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Karamoja Resilience Support Unit (KRSU)

THE PRODUCTIVITY AND ECONOMIC VALUE OF LIVESTOCK IN KARAMOJA SUB-REGION, UGANDA

July 2019

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ACRONYMS AND ABBREVIATIONS

IGAD   Intergovernmental Authority on Development

l   Liter

UBOS   Uganda Bureau of Statistics

UGX   Ugandan shilling

The average 2018 exchange rate used in this report for the Ugandan shilling (UGX) to the US dollar (USD) is UGX 3,600 to USD 1.00.

EXECUTIVE SUMMARY

This report calculates the direct use value of livestock in Karamoja Sub-region, Uganda. The concept of direct use value pulls together under one heading all the various economic benefits derived from livestock. These include products such as milk, blood and meat; physical services such as the cultivation by animal traction of arable fields; and financial services such as livestock-based credit, insurance and risk management. In these calculations, goods and services that are not marketed are assigned monetary values that reflect their potential commercial value. This approach generates a comprehensive estimate of the economic benefits derived from livestock by livestock owners in Karamoja and provides an evidence-based assessment of the value of the sub-region's livestock to the Ugandan national economy.

The data in this report are based on a survey of 1,237 livestock owners in five districts of Karamoja: Abim, Kotido, Kaabong, Moroto and Amudat. Standardized interviewing took place between March and June of 2019 and inquired about the previous year, as defined by Karamoja livestock keepers—March 2018 to February 2019. Estimations of annual livestock productivity in this report refer to the 12-month period from the beginning of March 2018 to the end of February 2019.

THIS STUDY SUPPORTS THE FOLLOWING CONCLUSIONS:

- Livestock in Karamoja produce three main products—milk, live and dead animal offtake, and blood. Livestock also provide physical services, primarily the ploughing of agricultural fields by cattle. In 2018–19, the total imputed monetary value of Karamoja livestock products and ploughing services was **Ugandan shilling (UGX) 1,161,660 million or United States dollar (USD) 323 million**. Karamoja livestock also directly benefit their owners by providing financially related livelihood services, including the provision of credit, asset-based insurance, and the pooling of risk through the sharing of live animals, livestock products and services. In 2018–19, the total value of the financially derived benefits from cattle, goats and sheep was **UGX 437,409 million or USD 122 million**. Combining physical outputs and financial services, in 2018–19 Karamoja cattle, goats and sheep provided their owners with benefits valued at **UGX 1,599,069 million or USD 444 million**.

- Cattle are by far the most productive livestock species in Karamoja, providing 89% of the total gross value of regional livestock's physical output. The contribution by goats and sheep to physical production is roughly equal, at 6% for goats and 5% for sheep. The output profile for cattle is evenly split, half attributable to animal offtake and half to the remaining three products/services: blood, ploughing and, most importantly, milk at 42% of all cattle production by value. Small stock realize the greater part of their value in the form of animal offtake—81% of the total for goats and 86% for sheep.

- Annual net livestock sales rates—defined as the number of animals sold less the number purchased as a percentage of opening herd size—were uniformly low. In 2018–19, these rates ranged from 2–3% per annum for cattle and from 1–3% for goats. Net sales rates for sheep were more variable, from a high of 6% to a low of –0.5%. For all species in all sampled districts, mortality rates were higher than net sales rates.

- The evidence in this report suggests that Karamoja livestock owners use the market primarily to strengthen their system of self-provisioning by profitably disposing of surplus or sick animals in order to acquire limited amounts of money to buy the kinds of things that only money can buy—food when harvests are insufficient, veterinary inputs, clothing, etc. They also exploit the market as an exchange mart, trading animals that have a high market value for those with a lower market value but with productive and reproductive potential.

- Livestock owners steadfastly maintain that they eat all fallen animals that they can find. The prevalence of this practice effectively transforms a dead animal—a total economic loss—into a form of offtake, which is a limited economic gain. The negative implications of mortality are, therefore, not in terms of immediate economic losses but in terms of the imperilled capacity for future herd growth and production, an important consideration for pastoralists and agro-pastoralists.

- Low net sales rates and the transformation of mortality into a contribution to total economic offtake raise questions about the emphasis in government and donor policy and development programs on markets, marketing chains and the commercial possibilities for the Karamoja livestock industry. A development focus more in keeping

with pastoral and agro-pastoral values and responding to the immediate needs of livestock owners might instead address high and potentially devastating levels of livestock disease and mortality, which limit herd growth and prevent the systematic management of offtake, both for the market and home consumption.

- At 37% of all livestock production by value, cattle milk is the second-most important product provided by Karamoja livestock; only cattle offtake has a higher monetary value. Dairy production by goats and sheep lags far behind that of cattle, with the milk of each species of small stock constituting 1% or less of all livestock output.

- Cattle are consistently bled as a food supply in all study districts except Abim. Small stock are almost universally bled in Kotido District, but less so in Kaabong, Moroto and Amudat, and not at all in Abim. Adult cattle, especially male animals, produce the most blood—up to 7 liters per year in Moroto District—and are bled up to three times in a year. Blood production and consumption is the most thoroughly subsistence-oriented sector in the pastoral and agro-pastoral economy. Livestock owners say that they consume all the blood that they produce; none is sold. The estimated regional value of cattle, goat and sheep blood combined (UGX 46,961 million; USD 13 million) is greater than the value of cattle ploughing services, worth UGX 39,554 million (USD 11 million).

- Ploughing is economically most valuable in Abim District, followed in order by Kaabong, Kotido, Moroto and, finally, Amudat District, where animal traction is not used for field cultivation. The provision of ploughing services is more commercialized in districts where it is both more highly valued and takes place over a longer ploughing season, but in all districts the use of one's own cattle or the borrowing of ploughing services from neighbors or kin are both more common than cash payments as a way for cultivators to obtain ploughing.

INTRODUCTION: METHODS AND SCOPE OF THE PRESENT STUDY

DIRECT USE BENEFITS

This report calculates the direct use value of livestock in Karamoja Sub-region, Uganda. The concept of direct use value was developed by economists attempting to quantify and monetarize the benefits derived from the natural environment (Barbier 1993) and has subsequently been applied to livestock (Hesse and McGregor 2006).

The concept of direct use value pulls together under one heading all the various economic benefits derived from livestock. These include goods—products such as milk, blood and meat—and physical services such as the cultivation by animal traction of arable fields and financial services such as livestock-based credit, insurance and risk management. This approach generates a comprehensive estimate of the economic benefits derived from livestock and, to some extent, explains the economic reasons why livestock owners keep and value their animals.

In these calculations, goods and services that are not marketed are assigned monetary values that reflect their potential commercial value. These "shadow" prices are based on average producer prices for equivalent goods or services that are traded, or on the cost of substituting untraded outputs with purchased replacements. For example, animals slaughtered for home consumption are valued at the price at which their owners could have sold them, had they chosen to do so. Alternatively, the financial services provided by livestock as credit, as a substitute for insurance or in risk management can be valued at the cost of replacing these self-services with commercial alternatives.

These estimation techniques are difficult to accurately implement whenever there are not enough items traded to confidently establish a producer price; this is the case for home-consumed livestock blood in Karamoja. Shadow pricing is also imprecise whenever there are no reasonable commercial alternatives for an unsold service, such as the absence of formal insurance provisions that might replace the security provided by livestock for Karamoja agro-pastoralists. A final limitation of the direct use benefit approach is the expression of value in monetary terms when other measures of benefit might be more appropriate. For instance, for the pastoral family that will consume it, the dietary importance of livestock blood when alternative food sources are insufficient may bear little resemblance to the retail price of blood products sold to people in urban areas. This limitation is particularly problematic when, as in Karamoja, by far the greatest part of livestock output is not sold but rather consumed by livestock producers themselves.

THE STUDY

The data in this report are based on a survey of 1,237 livestock owners in five districts of Karamoja—Abim, Kotido, Kaabong, Moroto and Amudat. Interviewing took place in two rounds using four different questionnaires, from March to June 2019. Copies of all four questionnaires are provided in the Annex to this report. With the exception of Katikekile Sub-county in Moroto District, interviews were conducted in all sub-counties of the five surveyed districts. Table 1 gives the total number of interviews for each round of each module in the five districts surveyed. Table 2 provides an overview of the species composition of the surveyed herds, and Table 3 summarizes the extent to which surveyed herd owners milked or bled different livestock species.

The first questionnaire (Module 1 round 1) enquired about the age and sex composition of herds, the rates and reasons for animals exiting herds, and ploughing. Informants were asked to use small stones to represent individual animals of different ages and sexes, and to represent animals that exited the herds for different reasons. A second and much shorter questionnaire (Module 1 round 2) asked about the rates and prices at which livestock were bought and sold.

A second pair of questionnaires (Module 2, rounds 1 and 2) asked about livestock reproductive rates, and milk and blood production. To estimate milk and blood production, informants were asked to fill their own milking and blood collection containers with water equivalent to the volume of milk or blood taken for human consumption from different livestock species under different conditions. This water was then transferred to measuring containers, and the volume was recorded. A second, shorter questionnaire asked about the proportion of good and poor milking animals in herds, and the relative levels of milk production for human use from good and poor milk producers.

Development and pretesting of the questionnaires took place in Moroto and Abim Districts between February 21 and March 14, 2019. Sixteen focus group discussions and 30 individual interviews were conducted in developing the first-round questionnaires. Twelve focus group discussions were held in five districts after completion of the first round of the survey, to clarify outstanding issues raised by the preliminary analysis of survey results and to design the second-round questionnaires. Four blood sellers, five milk traders and eight livestock traders were interviewed to determine local commodity prices.

