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Karamoja Resilience Support Unit (KRSU)

LIVESTOCK AND POVERTY IN KARAMOJA
AN ANALYSIS OF LIVESTOCK OWNERSHIP, THRESHOLDS, AND POLICY IMPLICATIONS

October 2018

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SUMMARY

- Conventional national poverty assessments use cash income or consumption expenditure as key indicators of poverty, and thresholds or poverty lines to distinguish between poor and non-poor households.

- In pastoralist and agro-pastoralist areas, an asset-based approach is useful for understanding poverty and in particular, the measurement of livestock assets.

- While conventional poverty assessments often use an income threshold, such as US$1.25/day to define the poor and non-poor, a livestock threshold can be used in pastoralist areas for the same purpose.

- This analysis used raw data from a recent livestock population survey to analyze livestock ownership in Karamoja, and measure poverty against a livestock threshold. The survey did not collect information on the ownership of camels, donkeys or poultry, and so overall, the livestock ownership results in the analysis are an under-estimate of actual ownership. The analysis covered the six main livestock-rearing districts of Karamoja viz. Napak, Nakapiripirit, Moroto, Kaabong, Kotido, and Amudat.

- Some of the main findings were:

  o For an agro-pastoralist household with six family members, the livestock threshold was 3.3 Tropical Livestock Units (TLU)/capita, equivalent to about 5 cattle per person or 33 sheep or goats per person. This threshold enables a livelihood based primarily on livestock production, complemented with some own production of cereals;

  o In agro-pastoralist and pastoralist areas of Karamoja, 56.5% of households owned less than 3.3 TLU/capita and so could be categorized as "livestock poor;"

  o The analysis showed a skewed ownership of livestock towards wealthier households. For example, the wealthiest 30% of households owned 69.3% of livestock in terms of TLU. This pattern of ownership is similar to some pastoralist areas of Ethiopia and Kenya, where comparable data are available;

  o Among poorer households, those below the 3.3 TLU/capita livestock threshold, livestock ownership was skewed away from the threshold. For example, 47% of these households owned only 1.2 TLU/capita or less;

  o Only 13% of households owned no livestock at all.

- The main conclusions from the analysis were:

  o Poverty in Karamoja is best measured and understood using measures of both livestock ownership and income;

  o Given the numbers of livestock-poor households, the use of area-wide, generic livestock policies and programming raises questions about the relevance of these approaches, specifically for poorer households. For example, a common strategy of poorer households is to maximize the rate of herd growth and so build financial capital. During the growth period, livestock sales are deliberately and logically minimized;

  o There is a need to consider how restocking might be further used in Karamoja and at what scale. The design of restocking, at any scale, requires an understanding of traditional restocking systems that are in use, and other strategies used by poorer households to build herds. Restocking should support traditional restocking systems;

  o Restocking is not a standalone intervention, and requires coordination and integration with other types of support until herds have reached a sufficient size. One option is to link restocking with social protection, with the latter supporting food security during the period of herd growth. A combined restocking-social protection approach would need careful design and piloting;

  o Restocking is not a panacea or suitable for all households. Communities will often have rational criteria for selecting people to be restocked.

I. INTRODUCTION

1.1 ASSET-BASED ANALYSIS OF POVERTY IN PASTORALIST AREAS: THE LIVESTOCK THRESHOLD

Conventional approaches to measuring human development often recognize the multi-dimensional nature of poverty, and use economic, social, and other indicators, either separately, or as a composite index. For example, the UN Human Development Index draws on national health, education, and income statistics, including per capita income.[1] Similarly, poverty assessments often use an income threshold or poverty line to define the poor and non-poor; the first UN Sustainable Development Goal uses an international poverty line of US$1.90 per person per day.[2] These approaches have been widely used in Uganda, and to some extent, in the Karamoja sub-region. For example, in 2013 a UNDP Human Development Report for northern Uganda used a US$1.25 per day poverty line, and reported that 65.8% of people in Karamoja districts were below this threshold, compared to a national average of 35.5%.[3] The Ugandan government's National Household Survey assesses poverty using consumption expenditure indicators, and the most recent survey for 2016 to 2017 reported that 60.8% of people in the Karamoja sub-region were below the national poverty line, relative to a national average of 27.0%.[4]

In pastoralist and agro-pastoralist households in East Africa, livestock not cash are usually the main financial asset. Animals are sold to buy grain and to meet other domestic needs, and animals also provide food, especially milk, for direct human consumption. Although often viewed by central policy makers as irrational or backward, the ownership of large herds in dryland areas has a sound economic basis. In Karamoja, people manage their herds *"…more like an investment portfolio. The primary management objective is to increase the value of their portfolio. Income is generated in the form of capital gains, not from the sale of livestock. When pastoralists sell animals, they are simply monetizing capital gains …"*[5] Therefore, an asset (livestock)-based approach to understanding poverty and livelihoods is particularly useful in pastoralist areas, as is an understanding of how household livestock assets change over time and why.[6] Livestock are also central to social capital in pastoralist areas, and enable a complex range of transactions, social networks, and insurance. Across East Africa and the Horn of Africa, pastoralists' own descriptions of wealth and poverty focus on livestock ownership, not income, and a wealthy household owns relatively large numbers of animals.[7]

