(MIS)measuring the contribution of livestock to household livelihoods: evidence and lessons from LSMS surveys in Tanzania and Uganda

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ABSTRACT

Livestock are estimated to contribute to the livelihoods of about 60 percent of rural households in developing countries, including the poor. Measuring the extent of such contribution has been traditionally challenging because of data gaps. This paper presents an attempt to assess the contribution of livestock to household livelihoods, measuring both tradable and non-tradable or marginally tradable outputs. It builds on the National Panel Surveys of Uganda and Tanzania, that presents a comprehensive livestock module, as well as on ad hoc surveys implemented by the Ministries responsible for livestock in both countries to fill some NPS information gaps. Results suggest that non-tradable and marginally traded livestock outputs represent about half of the contribution of livestock to household livelihoods.

Keywords: LSMS, livestock, non-tradable outputs, social capital

PAPER

1. Introduction

Livestock are estimated to contribute to the livelihoods of about 60 percent of rural households in developing countries. Measuring the extent of such contribution has been traditionally challenging because of because of data gaps. In recent yearsa number of African countries have released Living Standards Measurement Studies (LSMS) datasets with a specific focus on agriculture. These datasets provide an unparalleled opportunity to measure with statistical accuracy the contribution of agricultureto household livelihoods,including specifically that of livestock.

This paper relies upon the Tanzania 2012/13 National Panel Survey (TZNPS) and the Uganda 2011/12 National Panel Survey (UNPS) to quantify the contribution of livestock to household livelihoods. The National Panel Surveys of both countries currently represent one of the largest sets of livestock data at household level throughout Africa. They include information on livestock ownership and husbandry and production practices, such as on labour, feed and health inputs, and both tradable and non-tradable or marginally tradable outputs, such as manure and animal power. The NPSs, however, also present some data gaps if the objective is to measure the contribution of livestock to household livelihoods, as they include neither questions on the quantities and unit prices of non-tradable livestock outputs nor questions specifically aimed at measuring social capital. To fill these gaps, the Ministries responsible for livestock in Tanzania and Uganda undertook two ad hoc surveys with local expertson "measuring the non-measured contribution of livestock to household livelihoods. By combining data from the NPSs and the Ministries'surveys, the paper develops and applies a methodology to estimate the full contribution of livestock to household livelihoods. This involves measuring net the income stream from sales of meat, milk, eggs and other livestock products, such as hides and skins; quantifying the value of manure, transport services and draught power rendered by animals; assessing the value of live animals as savings and insurance; and estimating the contribution of live animals to social capital. Results indicate that non-tradable outputs represent about half of the total contribution of livestock to household livelihoods. The remainder of the paper proceeds as follows. Section 2 illustrates the data and reports summary statistics. Section 3 discusses the methodology. Section 4 reports the results. Section 5 draws conclusions.

2. Data and Summary Statistics

2.1 The datasets

This paper uses data on livestock collected by the Tanzania National Bureau of Statistics (NBS) and the Uganda Bureau of Statistics (UBOS) as part of the implementation of the Tanzania and Uganda National Panel Surveys respectively (TZNPSs and UNPSs)[1]. For Tanzania, data are available for the 2008/09, 2010/11 and 2012/13 TZNPS,for Uganda for the 2009/10, 2010/11 and 2011/12 UNPS.

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[1] These surveys have been implemented in the context of the Living Standard Measurement Studies – Integrated Surveys on Agriculture (LSMS-ISA) Project of the World Bank.

The 2012/13 TZNPS and the 2011/12 UNPS include an expanded livestock module, with between 80 and 100 questions. The NPS surveys collect information on livestock ownership and herd dynamics due to different reasons (e.g. sales; thefts; gifts; etc.), breeds, differentiated by local/indigenous and improved/exotic; use of inputs, including feed, water, labour, vaccines and drugs; production of livestock products, including not only meat, milk and eggs, but also dung and other services provide by livestock, such as transport; consumption and self-consumption of animal source foods.These surveysrepresent one of the largest sources of household-level livestock data throughout Africa[2]. As a way of comparison, traditional LSMS surveys include between 5 and 20 questions on livestock.

