08	2.60	2.88	3.14
Mali	0.09	0.12	0.31	0.14	0.20	..	..	..	..

Mauritania	0.38	1.15	1.42	1.97	..	2.58	2.62	2.69	3.15
Niger	0.25	0.29	0.36	0.44	0.54	0.53	0.54	0.59	0.63
Senegal	0.80	1.08	1.18	1.22	1.23	1.27	1.23	1.41	..
Sierra Leone	0.74	0.83	0.95	0.91	1.49	1.52	1.77	2.14	1.77
Swaziland	..	2.27	1.99	2.12	2.57	2.67	3.22	5.28	6.64
Tanzania	0.51	0.72	0.25	0.26	0.93	0.93	0.74	0.85	0.94
Togo	0.64	0.60	0.83	0.85	0.78	0.57	0.45	0.55	0.77
Zambia	3.99	3.76	3.71	3.54	3.54	..	3.50	3.09	3.32
Zimbabwe	..	0.71	0.64	..	..	..	0.49	0.54	0.78

1. TLU: Tropical (ruminant) livestock units of 250 kg liveweight excluding camels. Conversion rates: cattle 0.7, sheep and goats 0.1.

2. See note 1/under Table A 1.

".." = data not available

Table A 4. Changes in livestock recurrent expenditure per TLU by country (US$ per TLU in 1975 constant prices)

Country	Period	Annual Growth Rate, % p.a.[a]
Benin	70/71 – 77/78	3.28
Botswana	70/71 – 78/79	– 6.59
Burkina Faso	70/71 – 78/79	1.76
Cameroon	74/75 – 78/79	10.18
CAR	70/71 – 78/79	– 5.64
Chad	70/71 – 75/76	15.58
Côte d'Ivoire	70/71 – 78/79	8.76

Ethiopia	70/71 – 78/79	5.20
Gambia	70/71 – 78/79	31.61
Kenya	74/75 – 78/79	0.00
Lesotho	71/72 – 78/79	15.94
Malawi	70/71 – 78/79	4.02
Mali	70/71 – 74/75	22.09
Mauritania	70/71 – 78/79	30.26
Niger	70/71 – 78/79	12.25
Senegal	70/71 – 77/78	8.43
Sierra Leone	71/72 – 78/79	11.52
Swaziland	70/71 – 78/79	16.57
Tanzania	70/71 – 78/79	7.94
Togo	70/71 – 78/79	2.34
Zambia	70/71 – 78/79	– 2.27
Zimbabwe	71/72 – 78/79	1.35

a. Calculations made on same basis as in Table A 2.

Table A 5. Number of total high-level (HL) and auxiliary personnel (AP) in livestock services

	1970/71			1974/75			1978/79		
	HL	AP	Total	HL	AP	Total	HL	AP	Total
Benin	9	39	88	16	114	130	20	162	182
Botswana	..	..	..	37	280	317	37	360	397
Burkina Faso	..	..	..	30	199	229	16	179	195
Cameroon	..	..	..	29	421	450	31	474	505
CAR	..	107	107	7	187	194	13	317	330

Chad	9	212	221	23	276	299	..	..	..
Ethiopia	41	506	547	73	562	635	113	823	936
Kenya	..	..	..	111	1734	1845	235	2365	2600
Lesotho	7	99	106	10	210	220	12	203	215
Malawi	10	302	312	16	317	333	16	368	384
Mauritania	-	5 103	108	6	106	112	5	160	165
Niger	3	207	210	13	249	262	33	339	372
Senegal	79	615	694	108	440	548	148	478	626
Swaziland	..	..	..	15	..	..	12	279	291
Togo	4	80	84	13	103	116	13	116	129

".." = data not available

Sources: Anteneh (1983, 1985 and unpublished data for Ethiopia, Lesotho and Swaziland).