Standardized interviewing took place between March and June of 2019 and inquired about the previous year (12

months), as defined by Karamoja pastoralists and farmers—March 2018 to February 2019. If not otherwise stated, all estimations of productivity in this report refer to the 12-month period from the beginning of March 2018 to the end of February 2019. Rainfall in Karamoja is erratic and unpredictable, and a statistically average year for agricultural production is not a realistic expectation. The pastoralists interviewed for this study considered 2018–19 to be a poor year. While rainfall was sufficient to produce adequate grazing, timing and amounts were not optimal, which led to crop failure, forcing agro-pastoralists to sell more animals than they would have liked in order to purchase food. Losses due to a variety of livestock diseases were also considered to be heavy.

Livestock owners saw 2018–19 as part of a longer-term process of recovery following disarmament and the militarily enforced "protected *kraals*" program. An estimated 65–75% of all livestock in Karamoja were lost between 2008 and 2013, equivalent to the scale of losses from a once-in-a-lifetime drought, according to one Karamoja informant (Cullis 2018). Herd owners uniformly agreed that herd sizes had not yet recovered and that rebuilding would take several more years in the best of circumstances. The livestock economy depicted in this report is therefore in flux following a major disaster and is likely to continue to change rapidly for some years.

Table 1. Number of interviews by district

District	Module 1 first round	Module 1 second round	Module 2 first round	Module 2 second round
Abim	61	46	65	50
Kotido	71	71	69	50
Kaabong	74	55	63	50
Moroto	60	34	68	48
Amudat	66	73	94	69
Study total	332	279	359	267

Table 2. Count of sampled district herds that kept different livestock species (Module 1 first round interviews)

District	Sample size	Cattle	Goats	Sheep	Camels	Donkeys
Abim	61	61	61	61	0	0
Kotido	71	71	70	71	0	51
Kaabong	74	74	74	74	0	24
Moroto	60	60	60	60	6	44
Amudat	66	66	65	59	4	0
Study total	332	332	330	325	10	119

Table 3. Count of sampled district herds that kept, milked or bled different livestock species (Module 2 first round interviews)

District	Abim	Kotido	Kaabong	Moroto	Amudat
Sample size	65	69	63	68	94
Cattle					
Herds kept	65	69	63	68	94
Herds milked	65	69	63	68	94
Herds bled	0	68	63	68	66
Goats					
Herds kept	49	69	63	68	94
Herds milked	7	69	60	68	94
Herds bled	0	63	49	37	36
Sheep					
Herds kept	11	66	59	61	78
Herds milked	1	48	23	59	10
Herds bled	0	62	18	31	1
Camels					
Herds kept	0	1	1	5	8
Herds milked	0	0	0	2	6
Herds bled	0	0	0	3	1
Donkeys					
Herds kept	0	20	4	29	6
Herds milked	0	2	0	2	1
Herds bled	0	1	0	1	0

STATISTICAL OVERVIEW OF LIVESTOCK-KEEPING IN KARAMOJA

Table 4 gives the 2017 population totals by district and for the region as a whole for cattle, goats and sheep, the principal livestock species kept by farmers and pastoralists in Karamoja, and the only species for which we have current population estimates (Schloeder 2018). Livestock in Karamoja produce three main products: milk, live and dead animal offtake, and blood. They provide physical services, primarily the ploughing of agricultural fields by cattle. Figure 1 provides an overview of the estimated monetary value of the physical output of Karamoja livestock in the 2018–19 agricultural year, from March

2018 to February 2019. For that year, the total imputed monetary value of Karamoja livestock products and ploughing services was **UGX 1,161,660 million or USD 323 million** at an average 2018 exchange rate of UGX 3,600 to USD 1.00. Figure 2 gives the percentage contribution to total output of the different kinds of physical output.

Karamoja livestock also directly benefit their owners by providing financially related livelihood services that outside observers do not routinely identify as part of the
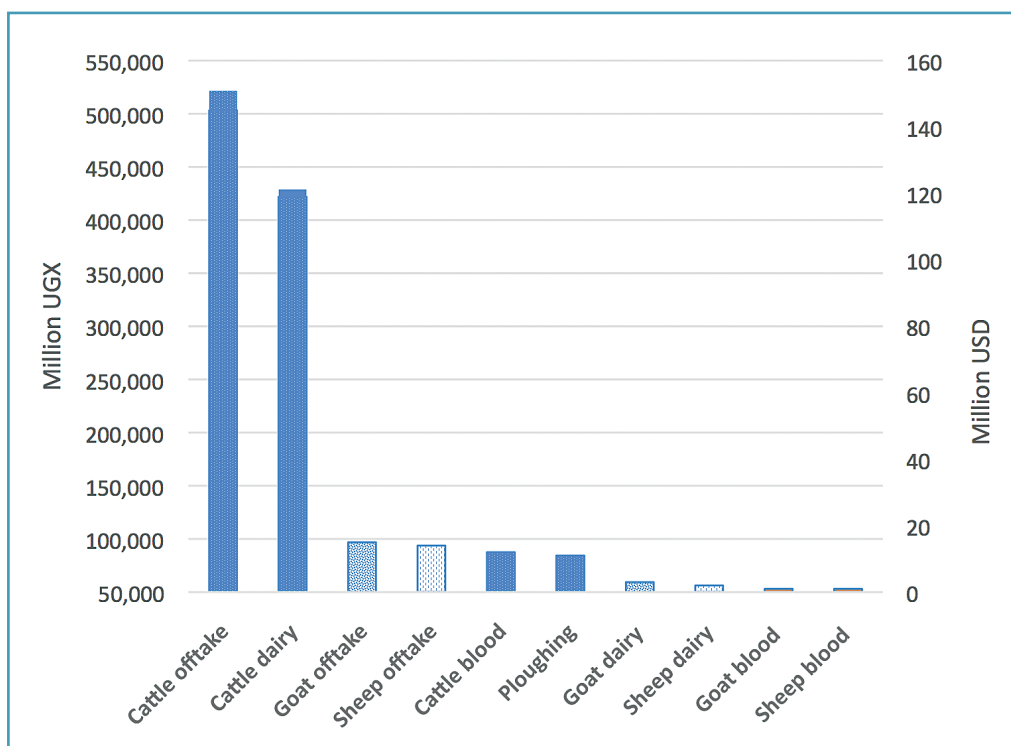
Figure 1. Monetary value of livestock physical output, Karamoja Sub-region, UGX and USD.
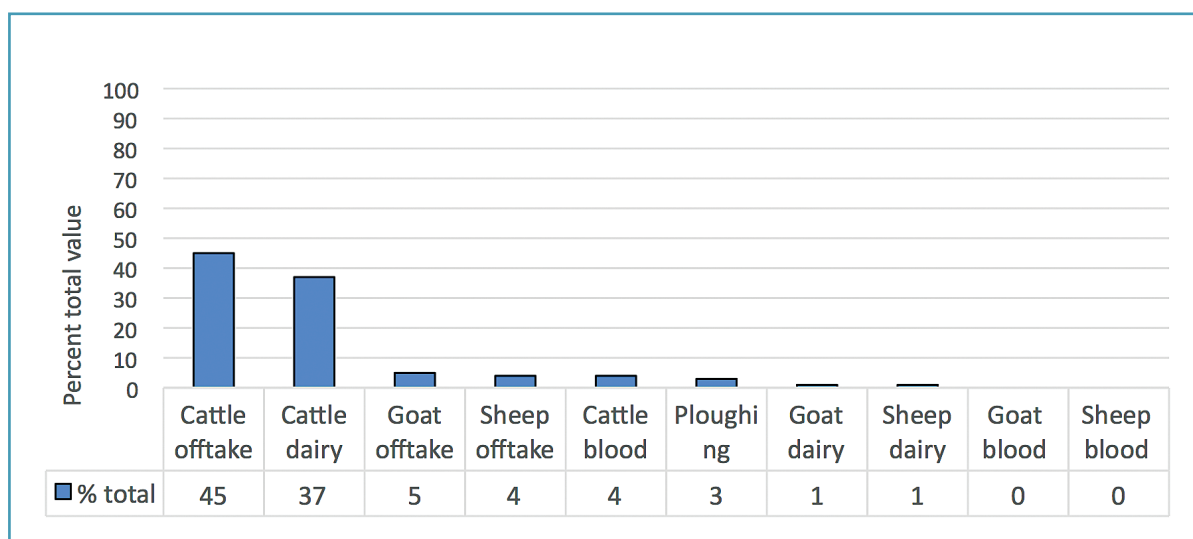
Figure2. Physical output from livestock in Karamoja Sub-region: percent value.

value of livestock-keeping. These services include the provision of credit, asset-based insurance, and the pooling of risk through the sharing of live animals, livestock products and services. In 2018–19, the total value of the financially derived benefits from cattle, goats and sheep was **UGX 437,409 million or USD 122 million**.

Combining physical outputs and financial services, in 2018–19 Karamoja cattle, goats and sheep provided their owners with direct use benefits valued at **UGX 1,599,069 million or USD 444 million** at an average 2018 exchange rate of UGX 3,600 to USD 1.00 (Figure 3). To put these figures in perspective, the Intergovernmental Authority on Development (IGAD) and the Uganda Bureau of Statistics (UBOS) estimated the USD value of livestock production to the Ugandan national gross domestic product (GDP) in 2009 at USD 526 million (Behnke and Nakirya 2012), which was nearly double the official Government of Uganda estimate for that year of USD 282 million (UBOS 2011).

Cattle are by far the most productive livestock species in Karamoja, providing 89% of the total gross value of regional livestock's physical output. The contribution by goats and sheep to physical production is roughly equal, at 6% for goats and 5% for sheep (Figure 4). The output profile for cattle is evenly split, half attributable to animal offtake and half to the remaining three products/ services—blood, ploughing and, most importantly, milk at 42% of all cattle production by value. Small stock realize the greater part of their value in the form of animal offtake—81% of the total for goats and 86% for sheep. The combined financial benefits provided by the three main livestock species total slightly less than the estimated value of cattle offtake but slightly more than the value of cattle dairy production.

