



IGAD
Livestock
Policy
Initiative

The Contribution of Livestock to the Economies of IGAD Member States

Study Findings, Application of the
Methodology in Ethiopia and
Recommendations for Further Work

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DISCLAIMER

This paper on Ethiopia is part of a series of Working Papers on The Contribution of Livestock to the Economies of IGAD Member States planned by the Inter-Governmental Authority on Development's Livestock Policy Initiative (IGAD LPI). The purpose of these papers is to provide support to Livestock Policy Hubs in the Member States to use study outcomes in their engagements with PRSPs processes in their respective countries (Ethiopia's Plan for Accelerated and Sustained Development to End Poverty-PASDEP) to advocate and ensure that the representation of livestock in these national strategy documents is commensurate with its important contribution to economic growth, poverty reduction and food.

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of either the Food and Agriculture Organization of the United Nations or the Inter-Governmental Authority on Development concerning the legal status of any country, territory, city or area or its authorities concerning the delimitations of its frontiers or boundaries.

The opinions expressed in this paper are solely those of the author and do not constitute in any way the position of the FAO, IGAD, the Livestock Policy Initiative nor the governments studied.

This study was undertaken in close collaboration with the National Accounts Department (NAD) of the Ministry of Finance and Economic Development (MOFED) of the Federal Republic of Ethiopia. NAD has provided constructive review and comments on the study. While the majority of these comments were incorporated, there were however areas where opinions differ. These mainly stem from the fact that IGAD LPI is most interested in the broader contribution of livestock to the national economy of the country, whereas the responsibility of MOFED relates more to GDP calculation and strict adherence to the guidelines on its calculation. A case in point is the use of oxen as source of traction power for own use. According to the GDP guidelines oxen should not be considered as production but part of non produced natural assets. The author and IGAD LPI question why milk and meat produced and used by a farm family are assigned a value for GDP estimates, but traction power is not. Furthermore, even if traction should not be included in GDP calculations, it nonetheless contributes to the Ethiopian economy and IGAD LPI believes it is therefore appropriate to include the figures in this report.

There are other areas where MOFED has its reservations, relating mainly to the weakness or lack of data. The study suggests future work on refining and updating the finding of this work particularly on improving the estimates of cattle and goat output, which are both high in absolute terms and apparently underappreciated in national accounting terms. The consensus on addressing the data issue is to set up a taskforce consisting of different stakeholders (data providers, researchers and relevant line ministries and departments) to forge a common understanding and to be sure on some of the facts and figures presented in this document.

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ABBREVIATIONS

BOFED	Bureau of Finance and Economic Development
CSA	Central Statistics Agency
DGDP	Dairy Goat Development Project
EB	Ethiopian birr
EEA	Ethiopian Energy Authority
GDP	Gross Domestic Product
ILCA	International Livestock Centre for Africa
ILRI	International Livestock Research Institute
LDMPs	Livestock Development Master Plan Study
MOFED	Ministry of Finance and Economic Development
PADS	Pastoral Areas Development Study
SC-UK	Save the Children, UK
ISIC	Standard Industrial Classification of All Economic Activities
SNA	System of National Accounts
SNNPR	Southern Nations, Nationalities and Peoples Region
TLU	Tropical Livestock Unit

EXECUTIVE SUMMARY

1. This is the final report in a series of three reports on the contribution of livestock to the economies of IGAD member states. This report appraises the contribution of livestock to Ethiopia's agricultural GDP. It also reviews the methods developed to examine the contribution of livestock to the Ethiopian economy, and recommends that these methods be extended to evaluate the contribution of livestock to agricultural GDP and to the wider economy of the other IGAD member states.
2. **The contribution of livestock to agricultural GDP is the most commonly quoted single measure of livestock's contribution to the overall national economy. It is therefore a very important figure.** GDP estimates for Ethiopia are prepared by the National Accounts Department of the Ministry of Finance and Economic Development (MOFED) according to internationally recognized procedures described in the *System of National Accounts 1993*. Ethiopia follows the production approach to estimating GDP, in which the goods and services produced by all categories of economic activity are summarized to arrive at total GDP. For livestock this approach involves four stages. First, national livestock populations are estimated by MOFED based on data supplied by the Central Statistics Agency (CSA). Second, production coefficients are applied to the livestock population estimates to generate estimates of the total output of goods such as meat, milk, butter, dung for fuel etc. Third, based on CSA producer price surveys, a monetary value expressed in Ethiopian birr – the gross value of output – is ascribed to the total output of each kind of livestock product. Finally, input costs (intermediate costs) are deducted from the gross value of output to derive value added.
3. The production approach followed by Ethiopia is the most direct method of estimating GDP and is almost certainly the method used by other IGAD states. Adjusted to local husbandry practices and output profiles, **the methods developed in this report should apply equally to the re-estimation of the contribution of livestock to agricultural GDP in the other IGAD states.**
4. The production coefficients presently used by MOFED are potentially outdated. We evaluated and adjusted these production coefficients in light of current research and survey evidence, developed 7 revised coefficients, and retained unchanged 5 pre-existing coefficients. We retained unchanged MOFED's estimates of the size of national cattle and camel populations, but recommended an objective formula that adjusted upwards the estimated size of goat and sheep populations. Using MOFED producer price figures for 2008-09, we then recalculated the combined gross value of 12 categories of livestock product output using our revised set of coefficients and livestock population estimates. **The recalculated combined gross value of 12 categories of livestock product output totalled 48.095 billion birr in 2008-09, an increase of about 47% over the gross value of ruminant production estimated according to MOFED's current set of coefficients and herd size estimates.**
5. About 80% of Ethiopian farmers use animal traction to plough their fields. Both the mean area cultivated by a farm household and their yields per hectare are positively associated with cattle ownership and ploughing, in comparison to hand cultivation. Despite these contributions to agricultural output, no attempt is currently made to impute the monetary value of animal

traction for Ethiopian agriculture. The value of the animal draught power input into arable production can be estimated at 26.4% of the value of annual crop production. *This calculation transfers 26.4% of the value of the production of annual crops from the arable to the livestock subsector. Based on these figures, nearly a third (31%) of the total gross value of livestock output is represented by the value of animal draught power as an input into crop cultivation, an estimated 21.500 billion EB in 2008-09.* As a livestock service (albeit one provided by agriculture for agriculture) rather than a livestock product, ploughing services are classified for GDP purposes as animal husbandry service activities under the agricultural sector of national accounts.

6. The recalculated gross value of the agricultural output of ruminant livestock including the use of animal traction for cultivation totals 69.595 billion birr in 2008-09. This represents an increase of about 113% over current estimates of the 2008-09 gross value of ruminant livestock's contribution to agriculture, 32.640 billion birr according to MOFED's present set of coefficients and livestock population estimates.
7. In 2008-09 according to MOFED the gross value added of crop production was 111.737 billion EB at current prices. This figure does not include all of the intermediate costs of crop cultivation, now estimated at an additional 21.5 billion EB for animal traction in 2008-09 (point 5, above). When these cultivation costs are deducted from the gross value of crop output, the revised estimate of the gross value added of crop production is 90.237 billion EB in 2008-09. In the same year, the gross value added by all branches of livestock production (ruminant livestock, poultry and bees) was 74.338 billion EB (including the value of ploughing services) at prices current at that time. Total re-estimated agricultural gross value added in 2008-09 was therefore 164.575 billion EB. If we include the value of ploughing services, livestock provided 45% of agricultural GDP in 2008-09. Current MOFED estimates place livestock's contribution at about 25% of total agricultural GDP. The gap between MOFED estimates of the contribution of livestock and the estimates in this report suggests that the significance of livestock relative to crop production has been considerably underestimated in past calculations of agricultural GDP.
8. In terms of the amount they contribute to agricultural GDP, cattle are by far the most important ruminant species, providing output re-valued in this report at about 54 billion EB in 2008-09, if the value of dung for fuel and animal draught power for cultivation are both attributed solely to cattle. At the national level, goats are the second most economically important herd species, with a re-estimated 2008-09 output value of about 8.7 billion EB. These results suggest that future work on refining and updating the conclusions of this report should focus on improving the estimates of cattle and goat output, which are both high in absolute terms and apparently underappreciated in national accounting terms.
9. Agricultural GDP is based on the value of unprocessed or lightly processed agricultural produce at point of first sale. Some agricultural produce is consumed at this stage, but much is taken up by the service and manufacturing sectors of the economy which use it, modify it, and add value to it. As these livestock goods and services transit through the wider economy they continue to contribute to national GDP, not in the form of agricultural output but classified now as services or manufactured products. The GDP benefits derived from livestock in this way appear under a variety of accounting headings and are not readily attributed to livestock, which makes it difficult to assess the full extent of livestock's influence on the national economy. To remedy this situation and to gain a clearer understanding of the size of the livestock sector and the economic linkages between livestock production and the wider

economy, it is necessary to reassemble the data on livestock that are scattered under different headings throughout the national accounts. This reworking of the standard GDP estimates is termed 'satellite accounting.' **A proposal to carry out a simplified form of satellite accounting for livestock is presented in Part II of this report.**

10. Both satellite accounts and standard accounts of agricultural GDP examine the direct use value of livestock output – the immediately useful products and services, both traded and for home consumption, that livestock provide. Livestock also provide less tangible but no less important economic benefits. For rural smallholders, the most commonly cited economic functions of this kind are the use of livestock as savings, as assets that provide interest-free credit, and as insurance to mitigate risk. Without access to formal financial institutions, many peasants and pastoralists depend instead on their livestock for these important financial services.
11. **The concluding sections of this report briefly discuss methods that can be used to quantify in monetary terms the value of the informal financial services provided by livestock.** Preliminary results suggest that in 2008-09 the capital value of Ethiopia's national herd as a form of savings was roughly 86 billion EB, with an annual return on this investment of about 21-26 billion EB. It is not possible at this point to accurately impute monetary values to the credit and risk mitigation functions of Ethiopian livestock, but with further research it should be possible to derive reliable estimates of these values.
12. The re-evaluation in this report of the relative contributions of crop and livestock production to Ethiopian agricultural GDP was large in absolute terms and suggests new ways of viewing the role of livestock in the national economy. The techniques developed in this report to estimate the value of the informal financial services provided by livestock are generally applicable to peasant and pastoral production systems and should be appropriate for use in all the IGAD member states. **In sum, the results of this exercise are potentially significant for Ethiopian economic policy and a similar exercise can be replicated in other IGAD states. Continuation of this programme should contribute to a new understanding of the regional importance of livestock and a clearer appreciation of its true economic significance in regional economic development.**
13. The reappraisal of the value of livestock output contained in this report is based on recent available field research. In a general review of this kind, some important surveys and specialized studies may not have come to the attention of the consultant and were not examined, or were in preparation or otherwise unavailable. An open discussion with the different stakeholders – data providers, livestock researchers, and relevant line ministries and departments – is necessary to have a common understanding and to appraise the accuracy of the facts and figures contained in this document.