Table A 6. TLU per total, high-level (HL) and auxiliary personnel (AP)

	1970/71			1974/75			1978/79		
	(000 TLU per)								
	HL	AP	Total	HL	AP	Total	HL	AP	Total
Benin	63	7	6	41	6	5	36	4	4
Botswana	..	..	..	44	6	5	60	6	6
Burkina Faso	..	..	..	47	7	6	145	13	12
Cameroon	..	..	..	73	5	5	34	5	5
CAR	..	4	4	68	2	2	65	3	3
Chad	400	17	16	116	10	9	..	..	..
Ethiopia	508	41	38	297	39	34	196	27	24

Kenya	..	..	..	54	3	3	35	3	3
Lesotho	87	6	6	62	3	3	48	3	3
Malawi	40	1	1	28	1	1	39	2	2
Mauritania	475	23	22	270	15	14	312	10	9
Niger	1232	18	18	186	10	9	93	9	8
Senegal	26	3	3	18	4	3	15	4	3
Swaziland	..	..	..	31	..	..	40	2	2
Togo	65	3	3	22	3	2	25	3	3

".." = data not available

Sources: Same as Table A 5 plus FAO Production Yearbooks for TLU populations.

Table A 7. Staff ratios by category - number of AP per HL staff

Country	1970/71	1974/75	1978/79
Benin	4	7	8
Botswana	..	7	10
Burkina Faso	..	7	11
Cameroon	..	14	15
CAR	..	27	24
Chad	23	12	..
Ethiopia	12	8	7
Kenya	..	16	10
Lesotho	14[1]	21	17
Malawi	30	20	23
Mauritania	21	18	32

Niger	69	19	10
Senegal	8	4	3
Togo	20	8	9

".." = data not available

1. 1971/72

Sources: Anteneh (1983 and 1985); GTZ/SEDES (1976). Anteneh (Unpublished data for Ethiopia and Lesotho).

Table A 8. Staff (SE) and non-staff expenditure (NSE) (000 US$ in 1975 constant prices)

Country		70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79
Benin	SE	325	352	344	467	493	..	..	..	..
	NSE	81	93	97	109	115	..	..	..	..
Botswana	SE	1427	1157	942	867	1275	1105	956	918	981
	NSE	1745	1413	1152	1611	2368	2242	1628	2483	2083
Burkina Faso	SE	392	372	394	412	330	465	495	497	484
	NSE	60	60	64	51	41	57	49	49	48
CAR	SE	..	173	189	155	130	117	121	149	175
	NSE	..	102	81	103	80	95	60	28	9
Chad	SE	391	355	415	514	736	805	..	..	..
	NSE	167	89	110	98	130	189	..	..	..
Côte d'Ivoire	SE	1418	1505	1681	..	2765	2760	2811	3327	4237
	NSE	552	614	721	..	971	871	1263	1359	1489
Ethiopia	SE	739	822	1080	1215	1248	1212	1081	878	1023
	NSE	130	168	191	214	256	254	233	233	306
Gambia	SE	32	49	59	62	89	88	212	317	326

	NSE	8	14	18	20	25	33	71	70	140
Kenya	SE	..	..	..	..	4637	5212	4613	4918	6663
	NSE	..	..	..	..	7253	6908	4998	4725	9587
Lesotho	SE	..	..	319	311	293	285	567	582	1123
	NSE	..	213	208	250	206	255	388	243	455
Malawi	SE	468	428	502	509	492	435	484	658	873
	NSE	449	464	589	702	601	709	1027	1073	1067
Mali	SE		220	245	244	363	477	..	..	..
	NSE	238	288	310	179	225	..	..	..	..
Mauritania	SE	420	1378	2015	2014	..	..	3001	2883	3539
	NSE	474	1174	823	1520	..	..	1478	1295	1376
Niger	SE	499	528	609	614	784	980	907	1094	1188
	NSE	408	450	479	523	522	440	631	642	760
Senegal	SE	1213	1400	1616	1718	1873	2024	2025	2456	..
	NSE	404	600	568	429	383	385	357	434	..
Sierra Leone	SE	68	73	85	90	80	128	124	140	140
	NSE	77	92	113	105	253	227	305	360	343
Swaziland	SE	..	514	481	460	731	789	956	1505	2085
	NSE	..	475	409	409	448	463	562	1003	1122
Togo	SE	152	150	218	230	211	161	121	162	234
	NSE	15	11	16	15	13	3	17	16	20
Zambia	SE	1230	1176	1463	..	1790	..	..	1972	2428
	NSE	3326	3180	2969	..	2684	..	..	2314	2428

Zimbabwe	SE		..	3117	3128	..	..	..	3482	3422
	NSE	..	3244	3980	..	..	..	2626	2188	1470

Note and sources as in Table A 1.