Donkeys were kept by over half of the surveyed livestock-owning households in Kotido and Moroto Districts, and by about a third of households in Kaabong. We interviewed no one owning donkeys in Abim and Amudat
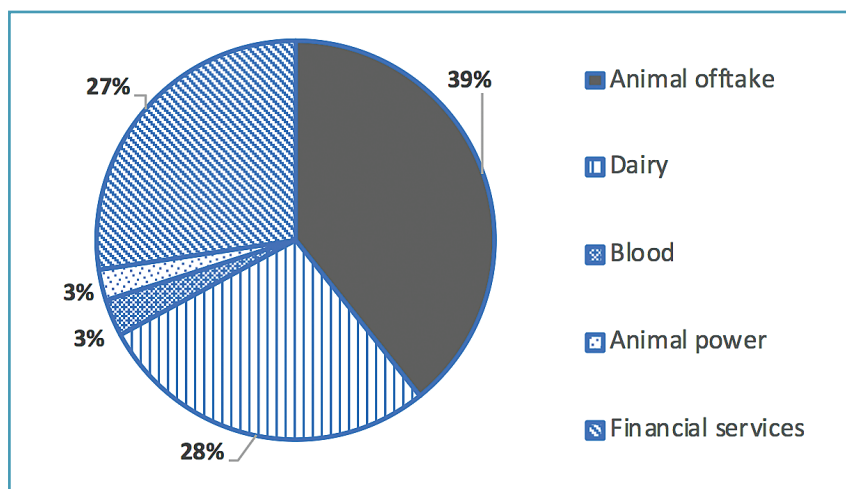
Figure 3. Percent of total direct use value (cattle, goats and sheep).
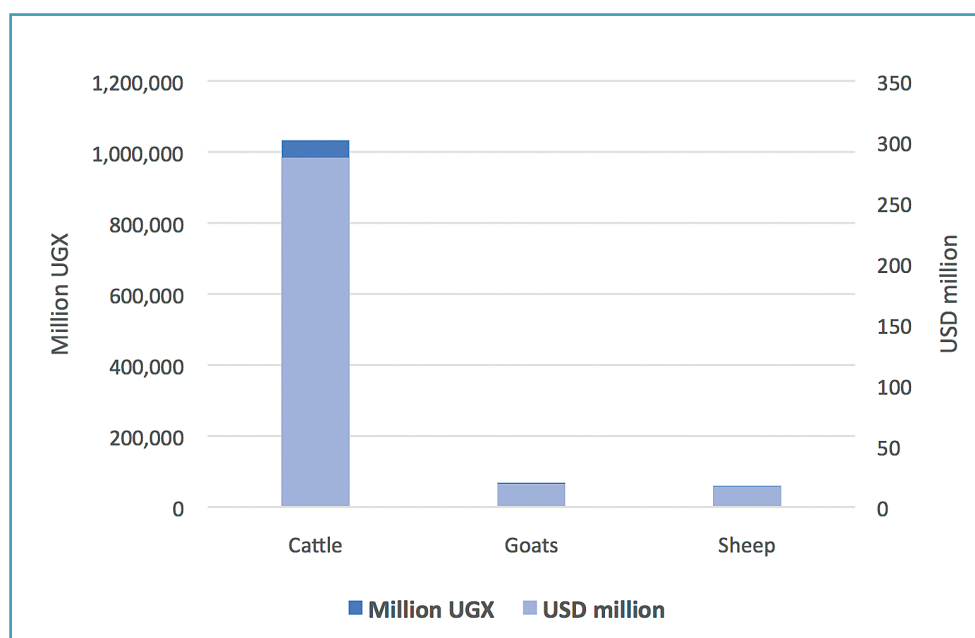
Figure 4. Value of physical output by species, Karamoja Sub-region.

Districts, although donkeys are kept in Amudat. We could obtain no current population estimates for donkey numbers in Karamoja and for that reason cannot estimate the regional value of their output. The sale and slaughter of donkeys is relatively common and probably makes a modest but unmeasured contribution to regional livestock offtake; donkeys are not commonly milked. Almost all donkey owners use their animals for haulage and/or transport, and it is likely that the greater part of the value of this species lies in these services.

We sampled very few camel owners—10 out of a total of 332 round-one interviews on herd structure and offtake, and 15 out of 359 round-one interviews on milk and reproduction. Since camel herds are small, this sample was insufficient to reach any firm conclusions about camel productivity and value, which combines animal offtake and milk production.

Across all three of the main herd species, the age and sex composition of herds and flocks is remarkably consistent (Figure 5; Tables 5–8). Irrespective of the species, immature males constitute 22–23% of the herd or flock, adult males 15–16%, immature females 32–33%, and adult females 28–31%. The female component totals 62% for cattle, 61% for goats and 63% for sheep, which reflects the interest of pastoralists and agro-pastoralists in dairy production and herd reproduction. Tables 9–11 combine the estimates of herd composition from the survey with livestock census data to calculate the number of animals in different sex and age categories in each district in 2018.
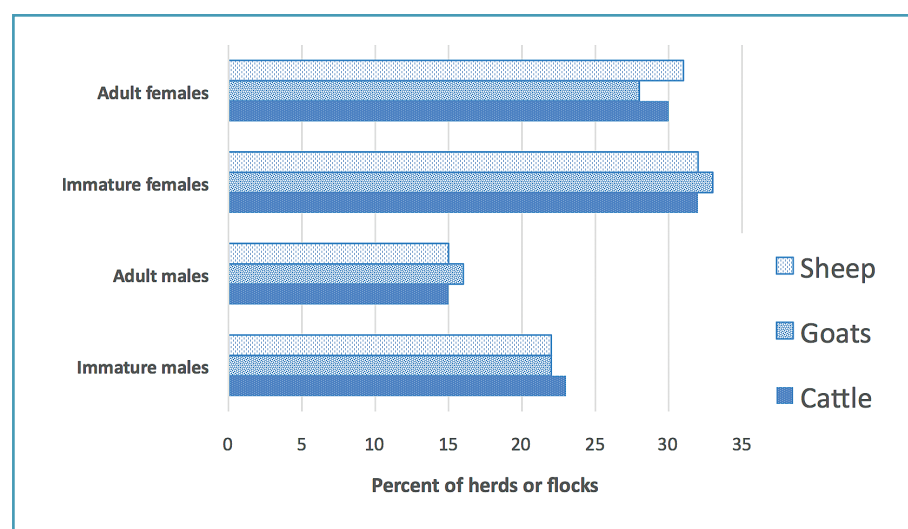
Figure 5. Herd structure %, Karamoja, all livestock.

Table 4. Estimates of Karamoja Sub-region livestock populations, livestock head by district

District	Cattle	Goats	Sheep
Abim	59,933	127,524	3,829
Kotido	507,985	400,621	1,232,456
Kaabong	257,782	238,404	375,382
Moroto	529,395	539,124	564,597
Napak	562,175	337,914	778,700
Amudat	519,823	692,473	212,657
Nakapiripirit	457,429	355,574	137,174
Karamoja Sub-region total	2,894,523	2,691,634	3,304,795

Source: Schloeder 2018

Table 5. Age and sex composition of district cattle herds

District	Immature males %	Adult males %	Immature females %	Adult females %	Sample: head of cattle
Abim	18.29	23.60	28.28	29.81	1,241
Kotido	22.51	14.06	34.91	28.51	4,749
Kaabong	20.84	16.49	29.34	33.32	3,439
Moroto	21.68	12.28	31.97	34.07	4,829
Amudat	21.26	16.13	34.48	28.13	8,307

Table 6. Age and sex composition of district goat herds

District	Immature males %	Adult males %	Immature females %	Adult females %	Sample: head of goats
Abim	22.03	21.38	31.56	25.02	1,241
Kotido	23.44	15.2	34.53	26.8	5,898
Kaabong	20.13	16.43	32.97	30.47	4,260
Moroto	21.92	14.22	33.78	30.08	5,282
Amudat	23.49	17.07	32.04	27.4	7,616

Table 7. Age and sex composition of district sheep herds

District	Immature males %	Adult males %	Immature females %	Adult females %	Sample: head of sheep
Abim	18.46	24.47	27.69	29.37	1,239
Kotido	21.09	14.72	34.08	30.08	7,707
Kaabong	19.7	15.51	32.65	32.14	2,959
Moroto	23.73	13.38	30.91	31.98	4,581
Amudat	23.02	18.79	33.1	25.09	4,305

Table 8. Age and sex composition of district donkey herds

District	Immature males %	Adult males %	Immature females %	Adult females %	Sample: head of donkeys
Abim	-	-	-	-	0
Kotido	13.51	27.03	17.72	41.74	333
Kaabong	8.82	24.26	19.12	47.79	136
Moroto	10.68	27.67	19.90	41.75	206
Amudat	-	-	-	-	0

Table 9. Estimates of Karamoja Sub-region cattle numbers, head of cattle by district

District	Immature males: head	Adult males: head	Immature females: head	Adult females: head
Abim	10,961	14,144	16,949	17,866
Kotido	107,134	74,775	173,121	152,801
Kaabong	50,783	39,981	84,165	82,851
Moroto	125,625	70,833	163,635	169,300
Napak	133,404	75,219	173,768	179,783
Amudat	119,663	97,674	172,061	130,423
Nakapiripirit	105,287	67,329	139,815	144,985
Karamoja Sub-region	652,859	439,957	923,516	878,011
Percentage of regional cattle herd	22.56%	15.20%	31.91%	30.34%

Table 10. Estimates of Karamoja Sub-region goat numbers, head of goats by district

District	Immature males: head	Adult males: head	Immature females: head	Adult females: head
Abim	28,093	27,264	40,246	31,906
Kotido	93,905	60,894	138,334	107,366
Kaabong	47,990	39,169	78,601	72,641
Moroto	118,175	76,663	182,116	162,168
Napak	74,070	48,051	114,147	101,644
Amudat	162,661	118,205	221,868	189,737
Nakapiripirit	78,082	59,693	117,281	100,503
Karamoja Sub-region	602,980	429,942	892,596	765,969
Percentage of regional goat herd	22.40%	15.97%	33.16%	28.46%

Table 11. Estimates of Karamoja Sub-region sheep numbers, head of sheep by district

District	Immature males: head	Adult males: head	Immature females: head	Adult females: head
Abim	706	936	1,060	1,124
Kotido	259,924	181,417	420,021	370,722
Kaabong	73,950	58,221	122,562	120,647
Moroto	133,978	75,543	174,516	180,558
Napak	184,785	104,190	240,696	249,028
Amudat	48,953	39,958	70,389	53,355
Nakapiripirit	32,349	18,778	42,277	43,768
Karamoja Sub-region	734,649	479,046	1,071,523	1,019,205
Percentage of regional sheep herd	22.23%	14.50%	32.43%	30.84%

LIVE AND DEAD LIVESTOCK OFFTAKE

A series of nine tables—three on each of the principal livestock species—analyzes the type and value of live and dead animal offtake. For each species, the first three tables in the sequence (Tables 12–14) examine the rates at which different ages and sexes of animals exit from herds in each of the surveyed districts. The second series of tables (15–17) examines offtake rates by the reasons that herd owners give for disposing of an animal:

- Slaughter for home or local consumption, or in rituals and ceremonies;

- For sale;

- As gifts, loans or dowry payments to fellow pastoralists or farmers;

- Due to death from disease or accident while in the owner's possession;

- Or the animal has been lost/stolen.