INTRODUCTION

This study has the following objectives:

- To provide an assessment on whether the contribution of livestock to GDP is correctly reflected in national income accounting in Ethiopia.
- To propose and refine a methodology for the internal assessment of livestock's contribution to GDP in Ethiopia which can subsequently be applied in Djibouti, Kenya, Somalia, Sudan and Uganda.

This is the third in a series of three reports. An Inception Report presenting the findings of the situational analysis and the proposed methodology for the study was presented on 1 December 2009. A second draft report, submitted 12 February 2010, presented the preliminary results of work conducted in Ethiopia using the proposed methodology. This final report contains the study findings, an assessment of the application of the methodology in Ethiopia and further recommendations for its application in the other IGAD member states.

The contribution of livestock to agricultural GDP is the most commonly quoted single measure of livestock's importance to the overall national economy. Agricultural GDP represents the value of unprocessed or lightly processed agricultural produce at point of first sale. Part I of this report examines the methods currently used by MOFED to estimate the contribution of livestock to Ethiopian agricultural GDP and recommends some modifications to these methods. The impact of adopting these modifications is illustrated by recalculating livestock's contribution to agricultural GDP in 2008-09.

Agricultural GDP is based on the value of unprocessed or lightly processed agricultural produce. Some agricultural produce is consumed at this stage, but much is taken up by the service and manufacturing sectors of the economy which use it, modify it, and add value to it. The secondary GDP benefits derived from livestock in this way appear under a variety of accounting headings and are not readily identified with livestock. To gain a clearer understanding of the size of the livestock sector, it is necessary to reassemble the data on livestock that are scattered under different headings throughout the national accounts. This reworking of the standard GDP estimates is termed 'satellite accounting.' A proposal to carry out a modified form of satellite accounting for livestock is discussed in Part II of this report.

For rural smallholders, livestock also perform important economic functions as repositories of household savings, as assets that provide interest-free credit, and as insurance to mitigate risk. These 'self-help' financial services are especially important for rural people who lack access to formal financial institutions and depend instead on their livestock. The concluding sections of Part II briefly discuss methods that can be used to quantify in monetary terms the value of the informal financial services provided by livestock.

PART I - AGRICULTURAL GDP

1.1. Methodology

Ethiopia's GDP estimates conform to internationally recognized standards codified in the *System of National Accounts 1993*, established by the United Nations and a group of international financial institutions, and the *International Standard Industrial Classification of all Economic Activities*, prepared by the United Nations Statistics Division. Application of these procedures in Ethiopia is guided by the *National Accounts Statistics of Ethiopia: Sources and Methods-1992 (1999/2000) Base Year Series*, a manual prepared by the National Accounts Department, Ministry of Finance and Economic Development (MOFED). The GDP estimates for Ethiopia are prepared by the National Accounts Department of MOFED.

GDP can be calculated in three ways, each of which should in theory give the same result. Ethiopia follows the production approach in which the outputs of every category of economic activity are summarized to arrive at total GDP. An alternative, the expenditure approach, assumes that all production must be purchased by somebody and that the total value of output must therefore equal the sum of all expenditures. Finally, the income approach assumes that producers' incomes must be equal to the value of their outputs, and arrives at GDP by adding together the income from all sources. The production approach followed by Ethiopia is the most direct method for calculating GDP and is, almost certainly, the method followed by the remaining IGAD states. Methodologies and lessons developed in the analysis of the contribution of livestock to Ethiopian GDP are therefore likely to be pertinent to the other IGAD states.

The calculation of livestock's contribution to agricultural GDP in Ethiopia involves four different types of data. First, national livestock populations are estimated by MOFED based on data supplied by the Central Statistics Agency (CSA) (Table 1). Second, based on CSA producer price surveys, a monetary value expressed in Birr is ascribed to the output of each kind of livestock product (Table 2). Third, production coefficients are applied to the livestock population estimates to generate estimates of the total output of products such as meat, milk, butter, dung for fuel etc. (Table 3). The total monetary value of the output of various livestock products is termed the gross value of output. Finally, input costs (Table 4) are deducted from the gross value of output to estimate value added.

Calculations of GDP in this report are based either on information in Tables 1-4 or revised versions of these tables, as follows:

- As discussed in detail in the next section of this report, the CSA data on national livestock populations that forms the basis for Table 1 is flawed because it does not include the pastoral areas of Somali and Afar Regions. The following section of this report recommends a procedure for adjusting CSA annual livestock figures to incorporate all pastoral animals.
- Table 2, based on CSA surveys of producer prices, is the sole source of price data used in this report.
- The production coefficients presently used by MOFED and summarized in Table 3 are potentially outdated. Later sections of this report adjust these production coefficients in light of current research and survey evidence. These adjustments produce significant changes in the estimated volume of ruminant livestock production, in turn producing substantial increases in the estimated levels of agricultural GDP attributable to the livestock subsector.
- Table 4 gives MOFED's estimates of the input costs associated with livestock production. Based on the aggregated figures in Table 4, it is not possible to assign precise costs to keeping particular species of livestock or to the production of particular livestock products.

Table 1: Livestock mid-year populations, 1000 Head

Livestock Type	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	1997/98	1998/99	1999/2000	2000/2001	2001/2002	2002/03	2003/04	2004/05	2005/06	2006/07	2007\08	2008\09
CATTLE	41820.6	42370.8	42927.7	43557.2	44194.4	44198.7	44306.2	45059.4	45825.4	46604.4	47396.7	48202.5
GOAT	22412.8	22440.8	22468.9	22693.1	22854.1	22257.2	21912.4	22322.2	22739.6	23164.8	23598.0	24039.3
SHEEP	22310.4	22399.6	22489.2	22846.2	23269.5	22937.2	22805.3	23437.0	24086.2	24753.4	25439.1	26143.8
CAMEL	2,289.2	2,301.1	2,301.1	2,298.4	2,303.5	2,302.4	2,300.3	2,293.0	2,293.1	2,293.4	2,293.6	2,293.8
ASSES	4,168	4,175	4,170	4,181	4,193	4,183	4,171	4,171	4,171	4,172	4,173	4,173
HORSES	1506.5	1505.8	1503.2	1503.8	1505.2	1503.8	1503.2	1504.5	1505.8	1507.2	1508.6	1510.0
MULES	357.9	357.4	357.1	357.4	357.7	356.9	356.5	357.1	357.7	358.2	358.8	359.4

Source: MOFED, unpublished data National Accounts Department

Table 2: MOFED Producer Prices for Livestock and Livestock Products

LIVESTOCK SUB-SECTOR	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
PRODUCER PRICES	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007\08	2008\09
1. CATTLE												
1.1 Average price	442.0	383.0	384.0	413.2	416.5	413.7	429.9	580.9	797.4	995.2	1217.4	1400.9
1.2. Off-take price	509.5	442.0	444.5	476.3	483.1	477.8	488.1	631.8	1006.0	1248.1	1492.6	1867.7
2. GOAT	61.7	50.4	56.4	62.3	63.7	72.3	75.3	99.9	126.3	155.4	180.1	206.4
3. SHEEP	61.7	55.2	59.8	70.7	75.1	86.3	88.8	105.6	133.7	159.1	180.9	209.5
4. CAMEL	953.6	804.8	974.8	1072.8	1072.7	959.8	979.0	1481.8	1879.3	2006.4	2794.7	3162.9
5. ASSES	206.9	203.5	203.5	220.4	261.7	242.8	242.8	330.6	428.3	521.1	672.7	767.5
6. HORSES	505.1	377.8	378.4	421.9	400.2	418.2	426.5	554.8	813.5	900.0	1196.3	1241.9
7. MULES	893.3	712.9	759.9	791.8	756.7	791.3	807.2	1006.3	1289.5	1673.8	2427.8	2374.6
8. POULTRY (CHICKEN)	6.5	6.1	7.0	6.9	6.0	6.8	7.0	6.1	7.8	8.9	11.5	14.9
Stock price	5.6	5.2	6.0	5.9	5.2	5.8	5.9	5.1	6.6	7.5	9.7	12.6
9. COW MILK	2.2	2.0	2.3	2.2	1.9	2.2	2.2	2.5	2.9	2.8	3.7	4.9
10. GOAT MILK	2.1	2.0	2.1	2.1	2.5	2.8	2.9	3.2	3.7	4.4	3.4	6.4
11. CAMEL MILK	2.2	2.0	2.6	2.0	2.3	2.4	2.4	2.7	3.2	3.0	3.8	5.5
12. BUTTER	18.6	17.2	19.4	16.7	15.1	18.6	18.9	23.5	29.8	27.1	40.9	49.8
13. MILK after BUTTER	0.9	0.8	0.9	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.5	1.9
14. EGG	0.3	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.5	0.7
15. HONEY	9.2	8.6	9.1	8.4	17.0	8.0	8.1	10.0	12.1	15.5	19.0	22.1
16. BEE-WAX	4.1	3.9	4.1	3.8	7.7	3.6	3.6	4.5	5.5	7.0	8.5	9.9
17. SHEEP WOOL	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
18. ANIMAL DUNG	177.3	149.6	174.6	196.1	195.2	134.0	149.3	199.8	174.3	246.5	263.5	306.0
19. Cheese	3.6	3.3	3.7	3.2	2.9	3.6	3.6	4.0	5.4	5.9	8.1	10.6