In the same way that a poverty line or income threshold is used in conventional poverty assessments, a "livestock threshold" can be used in pastoralist areas. The use of livestock thresholds dates back to the late 1960s, and an assumption that a minimum number and type of animals were needed to provide food to meet the needs of a pastoralist household. Using estimates of herd production, especially milk production, early livestock threshold analysis calculated figures of between 4 to 5 TLU per person,[8] equivalent to about 6 to 7 cattle, or 40 to 50 goats per person.[9] However, these early studies assumed that there was minimal sale of livestock in exchange for cereals, and so minimal market engagement. Later studies took account of changes to pastoralist systems due to population growth, declining access to rangeland, increasing sales of livestock, and other trends. In these more market-based forms of pastoralism and agro-pastoralism, the calculation of a threshold herd depended not only on milk production and the direct consumption of livestock products, but also on the terms of trade between livestock and cereals. In these contexts, the livestock thresholds were often in the range of 2.5 to 3.5 TLU/person, but with variations according to local market values for livestock and grain.

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[1] http://hdr.undp.org/en/content/human-development-index-hdi

[2] https://www.un.org/sustainabledevelopment/poverty/

[3] UNDP (2015).

[4] UBOS (2017).

[5] Rockeman et al. (2016).

[6] Little et al. (2008); McPeak et al. (2012).

[7] For example, Potkanski (1999) describes five distinct wealth groups among Maasai pastoralists in Tanzania, with a progression of TLU/capita as wealth increased.

[8] Pratt and Gwynne (1977); Kjaerby (1979).

[9] A Tropical Livestock Unit (TLU) is a convenient way to represent different livestock species using a single unit. In this report we use the Food and Agriculture Organisation definition of TLU, as an animal of 250kg bodyweight, which in turn, is drawn from Jahnke (1982); with this definition, 1 camel = 1 TLU, 1 cattle = 0.7 TLU, and 1 sheep or goat = 0.1 TLU. However, the earlier definitions of TLU use an animal of 450kg bodyweight e.g. Pratt and Gwynne (1977). The different definitions of TLU hinder direct comparison of different studies over time.

1.2 LIVESTOCK POVERTY IN KARAMOJA

The Karamoja sub-region has been experiencing an overall improvement in security since 2010 and a reduction in armed raiding. However, the government disarmament campaign that contributed to these changes is also associated with a dramatic decline in the livestock population and an apparent redistribution of livestock, with wealthier households thought to now own substantially more animals than poorer households.[10] If accurate, these changes in livestock ownership are probably the most important livelihoods issue in the region today, because limited animal ownership often pushes poorer households into negative diversified activities. Although diversification can help to reduce risks, many forms of diversification currently practiced in Karamoja have harmful social or environmental consequences, or, result in very low levels of income and poverty traps.[11] Not only will a decline in livestock ownership have a negative impact on poverty and food security, but it will also influence many of the social institutions and networks that support livelihoods, and define Karamojong culture and leadership. At the same time, livestock markets are active and expanding in Karamoja, including a dynamic cross-border trade with Kenya.[12] To date, the concept of livestock assets per person has not been used to assess poverty in Karamoja, and a threshold of livestock ownership has not been estimated. A further challenge is that different surveys and reports from Karamoja provide very different findings on the distribution of livestock ownership (Box 1).

Box 1. Comparing livestock ownership data for Karamoja

To illustrate the differences in livestock ownership figures between different reports in Karamoja, two reports were compared (Table 1):

- A food security and nutrition (FSNA) survey[13] - using a questionnaire, with direct questions to respondents on the numbers of animals they own, by livestock species;

- A household economy approach (HEA) survey[14] - using focus groups to describe livestock ownership by locally defined wealth groups, and then, using proportional methods to assess the proportion of households in each wealth group.

Table 1. Comparing FSNA and HEA livestock ownership results

| Method | Household livestock ownership (proportion of households) | | | | |
	0 TLU	< 0.5 TLU	0.5-2 TLU	2-5 TLU	> 5 TLU
FSNA, Kotido District, July 2016	37%	20%	22%	18%	3%
HEA, Livestock-Sorghum Livelihood Zone, May 2016	0%	29%	0%	33%	38%

For the sake of comparison, assume that the livestock threshold in Kotido District is 3 TLU/person. Therefore, a family of six people would need 18 TLU to be viable agro-pastoralists.

- FSNA findings imply that 97% of households lack sufficient animals to be agro-pastoralists, because they have fewer than 18 TLU; only 3% of households might be viable agro-pastoralists.

- In contrast, HEA data implies that 62% of households lack sufficient animals to be agro-pastoralists (they have fewer than 18 TLU); 38% of households might be viable agro-pastoralists.

- FSNA reports 37% of households with no livestock; HEA reports 0% of households with no livestock.

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[10] Burns et al. (2013); Stites et al. (2016).

[11] Bushby and Stites (2016); Iyer and Mosebo (2018).

[12] Rockeman et al. (2016); Aklilu (2017).

[13] FSNA (2016).

[14] DFID/FAO (2016).