Although the livestock module in the NPSs is particularly comprehensive, it does not collect quantity and price parameters on some important non-marketable or marginally traded livestock outputssuch as dung, draft power and transport. In addition, the surveys do not explicitly target the measurement of social capital,which is often considered as a major value of livestock In order to address these gaps, the Ministry of Agriculture, Livestock and Fisheries in Tanzania and the Ministry of Agriculture, Animal Industry and Fisheries in Uganda implemented two on line surveys with local experts. The two surveys were completed by a total of 145 experts, 61 from Tanzania and 84 from Uganda, and collected

Table 1: Livestock ownership in Tanzania and Uganda

Variables		Mean	Standard deviation	Observations
Livestock owners (% of all households)	Tanzania	0.56	0.50	12,190
	Tanzania Rural	0.70	0.46	7,908
	Uganda	0.57	0.49	8,514
	Uganda Rural	0.66	0.47	6,558
Herd/flock size in TLUs (livestock owners only)	Tanzania	2.39	7.76	5,890
	Uganda	1.65	6.05	5,507
Large ruminants owner (% of livestock owners)	Tanzania	0.32	0.47	5,895
	Uganda	0.44	0.50	5,507
Number of large ruminants (large ruminants owners only)	Tanzania	11.15	21.50	1,844
	Uganda	6.04	17.17	2,554
Small ruminants owner (% of livestock owners)	Tanzania	0.43	0.49	5,891
	Uganda	0.64	0.48	5,507
Number of small ruminants (small ruminants owners only)	Tanzania	9.88	22.32	2,320
	Uganda	3.15	3.14	3,509
Pigs owner (% of livestock owners)	Tanzania	0.11	0.32	5,890
	Uganda	0.23	0.42	5,507
Number of pigs (pigs owners only)	Tanzania	2.49	3.36	593
	Uganda	1.54	1.54	1,287
Poultry owner (% of livestock owners)	Tanzania	0.87	0.34	5,890
	Uganda	0.71	0.45	5,507
Number of poultry (poultry owners only)	Tanzania	13.39	25.22	5,042
	Uganda	7.90	26.69	3,962

Source: own elaboration based on TNPS waves 2008/09, 2010/11 & 2012/13 and UNPS waves 2009/10, 2010/11 & 2011/12

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[2] The information collected through these newly added questions has been systematically reviewed and validated by experts from the Ministries responsible for livestock in both countries through a series of workshops within the project "Livestock in Africa: improving data for better policies" joint with the FAO and the countries' statistical institutes.

information on dung production per day by animal species; unit price of dung by animal species; frequency of use of cattle and equines for transporting goods and persons and for draft power; unit cost of animal hiring; on the relative contribution of different representative herds to cash, food, animal power, insurance and savings and social capital.

2.2 Livestock ownership

Table 1 reports summary statistics of livestock ownership in Tanzania and Uganda over the 3 survey rounds. The data indicate that 56%of all Tanzanian households and 57% of all Uganda households own livestock, with these percentages being 70% and 66% in rural areas respectively.In Tanzania, 87% of livestock owners have poultry, 43% have small ruminants and 32% have large ruminants. The ranking is the same in Uganda where 71% of livestock keepers have poultry, 63% have small ruminant and 44% have large ruminants. Pigs are more common in Uganda (23%) than in Tanzania (11%).

The average herd/flock size in the two countries is reported both in terms Tropical Livestock Units (TLUs) and number of animals owned by species One TLU is equivalent to 250 kg of live weight. The conversion factors used for this paper are 0.5 for large ruminants, 0.1 for small ruminants, 0.2 for pigs and 0.01 for poultry. The average herd/flock size in Tanzania is larger than in Uganda: they measure 2.39 and 1.65 TLUs, respectively. Tanzanian livestock owners seems to have more of all types of animals but the largest difference can be found for small ruminants where the average herd size in Tanzania is 9.88 and in Uganda is only 3.15.