Table 3: MOFED livestock product output coefficients

CATTLE	
Population	CSA reports adjusted
Offtake percentage	7% of total population
Cows giving milk	12 of total population, or survey estimate
Milk production	Number of milking cows * 210 lit./head/year
Milk for butter	50% of milk produced
Butter production	5.1% of milk for butter * 1.031 kg.
By products of milk production	.95 of milk for butter
Livestock dung for fuel	Per capita expenditure from CSA survey
GOATS	
Population	CSA reports adjusted
Offtake percentage	31.5% of total population
Goats giving milk	25.1% of total population
Milk production	Number of milking goats * 35 lit./head/year
SHEEP	
Population	CSA reports adjusted
Offtake percentage	30% of total population
Wool production	5% of total population * 1 kg./head/year
CAMELS	
Population	CSA reports adjusted
Offtake percentage	2% of total population
Camels giving milk	20% of total population
Milk production	Number of milking camels * 784 lit./head/year
POULTRY	
Population	CSA reports adjusted
Hens laying eggs	20% of total population
Egg production	60 eggs/laying hen/year
Offtake percentage	98% of total population
BEE PRODUCTS	
Honey production	CSA reports
Wax production	40% of honey production

Source: National Accounts Department, MOFED, unpublished

Table 4: Value of intermediate inputs for livestock production (current price)

	unit	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
		1999/2000	2000/2001	2001/2002	2002/03	2003/04	2004/05	2005/06	2006/07	2007\08	2008\09
Prepared animal feed	000 birr	7707.7	9474.6	11306.0	13491.4	16908.6	18641.7	20552.5	21431.5	22351.0	23309.9
Vaccines	000 birr	23850.4	29318.7	25995.4	23048.8	20436.1	22530.8	22621.0	23588.5	24600.5	25655.9
Salt for cattle	000 birr	74694.2	77967.4	71153.0	72485.82	74434.4	79484.8	84877.8	88147.4	91548.6	95081.1
Poultry feed	000 birr	33887.0	23552.1	18883.8	29022.5	30814.2	36628.2	40483.8	42718.5	43625.2	44551.2
AI	000 birr	105.3	106.9	107.2	106.0	106.3	117.2	123.1	125.7	128.3	162.3
Oil cake	000 birr	30355	34228	190828	190828	191369	210984	232610	242559	252965	263817
TOTAL	000 birr	170597.3	174647.7	318273.9	328983.0	334068.5	368386.9	401268.3	418570.4	435218.4	452577.5

Source: MOFED unpublished data

1.2. National livestock population estimates

Information on the size of Ethiopian livestock populations is available from the Central Statistical Agency's (CSA) annual report series, the *Agricultural Sample Survey, Livestock and Livestock Characteristics (Private Peasant Holdings)*, the most recent issue being Statistical Bulletin 446 of 2009 covering the agricultural year 2008-09. MOFED adjusts the figures from CSA to arrive at the livestock population estimates used in GDP calculations; 'smoothing' what they consider to be unexplained annual fluctuations in CSA population estimates. MOFED estimates are presented in the Table 1 *Livestock Mid-year Population, 1000 heads*. MOFED estimates of cattle populations have grown steadily by small increments for the last decade, as have sheep and goat populations, with the exception of modest population declines for small ruminants between 2002 and 2006. Camel populations have remained essentially unchanged.

Annual CSA surveys cover only 2 of the 5 Zones in Afar Region and 3 of the 10 Zones in Somali Region, leaving out pastoral Zones with high numbers of livestock. The CSA does not attempt to estimate livestock populations in these pastoral Zones, which are completely excluded from national estimates. Table 5 compares MOFED and CSA livestock population estimates for 2005-06 with those of the Livestock Development Master Plan Study (LDMPs) for 2006 (Phase I, Volume B). The LDMPs estimates are important because they include all of Afar and Somali Regions, incorporating animals included in the special CSA Pastoral Areas Enumerations of those regions in November and December of 2003 (CSA 2004a, b); 2006 is the most recent year in which it is possible to make the three-way comparison between MOFED, CSA and LDMPs national estimates.

Table 5: MOFED and CSA national livestock population estimates for 2005-06, 1000 head

	MOFED 2005-06	CSA 2005- 06	LDMPs 2006
Cattle	45825.4	40281.1	43122.8
Sheep	24086.2	20721.6	30620.4
Goats	22739.6	16248.9	26797.0
Camels	2293.1	436.6	2466.4
Horses, donkeys and mules	6034.5	6190.4	6457.7

What MOFED requires is a method of adjusting the CSA annual estimates to include pastoral animals. According to LDMPs figures for 2006, cattle in Afar and Somali Regions constitute 8.2% of the national cattle herd, 34.6% of the national sheep flock, 43.2% of the national goat flock, and 92.9% of the national camel herd (recalculated from LDMPs Phase 1, Volume B, Table 3). Assuming that the proportion of the national herd in Afar and Somali Regions remained constant between 2006 and 2009, the most recent CSA livestock survey results for 2009 can be adjusted to include the pastoral animals routinely excluded from these annual surveys. This adjustment is carried out in Table 6.

Table 6: CSA 2008-09 national ruminant livestock population estimates adjusted to include pastoral animals in Afar and Somali Regions

		Cattle	Sheep	Goats	Camels
A	CSA national	49297898	25017218	21884222	759696
B	Afar (2 Zones)	43270	403255	801497	171514
C	Somali R. (3 Zones)	620583	1162743	1374540	241943
D = A - (B + C)	CSA national with 5 zones removed	48204045	23451220	19708185	346239
E	Constant	1.0894	1.5294	1.7599	14.0269
F = D * E	CSA national adjusted	52513486	35866295	34684434	4856659
G	MOFED national estimates	48202500	26143800	24039300	2293800

The correction procedures illustrated in Table 6 are based on survey results adjusted according to a standard set of rules: The partial annual returns from Afar and Somali Regions are first deducted from CSA annual national estimates. Corrected to exclude the two pastoral regions, the national figures are then multiplied by a constant that reflects the proportion of the national herd that was estimated by LDMPs to be in Afar and Somali Regions in 2006. The advantage of this approach is its objectivity, but there are disadvantages as well. In particular, there is no reason to assume that the proportion of the national herd that resides in Afar and Somali Regions should necessarily be stable over time, given that the pastoral lowlands are subject to different climatic regimes than the highlands, and that pastoralists buy and sell different products in different markets than highland farmers. Especially with respect to camels, it makes little sense to use the small highland camel population to predict the size of the much larger lowland camel population. Finally, with respect to cattle, it is biologically improbable that the national cattle herd should grow year upon year unless there is a corresponding expansion in the amount of feed available, for which there is little indication. There is also evidence of a decline in cattle numbers and a shift to the raising of increased numbers of camels and goats in some pastoral areas. Additional evidence is therefore needed to corroborate the population estimates in Table 6. Such evidence as exists is discussed below.

Table 7 presents additional information on livestock populations in Afar Region. In Afar CSA annual surveys cover two zones (Zones 1 and 3) and the livestock population estimates for these zones are substantially in disagreement with those provided by the Regional Authorities (see Table 7). Aerial livestock surveys in 1990 covered an area of 7450 square kilometres roughly corresponding to Amibara, Awash Fentale and Dulesa woredas in Zone 3. These surveys estimated cattle populations at 46,000 head and small stock at 119,950 (ILCA 1990). These figures also bear little relationship to current estimates by Regional officials of the livestock populations of these three districts (Table 7). There is, however, broad agreement between the Regional estimates for 2009 (BOFED) and the LDMPs estimates for 2006, with the LDMPs estimates generally somewhat higher than those of the regional authorities.

Table 8 summarizes available information on livestock population levels in Somali Region. This table combines aerial survey data from 2003 for seven Zones, with CSA ground survey data for 2008-09 for two Zones not included in the earlier aerial survey. The hybrid regional total derived in this way is compared to LDMPs estimates for 2006, and there is a remarkably high level of agreement between these two different estimation procedures.

To summarize, we do not know the size of the livestock populations in Afar and Somali Regions, and hence do not know the size of the Ethiopian national herd. Discrepant estimates of livestock population levels produce, moreover, large effects on GDP calculations. **An accurate estimate of the contribution of livestock to Ethiopia's GDP will not be possible until the size of national livestock populations has been established.** At present, however, the balance of available evidence suggests that MOFED's estimates of national cattle and camel populations are reasonable and should be retained, but that MOFED may underestimate small ruminant populations by about 20 million head of sheep and goats. Calculations in the remainder of this report are based on the MOFED estimates for cattle and camel numbers and on CSA estimates of sheep and goat numbers adjusted using procedures illustrated in Table 6.

Table 7: Afar Regional livestock population estimates for 2008-09

Woreda	Zone	Cattle	Sheep	Goats	Camels	Equines
Dalifage	2	61450	88886	117957	20981	
Dewe	5	35457	50726	101524	15240	856
Hadeleela	5	19415	58428	112856	16907	1951
Semurobi	5	44466	31420	139142	16498	6145
Telalak	5	40549	58051	116102	17394	978
Zone 5 sub-Total		201337	287511	587581	87020	9930
Awra	4	25000	114951	131040	11000	300
Ewa	4	225229	196013	145220	47890	12063
Gulia	4	11231	11079	37158	4818	271
Teru	4	131325	209552	233093	29668	7776
Yalo	4	19372	17800	46706	14817	1899
Zone 4 sub-Total		412157	549395	593217	108193	22309
Amibara	3	103959	48043	122526	39995	3888
Argoba	3	14500	1033	9834	0	1473
Awash Fentale	3	52000	35000	47192	3230	
Buremudaitu	3		725890	103660	11685	5180
Dulesa	3	52000	35000	47192	3230	
Gewane	3	106111	80498	75669	25606	5030

Zone 3 sub-Total		328570	925464	406073	83746	15571
CSA Zone 3		218045	204135	426289	124202	
Abaala	2	44605	38306	87352	28834	4841
Afdera	2	29946	89180		51034	9433
Berhale	2	730	6855	83004	13366	1541
Biddu	2					
Dalol	2	41783	17600	13081	32804	1106
Erebt	2	40334	36334	72750	10899	3000
Koneba	2		32659	79817	3000	6550
Megale	2	38992	54982	171591	16946	4221
Zone 2 sub-Total		196390	275916	507595	156883	30692
Adaar	1					
Afambo	1	85176	39135	6597	4913	2283
Aysaita	1	71383		23086	3277	482
Chifra	1	352316	342286	306720		1771
Dubti	1	40599	46819	52729	5966	1591
Elidar	1	29946	89180		51034	9433
Kuri	1					
Mille	1	135924	248516	304005	69549	885
Zone 1 sub-Total		715344	765936	693137	134739	16445
CSA Zone 1		255225	199120	375208	47312	
TOTAL BOFED		1853798	2804222	2787603	570581	94947
LDMP5 2006		2152725	2570713	4467901	873493	