From a policy and programming perspective, analysis of livestock thresholds in Karamoja provides a measure of the proportion of households who are pursuing a livelihood based mainly on pastoralism or agro-pastoralism, versus those who might own some animals, but are using various strategies to make a living. Furthermore, livestock threshold analysis can provide insights into the number or proportion of households that are caught in a poverty trap. These households have very low levels of livestock ownership and will often struggle to rebuild their herds to a sufficient level to resume a pastoralist livelihood. For example, non-livestock activities often take the form of "bad diversification"[15] and activities such as charcoal production, firewood sales, or wage labor that provide levels of income that might contribute to household food security but are far too low to enable livestock purchases.[16] Although poorer households with few animals might self-identify as pastoralists, from an economic perspective they need a "substantial positive shock"[17] to their livestock assets to function as pastoralists.

1.3 OBJECTIVES

This analysis of livestock ownership in Karamoja was based on three main questions:

1. What is the livestock threshold for agro-pastoralism in Karamoja?

2. What proportion of households are positioned above and below the livestock threshold?

3. For households below the livestock threshold, what is the gap in livestock assets against the threshold?

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[15] Little (2016).

[16] Iyer and Mosebo (2017).

[17] McPeak and Little (2017).

2. DESIGN AND METHODS

2.1 ESTIMATING A LIVESTOCK THRESHOLD

The estimation of a livestock threshold assumed that an agro-pastoralist household in Karamoja derives food from three main sources: the direct consumption of livestock products, especially milk; the sale of livestock in exchange for cereals; and the direct consumption of own-produced cereals. Therefore, a household's capacity to meet its basic food needs depends mainly on: the size, composition, and productivity of the herd; the area of land available for crop production and crop yields; and market prices of livestock and cereals. Using these assumptions, a simple household-level model can be developed to calculate the minimum number and type of livestock that are needed for the household to be food secure. A detailed list of the variables used in the model is provided in Annex 1, and some of the main variables and assumptions are outlined below.

Household characteristics and food needs

- The model used a household of six people, comprising two adults and four children.[18]

- Food energy needs per person were assumed to be 2,100 kcal/day.

Livestock herd and production

- Milk in agro-pastoralist households is derived mainly from cows and goats.

- Milk production and off-take depend on the number of cows and goats of breeding age, reproductive performance, production, and herd management.

- Production losses include losses due to disease and drought.

- Information on livestock herd production in Karamoja is limited, but reasonable information is available from comparable pastoralist systems in East Africa (see Annex 1 for literature and data used).

- The food energy value of cow and goat milk is known.

Land and crop production

- The area of land available from cropping is limited by the use of hand tools and manual labor; the model used a land area of 0.4 hectare (ha) cultivated.

- For the sake of simplicity, the model used sorghum as the single crop produced by the household.

- Limited information is available on sorghum yields in Karamoja, or losses due to pests, rainfall variability, and other causes; information on post-harvest losses is also limited. Sorghum yields were averaged from estimates provided by Nabuin Zonal Agricultural and Research Development Institute.

- The food energy value of sorghum is known.

Market prices

- Good information is available on the prices of livestock and cereals in Karamoja; the model used average prices for 2017.

- The model assumed that the household sold young male goats, and bulls, and retained breeding females; this approach is consistent with maximizing herd growth while also selling animals to meet domestic needs.

The list of assumptions above shows a reliance on two main types of data, with different levels of validity. First, relatively valid information is available for variables such as human food energy needs, the energy values of foods such as milk and sorghum, and the market prices of livestock and cereals in Karamoja. These variables are either standard figures derived from nutrition tables, or absolute market price figures. Second, less valid information is available on herd production, livestock losses, land cultivated, and sorghum yields and losses, because there are few studies that describe these variables in Karamoja. There is also likely to be wide variation between households for these variables, and variation by year and season. In part, these limitations were handled by assessing the sensitivity of the threshold model to changes in

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[18] Based on census data for the six districts from the Uganda Bureau of Statistics: **https://www.ubos.org/wp-content/uploads/publications/03_2018Population_by_Parish_Census_2014_Northern_Region.pdf**.

variables such as livestock production, land cultivated, and crop yields i.e. those variables for which secondary data were used or for which wide variability was expected.

2.2 APPLYING THE LIVESTOCK THRESHOLD

To measure the proportions of households above and below the livestock threshold in Karamoja, we used raw data from a livestock demographic survey commissioned by Mercy Corps and conducted in 2017.[19] This survey collected livestock ownership figures from a sample of 3,578 households across Karamoja's seven districts. From the raw dataset, we selected the six districts of Napak, Nakapiripirit, Moroto, Kaabong, Kotido, and Amudat, and categorized these areas as the main livestock-rearing districts. We deselected households in Abim District, as we categorized Abim as primarily an agricultural district.

This selection of districts produced a sample of 2,729 households. For each household in this sample, we converted the numbers of livestock by species and household into TLU, using conversion factors of 1 cattle = 0.7 TLU, and 1 sheep or goat = 0.1 TLU,[20] and then calculated TLU/capita for each household. We assumed an average household size of six people, derived from UBOS population data from 2014.[21]

There were three main limitations to this part of the analysis. First, the livestock demographic survey did not collect data on the ownership of donkeys, camels, or poultry, and therefore, the survey under-estimated total household livestock ownership. Camels are particularly important in Amudat District. Second, for the sake of simplicity and due to the exploratory nature of the analysis, we regarded Amudat District as agro-pastoralist; in reality it is more pastoralist than other districts. Third, we did not probe the definition of "household" in the demographic survey, or the possibility that wealthier households might be polygamous, with more household members.[22]

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[19] Schloeder (2018).