Table A 9. Growth in staff (SE) and non-staff (NSE) expenditure (percent per year)

Country	SE	NSE
Benin[1]	11.0	9.2
Botswana	–4.6	2.2
Burkina Faso	2.2	– 0.3
CART[2]	0.2	–29.3
Chad[3]	15.5	2.5
Côte d'Ivoire	14.7	13.2
Ethiopia	4.1	11.3
Gambia	33.7	43.0
Kenya[4]	9.5	7.2
Lesotho[2]	17.2	11.5
Malawi	8.1	11.4
Mali[1]	21.1	– 1.4
Mauritania	30.5	14.2
Niger	11.5	8.1
Senegal[5]	10.6	1.0
Siera Leone	9.4	20.5
Swaziland[2]	22.1	13.1
Togo	5.5	3.7

Zambia	8.9	– 3.9
Zimbabwe[2]	– 8.1	–10.7

Period covers 1970/71 – 1978/79 except for the following:

1 1970/71 – 74/75
2 1971/72 – 78/79
3 1970/71 – 75/76
4 1974/75 – 78/79
5 1970/71 – 77/78.

Source: Based on Table A 8.

Table A 10. Percent share of staff expenditure in total recurrent expenditure (%)

Country	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79
Benin	80	79	78	81	81	..	..	..	..
Botswana	45	45	45	35	35	33	37	27	32
Burkina Faso	89	86	86	89	89	91	91	91	91
CAR	..	63	70	60	62	55	67	84	95
Chad	70	80	79	84	85	81	..	..	..
Côte d'Ivoire	72	71	70	..	74	76	69	71	74
Ethiopia	85	83	85	85	83	82	81	79	77
Gambia	81	77	76	75	78	73	75	82	70
Kenya	..	..	..	..	39	43	48	51	41
Lesotho	..	60	60	54	58	69	60	69	68
Malawi	51	48	46	42	45	38	32	38	45
Mali	48	46	44	67	68	..	..	..	..
Mauritania	47	54	71	57	..	..	67	69	72

Niger	55	54	56	54	60	69	59	63	61
Senegal	75	70	74	80	83	84	85	85	..
Swaziland	..	52	54	48	62	63	63	60	65
Togo	91	93	93	94	94	97	88	91	92
Zambia[1]	27	27	33	..	40	..	..	46	50
Zimbabwe	..	49	44	..	..	..	57	61	54

".." = data not available

1. Calendar years – e.g. 1970/71 data are for 1970.

Source: Anteneh (1983, 1985 and unpublished data for Ethiopia, Lesotho and Swaziland).

Table A 11. Amount of non-staff expenditure (NSE) per staff and per TLU per year (US$ in 1975 constant prices)

	1970/71		1974/75		1978/79	
	Per staff	Per TLU	Per staff	Per TLU	Per staff	Per TLU
Botswana	..	1.31	7470	1.47	5247	0.94
Burkina Faso	..	0.02	179	0.03	246	0.02
CAR	..	0.26[1]	412	0.17	27	0.01
Chad	756	0.05	435	005	..	..
Ethiopia	238	0.01	403	0.01	327	0.01
Kenya	..	..	3931	1.22	3687	1.18
Lesotho	2009[1]	5.00[1]	936	0.33	2116	0.73
Malawi	1439	1.12	1804	1.32	2779	1.73
Mauritania	4389	0.20	..	..	8339	0.88
Niger	1943	0.11	1992	0.22	2043	0.25
Senegal	582	0.20	698	0.21	693[2]	0.20[2]

Sierra Leone	2081	0.39	4960	1.13	..	..
Togo	189	0.06	112	0.04	155	0.06

".." = data not available

1. 1971/72

2. 1977/78.

Sources: Calculated from data in Tables A 5 and A 8 for NSE per staff and Table A 8 and FAO Production Yearbooks for livestock population data to calculate NSE per TLU.

Table A 12. Percent of total land area infested by tsetse – 1978/79

Country	Percent Tsetse Infested (TTI)
Benin	100
Botswana	4
Burkina Faso	77
Cameroon	90
CAR	100
Côte d'Ivoire	100
Ethiopia	9
Gambia	100
Kenya	17
Lesotho	0
Malawi	65
Mauritania	0
Niger	3
Senegal	46
Sierra Leone	100

Swaziland	0
Tanzania	72
Togo	100
Zambia	40
Zimbabwe	18

Source: Jahnke (1982) except for Lesotho and Swaziland.