Source: CSA 2009, BOFED 2009, LDMP5 2006

Table 8: Estimated livestock populations in Somali Regional State

	Afder	Degehabur	Fik	Gode	Korahe	Shinile	Warder	2003 subtatoal	Jijjiga 2009 CSA	Liben 2009 CSA	Regional estimated total	LDMPs 2006
Cattle	166471	51536	17072	165277	26301	207472	36146	670,275	372940	228765	1,271,980	1,386,903
Sheep	1152509	1395779	57561	517668	362778	670956	2253550	6,410,801	852393	182100	7,445,294	8,028,693
Goats	722709	721925	141475	985869	690891	849451	1413143	5,525,463	603098	487776	6,616,337	7,102,281
Camels	140454	131106	25605	115498	149971	103052	376183	1,041,869	76952	149873	1,268,694	1,417,080

Source: SC-UK n.d., CSA 2009 and LDMPs 2006

1.3. Livestock production estimates

To determine the volume of production, MOFED uses a set of coefficients that estimate the output of a known number of livestock. These coefficients were developed in the 1980s in order to construct national economic plans under the Derg regime. MOFED could not give scholarly or scientific references for these production coefficients. The following sections of this report re-examine the probable accuracy of those coefficients that pertain to ruminant livestock. In light of this review, we suggest some modifications to the existing coefficients and calculate the likely impact of these adjustments on the volume and value of different livestock products.

1.3.1. Offtake rates - cattle, small ruminants and camels

An overview of available information on livestock offtake rates is provided in Table 9.

Table 9: Estimated net offtake rates (sales + slaughter - purchases) for Ethiopian livestock

Source/region	Cattle	Sheep	Goat	Camels
GDP-MOFED, national (1)	7	30	30.1	2
ILRI Highlands (2)	(8)9	(22)37	(18) 26	No estimate
CSA (2)	(7)7.6	(7) 11	(8) 12	No estimate
GL-CRSP(2)	(9)9	(6) 13	(7) 9	No estimate
PADS (3)	8	19	25	No estimate
ESGPIP (4)	No estimate	33	35	No estimate
Kassahun Awgichew (5)	No estimate	40	No estimate	No estimate
DGDP (6)	No estimate	No estimate	29	No estimate
National estimate (7)	No estimate	35	38	No estimate
Fourth LDP (8)	4.1	No estimate	No estimate	No estimate
Somali Regional State (9)	20		68	8.6
Jigjiga Zone , SNRS (10)	No estimate	No estimate	No estimate	7.7

Sources and notes:

- (1) Unpublished records, MOFED, summarized in Table _.
- (2) Asfaw Negassa and Mohammad Jabbar. 2008. Commercial offtake rates are in parentheses () and total offtake is derived from information on pages 8, 14-16.
- (3) PADS Study 5, page 4.
- (4) Adane Hirpa and Girma Abebe 2008.
- (5) Kassahun Awgichew 2000.
- (6) Ayalew et al n.d. 29% net (65% gross) offtake referred to traditionally managed flocks; improved management under the Dairy Goat Development Project (DGDP) 1989-97 supported a net offtake (sales, slaughter and transfer-out less purchases and transfer-in) of 38%.
- (7) Tsedeke Kocho Ketema 2007 citing Workneh Ayalew 2006.
- (8) GRM International 1994. The cattle sales rate was 13.4%. The low net offtake rate reflects high levels of cattle purchases for fattening and draught combined with low rates of slaughter for home consumption.
- (9) Baars 1994. All figures refer to gross offtake rates
- (10) Yohannes Mehari et al. n.d. 7.7% is the gross offtake rate; more animals were purchased than sold leading to a negative net offtake rate.

Several points require emphasis:

- a) The balance of recent survey evidence suggests that the national cattle net offtake rate is around 9%, rather than the 7% used by MOFED. Evidence of a much lower offtake rate (4.1%, Fourth Livestock Development Project) comes from 1990-1993 and reflects lower levels of market development at that time.
- b) Quoted sheep and goat offtake rates are highly variable. The higher offtake estimates come from more recent sources (ESGPIP 2008; Ketema 2007 citing Ayaleu 2006), suggesting a secular trend towards higher levels of market involvement and sales by small ruminant producers. This possible trend warrants further investigation, but there is at present insufficient evidence to justify an increase in the estimated rates of sheep or goat offtake currently used by MOFED.
- c) There is insufficient evidence to warrant changing the MOFED estimated camel offtake rate of 2% of the total herd.
- d) Offtake rates are variable over time and the results of single-year studies must be treated with caution. This is especially true in the lowlands where recurrent cycles of drought and recovery produce periods of high offtake during droughts followed by periods of herd recovery when offtake rates are minimal. Used by their owners both as a buffer against drought and as the fastest form of livestock accumulation following a drought, small ruminants are particularly exposed to alternating periods of high and low offtake.
- e) Offtake rates measured in head of livestock can be misleading when producers purchase young stock for fattening. When offtake is estimated per head, a small or young animal entering a herd will be counted as the equal to a larger or older animal leaving a herd, irrespective of the different mean weights at which animals enter and exit the herd.

1.3.2. Cattle milk yields

Table 10 summarizes available information on milk yields for human consumption from Ethiopian cattle held by pastoral and peasant producers. In calculating milk yields for GDP estimates, MOFED estimates national cattle milk output as a function of the percent of the herd that is lactating multiplied by the litres of offtake per lactation. Table 10 emphasises recent studies that express milk output in a form compatible with this format. For comparative purposes, the results of these studies are summarized as litres of milk offtake per 100 head of cattle.

Several conclusions are supported by this comparison. First, as one might expect given the diversity of ecological conditions and different livestock production systems in Ethiopia, there is a wide range of output estimates from different studies – the highest levels of milk output being about 30 times more than the lowest estimates. Moreover, both in terms of litres per lactation and total offtake per 100 cattle, MOFED coefficients are the lowest among the dozen studies reviewed here. There can be little doubt that MOFED would underestimate cattle milk yields if its calculations were based on these coefficients. However, over the last five years MOFED's estimate of the proportion of the cattle herd that is milking has averaged 19.9%, and the assumed milk yield per lactation has been 326.5 litres.

The suitability of these coefficients is difficult to assess given the variability in the milking performance of the cattle reviewed in Table 10. Highland cattle provide draught power and manure, but produce reduced quantities of meat and milk when compared to pastoral and agro-pastoral cattle. Specialized urban dairy herds produce the highest milk yields per head but, from the national perspective, represent few animals in total. MOFED currently applies a single milk output coefficient to the entire

national herd. Arguably, a more accurate procedure would be to divide the national cattle herd into different production systems and to separately estimate the mean output per head for each system.

Additional research would be required to conclusively identify a single appropriate milk yield coefficient. In lieu of this research, calculations of milk output in this report assume the production of 9216 litres of milk for human consumption per 100 head of cattle per year. This is the mean output from 7 rural studies summarized in Table 10 (excluding MOFED's estimates, an anomalously high value in one Somali study (Baars 2000) and SNNPR urban dairy operations). The recommended formula for determining cattle milk output is:

$$20.6 \text{ (percentage of cattle herd giving milk)} * 448 \text{ (litres of milk per lactation)} = 9216 \text{ litres of milk for human consumption per 100 head of cattle}$$

Table 10: Estimated milk offtake from Ethiopian cattle populations

Source/region	Percent herd lactating	Litres offtake per lactation	Litres offtake per 100 head of cattle
GDP-MOFED, national (1)	12	210	2520
Gryseels (2)	9.5	292	2774
Central Statistics Authority, national (3)	20	238	4760
MOFED 2005-09 (1)	19.8	326.5	6465
Highland zebu (4)	15.5	447	6934
Gondor transhumant (5)	14.8	540	8004
Borana pastoral (6)	31.5	294	9261
Highland crossbreed (7)	15.5	923	14317
Afar pastoral (8)	41	401	18464
Somali pastoral (9)	23.5	2285	53675
SNNPR, urban dairy herds (10)	50.7	1516	76863
Southern Ethiopia (11)	No estimate	555	No estimate
Mieso, Orimiya (12)	No estimate	271	No estimate

Sources and notes:

(1) Unpublished records, MOFED, based on a three year moving average of data obtained from the CSA.

(2) Gryseels n.d.

(3) Central Statistical Agency. 2009. Derived from data on pages 26, 37, 111.

(4) GRM International 1994. Derived from data on pages 16, 21, 39, 49.

(5) Azage Tegegne et al. 2009. Derived from information on pages 27, 44, 45.

(6) D.L. Coppock. 1994. Derived from information on pages 155, 145, 171.

(7) GRM International 1994. Derived from data on pages 16, 21, 39, 51.

(8) Davies, J. 2003. Derived from information on pages 190-94, 196, 197.

(9) Baars, R.M.T. 2000.

(10) Sintayehu Tigrem et al. 2008. Derived from information on pages 22-24.

(11) Adugna Tolera and Aster Abebe 2007.

(12) Hussen et al. 2008

1.3.3. Milk yields from small ruminants

We have been able to locate only two studies that express goat milk output as a function of total goat numbers, the format used by MOFED in their calculations (Table 11). It has therefore been necessary to construct a composite estimate of goat milk output based on the following assumptions:

- 43% of the national goat flock are breeding females, as documented in the Afar study in Table 11
- highland small ruminants have 1.2 births per year (Gryseels n.d.) as compared to 1.7 births per year for lowland flocks in Afar (Davies 2003), or an unweighted mean national birth rate of 1.45
- excluding MOFED's undocumented estimate, unweighted mean lactation yields in Table 11 are 46.5 litres/year.