[20] After Jahnke (1982).

[21] **https://www.ubos.org/wp-content/uploads/ publications/03_2018Population_by_Parish_Census_2014__Northern_Region.pdf** (accessed August 2018)

[22] For example, see Levine (2010).

3. RESULTS

3.1 LIVESTOCK THRESHOLD FOR AGRO-PASTORALISM

The simple household model produced a livestock threshold for agro-pastoralism in Karamoja of 3.3 TLU/capita, equivalent to 4.7 cattle or 33 goats per capita. Below this threshold, a household could not meet its basic food energy requirements, and would need to supplement its own-produced food (or income from livestock) from other sources.

For a household of six people (two adults, four children), and 3.3 TLU/capita:

- The herd could comprise 45 goats and 22 cattle, and would produce milk to supply 18% of annual household energy requirements;

- Own crop production would produce sorghum to supply 23% of annual household energy requirements;

- The annual food energy balance would be met through the sale of livestock and related sorghum purchases; the herd could produce 9 male goats and 2 bulls for sale each year, with the income sufficient to buy enough sorghum to meet this requirement;

- In this model, the annual household balance of cash income after sorghum purchases is Ugandan shilling (UGX) 50,257 (US$13.57) i.e. a very

limited sum for other domestic expenses such as health or education, or for livestock purchases.

The sensitivity of the model to changes in the values of selected input variables is shown in Table 2. For example:

- If livestock mortality is reduced by 20% (i.e. survival is increased by 20%), the annual cash balance increases 6-fold; this increase is particularly sensitive to cattle mortality/survival, and indicates the relevance of support such as veterinary programs, and drought management on livelihoods;

- If milk production is increased by 20%, there is a 3.5-fold increase in the annual cash balance, indicating the relevance of support such as livestock feed supplementation;

- Increasing own production of sorghum by 20% produces a 4.3-fold increase in the annual cash balance, indicating the relevance of improving yields and/or reducing post-harvest losses.

Regarding the sensitivity of the model to price changes, as expected, increases in livestock prices leads to more cash income and a higher annual cash balance. However, increases in sorghum prices have the opposite effect, producing a food deficit. This is because the household in the model is a net purchaser of sorghum i.e. purchases exceed own production.

Table 2. Sensitivity estimates for livestock threshold model at 3.3 TLU/capita

| Input variable	Change in input variable	Annual cash balance
Basic model	No changes	UGX 50,257
Production changes:		
Livestock survival	Increase by 20%	UGX 308,625
Sorghum own production	Increase by 20%	UGX 216,017
Milk yield	Increase by 20%	UGX 176,753
Price changes:		
Cattle price	Increase by 10%	UGX 114,753
Goat price	Increase by 10%	UGX 206,412
Sorghum price	Increase by 10%	- UGX 165,369

3.2 DISTRIBUTION OF LIVESTOCK OWNERSHIP

Figure 1 shows the pattern of livestock ownership in the six main livestock-rearing districts of Karamoja. The five lowest wealth deciles or 50% of population own 11.2% of livestock, whereas the wealthiest three deciles or 30% of population, own 69.3% of livestock.

Figure 2 shows mean TLU/capita by wealth decile, and as expected, has a similar pattern of ownership to that shown in Figure 1. Applying a livestock threshold of 3.3 TLU/capita to the graph shows that the lowest six wealth deciles,

or about 60% of population, fall below the livestock threshold. An actual count of households showed that 1,542 households from the sample of 2,729 households owned less than 3.3 TLU/capita, or 56.5% of households.

Figure 3 looks specifically at poorer households, below the 3.3 TLU/capita threshold. The graph illustrates a skewed ownership away from the threshold, indicating a substantial asset gap for many households in terms of attaining the threshold. For example, 67% of households below the livestock threshold owned 1.5 TLU/capita or less i.e. less than half of required livestock to reach the threshold.

Figure 1. Total livestock ownership by wealth decile, Karamoja[a], 2017.
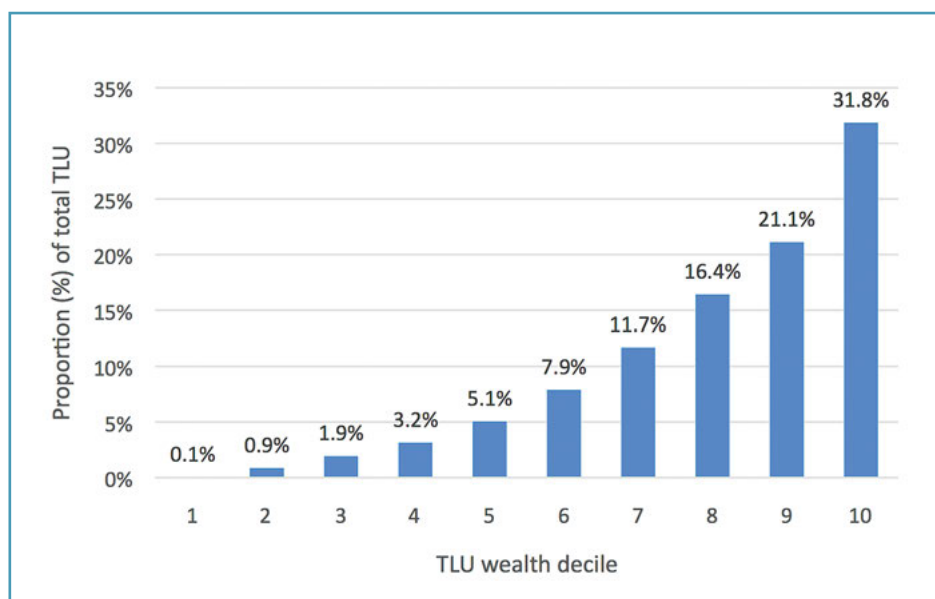
Notes:
n = 2,729 households.
[a] Data derived from the six districts of Amudat, Kaabong, Kotido, Napak, Nakapiripirit, and Moroto covered by the 2017 livestock demographic survey.[23]