The final three tables in the sequence (Tables 18–20) present information on the economically significant rate of offtake and the mean value of animals sold, by district and for the sub-region as a whole.

Across these tables there are interesting variations between districts in the rates of offtake, reasons for offtake and the species that are disposed. The figures for Abim in particular are distinctive, apparently reflecting the greater emphasis on farming in this district and the consequent importance of retaining mature cattle (especially males) for ploughing, as will be documented in a subsequent section of this report. We cannot comment authoritatively on these patterns because we have as yet no measures of the statistical significance of the differences between districts.

A uniform feature across all districts is the low rate of **net** livestock sales, defined as the number of animals sold per annum less the number purchased as a percentage of total opening herd size. For cattle in 2018–19, these rates range from as low as 2% per annum to as high as 3%, and for goats from 1–3%. Net sales rates for sheep are more variable, from a high of 6% to a low of –0.5%. Low and occasionally negative net sales rates and the difference between gross and net sales rates reflect the commitment by livestock owners in Karamoja to buying a replacement each time they sell an animal. The defining feature of the replacement animals is that they cost less to purchase than the money received from the preceding sale or sales. Ideally, owners aim to sell mature male animals with a high market value and replace them with immature female

animals that have a much lower market value but are valuable in a pastoral setting because they have the potential to grow and reproduce. Optimally, animal owners aim to acquire both cash to spend on other purchases and an animal that will preserve in the herd the heritage or conceptual "lineage" of the sold animal. The sale animal and the purchased replacement need not be of the same species. The availability of young animals for purchase reflects distress sales by owners who have pressing cash needs but lack animals more suitable for sale or, more rarely, sales to specialized traders who offer exceptionally high prices for immature animals.

A second distinctive feature of Karamoja offtake is the economic impact of livestock mortality. Livestock owners in all districts steadfastly maintain that they eat all fallen animals that they can find. Pressed on the hygiene implications of this practice, they insist that it does not cause illness, in part because the meat from fallen animals is handled differently and cooked more thoroughly than that from slaughtered animals. They also discard obviously infected body parts, frequently mentioning infected lymph nodes, lungs and portions of the rib cage attached to infected lungs, and may not eat all of the emaciated animals that die in a drought. There is, therefore, some wastage, but informants insist that wastage is minimal and that basically they eat all fallen animals. The prevalence of this practice effectively transforms a dead animal—a total economic loss—into a form of offtake, or a limited economic gain. The negative implications of mortality are, therefore, not in terms of immediate economic losses but in terms of the imperilled capacity for future herd growth and production, an important consideration for pastoralists and agro-pastoralists.

Finally, rates of giving or loaning animals within local communities are not treated in this analysis as economically significant offtake, since these animals circulate within the rural areas, and the rates at which animals exit herds must eventually equal the rates at which they enter other local herds. The significance of this rural circulation of animals will be discussed in greater detail later in the report.

The preceding paragraphs provide an explanation of what is termed the "economic offtake rate" in the final three tables (Tables 18–20) in the series of tables on offtake. In conformity with practices in Karamoja, the economically significant offtake rate includes animals that are slaughtered for home or local consumption, animals that are sold less the number purchased (net sales), and those that die and are recovered and eaten. Compiled in this way, annual offtake rates by district for all species of

livestock in Karamoja are high—16–27% for cattle, 18–28% for goats and 14–29% for sheep. Net sales are not insignificant, either in terms of practice or economic value, but they are without exception lower than mortality rates (Tables 15–17). This fact has both policy implications and implications for the techniques used to estimate the value of livestock in this report.

With respect to this report, the expression of Karamoja livestock value solely in monetary terms is potentially misleading. Readers must remember that the prices affixed to livestock production are shadow prices—a conceptual metric that purports to assess the relative importance of products and services that, on the whole, are never marketed but rather are consumed within the rural communities that produce them. If the importance of self-provisioning is clear with regard to animal offtake— the most commercialized segment of the livestock production system—then it is doubly true for dairy production, blood and ploughing services, as will be discussed in the sections of this report dealing with those outputs.

This finding raises questions about the balance of emphasis in government and donor policy and development programs on markets, marketing chains and the commercial possibilities for the Karamoja livestock industry. As presently constituted, Karamoja pastoralists

and agro-pastoralists are not specialized commodity producers. According to the testimony of focus group discussants, by preference they sell surplus and sick animals. They also exploit the market as an exchange mart, trading animals that have a high market value for those with a lower market value but with productive and reproductive potential. Viewed from the perspective of the marketplace or with an ideological commitment to commercialization, it might appear that there are high and growing levels of commitment to market-oriented production. The evidence in this report suggests, to the contrary, that Karamoja livestock owners are using the market to strengthen their system of self-provisioning by acquiring limited amounts of money to buy the kinds of things that only money can buy—food when harvests fail, veterinary inputs, clothing, etc. A development focus more in keeping with pastoral and agro-pastoral values and recognizing the immediate needs of livestock owners might instead address high and potentially devastating levels of livestock disease and mortality (Tables 15–17) that limit herd growth and the systematic management of offtake levels, both for the market and home consumption.

Two final tables in this section (Tables 21 and 22) summarize the survey data on donkey offtake. Without census data on donkey numbers, it was not possible to use these data to establish the economic value of donkey offtake.

Table 12. Cattle offtake rates by age and sex category, exits as % of opening herd size, March 2018

District	Immature males %	Adult males %	Immature females %	Adult females %	All exits %
Abim	4.43	8.78	6.76	8.62	28.6
Kotido	5.66	4.14	7.68	7.36	24.86
Kaabong	7.39	6.78	9.74	15.85	39.76
Moroto	6.77	4.20	7.64	8.28	26.90
Amudat	7.79	5.95	8.21	8.2	30.15

Table 13. Goat offtake rates by age and sex category, exits as % of opening herd size, March 2018

District	Immature males %	Adult males %	Immature females %	Adult females %	All exits %
Abim	8.79	13.15	13.23	9.68	44.87
Kotido	6.81	5.69	9.18	7.3	28.98
Kaabong	7.14	6.39	9.62	14.16	37.3
Moroto	6.4	5.21	7.99	6.08	25.67
Amudat	8.52	7.23	8.27	6.46	30.49

Table 14. Sheep offtake rates by age and sex category, exits as % of opening herd size, March 2018

District	Immature males %	Adult males %	Immature females %	Adult females %	All exits %
Abim	7.41	13.42	10.62	10.48	41.95
Kotido	5.39	4.93	7.87	6.65	24.84
Kaabong	6.29	6.15	11.76	13.45	37.65
Moroto	5.35	4.26	6.96	5.68	22.24
Amudat	7.68	7.74	9.18	7.48	32.06

Table 15. Cattle offtake rates by reason for exit, exits as % of opening herd size, March 2018

District	Slaughtered %	Gross sales %	Net sales %*	Given/ loaned %	Died %	Lost %	All exits %
Abim	3.38	4.91	3.18	1.85	9.26	9.18	28.6
Kotido	7.05	3.79	2.59	1.07	9.24	3.72	24.87
Kaabong	16.23	4.05	2.00	0.84	8.51	10.23	39.86
Moroto	12.83	4.14	2.99	2.22	7.17	0.6	26.96
Amudat	7.8	4.6	2.64	2.43	13.14	2.2	30.17

Note: *Net sales = livestock sales less purchases

Table 16. Goat offtake rates by reason for exit, exits as % of opening herd size, March 2018

District	Slaughtered %	Gross sales %	Net sales %*	Given/ loaned %	Died %	Lost %	All exits %
Abim	9.76	5.81	3.18	2.25	10.89	16.7	45.43
Kotido	8.34	5.44	3.16	1.89	10.15	3.17	28.98
Kaabong	17.49	4.67	0.82	1.17	10.4	3.71	37.44
Moroto	6.87	5.68	1.64	2.95	8.88	1.1	25.48
Amudat	4.6	7	3.02	3.43	14.21	1.3	30.54

Note: *Net sales = livestock sales less purchases

Table 17. Sheep offtake rates by reason for exit, exits as % of opening herd size, March 2018

District	Slaughtered %	Gross sales %	Net sales %*	Given/ loaned %	Died %	Lost %	All exits %
Abim	8.81	6.01	6.01	0.2	13.84	13.84	42.7
Kotido	7.4	4.51	2.03	1.21	7.29	4.42	24.84
Kaabong	13.25	4.49	−0.5	1.32	12.4	6.42	37.88
Moroto	6.63	5.32	0.97	2.9	6.48	0.89	22.22
Amudat	4.7	6.5	6.5	2.65	16.98	1.3	32.13

Note: *Net sales = livestock sales less purchases

Table 18. Value of cattle offtake by district

District	Head of district cattle	Economic offtake rate* %	Head of off take	Value per head in UGX	District total in million UGX
Abim	59,933	15.82	9,481	723,174	6,857
Kotido	507,985	18.88	95,908	674,602	64,699
Kaabong	257,782	26.74	68,931	882,258	60,815
Moroto	529,395	22.99	121,708	839,730	102,202
Napak	562,175	22.99	129,244	839,730	108,530
Amudat	519,823	23.54	122,366	775,500	94,895
Nakapiripirit	457,429	22.05	100,863	828,774	83,593
Karamoja Sub-region total	2,894,522	22.40	648,501	804,302	521,591

Note: *Includes animals that are slaughtered for home or local consumption, animals that are sold less the number purchased (net sales), and those that die and are recovered and eaten.