Table A 13. Real livestock recurrent expenditure (LRE) per caput of the agricultural population – 1978/79

Country	LRE per caput (LRE_C)
Benin	0.41
Botswana	4.74
Burkina Faso	0.11
Cameroon	0.65
CAR	0.11
Côte d'Ivoire	0.93
Ethiopia	0.05
Gambia	1.01
Kenya	1.32
Lesotho	1.29
Malawi	0.39
Mauritania	3.72
Niger	0.43
Senegal	0.71
Sierra Leone	0.22

Swaziland	8.08
Tanzania	0.63
Togo	0.14
Zambia	1.32
Zimbabwe	0.75

Sources: Anteneh (1983, 1985 and unpublished data for Ethiopia, Lesotho and Swaziland); Jahnke (1982).

Table A 14. Share of animal protein (AP) in total protein (TP) consumption – 1980

Country	Share of AP in TP (AP/TP) percent
Benin	16.2
Botswana	34.1
Burkina Faso	10.5
Cameroon	8.2
CAR	22.1
Côte d'Ivoire	27.5
Ethiopia	18.8
Gambia	25.3
Kenya	25.3
Lesotho	16.1
Malawi	9.4
Mauritania	51.3
Niger	18.6
Senegal	27.4

Sierra Leone	21.4
Swaziland	38.6
Tanzania	31.8
Togo	14.8
Zambia	19.1
Zimbabwe	21.8

Source: Calculated from FAO Production Yearbook 1980.

Table A 15. Growth in the ruminant livestock population (in TLU) 1970/71–1978/79*

Country	TLU Growth Rate (D(TLU)) percent per year	LRE/TLU Growth Rate (D(LRE/TLU))
Benin	4.3	3.28
Botswana	5.1	–6.59
Burkina Faso	0.8	1.76
CAR	6.1	–5.64
Côte d'Ivoire	4.6	8.76
Ethiopia	– 0.1	5.20
Gambia	2.1	31.61
Lesotho	0.1	15.94
Malawi	4.6	4.02
Mauritania	– 2.5	30.26
Niger	– 0.9	12.25
Senegal	– 0.3	8.43
Sierra Leone	1.9	11.52
Swaziland	1.6	16.57

Tanzania	2.3	7.94
Togo	2.5	2.34
Zambia	3.	– 2.27
Zimbabwe	0.2	1.35

* Excluding camels.

Source: Calculated from data in FAO Production Yearbooks, 1974 and 1979.

Table A 16. Percent of the total livestock population (TLU) formed by cattle – 1978/79

Country	Share of Cattle in Total TLU (CTL_{tlu})
	percent
Benin	75
Botswana	93
Burkina Faso	81
CAR	84
Côte d'Ivoire	66
Ethiopia	78
Gambia	91
Kenya	84
Lesotho	69
Malawi	85
Mauritania	42
Niger	63
Senegal	87
Sierra Leone	89
Swaziland	94

Togo	52
Zambia	97
Zimbabwe	92

Source: Calculated from data in FAO Production Yearbook 1979.

Table A 17. Average livestock holding (in TLU) per caput of the agricultural population – 1978/79

County	TLU per caput (TLU_p)
Benin	0.47
Botswana	3.83
Burkina Faso	0.42
CAR	0.29
Côte d'Ivoire	0.11
Ethiopia	0.91
Gambia	0.47
Kenya	0.71
Lesotho	0.53
Malawi	0.13
Mauritania	2.03
Niger	0.73
Senegal	0.54
Sierra Leone	0.09
Swaziland	1.22
Togo	0.19
Zambia	0.35

Zimbabwe	0.89

Source: Jahnke (1982)

Table B 1. Recurrent expenditure on livestock services per TLU 1978–79 and 1985–87

Country	1978–79	1985–87
	US$ per TLU[a]	
Benin	0.89[b]	1.10[c]
Botswana	1.38	4.66[d]
Burkina Faso	0.23.	0.76[c]
Cameroon	1.68	3.93[e]
CAR	0.22	0.74[e]
Côte d'Ivoire	8.40	22.63[e]
Kenya	2.00	1.74[d]
Mauritania	3.15	0.65[d]
Niger	0.63	0.36[d]
Senegal	1.41[b]	1.95[d]
Tanzania	0.94	0.22[e]
Zambia	3.32	0.71[d]
Zimbabwe	0.78	1.12[e]

a. For 1978–79 in 1975 constant prices; for 1985–87 in 1980 constant prices
b. 1977/78
c. 1986
d. 1985
e. 1987

Sources: Annex Table A 3 and de Haan and Bekure (1989).