Figure 2. Livestock ownership (TLU/capita) by wealth decile, Karamoja[a], 2017
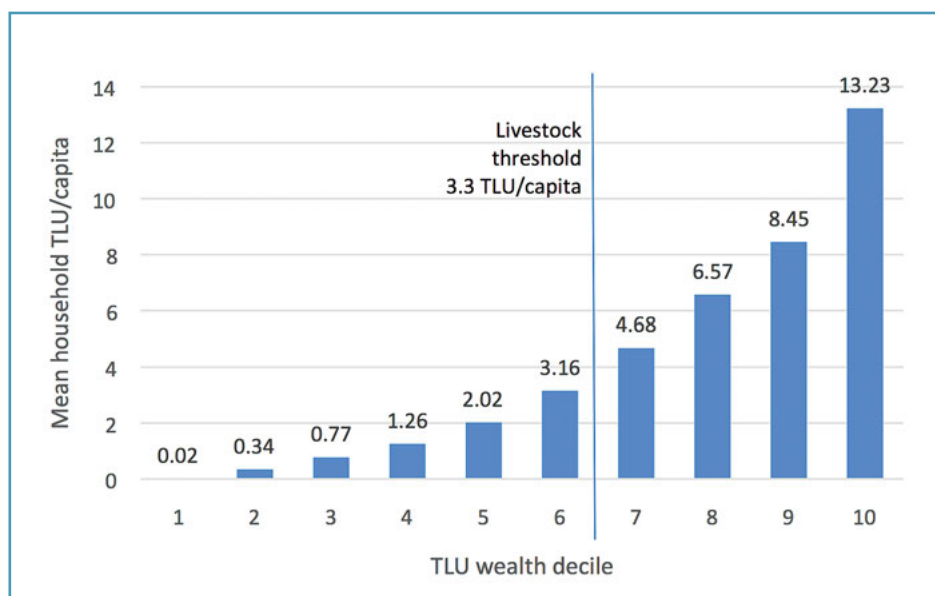
Notes:
n = 2,729 households.
[a] Data derived from six districts as per Figure 1.

[23] Schloeder (2018).

Figure 3. Livestock ownership in households below the livestock threshold, Karamoja, 2017

Using this data, it is also possible to estimate the total "livestock asset gap" in the six districts of Karamoja covered by the study, and against the livestock threshold. The estimate is shown in Table 3; a total of 1.04 million TLU would be needed to fill the livestock asset gap in the six districts. This is equivalent to 1.48 million cattle or 10.4 million goats.
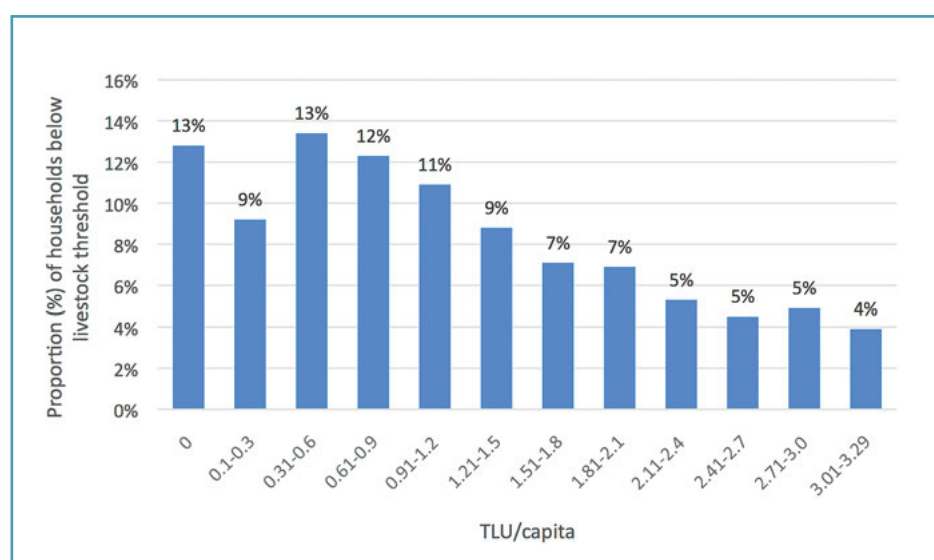
Table 3. The livestock asset gap in Karamoja against the livestock threshold

Livestock asset gap (TLU/capita) against livestock threshold	Proportion of population affected	Number of people affected[a]	TLU required to reach livestock threshold
3.30	13%	62,195	205,244
3.10	9%	44,703	138,579
2.84	13%	65,111	184,914
2.54	12%	59,766	151,805
2.24	11%	52,963	118,637
1.94	9%	42,759	82,953
1.64	7%	34,499	56,578
1.34	7%	33,527	44,926
1.04	5%	25,753	26,783
0.74	5%	21,866	16,180
0.44	5%	23,809	10,476
0.14	4%	18,950	2,653
		485,900	1,039,729

[a]Assumes a human population of 860,000 in the six districts covered by the analysis.