Table 19. Value of goat offtake by district

District	Head of district goats	Economic offtake rate* %	Head of offtake	Value per head in UGX	District total in million UGX
Abim	127,524	23.67	30,185	90,082	2,719
Kotido	400,621	21.65	86,734	86,647	7,515
Kaabong	238,404	28.71	68,446	97,281	6,658
Moroto	539,124	17.39	93,754	107,547	10,083
Napak	337,914	17.39	58,763	107,547	6,320
Amudat	692,473	23.67	163,908	109,610	17,966
Nakapiripirit	355,574	19.64	69,843	61,067	4,265
Karamoja Sub-region total	2,691,634	21.24	571,633	97,135	55,526

Note: *Includes animals that are slaughtered for home or local consumption, animals that are sold less the number purchased (net sales), and those that die and are recovered and eaten.

Table 20. Value of sheep offtake by district

District	Head of district sheep	Economic offtake rate* %	Head of offtake	Value per head in UGX	District total in million UGX
Abim	3,829	28.66	1,097	94,263	103
Kotido	1,232,456	16.72	206,067	81,433	16,781
Kaabong	375,382	25.15	94,409	78,889	7,448
Moroto	564,597	14.08	79,495	108,091	8,593
Napak	778,700	14.08	109,641	108,091	11,851
Amudat	212,657	28.66	60,947	76,008	4,632
Nakapiripirit	137,174	14.48	19,872	102,103	2,029
Karamoja Sub-region total	3,304,795	17.29	571,528	90,000	51,437

Note: *Includes animals that are slaughtered for home or local consumption, animals that are sold less the number purchased (net sales), and those that die and are recovered and eaten.

Table 21. Donkey offtake rates by age and sex category, exits as % of opening herd size, March 2018

District	Immature males %	Adult males %	Immature females %	Adult females %	All exits %
Abim	-	-	-	-	-
Kotido	0	4.20	2.10	5.71	12.01
Kaabong	2.21	13.24	5.88	19.12	40.44
Moroto	4.23	8.45	3.70	5.81	20.38
Amudat	-	-	-	-	-

Table 22. Donkey offtake rates by reason for exit, exits as % of opening herd size, March 2018

District	Slaughtered %	Gross sales %	Net sales %*	Given/ loaned %	Died %	Lost %	All exits %
Abim	-	-	-	-	-	-	-
Kotido	0	3.30	.41	0	5.11	3.90	12.61
Kaabong	16.17	8.82	0	0.73	0.73	13.97	40.42
Moroto	1.5	7.76	1.55	1.00	7.76	2.4	20.42
Amudat	-	-	-	-	-	-	-

Note: *Net sales = livestock sales less purchases

MILK AND DAIRY PRODUCTS

At 37% of all livestock production by value, cattle milk is the second-most important product provided by Karamoja livestock. Only cattle offtake has a higher monetary value. Dairy production by goats and sheep lags far behind that of cattle, with the milk of each species of small stock constituting 1% or less of all livestock output.

For all herd species, the volume and value of milk produced for human consumption is a complex outcome of numerous variables. The next series of three tables summarizes the major coefficients of livestock performance and milk output that determine the volume of production for each of the three main herd species (Tables 23–25). The subsequent series of three tables uses these coefficients in combination with livestock census data to estimate the volume of milk for human use produced by each species, by district, and for the Karamoja Sub-region as a whole (Tables 26–28). The final set of three milk tables assigns monetary values to district and regional levels of milk output (Tables 29–31).

The biological parameters that determine the volume of milk output available for human use include:

- The proportion of the herd or flock made up of adult females and the proportion of those females that give birth in a year;

- The proportion of all live births that survive to weaning, since mothers with dead offspring often stop lactating, or lactate for a much-reduced period of time and provide less milk, even if they are given a foster calf, kid or lamb to suckle;

- For small stock, twin births also interfere with milk production for human consumption since all milk is left to the suckling offspring, or in the case of sheep that have twins in their first pregnancy, the ewe is frequently slaughtered;

- Milk yields also depend on the season in which a birth occurs, and how much milk an owner considers prudent to take for human use from offspring that are still suckling. Dry season milk yields are invariably low, though cattle giving birth in the dry season commonly yield more milk over their total lactation than those having a calf in the wet season. This anomaly arises because cattle calving in the dry season often continue to lactate in the following wet season, and their milk yields rebound as environmental conditions improve, and milking only stops with the onset of the next dry season;

- The ratio of good versus poor milking animals in a herd or flock. Many flock owners do not bother to milk livestock species or individual animals, especially sheep, that they consider to be poor milk producers. Alternatively, milk from these animals is often left to be consumed opportunistically by herdsmen and children, making it difficult to provide any estimate of the amounts involved. Cows that are poor milk producers are a short-term liability but, in compensation, their abbreviated lactation periods allow them to become pregnant and calve more frequently.

Tables 26–28 apply the reproduction and production coefficients to livestock populations of different sizes to estimate milk output for human consumption at district and regional levels.

Finally, Tables 29–31 transform estimates of milk volumes into estimates of monetary value. In 2018–19, a liter of whole milk was worth UGX 800 (USD 0.22) in the wet season at the farm gate and somewhat more if producers brought their milk to a town like Moroto. Producers sold buttermilk in the wet season at UGX 600 per liter. Clarified butter sold at UGX 11,000–12,000 per liter (USD 3.10–3.30) in the dry season.

According to milk traders and processors, one liter of fresh milk yields 160–200 ml of clarified butter, leaving behind a residue of somewhat less than 800 ml of buttermilk. Based on these conversion ratios, a liter of whole milk processed into buttermilk and clarified butter is valued at more than three times the price of whole milk. The value ascribed to milk output is therefore very sensitive to assumptions about the proportion of milk output that is processed. In Moroto and Amudat Districts, about 40% of all milking cattle are allocated to men and herders and 60% to women; men drink the milk from their animals as whole or sour milk, whereas women process almost all the milk from the animals that they manage into buttermilk and clarified butter. In Abim District, milking cattle are not allocated separately to men and women, and these types of data were not collected in the remaining two districts covered in this survey. For these districts, we have no indication of the proportion of milk that is consumed whole versus that which is processed. For the purposes of pricing milk output in this study, we have assumed that 40% of milk is consumed directly and 60% is processed in all districts of Karamoja Sub-region. Priced in this way, the total value of milk production from cattle and small stock combined was UGX 446,591 million (USD 124.1 million) in 2018–19.

Table 23. District cattle milk production, performance estimates

District	Adult female component in herd %	Calving rate (% live births to adult females, per annum)	Calf mortality rate (% calves that die prior to weaning)	% of all births in wet season	% of all births in dry season	Mean lactation: l milk for human use/ wet season birth, good-yielding cow	Mean lactation: l milk for human use/ dry season birth, good-yielding cow	Mean lactation: l milk for human use/ wet season birth, average cow	Mean lactation: l milk for human use/ dry season birth, average cow
Abim	29.81	54.68	27.41	63.17	36.83	712.63	729.61	483	494
Kotido	28.51	58.79	20.96	64.62	35.37	609.17	663.87	489	534
Kaabong	33.32	55.64	28.98	62.91	37.09	576.44	625.5	474	515
Moroto	34.07	60.71	23.86	67.26	32.74	739.60	740.53	622	623
Amudat	28.13	62.71	12.55	70.50	29.5	746.63	858.45	542	623

Table 24. District goat milk production, performance estimates

District	% flocks milked	Adult female component in herd %	Kidding rate (% live births to adult females, per annum)	Kid mortality rate plus twinning rate %	% of all births in wet season	% of all births in dry season	Mean lactation: l milk for human use/ wet season birth, good milk production*	Mean lactation: l milk for human use/ dry season birth, good milk production*	Mean lactation: l milk for human use/ wet season birth, average milk production*	Mean lactation: l milk for human use/ dry season birth, average milk production*
Abim	12	25.02	104	33.33	39.21	60.78	No estimate	No estimate	No estimate	No estimate
Kotido	100	26.80	137.17	25.64	51.72	48.28	15.88	1.12	10.99	0.77
Kaabong	95	30.47	162.79	22.96	52.48	47.52	19.04	.44	10.68	0.25
Moroto	100	30.08	133.96	20.44	49.29	50.72	23.04	1.13	17.45	0.86
Amudat	100	27.4	115.60	16.95	52.30	47.7	23.10	0.45	16.74	0.33

*Average yield of milk from both milked and un-milked flocks

Table 25. District sheep milk production, performance estimates

District	% flocks milked	Adult female component in herd %	Lambing rate (% live births to adult females, per annum)	Lamb mortality rate plus twinning rate %	% of all births in wet season	% of all births in dry season	Mean lactation: l milk for human use/wet season birth*	Mean lactation: l milk for human use/dry season birth*	Mean lactation: l milk for human use/wet season birth, average milk production*	Mean lactation: l milk for human use/dry season birth, average milk production*
Abim	9% (1 flock)	29.37	-	-	-	-	-	-	-	-
Kotido	72% (48 flocks)	30.08	137	20.76	52.43	47.56	3.8	0.57	2.92	.44
Kaabong	39% (23 flocks)	32.14	157.43	18.43	52.02	47.98	6.57	0.26	5.30	0
Moroto	97% (59 flocks)	31.98	135.15	14.11	50.81	49.19	11.91	1.99	7.68	1.28
Amudat	13% (10 flocks)	25.09	122.14	17.54	52.61	47.39	0.91	0	0.91	0