Table B 2. Share of staff expenditure in total livestock recurrent expenditure — 1978–79 and 1985–87

Region/Country	1978–79[a]	1985–87

	percent	
West and Central Africa		
Benin	81 (74/75)	98
Burkina Faso	91	99
Cameroon	..	77
CAR	95	75
Chad	81 (75/76)	73
Côte d'Ivoire	74	38
Mali	68 (74/75)	91
Mauritania	72	72
Niger	61	59
Senegal	85 (77/78)	87
East and Southern Africa		
Botswana	32	46
Kenya	41	54
Tanzania	56	59
Zambia	50	70
Zimbabwe	54	53

".." = data not available

a. Unless otherwise indicated by figures in brackets

Sources: Annex Table A 10 and de Haan and Bekure (1989).

Table B 3. Non-staff expenditure per staff 1978/79 and 1985–87

Country	1978–79	1985–87
	US$[a] per staff of all categories	

Botswana	5247	10764[b]
Burina Faso	246	27[c]
CAR	27	726[d]
Kenya	3687	1488[b]
Mauritania	8339	1083[b]
Niger	2043	765[b]
Senegal	693[e]	594[b]

a. For 1978/79 in 1975 constant prices; for 1985-87 in 1980 constant prices
b. 1985
c 1986
d. 1987
e. 1977/78

Sources: Annex Table A 11 and de Haan and Bekure (1989).

Table B 4. Number of high-level (HL) and auxiliary personnel (AP) 1978–79 and 1985–87

Country	1978–79			1985–87		
	HL	AP	Total	HL	AP	Total
	Numbers					
Benin	20	162	182	83	332	415[a]
Botswana	37	360	397	25	593	618[c]
Burkina Faso	16	179	195	190	439	629[c]
Cameroon	31	474	505	112	892	1004[b]
CAR	13	317	330	46	303	349[b]
Ethiopia	113	823	936	99	1059	1158[c]
Kenya	235	2365	2600	509	4799	5308[c]
Mauritania	5	160	165	41	225	266[b]
Niger	33	339	372	59	621	680[b]

Senegal	148	478	626	174	731	905[b]

a. 1987
b. 1986
c. 1985

Sources: Annex Table A 5 and de Haan and Bekure (1989).

Table B 5. TLU per staff of different categories and total staff – 1978/79 and 1985–87

Country	1978/79			1985–87		
	TLU (000s) per					
	HL	AP	Total	HL	AP	Total
Benin	36	4	4	12	3	2[a]
Botswana	60	6	6	106	4	4[c]
Burkina Faso	145	13	12	14	6	4[b]
Cameroon	84	5	5	30	4	3[b]
CAR	65	3	3	30	5	4[b]
Ethiopia	196	27	24	225	21	19[c]
Kenya	35	3	3	19	2	2[c]
Mauritania	312	10	9	39	7	6[b]
Niger	93	9	8	61	6	5[b]
Senegal	15	4	3	12	3	3[b]

a. 1987
b. 1986
c. 1985

Sources: Annex Table A 6 and de Haan and Bekure (1989).

Table B 6. Auxiliary personnel (AP) per high-level staff (HL) – 1978/79 and 1985–87

Country	1978/79	1985–88
	Number of AP per HL	

Benin	8	4[a]
Botswana	10	24[c]
Burkina Faso	11	2[b]
Cameroon	15	8[b]
CAR	24	7[b]
Ethiopia	7	11[c]
Kenya	10	9[c]
Mauritania	32	6[b]
Niger	10	11[b]
Senegal	3	4[b]

a. 1987
b. 1986
c. 1987

Sources: Annex Table A 7 and de Haan and Bekure (1989).

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