Combining these assumptions, **100 head of goats yields 2899 litres per year**. The recommended formula for determining goat milk output is:

$$[43 \text{ (percentage breeding females)} * 1.45 \text{ (mean birth rate/year)}] * 46.5 \text{ (litres per lactation)} \\ = 2899 \text{ litres of milk output per 100 head of goats per year.}$$

Table 11: Estimated milk offtake from Ethiopian goat populations

Source/region	Percent flock lactating/year	Litres offtake per lactation	Litres offtake per 100 head of goats
GDP-MOFED, national (1)	25.1	35	752.5
Central Statistics Authority, national (2)	No estimate	No estimate	No estimate
Borana pastoral (3)	No estimate	Average daily offtake .32kg/head	No estimate
Afar pastoral (4)	73	54	3947
Somali pastoral (5)	29	42	1218
Borana/Garri (6)	No estimate	43	No estimate
Borana (7)	No estimate	47	No estimate

Sources and notes:

- (1) Unpublished records, MOFED
- (2) Central Statistical Agency. 2009.
- (3) D.L. Coppock. 1994. Derived from information on pages 155, 145, 171.
- (4) Davies, J. 2003. Derived from information on pages 196-7. 43% of the flock is composed of adult females who give 1.7 births per year, giving a yearly milk offtake per female of 91.8 litres
- (5) Baars, R.M.T. 2000. Derived from information on pages 116, 121; calculations refer to combined flocks of sheep and goats.
- (6) Adugna Tolera and Aster Abebe. 2007.
- (7) Cossins NJ, Upton M. 1987.

1.3.4. Camel milk yields

Combining data from available research (Table 12), it is possible to derive a camel milk output estimate based on the following assumptions:

- breeding females constitute 20% of the camel population
- the mean lactation yield from the seven research studies/surveys of Ethiopian camel production summarized in Table 10 is 1326 litres per lactation. (This mean value ignores the anomalously high output reported in Baars 2000.)

Estimated camel milk yields per 100 camels are:

$$20 \text{ (percentage of lactating females)} * 1326 \text{ (litres per lactation)} = 26,520 \text{ litres of milk output per 100 head of camels.}$$

Table 12: Estimated milk offtake from Ethiopian camel populations

Source/region	Percent herd lactating/year	Litres offtake per lactation	Litres offtake per 100 head of camels
GDP-MOFED, national (1)	20	784	15680
Central Statistics Authority, national (2)	21	999	20,979
Afar Pastoral (3)	No estimate	904	No estimate
Somali Pastoral (4)	18	9343	168,181
Borana Pastoral (5)	No estimate	1045	No estimate
Borana pastoral (6)	No estimate	1746	No estimate
Borana/Garri (7)	No estimate	2369	No estimate
Mieso, Oramiya	No estimate	797	No estimate
Eastern Ethiopia (9)	No estimate	1422	No estimate
International (10)	No estimate	2911	No estimate

Sources and notes:

- (1) Unpublished records, MOFED
- (2) Central Statistical Agency. 2009.
- (3) Gebre Mariam 1987. Cited in Davies 2003.
- (4) Baars, R.M.T. 2000. Derived from information on pages 120, 124.
- (5) Belete Dessalegn. 1985. ILCA library ascension number 34923, cited in Coppock 1994.
- (6) Yohannes Mehari et al. 2007.
- (7) Adujna Tolera and Aster Abebe. 2007
- (8) Hussen et al. 2008.
- (9) Bekele et al. 2002.
- (10) Davies, J. 2003. Mean value derived from a review of published reports on camel production, world wide.

1.3.5. Production of livestock dung for fuel

In contrast to the methods used to compute the output of other livestock products, MOFED estimates of the value of dung used for fuel are based on CSA surveys of household expenditures on dung purchases (*Sources and Methods*, MOFED 2005). Most of the dung used for fuel is produced by farm households for their own use and is not bought or sold. By ignoring home production for home consumption, the use of CSA expenditure data underestimates the total value of dung as fuel. The inclusion within GDP accounts of home produced dung is permitted in terms of the NSA guidelines which encourage the valuation of home consumed agricultural production and specifically mention firewood, which performs a function similar to dung used for fuel:

The following types of production by households are, therefore, included [in estimates of GDP] whether intended for own final consumption or not: (a) The production of agricultural products and their subsequent storage...wood-cutting and the collection of firewood (SNA 1993: 125).

According to the Ethiopian Energy Authority, dairy cattle produce 2.01 kg. manure per head per day and nondairy cattle produce 2.27 kg/head/day (Asress Wolde Giogris n.d.). Based on data collected from 1987-93 the EEA calculates that 22% of all manure produced is used for fuel. (Hawando n.d. gives a higher utilization rate of 38% but provides no evidence for this estimate.) Based on EEA estimates, annual manure used for fuel per head of nondairy cattle can be calculated as follows:

$$2.27 \text{ (kg manure/head/day)} * 365 \text{ (days per year)} * .22 \text{ (utilization rate)} = 182 \text{ kg dung used for fuel/head/year}$$

An alternative method of calculation can be based on data provided in a study of manure use in Amhara Region (Mekonnen and Kohlin 2009). The mean weight of dung used for fuel by households in this study was equivalent to 293 kg dung used for fuel/head of cattle/year.

Gryseels and Goe n.d. calculated that farm households near Debre Zeit and Bebre Berhan used on average 2.314 tons of dung for fuel per year in the early 1980s. Mean livestock holdings (equines, cattle and small ruminants combined) for these households were 7.3 TLU per household, the equivalent of about 10.4 cattle. Expressing household dung use as a function of cattle numbers, each unit of cattle produced the equivalent of 222.5 kg of dung for fuel per year.

In this report we estimate that on average the amount of dung used for fuel per head of cattle is 232.5 kg., the mean of the three available studies.

1.3.6. Use of cattle draught power for the production of annual crops

About 80% of Ethiopian farmers use animal traction to plough their fields (CSA Agricultural Sample Enumeration 2001-02). In the Ethiopian highlands the area under cultivation is positively associated with cattle ownership (Abdinasir 2000; Bogale 2009; Gryseels n.d.; Meregia and Legesse 2005). Ploughing with cattle also increases crop output per hectare. According to a study in Oromiya Region based on CSA survey data, farmers who used oxen or a combination of oxen and hand cultivation obtained higher yields of both teff and maize compared to farmers using hand cultivation alone (Meregia and Legesse 2005). In an earlier study, Gryseels showed that highland farmers with one oxen increased their net farm cereal production by 267 kg more than farmers with no oxen, gaining a further 186 kg on average if they owned a second ox. MOFED makes no attempt to calculate the contribution of animal draught power to arable output.

The monetary value that farmers put on draught power can be estimated at prevailing sharecropping or oxen rental rates, using the following formula:

$$.80 \text{ (percentage of farmers using animal draught power for cultivation)} * .33 \text{ (portion of crop output paid for animal draught in sharecropping arrangements)} = .264 * \text{the value of annual crops.}$$

In the above formula, the costing of animal draught at 33% of crop output is based on Meregia and Legesse (2005). According to earlier data collected by Gryseels, highland farmers in Debre Zeit and Debre Berhan, would have expended on average 23% of their output of cereals and pulses on hiring a team of two oxen, based on the rental of an oxen costing between 200-225 kg of grain per year. Webb and von Braun (IFPRI Research Rept. 92) report a higher rental fee of 320 kg per oxen per annum in 1984. Teklu (2004) and Aune et al. (2001) imply sharecropping oxen rental rates approaching half of crop output. Oxen rental prices vary according to the relative value of land, labour and oxen in a community at a particular time, and these rates require more exhaustive investigation before attempting to determine a single national value.

There can be little doubt that the value of animal traction for purposes of cultivation can legitimately be included in national accounts. The SNA 1993 states:

Goods and services produced for own final use are included within the production boundary of the System....The goods and services should be valued at the basic prices at which they could be sold if offered for sale on the market. In order to value them in this way, goods or services of the same kind must actually be bought and sold in sufficient quantities on the market to enable reliable market prices to be calculated which can be used for valuation purposes (SNA 1993: 133).

The production of services must be confined to activities that are capable of being carried out by one unit for the benefit of another....It is also possible for a unit to produce a service for its own consumption provided that the type of activity is such that it could have been carried out by another unit (SNA 1993: 123).

Table 13 gives MOFED's estimates of the gross value of crop production for the last 10 years. The combined value of cereals and pulses provides a reasonable estimate of the value of those crops that are cultivated annually using animal draught. The monetary value of animal draught power as an input (or as intermediate cost) in crop production can be estimated at about 26% of the value of cereal and pulse production.

Table 13: Total Gross Value of Crop Production at current price in ('000 Birr)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cereals	9855529	11275177	10192806	7359173	8706897	12200069	15963979	21181828	28779361	46914669	72774444
Pulses	1096133	1625041	1296675	1077265	1215513	1581098	2285719	2703083	5040203	6374907	8665340
Oilseeds	302330	477894	477009	358517	584966	1031851	1805431	1662558	2112264	5010226	5093667
Vegetables	553258	728438	557992	496589	604271	608145	814409	1643181	1512605	4400169	4464776
Root Crops	3040266	3068418	3006707	3309273	3341727	3982769	4855130	5356551	6732459	10393887	13796554
Fruit Crops	167711	172811	185443	169783	158808	241438	275710	598524	662979	905316	1136728
Spice Crops	136387	140470	151565	162401	149580	178094	210507	215732	242165	368827	375256
Stimulants	1838523	1853281	2091836	1462193	1584281	1591837	3124095	4485047	6344519	9538887	10003422
Industrial Crops	210966	252181	251158	277821	261689	278422	317613	1046082	831005	859786	1262598
Flowers	0	2167	2541	1358	24916	43582	109506	190454	548105	938831	1362897
Total	17,201,101	19,595,879	18,213,732	14,674,373	16,632,646	21,737,304	29,762,099	39,083,039	52,805,664	85,705,506	118,935,681
B. Intermediate Consumption	1,701,089	1,883,028	1,881,464	1,539,696	1,678,176	2,004,527	2,465,124	3,680,492	4,441,377	5,692,447	7,198,314
C. Gross Value Added	15,500,013	17,712,850	16,332,268	13,134,677	14,954,471	19,732,776	27,296,975	35,402,548	48,364,287	80,013,059	111,737,367
Growth		14	(8)	(20)	14	32	38	30	37	65	40

1.4. The gross value of ruminant livestock production using current and revised production coefficients

The impact of revised output coefficients on estimates of output is summarized in Table 14 and illustrated using 2008-09 as an example.