*Average yield of milk from both milked and un-milked flocks

Table 26. District cattle milk for human use, production estimates

District	Head of district cattle	Adult females	Live births	Calf mortality	Survival to weaning	Wet season births	Dry season births	l milk wet births	l milk dry births	l total milk
Abim	59,933	17,866	9,769	2,677	7,091	4,479	2,611	2,163,357	1,289,834	3,453,191
Kotido	507,985	152,801	89,831	18,828	71,002	45,882	25,113	22,436,298	13,410,342	35,846,640
Kaabong	257,782	82,851	46,098	13,359	32,739	20,596	12,142	9,762,504	6,253,130	16,015,634
Moroto	529,395	169,300	102,782	24,523	78,258	52,636	25,621	32,739,592	15,961,883	48,701,475
Napak	562,175	179,783	109,146	26,042	83,103	55,895	27,208	34,766,690	16,950,584	51,717,274
Amudat	519,823	130,423	81,788	10,264	71,523	50,424	21,099	27,329,808	13,144,677	40,474,485
Nakapiripirit	457,429	144,985	86,943	21,091	65,851	44,002	2,612	24,583,306	14,775,691	39,358,997
Karamoja Sub-region	2,894,523	878,011	526,357	116,784	409,567	273,914	116,406	153,781,555	81,786,141	235,567,696

Table 27. District goat milk for human use, production estimates

District	Goats district head	Adult females	Live births	Kid mortality and twin births	Live births available for milking	Available wet season births	Available dry season births	l milk wet season births	l milk dry season births	l total milk
Abim	127,524	31,906	33,182	11,059	22,122	8,674	No estimate	No estimate	No estimate	No estimate
Kotido	400,621	107,366	147,273	37,761	109,513	56,640	52,872	622,473	40,711	663,185
Kaabong	238,404	72,641	118,252	27,150	91,102	47,810	43,291	510,610	10,822	521,433
Moroto	539,124	162,168	217,240	44,403	172,836	85,191	87,662	1,486,582	75,389	1,561,972
Napak	337,914	101,644	136,162	27,831	108,330	54,945	53,396	931,760	47,252	979,012
Amudat	692,473	189,737	219,335	37,177	182,158	95,268	86,889	1,594,786	28,673	1,623,459
Nakapiripirit	355,574	100,503	125,074	29,842	95,232	44,710	50,527	780,189	43,453	823,642
Karamoja Sub-region	2,691,634	765,969	996,518	215,223	781,293	391,689	389,632	5,926,400	246,300	6,172,703

Table 28. District sheep milk for human use, production estimates

District	Sheep district head	Adult females	Live births	Lamb mortality and twin births	Live births available for milking	Available wet season births	Available dry season births	l milk from wet season births	l milk from dry season births	l total milk
Abim	3,829	1,124	-	-	-	-	-	-	-	-
Kotido	1,232,456	370,722	507,889	105,437	402,451	211,005	191,405	616,135	84,218	700,354
Kaabong	375,382	120,647	189,415	34,909	154,506	80,374	74,132	425,983	0	425,983
Moroto	564,597	180,558	243,753	34,393	209,359	106,375	102,984	816,965	131,819	948,784
Napak	778,700	249,028	336,187	47,436	288,751	146,714	142,036	1,126,769	181,807	130,8576
Amudat	212,657	53,355	65,093	11,417	53,675	28,238	25,436	25,697	0	25,697
Nakapiripirit	137,174	43,768	59,086	8,337	50,749	25,785	24,963	198,035	31,953	229,989
Karamoja Sub-region	3,304,795	1,019,205	1,401,423	241,929	1,159,491	598,491	560,956	3,011,549	429,797	3,639,383

Table 29. District cattle milk for human use, estimates of monetary value

District	I total production	I whole milk	District value whole milk, million UGX	I processed milk	District value processed milk, million UGX	District total value of dairy production, million UGX
Abim	3,453,191	1,381,276	1,105	2,071,914	5,180	6,285
Kotido	35,846,640	14,338,656	11,471	21,507,984	53,770	65,241
Kaabong	16,015,634	6,406,253	5,125	9,609,380	24,023	29,148
Moroto	48,701,475	19,480,590	15,584	29,220,885	73,052	88,637
Napak	51,717,274	20,686,909	16,550	31,030,364	77,576	94,125
Amudat	40,474,485	16,189,794	12,952	24,284,691	60,712	73,664
Nakapiripirit	39,358,997	15,743,598	12,595	23,615,398	59,038	71,633
Karamoja Sub-region	235,567,696	94,227,076	75,382	141,340,616	299,635	428,733

Table 30. District goat milk for human use, estimates of monetary value

District	I total production	I whole milk	District value whole milk, million UGX	I processed milk	District value processed milk, million UGX	District total value, million UGX
Abim	-	-	-	-	-	-
Kotido	663,185	265,274	212	397,911	995	1,207
Kaabong	521,433	208,573	167	312,859	782	949
Moroto	1,561,972	624,788	500	937,183	234	2,843
Napak	979,012	391,604	313	587,407	1,469	1,782
Amudat	1,623,459	649,384	520	974,075	2,435	2,955
Nakapiripirit	823,642	329,456	264	494,185	1,235	1,499
Karamoja Sub-region	6,172,703	2,469,081	1,975	3,703,621	9,259	11,234

Table 31. District sheep milk for human use, estimates of monetary value

District	I total production	I whole milk	District value whole milk, million UGX	I processed milk	District value processed milk, UGX	District total value, million UGX
Abim	-	-	-	--	-	-
Kotido	700,354	280,141	224	420,212	1,051	1,275
Kaabong	425,983	170,393	136	255,589	639	775
Moroto	948,784	379,513	303	569,270	1,423	1,727
Napak	130,8576	523,430	419	785,145	1,963	2,382
Amudat	25,697	10,278	8	15,418	39	47
Nakapiripirit	229,989	91,995	74	137,993	345	419
Karamoja Sub-region	3,639,383	1,455,753	1,165	2,183,629	5,459	6,624

BLOOD PRODUCTION AND CONSUMPTION

Cattle are consistently bled in all study districts except Abim. Small stock are almost universally bled in Kotido District, but less so in Kaabong, Moroto and Amudat, and not at all in Abim (Table 3). In 359 interviews in Module 2 round one (on milk and blood production), two donkey owners and four camel owners reported bleeding those species. Adult cattle, especially male animals, produce the most blood—up to 7 liters per year in Moroto District—and are bled up to three times in a year.

The extent to which owners bleed their livestock means that we have reasonably robust production coefficients for blood (Tables 32–34). What is uncertain is the shadow price that should be ascribed to this product. Blood production and consumption is the most thoroughly

subsistence-oriented sector in the pastoral and agro-pastoral economy. Livestock owners say that they consume all the blood that they produce; none is sold. There may be half a dozen or so individuals in the entire region who collect blood from butchers and abattoirs and process it into a jelly-like product for sale in some district towns. We were able to interview only four blood processors/sellers, and the complexities of converting liquid blood into a saleable commodity makes it difficult to reliably determine its value, which we have estimated to be UGX 6,000 (USD 1.67) per liter. Priced at this level, the combined regional value of cattle, goat and sheep blood (UGX 46,961 million; USD 13 million) is greater than the value of cattle ploughing services, worth UGX 39,554 million (USD 11 million) (Tables 35–37).

Table 32. Cattle blood yields, liters per head per annum

District	Immature males	Adult males	Immature females	Adult females
Abim	0	0	0	0
Kotido	0.27	2.94	0.27	2.89
Kaabong	0.35	3.08	.244	2.46
Moroto	1.33	7.05	.97	5.44
Amudat	0.81	4.76	0.67	3.89

Table 33. Goat blood yields, liters per head per annum

District	Immature males	Adult males	Immature females	Adult females
Abim	0	0	0	0
Kotido	0	.24	0	.25
Kaabong	0	.21	0	.21
Moroto	0	.45	0	.35
Amudat	0	0.23	0	0.22

Table 34. Sheep blood yields, liters per head per annum

District	Immature males	Adult males	Immature females	Adult females
Abim	0	0	0	0
Kotido	0	.25	0	.23
Kaabong	0	.08	0	.08
Moroto	0	.32	0	.21
Amudat	0	0	0	0

Table 35. District and Karamoja Sub-region cattle blood production and monetary value

District	Immature males	Adult males	Immature females	Adult females	l total	Value, million UGX
Abim	0	0	0	0	0	0
Kotido	28,926	219,838	46,743	441,594	737,101	4,423
Kaabong	17,774	123,141	20,536	203,813	365,264	2,192
Moroto	167,081	499,373	158,726	920,992	1,746,172	10,477
Napak	177,427	530,294	168,554	978,020	1,854,295	11,126
Amudat	96,927	464,928	115,280	507,345	1,184,480	7,107
Nakapiripirit	125,453	374,954	119,180	691,527	1,311,114	7,867
Karamoja Sub-region total	613,588	2,212,528	629,019	3,743,291	7,198,426	43,191

Table 36. District and Karamoja Sub-region goat blood production and monetary value

District	Immature males	Adult males	Immature females	Adult females	l total	Value, million UGX
Abim	0	0	0	0	0	0
Kotido	0	14,614	0	26,841	41,455	249
Kaabong	0	8,225	0	15,254	23,479	141
Moroto	0	34,498	0	56,759	91,257	548
Napak	0	21,623	0	35,575	57,198	343
Amudat	0	27,187	0	41,742	68,929	414
Nakapiripirit	0	14,593	0	24,009	38,602	232
Karamoja Sub-region total	0	120,740	0	200,180	320,920	1,926

Table 37. District and Karamoja Sub-region sheep blood production and monetary value

District	Immature males	Adult males	Immature females	Adult females	l total	Value, UGX
Abim	0	0	0	0	0	0
Kotido	0	45,354	0	85,266	130,620	784
Kaabong	0	4,658	0	9,651	14,309	86
Moroto	0	24,173	0	37,917	62,090	373
Napak	0	33,340	0	52,295	85,635	514
Amudat	0	0	0	0	0	0
Nakapiripirit	0	5,709	0	8,955	14,664	88
Karamoja Sub-region total	0	113,234	0	194,084	307,318	1,844

PLOUGHING

In addition to an estimate of the value of ploughing in 2018–19, (UGX 39,554 million), Table 38 provides three indicators of the relative value of ploughing in the five sample districts. These indicators are:

- The number of days ploughed per head of adult cattle in the district herd;

- The daily costs of renting ploughing services;

- The annual value of ploughing services per head of adult cattle.