4. DISCUSSION

4.1 DATA ISSUES

4.1.1 Issues with survey data

When considering the findings from the analysis, it is important to recognize that the livestock survey data on which the analysis is based were not collected by the KRSU. The survey that produced this data used a questionnaire to collect data on the numbers and types of animals owned, and although this approach produces quantitative data, it can also be affected by important errors and biases. Typically, the use of questionnaires to collect livestock ownership data from pastoralists is subject to various non-sampling errors, including misinterpretation or inconsistent interpretation of the questions asked, or conscious mis-reporting of animal ownership, especially under-reporting. The risk of under-reporting is likely to be high in situations where: populations have long-term experience of development or humanitarian aid and expect aid to continue; when government policies or narratives are critical of pastoralism; or when government actions have had negative impacts on livestock survival. All three of these conditions apply to Karamoja. The survey report discusses some aspects of unreliable data, but only in relation to variables other than the basic herd size and composition.[24]

Furthermore, as outlined in section 2.2, the livestock survey did not cover the ownership of camels, donkeys or poultry. The implications of these omissions on the analysis include:

- Camels are a particularly important asset in Amudat District and surrounding areas, and as a valuable livestock species, are more likely to be owned by wealthier households. For example, a recent study in Rupa sub-county in Moroto District and Loroo and Amudat sub-counties in Amudat District reported that camels were owned by 45% of households, and these households had above-average income.[25] Camels represented 44.7% of herd composition in terms of TLU. The net effect is that the livestock ownership of wealthier households will be understated across the analysis;

- Donkeys are often an important livestock species kept by pastoralists and are used for transport e.g. for moving firewood, charcoal, or water; omitting donkeys from the analysis will lead to an under-estimation of TLU/capita, especially in poorer households;

- Poultry have a very low TLU value of only 0.01 TLU, and so the ownership of small numbers of poultry will not have much effect on the TLU/capita figures.

A forthcoming technical paper by the KRSU will discuss these challenges in more detail, and propose alternative methods for understanding livestock ownership across wealth groups.

4.1.2 Estimating the livestock threshold

The livestock threshold of 3.3 TLU/capita for agro-pastoralists in Karamoja is broadly consistent with other dryland areas of Africa. For example, modelling by the World Bank suggested that, *"3-4 TLU/capita are needed for pastoralists to stay above the poverty line."*[26]

The livestock threshold is relatively straightforward to calculate, but the validity of the 3.3 TLU/capita figure depends heavily on the estimates for the various indicators that are used for the threshold model. As explained in section 2.1, some of these indicators are standard figures (e.g. the energy values of specific foods), others are absolute values (e.g. market prices of livestock and cereals), and others are drawn from the literature (e.g. livestock production indicators). The main source of inaccuracy in the threshold model is the latter set of indicators because basic production information is not available for livestock in Karamoja, and so we used figures from other pastoralist areas of East Africa. In 2019, the KRSU will conduct a study on the economics of livestock systems in Karamoja, and this study will produce more accurate figures for indicators such as milk production, and herd reproduction. At that point, the threshold model can be revised as needed. A specific threshold for pastoralists (as opposed to agro-pastoralists) can then also be estimated.

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[24] Schloeder (2018), Annex 1.

[25] Salamula et al. (2017).

[26] De Haan (2016).

4.2 LIVESTOCK OWNERSHIP AND POVERTY

The livestock ownership pattern in agro-pastoralist and pastoralist areas of Karamoja is broadly similar to other pastoralist areas of East Africa where comparable data are available. For example, whereas the wealthiest 30% of the agro-pastoralist and pastoralist population in Karamoja owned 69.3% of livestock (Figure 1), in 11 different pastoralist ethnic groups in northern Kenya and southern Ethiopia, the wealthiest 30% owned 75% of livestock in terms of TLU.[27] Similarly, in Afar and Somali regions of Ethiopia, the wealthiest 30% of households owned approximately 75.7% and 71.2% of livestock respectively.[28] An assessment of poverty in Marsabit District of northern Kenya included the use of a 4.5 TLU/capita threshold[29] to define non-poor and poor households. The assessment reported that 88.6% of households were livestock-poor, and, *"The majority of households (over 70%) are both income and livestock-poor with few having escaped poverty within the five-year study period."*[30] Also, a wider study on dryland livestock systems in Africa in 2016 concluded that, *"Given expected population growth of 3% per year for pastoralists and 2.5% per year for agro-pastoralists, assuming the same ownership patterns, and based on a 'business as usual' scenario characterized by a continuation of current policies, 77% of pastoralists and 55% of agro-pastoralists will have less than 50% of the TLU per capita needed to stay above the poverty line by 2030, suggesting they will feel pressure to exit from the sector or face living indefinitely in poverty."*[31]