2.3 Household income

Table 2 presents details on the different sources of household income, including income from livestock, as calculated using the Rural Income Generating Activities (RIGA) methodology developed by the FAO.Household income derives from 6 main sources including wages, self-employment, crop production, livestock production, transfers, and other sources; it only includes regular income, and excludes investments, windfall gains, and purchase and sale of durable goods (Carletto et al., 2007). The advantage of this methodology is that it is developed specifically for LSMS data, with the purpose to generate figures comparable across countries. In both Tanzania and Uganda, the major source of household income in is crop agriculture, averaging 50% for rural households. Self-employment in non-farm activities comes second in both countries. The contribution of livestock to household income is estimated at8.7% and 8.5% for all Tanzanian and Ugandan households respectively, at 11.2% and 8.3 in rural areas.These estimates provide a lower bound of the overall contribution of livestock to household livelihoods as they not take into account outputs that are non-tradable or marginally tradable and the value of livestock as social capital.

Table 2: Components of household income (%) – RIGA methodology

| Income components	Tanzania		Uganda	
	Rural	Total	Rural	Total
Agricultural wages	6.37	5.09	5.96	5.11
Non-agricultural wages	9.25	18.11	9.04	12.17
Crop income	49.94	38.19	50.06	44.23
Livestock income	11.23	8.73	9.34	8.05
Self-employment	14.71	22.30	16.96	19.53
Transfers	8.36	7.46	7.66	9.38
Other sources	0.15	0.12	0.99	1.54
Total Income	100	100	100	100
Observations	7,836	12,003	6,393	8,205

Source: RIGA project WB based TNPS waves 2008/09, 2010/11 & 2012/13 and UNPS waves 2009/10, 2010/11 &2011/12

2.4 Tradable and non-tradable livestock outputs

Figure 1 displays the relative contribution of livestock to food, cash, insurance and savings, animal power and social capital. These are presented for herds quartile (Q) of the TLU distribution. In Tanzania the bottom herd quartileis composed by 7 chickens; the second by 1 goat and 13 chickens; the third by 1 cattle, 4 goats, 1 pig and 11 chickens; and the top quartile by 18 cattle, 16 goats, 1 pig and 15 chickens. In Uganda, the bottom herd quartile comprises a flock of 5 chickens; the second herd quartile includes 2 goats and 5 chickens; the third 1 cattle, 3 goats, 1 pig and6 chickens; and the top quantile includes 10 cattle, 7 goats, 1 pig and 12 chickens.

The figure indicates that while tradable livestock outputs, including self-consumption of animal protein and cash from the sale of animal products and live animals represent the main channel through which livestock contribute to household livelihoods, as they make up 67% and 59% of the total value of livestock "outputs" in Tanzania and Uganda respectively. Their relative contribution