On all three indicators there is a consistent progression: ploughing is most valued in Abim followed in order by Kaabong, Kotido, Moroto and, finally, Amudat District, where animal traction is not used for field cultivation.

Four additional tables examine the seasonality of ploughing in the sampled districts and the extent to which ploughing is commercialized (Tables 39–42). Eighty percent or more of all ploughing takes place in the course of four months in Abim, over about three months in Kotido and Kaabong, and in two months in Moroto. On the same pattern, ploughing services are provided on a fee-paying basis for 17% of all days of ploughing in Abim, 14% in Kaabong, 7% in Kotido and 5% in Moroto. In sum, the provision of ploughing services is more commercialized in districts where it is both more highly valued and takes place over a longer time period, but in all districts cash payments are the least common way for cultivators to obtain ploughing services.

Table 38. The value of cattle-ploughing services

District	% adults in herd	District herd: head of adult cattle	Days of ploughing per adult	Value of a day's ploughing, UGX	Annual value of ploughing services per adult, UGX	Annual value of ploughing services, district total, million UGX
Abim	53.42	32,010	6.93	19,417	134,560	4,307
Kotido	42.57	227,577	2.51	17,500	43,925	9,996
Kaabong	49.81	122,833	3.32	22,058	73,233	8,995
Moroto	46.34	240,133	1.25	14,150	17,688	4,247
Napak	46.34	255,002	1.25	14,150	17,688	4,510
Amudat	43.88	228,098	0	0	0	0
Nakapiripirit	46.41	212,314	2.11	16,736	35,313	7,497
Karamoja Sub-region total	45.53	1,317,970	1.72	17,442	30,011	39,554

Table 39. Days ploughing by cattle in Abim District sample, month and payment type

Month	Own household	For others without payment	For others with payment	Total days/ month	% of all ploughing that took place in a month
March	140	110	42	292	6.4
April	597	477	163	1,237	26.9
May	512	431	225	1,168	25.4
June	286	337	160	783	17
July	264	291	127	682	14.9
August	176	179	73	428	9.3
Total days/ payment arrangement	1,975	1,825	790	4,590	
% payment type	43	40	17		

Table 40. Days ploughing by cattle in Kotido District sample, month and payment type

Month	Own household	For others without payment	For others with payment	Total days/ month	% of all ploughing that took place in a month
March	0	0	0	0	0
April	1,272	306	80	1,658	32.72
May	1,179	297	71	1,547	30.53
June	580	289	88	957	18.89
July	343	195	65	603	11.9
August	182	91	28	301	5.94
Total days/ payment arrangement	3,556	1,178	332	5,066	
% payment type	70.19	23.25	6.55	99.99	

Table 41. Days ploughing by cattle in Kaabong District sample, month and payment type

Month	Own household	For others without payment	For others with payment	Total days/ month	% of all ploughing that took place in a month
March	84	18	6	108	1.9
April	1,206	365	208	1,779	31.29
May	1,129	373	233	1,735	30.52
June	716	292	179	1,187	20.88
July	251	151	113	515	9.06
August	163	120	77	360	6.33
Total days/ payment arrangement	3,549	1,319	816	5,684	99.98
% payment type	62.43	23.2	14.35	99.98	

Table 42. Days ploughing by cattle in Moroto District sample, month and payment type

Month	Own household	For others without payment	For others with payment	Total days/ month	% of all ploughing that took place in a month
March	0	0	0		0
April	1,101	215	59	1,375	49.07
May	922	202	59	1,183	42.22
June	138	78	22	238	8.49
July	6	0	0	6	0
August	0	0	0	0	0
Total days/ payment arrangement	2,167	495	140	2,802	
% payment type	77.34	17.67	4.50		

FINANCIAL SERVICES

Thus far, this report has discussed the physical outputs from pastoral animals—meat, milk, blood and traction power. In this section, we estimate the value of a category of outputs that are less easily observed but nonetheless important—the pastoral and agro-pastoral equivalent of the financial services industry.

LIVESTOCK AS CREDIT

The credit or financing benefits of livestock derive from the ability of livestock owners to dispose of their animals for particular purposes at a time that they choose—their ability to "cash in" on the value of their animals as needed. This flexibility gives livestock owners access to money without the need to borrow and confers an additional financial benefit beyond the sale, slaughter or transfer value of their livestock. This additional financial benefit can be estimated as the opportunity cost of rural credit—what it would otherwise cost a livestock owner to obtain funds comparable to those produced by liquidating a part of the herd (Bosman et al. 1997). Employing this method of estimation, the additional finance value of a livestock holding is equivalent to the interest that the owners would have to pay to obtain loans equal to the value of their livestock offtake.

Livestock owners in Karamoja are unable to obtain loans from formal financial institutions. Therefore, commercial lending rates in urban Uganda are not relevant to the calculation of the value of pastoral and agro-pastoral livestock as credit. Groups of women in pastoral and agro-pastoral settlements do, however, operate voluntary self-help savings and loans groups. This study could not examine in detail the operation of these associations, but we did interview group members of ten associations (nine of which were still functioning) in five districts of Karamoja. In all nine functioning associations, the interest rate on loans was 10% per month, with repayment falling due in one to two months. Fines or penalties for non-repayment were high but varied widely from association to association, implying an annual interest rate on overdue loans of between 50% to more than 200%. The punitive nature of the quoted penalties suggests that most loans are short term and repaid on time after a month or two. When asked how they avoid defaulting on loans, group members invariably mention the sale of livestock. In other words, livestock are the collateral that stands behind the operation of these self-help associations. The use of livestock as a source of credit is a practical reality for pastoralists and agro-pastoralists in Karamoja. Since most cash loans are apparently short term and promptly repaid, a realistic interest rate for valuing livestock credit is the monthly rate of 10%, not an annual interest rate that in all probability is

largely theoretical.

Calculated on this basis, the credit benefits derived from Karamoja livestock are 10% of the value of the livestock offtake in Karamoja. The value of cattle, goats and sheep offtake in Karamoja in 2018–19 was UGX 628,554 million (Table 48), and the credit benefits attributable to these animals are 62,855 million UGX ($17.5 million USD) (10% of the value of offtake in Table 43).

Table 43. Value of livestock offtake, million UGX

Livestock species	Million UGX
Cattle	521,591
Goat	55,526
Sheep	51,437
Total	628,554

ASSET-BASED SELF-INSURANCE

Part of the insurance or security value of livestock comes from the ability of owners to liquidate their own herds in an emergency. In this instance, the level of security provided to a particular individual depends on the value of that individual's assets, and livestock ownership functions as self-insurance. The value of this form of asset-based insurance 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 (Bosman et al. 1997).

While sound in theory, this method is difficult to apply for livestock owners in Karamoja who have no access to formal insurance of any kind. Herd owners mention the sale of livestock to cover medical emergencies, but with no relevant health insurance market, it is difficult to reliably impute the additional value of livestock used in this way. Elsewhere in eastern Africa, the relevant insurance premium was estimated at 0.48% in Kenya, 2.4% in Sudan and 10% in rural Ethiopia (Behnke and Nakirya 2012). In the absence of additional evidence, we will assume that insurance in rural Karamoja would cost 10% of the value of the coverage provided, as it does in Ethiopia where formal rural insurance coverage is also generally unavailable. For purposes of this analysis, it is assumed that the value of livestock as capital in herds is 75% of their sale price, to reflect the retention of young, low-value animals and the preferred sale of older, high-value animals. On this basis, livestock holdings in Karamoja have a capital value of UGX 2,165,225 million (USD 602

million) and a self-insurance value of UGX 216,523 million (USD 60 million) (Table 44).

RISK POOLING

For livestock owners, 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 stock owners in time of need. These collective insurance schemes are based on the gifting and loaning within rural communities of live animals and livestock products and services. Since transfers are in-kind—meat, milk, live animals and ploughing/transport services—contributions into these systems are roughly comparable to withdrawals from them. The value of the system from the perspective of resource givers and receivers is therefore approximately equal: recipients extract a level of support from the system that equals what donors are willing to contribute. The value of this communal system

of livestock insurance is therefore approximately equal to the level of livestock loaning and gifting within rural communities.

The approximate rate of gifting and loaning for all species of livestock was 2% in 2018–19. We assume that sheep and goats are disposed of by their new owners within a year of their transfer and that cattle remain in the recipient's herd for four years. Based on these assumptions, the total value of livestock involved in these exchanges in 2018–19 was UGX 148,067 million, which was also the approximate value of the insurance/risk pooling benefit derived from these exchanges (Table 45). Based on the proportion of ploughing that is done for others without payment (Tables 39–42), Table 46 estimates the value of shared ploughing services at UGX 9,964 million. Total risk pooling from shared ploughing combined with livestock gifting and loaning is UGX 158,031 million (USD 44 million).