Our findings indicate that although the selected pastoralists areas of Ethiopia, Kenya, and Karamoja have important ecological, economic, and social differences, patterns of livestock ownership by wealth group are similar. Therefore, although Karamoja has experienced a unique large-scale disarmament program that was associated with dramatic livestock mortality, the sub-region's livestock ownership pattern is still typical of pastoralist areas that have experienced many decades of political marginalization, and inappropriate policies and development programs, coinciding with trends such as human population growth. In northern Kenya and

southern Ethiopia, it was recognized that different livelihood strategies were associated with different levels of wealth i.e. income and livestock assets, and so households were characterized as "left out" of pastoralism, "moving from" pastoralism, "staying with" pastoralism, and "combining" pastoralism with other sources of income.[32] These pathways are similar to the "Moving Up-Moving Out" analysis that was used to describe the co-existence of growing livestock trade with increased humanitarian needs in pastoralist areas, and a redistribution of livestock from poorer to wealthier households.[33] Our analysis indicates that both of these framings apply to Karamoja, but with the effect of the disarmament program being to accelerate a process of livestock redistribution.

The finding that 56.5% of households in the six selected districts fell below the livestock threshold is broadly consistent with measures of food insecurity and malnutrition in Karamoja. As so many households have too few animals, insufficient access to animal milk would be expected, with direct and negative impacts on the nutrition of children and mothers in particular. Low livestock holdings also force poorer households to rely more heavily on crop production, but in a context where yields are low e.g. due to rain failures, or small areas of cultivation.[34] However, in contrast to FSNA reports, the analysis shows far higher levels of livestock ownership in terms of the proportion of households owning any livestock at all. Whereas recent FSNA reports cite 45% to 46% of households without any animals,[35] our analysis of the Mercy Corps data indicates that only 13% of households were without any animals.

Ad hoc conversations between livestock keepers and KRSU staff in 2018 indicate a strong desire to rebuild livestock assets among poorer households. Strategies for acquiring livestock include using any excess income to buy sheep or goats, and then gradually trading up to cattle. However, excess income is difficult to acquire. There are probably various ways of acquiring livestock through social networks and obligations, but these systems are not well documented for Karamoja in the present day.

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[27] McPeak and Little (2017).

[28] Sabates-Wheeler and Lind (2013).

[29] The Marsabit study used a higher livestock threshold than we estimated for Karamoja.

[30] Mburu et al., (2017).

[31] De Haan (2016).

[32] McPeak et al. (2012).

[33] Aklilu and Catley (2010); Catley and Aklilu (2013).

[34] Cullis (2018).

[35] FSNA (2017; 2018).

4.3 MEASURING POVERTY

As proposed by studies in Kenya and Ethiopia, poverty in pastoralist areas is best understood by measuring both livestock assets and income.[36] In part, this is because the limited livestock ownership among poorer households means that they must use non-livestock sources of food income to meet their basic needs. In Karamoja, this is illustrated in our finding that 56.5% of households were below the livestock threshold. These households would be relying heavily on diversified livelihood activities such as crop production (but largely due to circumstance, not choice), casual labor, and having multiple "small jobs" in towns - including out migration to find work, agricultural labor, mining, the collection and sale of firewood, and charcoal, and other activities.[37] Therefore, a combination of livestock ownership and income measurement not only shows who is poor, but also largely explains *why* they are poor and the extent to which poverty traps are evident. Plus, a basic comparison of wage rates with food prices and other domestic needs such as school fees, indicates the extent to which households are able to save cash, buy assets, or invest in education.

Measuring income is also relevant to wealthier households or those "combining" with pastoralism or "moving up." These households will often show positive diversification by investing in local businesses, livestock services and trade, and education.

4.4 POLICY AND PROGRAMMING IMPLICATIONS

4.4.1 Poverty-focused livestock programming

Since the 1970s, development programs in pastoralist areas of East Africa have often recognized the importance of livestock and so have included livestock marketing, veterinary services, fodder production, rangeland management, water development, and similar activities. However, there has also been a general tendency to view pastoralists as universally poor, rather than consider the different aspirations and strategies of different wealth groups.

Looking specifically at livestock marketing, a substantial body of literature shows that marketing behavior among pastoralists is differentiated by wealth, and that middle and high wealth groups supply most of the animals to markets; this is because they have more excess animals to sell. In contrast, poorer herders pursue a logical economic strategy of maximizing herd growth, which equates to

maximizing their financial capital. During this process, they minimize livestock sales and only sell animals when they have important domestic needs.[38] Similarly, such sales are not very price responsive and are more affected by the timing or urgency of the need. It follows that market support provides disproportionately higher benefits to richer pastoralists.[39] This is not to say that markets have no relevance for the poor; good market access (proximity) is important to enable livestock sales and food purchases by poorer households, and minimize the transaction costs associated with travel, and moving animals to distant markets.