Table 14: Gross Value of Ruminant Livestock Production: Estimates for 2008-09 Using Current and Revised Production Coefficients

1. Cattle offtake

MOFED: 48202.5 (cattle population * 1000) * $.07$ (offtake rate) * 1867.7 (EB/head offtake price) = $6,301,946,674$ EB

REVISED: 48202.5 (cattle population * 1000) * $.09$ (offtake rate) * 1867.7 (EB/head offtake price) = $8,102,502,832$ EB

2. Sheep offtake

MOFED: 26143.8 (sheep population * 1000) * $.30$ (offtake rate) * 209.5 (EB/head) = $1,643,137,830$ EB

REVISED: 35866.3 (re-estimated sheep population * 1000) * $.30$ (offtake rate) * 209.5 (EB/head) = $2,254,196,955$ EB

3. Goat offtake

MOFRD: 24039.3 (goat population * 1000) * $.315$ (offtake rate) * 206.4 (EB/head) = $1,562,939,128$ EB

REVISED: 34684.4 (re-estimated goat population * 1000) * $.315$ * 206.4 (EB/head) = $2,255,040,950$ EB

4. Camel offtake

MOFED: 2293.8 (camel population * 1000) * $.02$ (offtake rate) * 3162.9 (EB/head) = $145,101,200$ EB

REVISED: no change

5. Cattle milk

MOFED: 48202.5 (cattle population * 1000) * $.22$ (lactating proportion of herd) * 326.5 (litres per lactation) * $.5$ (proportion of milk retained as fluid milk) * 4.9 (EB per litre) = $8,482,844,656$ EB

REVISED: 48202.5 (cattle population * 1000) * $.206$ (lactating proportion of herd) * 448 (litres per lactation) * $.5$ (proportion of milk retained as fluid milk) * 4.9 (EB per litre) = $10,898,855,180$ EB

6. Cattle milk for butter

MOFED: 48202.5 (cattle population * 1000) * $.22$ (lactating proportion of herd) * 326.5 (litres per lactation) * $.5$ (proportion of milk for butter) * $.051$ * 1.031 (conversion of fluid milk to kg of butter) * 49.8 (EB/kg of butter)

= **4,533,186,826 EB**

REVISED: 48202.5 (cattle population * 1000) * $.206$ (lactating proportion of herd) * 448 (litres per lactation) * $.5$ (proportion of milk for butter) * $.051$ * 1.031 (conversion of fluid milk to kg of butter) * 49.8 (EB/kg of butter)

= **5,824,289,931 EB**

7. Goat milk

MOFED: 24039.3 (goat population * 1000) * $.251$ (lactating proportion of flock) * 35 (litres per lactation) * 6.4 (EB per litre)

= **1,351,585,603 EB**

REVISED: 34684.4 (re-estimated goat population * 1000) * $.6235$ (lactating proportion of flock) * 46.5 (litres per lactation) * 6.4 (EB per litre)

= **6,435,815,283**

8. Camel milk

MOFED: 2293.8 (camel population * 1000) * $.20$ (lactating proportion of herd) * 784 (litres per lactation) * 5.5 (EB per litre)

= **1,978,173,120 EB**

REVISED: 2293.8 (camel population * 1000) * $.20$ (lactating proportion of herd) * 1326 (litres per lactation) * 5.5 (EB per litre)

= **3,345,736,680 EB**

9. Fluid residue of butter processing

MOFED: MOFED: 48202.5 (cattle population * 1000) * $.22$ (lactating proportion of herd) * 326.5 (litres per lactation) * $.5$ (proportion of milk for butter) * $.95$ (fluid residue after butter) * 1.9 (EB/litre of residue) = **3,124,802,979 EB**

REVISED: 48202.5 (cattle population * 1000) * $.206$ (lactating proportion of herd) * 448 (litres per lactation) * $.5$ (proportion of milk for butter) * $.95$ (fluid residue after butter) * 1.9 (EB/litre of residue) = **4,014,782,368 EB**

10. Dung for fuel

MOFED: **1,966,325,000 EB**, based on survey

REVISED: 48202.5 (cattle population * 1000) * $.237$ (tons of dung fuel per head of cattle per year) * 306 (EB/ton)

= **3,429,366,862 EB**

11. Animal draught power

MOFED: = none

REVISED: 81,439,784,000 (MOFED estimated value of cereal and pulses 2008-09) * .80 (proportion of farmers using animals for cultivation) * .33 (portion of crop yields paid for animal draught usage in sharecropping arrangements) or

.264 * 81,439,784,000 = 21,500,102,000 EB

12. Sheep wool

MOFED: 26143.8 (sheep population * 1000) * .05 (sheared proportion of flock) * 1 (kg fleece/head/year) * 2.6 (EB/kg of fleece) = 3,398,694 EB

REVISED: 35866.3 (re-estimated sheep population * 1000) * .05 (sheared proportion of flock) * 1 (kg fleece/head/year) * 2.6 (EB/kg of fleece) = 4,662,619 EB

13. Change in stocks

MOFED: 1,384,386,000 EB, refers to all livestock including poultry and equines

REVISED: 1,384,386,000 EB, refers to all livestock including poultry and equines; there should be a slight increase in the revised figure due to re-estimated sheep and goat numbers, but this increase has not been calculated.

The detailed information in Table 14 is summarized in Table 15:

Table 15: Estimated Gross Value of Ruminant Livestock Production 2008-09, billion EB

Product or service	MOFED ESTIMATE	REVISED ESTIMATE
Cattle offtake	6.302	8.103
Sheep offtake	1.643	2.254
Goat offtake	1.563	2.255
Camel offtake	0.145	0.145
Total estimated offtake	9.653	12.757
MOFED total offtake	9.653	
Cattle milk	8.483	10.899
Cattle milk for butter	4.533	5.824
Goat milk	1.352	6.436
Camel milk	1.978	3.346
Butter residue	3.125	4.015
Total estimated milk + products	19.471	30.520
MOFED total	19.634	
Sheep wool	0.003	0.005
Dung for fuel	1.966	3.429
Change in stocks	1.384	1.384
TOTAL RUMINANT PRODUCT OUTPUT	32.64	48.095
Percentage change		47%
Animal draught power	0	21.500
TOTAL RUMINANT PRODUCTION		69.595
Percentage change		113%

The recalculated combined gross value of output of ruminant livestock production totals 69.595 billion birr, an increase of about 113% over current estimates of the 2008-09 gross value of production, 32.640 billion birr according to MOFED's present set of coefficients.

According to the recalculated figures, nearly a third (31%) of the total gross value of livestock output is represented by the value of animal draught power for crop cultivation. Relative to other kinds of livestock production, draught power for cultivation is unusual on several scores:

- A. It is an input or 'intermediate cost' into cropping. Gross value added is the value of output less the value of intermediate consumption (SNA 1993: 121). The gross value added for arable production is the value of crop output less the cost of inputs such as draught power. For accounting purposes, animal draught power is in principle little different than a tractor ploughing service. By making animal traction costs explicit, valuing animal draught power increases the costs of cultivation and diminishes the contribution of arable production to GDP.
- B. Animal draught power for cultivation is a service performed for agriculture by livestock. In terms of the ISIC classification of industrial activities used in GDP accounting, animal draught power is classified as an animal husbandry service activity and is a contribution to the Agricultural sector of the national economy. **Explicitly valuing animal draught power reduces the apparent contribution of arable agriculture and increases the proportion of livestock's contribution to the Agricultural sector and to national GDP.**
- C. These calculations are important because of the scale and the cost of the contribution of animal draught power to agricultural output. 'National accounts are ... used to investigate the causal mechanisms at work within an economy' (SNA 1993:7), as a basis for 'informed, rational policy making and decision-taking' (SNA 1993: 6):

... estimates and imputations [of the value of unsold goods and services] should therefore not be interpreted as introducing hypothetical activities or flows of goods and services into the System. Their purpose is the opposite - namely, to capture in the accounts major flows of goods and services actually taking place in the economy that would otherwise be omitted (SNA 1993: 13).

1.5. Conclusions Part I

- 1. The contribution of livestock to agricultural GDP is the most commonly quoted single measure of livestock's contribution to the overall national economy. It is therefore a very important figure.
- 2. Our recalculated combined gross value of 12 categories of ruminant livestock product output totalled 48.095 billion birr in 2008-09, an increase of about 47% over the gross value of ruminant production estimated according to MOFED's current set of coefficients and herd size estimates.
- 3. Nearly a third (31%) of the total gross value of livestock output is represented by the value of animal draught power as an input into crop cultivation, an estimated 21.500 billion EB in 2008-09.
- 4. The recalculated gross value of the agricultural output of ruminant livestock including the use of animal traction for cultivation totals 69.595 billion birr in 2008-09. This represents an increase of about 113% over current estimates of the 2008-09 gross value of ruminant livestock's contribution to agriculture, 32.640 billion birr according to MOFED's present set of coefficients and livestock population estimates.
- 5. If we include the value of ploughing services, livestock provided 45% of agricultural GDP in 2008-09. Current MOFED estimates place livestock's contribution at about 25% of total agricultural GDP. The gap between these two estimates suggests that the significance of livestock relative to crop production has been considerably underestimated in past calculations of agricultural sector GDP.

6. The reappraisal of the value of livestock output contained in this report is based on the most recent available field research. Some important surveys and specialized studies may not have come to the attention of the consultant and were not reviewed here. An open discussion with the different stakeholders - data providers, livestock researchers, and relevant line ministries and departments - is necessary to have a common understanding and to appraise the accuracy of the facts and figures contained in this document.
7. In terms of the amount they contribute to agricultural GDP, cattle are by far the most important ruminant species, providing output re-valued in this report at about 54 billion EB in 2008-09, if the value of dung for fuel and animal drought power for cultivation are both attributed solely to cattle. At the national level, goats are the second most economically important herd species, with a re-estimated 2008-09 output value of about 8.7 billion EB. Cattle and goats were also probably the most under-valued livestock species in MOFED's previous GDP estimates. This report calculated the value of cattle output to be double the MOFED amount for 2008-09, with the re-estimated value of goat output being about three times that of MOFED's 2008-09 figure. These results suggest that future work on refining and updating the conclusions of this report should focus on improving the estimates of cattle and goat output, which are both high in absolute terms and apparently underappreciated in national accounting terms.