Figure 1 - Contribution of livestock to household livelihoods by livelihood dimension
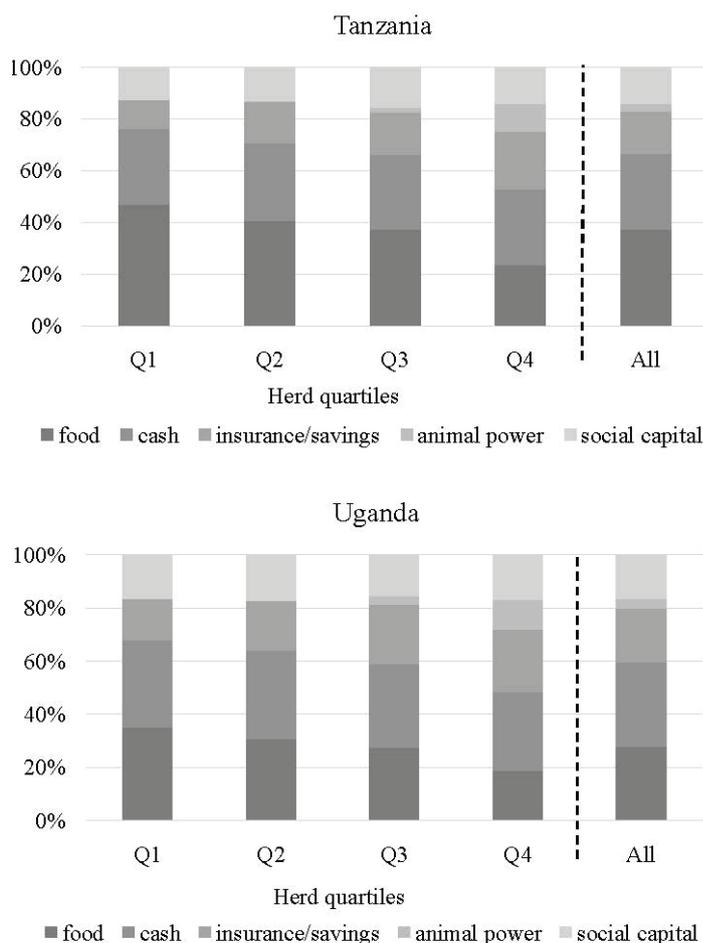
Tanzania

Uganda

Source: own elaboration based on data collected by the Tanzania and Uganda Ministries responsible for livestock

of tradable outputsto livelihoods decreases with herd / flock size as only households that keep a relatively large herd, comprising at least one cattle in the sample,significantly benefitfrom other livelihood services provided by livestock and most notably insurance, savings and animal power. As the figure presents relative value, note that in all cases households in the upper herd quartiles derive more benefits in absolute terms from both tradable and non-tradable outputs.

3. Measuring tradable and non-tradable livestock outputs

This section presents a methodology to compute the contribution of livestock household livelihoods taking into account non-tradable and marginally tradable livestock outputs.The starting point is livestock income as calculated applying the RIGA methodology, to which we add measures of the benefits obtained from non-tradable outputs: savings andinsurance; and self-consumption of marginally traded outputs, including animal power and dung. In particular, we slightly modified the RIGA methodology to assure comparability of the results between the two countries and computed livestock income as the sum of income from sale of live animals and livestock products and by–products, minus recurrent expenses and purchase of live animals. Equation 1illustrates the calculation.

$$
\begin{aligned}
Livestock\ income = \\
+\ sale\ of\ livestock \\
+\ sale\ of\ livestock\ byproducts\ (milk, eggs, dung, draught\ power, etc.) \quad (1) \\
+value\ of\ self\ consumption\ of\ livestock\ food\ products \\
-\ expenses\ for\ feed, water\ and\ hired\ labour \\
-\ expenses\ for\ veterinary\ services \\
-\ purchase\ of\ livestock
\end{aligned}
$$

We consider sale and purchases as income and expenditure rather than investment and disinvestment for the reasons both that purchase and sales of animals is common, particularly pf small ruminants and poultry, and that in many cases animals are not necessarily sold when they are no longer productive. Since the price data are noisy we use the median sale and purchase price for the region of reference to calculate the value of animals sold and purchased. As animal

dung is mainly used by the household as manure, we calculate its value by using the data provided in the crop production sections of the survey.In particular, the data provide information on the use of organic fertilizer and the quantity purchased, which allow us to compute the value of self-consumption of organic fertilizer. As for transport, insurance and savings and social capital, we usedthe data collected by the Ministries responsible for livestock described in section 2.1. For each quartile of livestock ownership distribution, we have data on the contribution of livestock to household livelihoods from food, cash, savings/insurance, animal power and social capital. We use this information to impute the value of each of these outputs as a share the household's cash and food livestock income, which we calculate from the NPS data.