A livestock programming approach that shifts from area-wide, generic delivery of interventions towards a more distinctive poverty-focused approach would need to recognize that the primary objective of poorer herders is often financial/herd growth (not livestock sales). Therefore, a focused approach would aim to assist this growth by maximizing production and avoiding preventable losses *specifically for poorer households*. This might involve:

- Ensuring access to productive rangeland for poorer herders, especially dry season access;

- Targeted livestock feed support e.g. fodder vouchers;

- Limiting the impacts of disease on production and survival - ensuring the accessibility, availability, affordability, and quality of primary veterinary services;

- Limiting excess mortality due to drought; using drought cycle management and interventions under the *Livestock Emergency Guidelines and Standards*;

- Preventing losses due to raiding; continuing to support peace building and conflict management.

There might also a role for selected restocking or linking restocking to social protection. This option is discussed below.

4.4.2 Restocking, social protection, and other issues

The results in Table 3 show that approximately 0.5 million people in Karamoja would need 1 million TLU to reach the livestock threshold, and thereby meet their basic food security needs. This points to a need to consider if and how restocking might be further used in Karamoja, and at what

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[36] McPeak and Little (2017).

[37] Bushby and Stites (2016).

[38] Catley (2017).

[39] Aklilu and Catley (2010); De Haan (2016).

scale. Some general experiences from restocking in pastoralist areas of East Africa are as follows:

- Restocking has been shown to improve food security and reduce dependency on external support,[40] but only when well-designed and implemented; good design often means complementing, rather than replacing, traditional restocking systems;

- Effective restocking also depends heavily on strong community participation and flexibility; these aspects are easier to ensure in small-scale, localized approaches compared with large-scale projects;

- Recipients of livestock under restocking usually require additional support until herds have grown to a sufficient size to produce meaningful amounts of milk and offspring; typically, this support has been mainly in the form of food aid and veterinary care;

- The use of local breeds of livestock, with local purchase, works far better than using non-local breeds, imported from other areas;

- There is a high risk that large-scale restocking will disrupt markets and inflate livestock prices.

Against these experiences, social protection programs in pastoralist areas of Ethiopia and Kenya have aimed to improve food security, and build and protect financial assets. Evaluations of these programs indicate some clear food security benefits, but limited or no livelihoods impact in terms of livestock assets.[41] In part, this relates to the size of the cash transfers in these programs, and the need to maximize the number of beneficiaries against a finite program budget; this means that the size of the transfers is sufficient to contribute towards food purchases, for example, but not sufficient to enable meaningful purchase of productive financial assets such as livestock. However, the option of combining social protection with selective restocking could be considered for Karamoja - but it would need very careful design and piloting. A critical area is to understand traditional restocking practices, and the strategies used by poorer households to build herds. External support could to add value or "top-up" these systems. Further guidance is available in the relevant chapter of the *Livestock Emergency Guidelines and Standards*.[42] Analysis of access to rangeland would also

need to be considered for growing herds, given changes in land use in Karamoja.[43]

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[40] E.g. see Lotira (2004), and Wekessa (2005).

[41] OPM/IDS (2012); Kumar and Hoddinott (2015).

[42] LEGS (2014).

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ANNEX I. THRESHOLD MODEL VARIABLES AND ASSUMPTIONS

Table A1. Livestock and milk

Variable	Value
Herd structure	
% goat herd as breeding females	70%
% of cattle herd as adult females	65%
Losses	
Annual mortality goat kids	20%
Annual mortality adult goats	15%
Annual mortality adult cattle	15%
Annual mortality cattle calves	20%
Average drought mortality	10%
Other losses and gifts	10%
Reproduction	
Annual birth rate goats	1.50
Annual birth rate cows	0.80
Milk production and off-take	
Goat milk offtake/day (litres)	0.20
Goat lactation period (days)	90
Annual goat milk offtake (litres)	368
Food energy goat milk (kcal/litre)	692
Cow milk offtake/day (litres)	0.5
Cow lactation period (days)	180
Annual cow milk offtake (litres)	836
Energy value cow milk (kcal/litre)	660
Total energy consumed goat milk (kcal)	255,036.6
Total energy consumed cow milk (kcal)	552,123
Total milk energy goats + cows (kcal)	807,159.6

Table A2. People, food, and prices

Family size adults	2
Family size children	4
Daily energy requirement adult (kcal)	2,100
Daily energy requirement child (kcal)	2,100
Energy value sorghum (kcal/kg)	3,290
Proportion (%) of household dietary energy from cereals	82%
Proportion (%) of household energy from milk	18%
Household total annual energy need (kcal)	4,599,000
Sorghum area planted (ha)	0.40
Sorghum yield (kg/ha)	800
Sorghum produced (kg)	320
Energy from own sorghum (kcal)	1,052,800.00
Energy from cereals (kcal)	3,791,840.40
Energy from purchase cereals (kcal)	2,739,040.40
Amount of sorghum purchase needed (kg)	832.54
Price of sorghum/kg (UGX)	2,590.00
Cost of total sorghum needs (UGX)	2,156,265.85
Price of goats (UGX)	70,000.00
Price of young bulls (UGX)	700,000.00
Potential sales income	
Male goats (UGX)	644,962.50
Bulls (UGX)	1,561,560.00
Total income from livestock (UGX)	2,206,522.50
Balance after sorghum purchases (UGX)	50,256.65

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