PART II - SATELLITE ACCOUNTING AND FINANCIAL SERVICES

Part I of this report examined the contribution of livestock to agricultural GDP, which is the most commonly quoted single measure of livestock's contribution to the overall national economy. Agricultural GDP is based on the value of unprocessed or lightly processed agricultural produce at point of first sale - metaphorically at the farm gate. Some agricultural produce is consumed at this stage, but much is taken up by the service and manufacturing sectors of the economy which use it, modify it, and add value to it. As these livestock goods and services transit through the wider economy they continue to contribute to GDP, now classified not as agricultural output but as services or manufactured products.

The secondary GDP benefits derived from livestock in this way appear under a variety of accounting headings and are not readily identified with livestock, which makes it difficult to assess the full extent of livestock's influence on the national economy. To remedy this situation and gain a clearer understanding of the size of the livestock sector and the economic linkages between livestock production and the wider economy, it is necessary to reassemble the data on livestock that are scattered under different headings throughout the national accounts. This reworking of the standard GDP estimates is termed 'satellite accounting.' A proposal to carry out a modified form of satellite accounting for livestock is discussed in the next section of this report.

Both satellite accounts and standard accounts of agricultural GDP examine the direct use value of livestock output - the immediately useful products and services, both traded and for home consumption, that livestock provide. These values are captured in GDP estimates which attempt to determine the total value of production which 'is understood to be a physical process ... in which labour and assets are used to transform inputs of goods and services into outputs of other goods and services' (SNA 1993: 4).

Livestock also provide less tangible but no less important economic benefits. For rural smallholders, the most commonly cited economic functions of this kind are the use of livestock as savings, as assets that provide interest-free credit, and as insurance to mitigate risk. These 'self-help' financial services are especially important for rural people who lack access to formal savings, credit or insurance facilities, either because these institutions do not operate in rural areas, because rural people lack the necessary skills or confidence to use them, or because relatively poor people are commercially unattractive as potential customers. Without access to formal financial institutions, many peasants and pastoralists depend instead on their livestock for important financial services. The concluding sections of this report briefly discuss methods that can be used to quantify in monetary terms the value of the informal financial services provided by livestock.

Part I of this report recommended specific, quantified changes in the methods used to estimate the contribution of livestock to agricultural GDP as defined by SNA 1993. Part II does not provide final results of this kind. It instead identifies analytical methods that could in future be used to estimate the value of livestock to the entire national economy - including livestock's contribution to the service and manufacturing sectors and the provision by livestock of informal financial services in rural areas.

2.1. Satellite accounting for livestock

Satellite accounting was developed to shed light on specialized topics that are not easily analyzed within the standard GDP accounts but are nonetheless important. Common satellite accounting topics are tourism, the environment, health, research and development, and transport. Satellite accounts are major undertakings for national accounts departments. By 2008 the UK Office for National Statistics, for example, had completed one satellite account, on the environment, was in the process of doing a second on research and development, and had secured funding to do a third, on tourism. It estimated that preparing a satellite account typically involved three full time staff and took about two to three years (ONS 2008).

MOFED does not have the human resources to undertake a full satellite analysis of livestock, nor should such an analysis necessarily be a high priority given the ministry's other responsibilities. What is proposed here is a scaled-down effort that borrows some of the principles but does not replicate the detail or precision of a complete satellite account. In standard national accounts, economically active institutions are classified into industries based on the characteristic product that they produce. The standard internationally recognized system of classification that is used in Ethiopia is the International Standard Industrial Classification of All Economic Activities, Rev. 3. (ISIC Rev. 3). Table 16 provides an overview of ISIC Rev. 3 major categories, with additional sub-categories in areas of likely importance for the livestock sector.

Internal satellite accounts reclassify into a single sectoral account expenditures which are normally presented in different industry groupings. We propose that such a re-classification be undertaken in collaboration with MOFED's National Accounts Department. Based on information already assembled by MOFED to compile the annual GDP accounts, this re-classification would bring together information on all industrial and service sector outputs related to or derived from livestock.

The coverage and accuracy of this reconnaissance exercise will only become clear once it has been possible to work with MOFED to examine their data. The main drawback of this approach is that the information needed to compile a revised account is often incomplete because the data was initially assembled for another purpose. In some cases it may be possible to seek additional data to supplement the information held by MOFED. The reconnaissance will also highlight areas where improved data collection is needed.

Table 16: International Standard Industrial Classification of All Economic Activities, Rev.3 (Categories of interest to livestock in bold)

- A - Agriculture, hunting and forestry
 - 01 - Agriculture, hunting and related service activities
 - 02 - Forestry, logging and related service activities
- B - Fishing
 - 05 - Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing
- C - Mining and quarrying
 - 10 - Mining of coal and lignite; extraction of peat
 - 11 - Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying
 - 12 - Mining of uranium and thorium ores

- 13 - Mining of metal ores
- 14 - Other mining and quarrying
- D - Manufacturing
 - 15 - Manufacture of food products and beverages
 - 151 - Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats
 - 152 - Manufacture of dairy products
 - 153 - Manufacture of grain mill products, starches and starch products, and prepared animal feeds
 - 154 - Manufacture of other food products
 - 155 - Manufacture of beverages
 - 16 - Manufacture of tobacco products
 - 17 - Manufacture of textiles
 - 18 - Manufacture of wearing apparel; dressing and dyeing of fur
 - 19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
 - 191 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness
 - 192 - Manufacture of footwear
 - 20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
 - 21 - Manufacture of paper and paper products
 - 22 - Publishing, printing and reproduction of recorded media
 - 23 - Manufacture of coke, refined petroleum products and nuclear fuel
 - 24 - Manufacture of chemicals and chemical products
 - 25 - Manufacture of rubber and plastics products
 - 26 - Manufacture of other non-metallic mineral products
 - 27 - Manufacture of basic metals
 - 28 - Manufacture of fabricated metal products, except machinery and equipment
 - 29 - Manufacture of machinery and equipment n.e.c.
 - 30 - Manufacture of office, accounting and computing machinery
 - 31 - Manufacture of electrical machinery and apparatus n.e.c.
 - 32 - Manufacture of radio, television and communication equipment and apparatus
 - 33 - Manufacture of medical, precision and optical instruments, watches and clocks
 - 34 - Manufacture of motor vehicles, trailers and semi-trailers

- 35 - Manufacture of other transport equipment
- 36 - Manufacture of furniture; manufacturing n.e.c.
- 37 - Recycling
- E - Electricity, gas and water supply
 - 40 - Electricity, gas, steam and hot water supply
 - 41 - Collection, purification and distribution of water
- F - Construction
 - 45 - Construction
- G - Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
 - 50 - Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
 - 51 - Wholesale trade and commission trade, except of motor vehicles and motorcycles
 - 511 - Wholesale on a fee or contract basis
 - 512 - Wholesale of agricultural raw materials, live animals, food, beverages and tobacco
 - 513 - Wholesale of household goods
 - 514 - Wholesale of non-agricultural intermediate products, waste and scrap
 - 515 - Wholesale of machinery, equipment and supplies
 - 519 - Other wholesale
 - 52 - Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
 - 521 - Non-specialized retail trade in stores
 - 522 - Retail sale of food, beverages and tobacco in specialized stores
 - 523 - Other retail trade of new goods in specialized stores
 - 524 - Retail sale of second-hand goods in stores
 - 525 - Retail trade not in stores
 - 526 - Repair of personal and household goods
- H - Hotels and restaurants
 - 55 - Hotels and restaurants
- I - Transport, storage and communications
 - 60 - Land transport; transport via pipelines
 - 601 - Transport via railways
 - 602 - Other land transport

603 - Transport via pipelines

- 61 - Water transport
- 62 - Air transport
- 63 - Supporting and auxiliary transport activities; activities of travel agencies
- 64 - Post and telecommunications
- J - Financial intermediation
 - 65 - Financial intermediation, except insurance and pension funding
 - 66 - Insurance and pension funding, except compulsory social security
 - 67 - Activities auxiliary to financial intermediation
- K - Real estate, renting and business activities
 - 70 - Real estate activities
 - 71 - Renting of machinery and equipment without operator and of personal and household goods
 - 72 - Computer and related activities
 - 73 - Research and development
 - 74 - Other business activities
- L - Public administration and defence; compulsory social security
 - 75 - Public administration and defence; compulsory social security
- M - Education
 - 80 - Education
- N - Health and social work
 - 85 - Health and social work
- O - Other community, social and personal service activities
 - 90 - Sewage and refuse disposal, sanitation and similar activities
 - 91 - Activities of membership organizations n.e.c.
 - 92 - Recreational, cultural and sporting activities
 - 93 - Other service activities
- P - Private households with employed persons
 - 95 - Private households with employed persons
- Q - Extra-territorial organizations and bodies
 - 99 - Extra-territorial organizations and bodies

2.2. The value of livestock as savings and investment

The value of livestock as savings is a function of the number of livestock and their potential sale value - *stock number * tradable value*. Using 2008-09 as an illustration, Table 17 estimates the current value of Ethiopia's national herd as savings.

Table 17: The capital value of the Ethiopian national herd

Species	2008-09 population	2008-09 market value EB per head	Value as savings - billion EB
Cattle	48,202,500	1400.9	67.526
Sheep	35,866,295	209.5	7.514
Goats	34,684,434	206.4	7.159
Camels	2,293,800	3162.9	7.256,
TOTAL			86.455

At an average exchange rate of 10 EB to one US dollar, the capital value of Ethiopia's livestock in 2009 was approximately \$8.645 billion US dollars.

The annual interest or the return on capital from this investment is a function of the profitability of herding enterprises (revenues net of costs) relative to the amount of the capital invested in it. Upton (1995) and Panin (2000) provide a detailed description of analytical procedures for smallholder livestock operations. Research conducted in Ethiopia and studies in Botswana suggest annual rates of return on investments in livestock ranging from 25 to 30 percent (Panin and Mahabile 1997; Panin 2000; Gryseels n.d.). These results come from intensive field studies that calculated investment returns using precise but data-demanding analytical methods. To estimate the returns to livestock investments for Ethiopia as a whole, it will be necessary to develop analytical procedures that are less data-demanding and can be implemented on a national scale. If the few studies that are presently available are any indication, the returns to capital from livestock in Ethiopia may be on the order of a 21-26 billion EB per year.

These preliminary results suggest that the accumulated capital value of Ethiopia's national herd is large, and that the annual returns to this investment are both large in absolute terms and high relative to the other investment opportunities open to Ethiopia's farmers and herders. Although they are exposed to natural disasters such as disease and drought, in-kind investments in livestock are also inflation-proof.