4. Results

Table 3 reports the decomposition of livestock income into its components as obtained from the modified RIGA methodology computation illustrated by equation 1. The table relies only on the 2012/2013 Tanzania NPS and the 2011/12 Uganda NPS, which include the expanded module of livestock with detailed information on production and husbandry practices. The relative importance of the different components is similar in the two countries. Households derive most of their livestock income from the self-consumption of animal products, which contribute 48% and 51% of the gross revenue from livestock (60% and 68% of the net livestock income). The sale of live animals come second, representing 42% and 35% of the gross livestock revenue, followed by the sale of meat, milk and eggs which account for 10% and 14%.

Table 3: Livestock contributionto household income (rural livestock keepers only)

Income components	Tanzania		Uganda	
	TZS	% livst income	UGS	% livst income
Sale of livestock	201,740	52.27	87,496	47.07
Sale of livestock by-products	47,250	12.24	27547	15.63
Sale of dung	19	0.01	42	0.02
Sale of animal power	N/A	N/A	6600	3.74
Food self-consumption	229,654	59.50	126,327	67.95
Expenditure (feed, water, labor)	-23,018	-5.96	-18,691	-10.05
Vet services	-14,809	-3.84	-14,827	-7.98
Purchase of livestock	-54,867	-14.22	-38,212	-20.55
Livestock income	385,970	100	176,282	100
Observations	1,780		1,585	

Source: own elaboration based on TNPS 2012/13 and UNPS 2011/12. Livestock by-products include milk, meat and eggs. Sale of animal power includes draught power and hauling services, this information was not collected for Tanzania

Table 4 reports the calculation of the total contribution of livestock to household livelihoodsbut also includes non-tradable or marginally-tradable outputs.The data indicate, first of all, that the contribution of livestock to household livelihoods is highly underestimated if only tradable outputs are measured: the benchmark measure of livestock income (table 3) accounts for less than 43% of the total contribution of livestock to livelihoods in Tanzania and for about 36% for Uganda. In particular, the results show that 45% and 43% of the livestock gross revenuecomes from non-tradables, including use of dung, animal power, insurance and savings and social capital. Dung account for 6% and 10%. The other half comes revenue from the sale of live animals, meat, milk and eggs.

Table 4: Contribution of livestock to household livelihoods (livestock keepers only)

Income components	Tanzania		Uganda	
	TZS	% tot contribution	UGS	% tot contribution
Cash(sales of livestock and by-products)	257,230	28.36	131,304	26.97
Food self-consumption	229,654	25.32	126,327	25.95
Dung self-consumption	59,340	6.54	57,447	11.80
Insurance, social capital, animal power	453,588	50.00	243,525	50.02
Expenditure (feed, water, labor)	-23,018	-2.54	-18,691	-3.84
Vet services	-14,809	-1.63	-14,827	-3.05
Purchase of livestock	-54,867	6.05	-38,212	-7.85
Total contribution	907,138	100	486,873	100
Livestock income (benchmark)	385,970	42.55	176,282	36.21
Observations	1,780		1,585	

Source: own elaboration based on TNPS 2012/13 and UNPS 2011/12

5. Conclusion

This paper presents an attempt to assess the contribution of livestock to household livelihoods, measuring both tradable and non-tradable or marginally tradable outputs. It builds on the National Panel Surveys of Uganda and Tanzania, that presents a comprehensive livestock module, as well as on ad hoc surveys implemented by the Ministries responsible for livestock in both countries to fill

some NPS information gaps. The results suggest that non-tradable and marginally traded livestock outputs play an important role for household livelihoods In particular, savings/insurance, social capital and animal power are estimated to account for as much as 50% of the total contribution of livestock to household livelihoods Standard methods to estimate livestock income, therefore, significantly underestimate the contribution of livestock to livelihoods.

While these findings need to be certainly substantiated with additional and more detailed analyses, they suggest that statistics offices should attempt to better measure the non-tradable dimensions on livestock in selected surveys and that policy makers should be caution when designing market-based policies to promote the development of livestock, as the market-related contribution of animals to household livelihoods is limited.

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