2.3. The value of livestock as credit and insurance

Livestock can also function as a form of credit in rural areas, giving livestock owners flexible access to the economic resources represented by livestock output, but without them having to borrow money and pay interest on the loan. According to Bosman and Moll (1995) and Moll (2005), the value of livestock as credit can be calculated as the interest rate that stock owners would need to pay to obtain alternative sources of credit equal to the value of livestock output. At a hypothetical annual interest rate of 10% for credit and a gross value of output in 2008-09 of about 69 billion EB, the value of

livestock as credit for Ethiopia as a whole would be an extra 6.9 billion EB, in addition to the value of their physical productivity.

The private insurance or security value of livestock comes from the ability of owners to liquidate their herds in an emergency. **Private insurance value can be calculated as the annual cost that herd owners would need to pay to purchase insurance coverage equal to the capital value of their herd.** The capital value of the Ethiopian herd in 2008-09 was roughly 86 billion EB (Table 17); we can assume for purposes of illustration that insurance premiums cost 5% of the value of the coverage they provide. In this case, for Ethiopian livestock owners as a whole, the incremental value of livestock as private insurance would be an extra 4.3 billion EB in addition to their value as capital.

For pastoralists in Ethiopia, the insurance value of livestock derives not only from their ability to liquidate their individual herds, but also from their ability to call upon assistance from fellow pastoralists in time of need. We can call this collective livestock insurance. These collective insurance schemes are based on resource sharing with large herd owners paying into the system and impoverished pastoralists drawing support from it. Since transfers are in-kind - meat, milk, live animals and traction/transport services - contributions into the system are roughly comparable to withdrawals from it in any time period. The value of the system from the perspective of resource givers and receivers is also approximately equal: Poor pastoralists extract a level of support from the system that equals what richer pastoralists are willing to invest in order to maintain their reputation for generosity and thereby retain their right to call upon community support if they require future assistance. **The value of the communal aspect of livestock as insurance is therefore equal to the value of resource sharing within a pastoral community.** Solely for purposes of illustration, we can assume that half of Ethiopian national livestock output or 35 billion ED annually comes from pastoral areas and that pastoralists share about 10% of this output among themselves. These hypothetical values imply that the collective insurance value of resource sharing in pastoral areas would be worth an additional 3.5 billion EB, quite apart from the more tangible values of pastoral production and pastoral livestock as capital, and in addition to the insurance value derived from the ability of pastoralists to liquidate their individual herds in time of need.

2.4. Conclusions Part II

1. Internal satellite accounts reclassify into a single sectoral account expenditures which are normally presented in different industry groupings. We propose that such a re-classification be undertaken to bring together information for Ethiopia on all industrial and service sector outputs related to or derived from livestock. Based on information already assembled by MOFED to compile the annual GDP accounts, this re-classification would borrow some of the principles of satellite accounting but would not attempt to replicate the detail or precision of a complete satellite account.

2. Objective methods exist to impute the monetary value of the informal financial services provided by livestock as savings, as sources of credit and as insurance against risk. The values assigned to these services in this report are hypothetical and for illustration only. Further work is needed to obtain the empirical data that will transform these rough calculations into estimates that are reliable enough to be suitable for planning and policy purposes in Ethiopia.

3. The techniques used in this report to estimate the value of the informal financial services provided by livestock were developed to examine the economics of smallholder livestock husbandry in Nigeria, Botswana, Zambia, West Africa, and Ethiopia. These methods are generally applicable to peasant and pastoral production systems and should be appropriate for use in the other IGAD member states.

ANNEXES

Annex I: Terms of Reference

Title: The Contribution of Livestock to GDP in the IGAD Member States - the case of Ethiopia.

Duration: November 09, 2009 - February 28, 2010

Background

The **overall objective** of the IGAD Livestock Policy Initiative is to enhance the contribution of the livestock sector to sustainable food security and poverty reduction in the IGAD region. The **project purpose** is to strengthen the capacity in IGAD, its member states, regional organizations, and other stakeholders to formulate and implement livestock sector and related policies that sustainably reduce food insecurity and poverty. The IGAD member states covered by the project are Djibouti, Ethiopia, Kenya, Somalia, Sudan and Uganda.

IGAD LPI activities in Ethiopia are being undertaken in cooperation with the Livestock Policy Forum (LPF) - a multi-stakeholder, advisory group hosted by the Ministry of Agriculture and Rural Development. The LPF has in this context expressly asked IGAD LPI to undertake this study on the contribution of livestock to GDP and is looking to use its outcome in their engagement with Ethiopia's PRSP process, as part of their cooperation with IGAD LPI. This request is supported by one of the findings of the recently concluded Mid-Term Review of the IGAD LPI project which established that whereas Output 1 of the IGAD LPI log frame¹ highlighted the relevance of livestock to GDP, the importance of the contribution of livestock to GDP in the countries was not adequately stressed. Furthermore, an IGAD LPI working paper has emphasised the range of services that livestock provide to the livelihoods of different socioeconomic groups. Many of these services are not marketed and it is therefore suspected that they are not currently reflected in the region's national income accounting. In response to this the IGAD LPI is commissioning studies to look at the contribution of livestock to GDP in the IGAD member states. The studies will initially be carried out in Ethiopia with a view to replication in the other IGAD member states in the second half of 2009. The findings will ultimately be linked to ongoing in-country processes that are supported by the project, especially those related to the better integration of livestock in PRSP processes and the allocation of national resources. The findings will inform policy hub and working group meetings, and the process of allocating public funds.

Objective

The study has the following objectives

- i) To provide an assessment and understanding on the current contribution of livestock to GDP and other livestock contributions to the agricultural sector and or to national economy, which are not accounted for in the production approach valuation of GDP currently adopted by Ethiopia. This will require assigning values to the non marketable services that livestock provides and familiarity with the System of National Accounts (SNA).
- ii) To revise and update the livestock economic activity coverage, data sources, estimation parameters and coefficients so as to reinforce the capacities in the country in improving the calculations in the system of national accounts in Ethiopia.

Specific Activities

In order to address the objective of the study, the consultant(s) will:

1. Hold initial meetings with LPF to chart out the study and to agree on the planning for the study
2. Prepare a list of literature to be reviewed and people to be interviewed
3. Make appointments for the interviews
4. Carry out a situational analysis (mainly through literature review and interviews) on how livestock is currently computed in GDP calculations within national income accounting in Ethiopia.
5. Consolidate and compile the findings of the literature review and the interviews
6. Propose a methodology for the internal computation of livestock in GDP that includes assigning values to the non marketable services that livestock provides.
7. Prepare an inception report containing the proposed methodology
8. Arrange for a date to present the inception report to IGAD LPI and LPF
9. Report the situational analysis findings and the proposed methodology to IGAD LPI and the LPF for discussion and comments.
10. Apply the proposed methodology (possibly with the support of personnel from the LPF) in determining the contribution of the livestock sector to Ethiopia's GDP.
11. Plan for and carry out any field work as required.
12. Report the findings of the application of the methodology in Ethiopia in a draft report to be presented to IGAD LPI and the LPF for comments.
13. Integrate comments of IGAD LPI and LPF in the draft report.
14. Prepare a final report to IGAD LPI containing the findings of the study and a critical assessment of the application of the methodology in Ethiopia, together with any pertinent recommendations for how similar studies could be implemented in Djibouti, Kenya, Somalia, Sudan and Uganda.
15. Present the final report to IGAD LPI, LPF and other stakeholders.

Outputs

1. Inception Report presenting the findings of the situational analysis and the proposed methodology.
2. Draft report of findings and the application of the methodology in Ethiopia.
3. Final report containing the study findings, an assessment of the application of the methodology in Ethiopia and further recommendations for its application in Djibouti, Kenya, Somalia, Sudan and Uganda.

Reporting

The consultant will report to FAO IGAD LPI against agreed outputs and for contractual matters. The final report and its contents will be agreed upon between the consultant and IGAD LPI (taking into consideration any technical responses/areas of contention of other stakeholders including the LPF).

Annex II: Summary of recommended formula to estimate the contribution of ruminant livestock to agricultural GDP

1. Cattle offtake

*MOFED cattle population * .09 (offtake rate) * EB/head CSA offtake price*

2. Sheep offtake

*re-estimated sheep population * .30 (offtake rate) * EB/head CSA offtake price*

3. Goat offtake

*re-estimated goat population * .315 (offtake rate) * EB/head CSA offtake price*

4. Camel offtake

*MOFED camel population * .02 (offtake rate) * EB/head CSA offtake price*

5. Cattle milk

*MOFED cattle population * .206 (lactating proportion of herd) * 448 (litres per lactation) * .5 (proportion of milk retained as fluid milk) * EB per litre CSA milk price*

6. Cattle milk for butter

*MOFED cattle population * .206 (lactating proportion of herd) * 448 (litres per lactation) * .5 (proportion of milk for butter) * .051 * 1.031 (conversion of fluid milk to kg of butter) * EB/kg CSA butter price*

7. Goat milk

*re-estimated goat population * .6235 (lactating proportion of flock) * 46.5 (litres per lactation) * EB/litre CSA goat milk price*

8. Camel milk

*MOFED camel population * .20 (lactating proportion of herd) * 1326 (litres per lactation) * EB/litre CSA camel milk price*

9. Fluid residue of butter processing

*MOFED cattle population * .206 (lactating proportion of herd) * 448 (litres per lactation) * .5 (proportion of milk for butter) * .95 (fluid residue after butter) * EB/litre CSA residue price*

10. Dung for fuel

*MOFED cattle population * .237 (tons of dung fuel per head of cattle per year) * EB/ton CSA dung price*

11. Animal draught power

*MOFED estimated value of cereal and pulses * .80 (proportion of farmers using animals for cultivation) * .33 (portion of crop yields paid for animal draught usage in sharecropping arrangements) or .264 * MOFED estimated value of cereal and pulses*

12. Sheep wool

*re-estimated sheep population * .05 (sheared proportion of flock) * 1 (kg fleece/head/year) * EB/kg of fleece CSA sale price*

13. Change in stocks

MOFED estimates refer to all livestock including poultry and equines; there should be a slight increase in the revised figure due to re-estimated sheep and goat numbers, but this increase has not been calculated.

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