Table 44. The capital value of Karamoja cattle, sheep and goats

Livestock species	2017 population	Mean producer sale price/head, UGX	Mean value/head at 75% of sale price, UGX	Capital value of stocks, million UGX
Cattle	2,894,523	804,302	603,226	1,746,052
Goats	2,691,634	97,135	72,851	196,089
Sheep	3,304,795	90,000	67,500	223,074
Total				2,165,225

Table 45. Value of livestock loaned or gifted to other pastoralists, million UGX

Livestock species	Annual gifting rate	% of herd gifted	Capital value of stock, million UGX	Value of gifted stock, million UGX
Cattle	2%	8	1,746,052	139,684
Goats	2%	2	196,089	3,922
Sheep	2%	2	223,074	4,461
Total				148,067

Table 46. The value of shared ploughing services, 2018–19, million UGX

District	Annual value of ploughing services, district total, million UGX	Percentage of all ploughing that is done for others without payment	Value in million UGX of ploughing that is done for others without payment
Abim	4,307	40	1,723
Kotido	9,996	23	2,299
Kaabong	8,995	23	2,069
Moroto	4,247	18	764
Napak	4,510	18	812
Amudat	0	0	0
Nakapiripirit	7,497	31	2,297
Karamoja Sub-region total	39,554	25	9,964

Combining credit provision, self-insurance and risk management, the total value of financial services provided by livestock in Karamoja for their owners in 2018–19 is estimated at UGX 437,409 million or USD 121.5 million (Table 47).

Table 47. Value of financial services provided by livestock in 2018–19

Type of financial service	Estimated value, million UGX
Credit provision	62,855
Self-insurance	216,523
Risk pooling	158,031
Total	437,409

SUMMARY: THE DIRECT USE VALUE OF CATTLE, GOATS AND SHEEP IN KARAMOJA

The gross monetary value of the benefits provided by Karamoja livestock to their owners in 2018–19 was UGX 1,599,069 million or USD 444 million (Table 48).

Table 48. Gross value of cattle, goat and sheep output, 2018-19

Product or service	Million UGX	Million UGX
Cattle offtake	521,591	
Goat offtake	55,526	
Sheep offtake	51,437	
Camel offtake	No estimate	
Donkey offtake	No estimate	
Subtotal animal offtake		**628,554**
Cattle dairy	428,733	
Goat dairy	11,234	
Sheep dairy	6,624	
Camel dairy	No estimate	
Subtotal dairy		**446,591**
Cattle blood	43,191	
Goat blood	1,926	
Sheep blood	1,844	
Subtotal blood		**46,961**
Ploughing	39,554	
Donkey transport and haulage	No estimate	
Subtotal animal power	39,554	
Livestock-based credit	62,855	
Self-insurance	216,523	
Risk pooling	158,031	
Subtotal financial services		**437,409**
TOTAL DIRECT USE VALUE		**1,599,069**

REFERENCES CITED

Barbier, E. 1993. Sustainable use of wetlands valuing tropical wetland benefits: Economic methodologies and applications. *The Geographical Journal* 159:22–32.

Behnke, R., and M. Nakirya. 2012. The contribution of livestock to the Ugandan economy. IGAD Livestock Policy Initiative working paper no. 02-12.

Bosman, H. G., H. A. J. Moll, and H. M. J. Odo. 1997. Measuring and interpreting the benefits of goat keeping in tropical farm systems. *Agricultural Systems* 53:349–372.

Cullis, A. 2018. Agricultural development in Karamoja, Uganda: Recent trends in livestock and crop systems, and resilience impacts. Karamoja Resilience Support Unit. USAID/Uganda, UK aid and Irish Aid, Kampala.

Hesse, C., and J. MacGregor. 2006. Pastoralism: Drylands' invisible asset? IIED drylands issue paper no. 142. International Institute for Environment and Development (IIED), London.

Schloeder, C. A. 2018. Karamoja livestock development master plan – current livestock demographics and 10-year population predictions for the Karamoja Region, Uganda. Unpublished report, sourced from Mercy Corps, Kampala.

UBOS 2011. Statistical abstract. UBOS, Kampala.

ANNEX: THE QUESTIONNAIRES

ANNEX
THE PRODUCTIVITY AND ECONOMIC VALUE OF LIVESTOCK IN KARAMOJA

QUESTIONNAIRE FOR MODULE 1: HERD STRUCTURE, MORTALITY, LIVE ANIMAL AND MEAT OFFTAKE, ANIMAL POWER

Interview number   Offtake_____
Name of enumerator   _____
Date of interview   _____
Sub-county and District   _____
Number of respondents   _____
Gender of respondents   _____

1.   What livestock species do you keep in your herd, including the animals of cowife/s? Tick YES or NO.

Cattle   YES _____   NO_____
If YES, ask questions in **section 1** on cattle.
If NO skip this section.

Goats   YES____   NO _____
If YES ask questions in **section 2** on goats.
If NO skip this section.

Sheep   YES _____   NO_____
If YES ask questions in **section 3** on sheep.
If NO skip this section.

Camels   YES _____   NO_____
If YES ask questions in **section 4** on goats.
If NO skip this section.

Donkeys   YES _____   NO_____
If YES ask questions in **section 5** on donkeys.
If NO skip this section.

2.   Do you use cattle or donkeys for ploughing?   YES _____   NO_____
If YES es ask questions in **section 6.**
If NO skip this section.

3.   Do you use donkeys for transport?   YES _____   NO_____
If YES ask questions in **section 7**.
If NO skip this section.

SECTION 1 CATTLE

To respondent: *Choose a cattle herd that you know well. This is probably your own herd or that of cowives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual cattle.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season to the end of February 2019. We would like you to tell us about the combined camp and village herd, that is men's cattle, women's cattle and the cattle for the herd boys altogether. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

1. Are you telling me about a combined village and camp herd or only the village herd?
Tick correct answer:
Combined camp and village _____   OR   village herd only   _____

2. Use stones to show how many cattle were in this herd at the beginning of the last wet season in March 2018. **Make it clear to respondents that this pile of stones represents all cattle in the herd at the beginning of the wet season last year, March 2018.**

3. Divide the first pile of stones to show how many of the cattle in this herd were male and how many were female at the beginning of the last wet season in March 2018. These stones should refer to all cattle present at the beginning of last wet season, including those that have left the herd over the last year.

4. Now divide the pile of stones that represent male cattle into immature and adult male cattle. These stones should refer to all males present at the beginning of last wet season, including those that have left the herd over the last year.

5. Also divide the pile of stones that represent female cattle into immature and adult female cattle. These stones should refer to all females present at the beginning of last wet season, including those that have left the herd over the last year.

Enumerators: *You will now have four piles of stones representing male and female, immature and mature cattle in March 2018. Count these piles and enter the numbers in the first two columns of the following table.*

Then, for each of the four piles of stones – immature males, adult males, immature females, adult females – ask the respondent to divide each pile into those cattle that were in the herd in March 2018 and are still in the herd versus those that left the herd in the previous twelve months, from March 2018 to the end of February 2019.

Enter the numbers of cattle that exited the herd in the last two columns of the following table.

	TOTAL in herd at the beginning of March 2018			**EXITS** from the herd last year from March 2018 to Feb. 2019	
	Males	*Females*		*Males*	*Females*
Immatures			*Immatures*		

Adults			_Adults_		

Double check the totals in the table. Do the numbers of the different kinds of cattle that left the herd look reasonable compared to the number and kinds of cattle that were in the herd at the beginning of the year? If not, double check your numbers.

Did the respondent fully understand your questions, and did you correctly interpret their answers? Ask for clarification if you need to, and if the respondent changes the numbers of stones in the piles, cross out the old figure and put the new numbers into the table.

Enumerators: _The next four questions ask in more detail about the cattle that left the herd last year, from the beginning of the wet season in March 2018 to the end of the dry season in February 2019. Listen to the reasons that respondents give for why cattle left the herd and record the number of cattle that left in terms of the five categories given below. Do not ask about exits category by category._

6.   Of all the **immature male cattle** that left the herd last year, how many were:

A. slaughtered by the herd managers/owners, for home use,
     in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

7.   Of all the **adult male cattle** that left the herd last year, how many were:

A. slaughtered by the herd managers/owners, for home use,
     in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

8.   Of all the **immature female cattle** that left the herd last year, how many were

A. slaughtered by the herd managers/owners, for home use,
     in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

9.   Of all the **adult female cattle** that left the herd last year, how many were:

A. slaughtered by the herd managers/owners, for home use,
     in rituals and ceremonies, or other uses by the owner: _____

B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

SECTION 2 GOATS
To respondent: *Choose a goat herd that you know well. This is probably your own herd or that of cowives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual goats.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

1.   Are you telling me about a combined village and camp herd or only the village herd?
Tick correct answer:
Combined camp and village _____   OR   village herd only   _____

2.   Use stones to show how many goats were in this herd at the beginning of the last wet season in March 2018. **Make it clear to respondents that this pile of stones represents all goats in the herd at the beginning of the wet season last year, March 2018.**

3.   Divide the first pile of stones to show how many of the goats in this herd were male and how many were female at the beginning of the last wet season in March 2018. These stones should refer to all goats present at the beginning of last wet season, including those that have left the herd over the last year.

4.   Now divide the pile of stones that represent male goats into immature and adult male goats. These stones should refer to all males present at the beginning of last wet season, including those that have left the herd over the last year.

5.   Also divide the pile of stones that represent female goats into immature and adult female goats. These stones should refer to all females present at the beginning of last wet season, including those that have left the herd over the last year.

Enumerators: *You will now have four piles of stones representing male and female, immature and mature goats in March 2018. Count these piles and enter the numbers in the first two columns of the following table.*

> *Then, for each of the four piles of stones – immature males, adult males, immature females, adult females – ask the respondent to divide each pile into those goats that were in the herd in March 2018 and are still in the herd versus those that left the herd in the previous twelve months, from March 2018 to the end of February 2019.*
>
> *Enter the numbers of goats that exited the herd in the last two columns of the following table.*

TOTAL in herd at the beginning of March 2018			**EXITS** from the herd last year from March 2018 to Feb. 2019	
Males	*Females*		*Males*	*Females*
Immatures		*Immatures*		
Adults		*Adults*		

Double check the totals in the table. Do the numbers of the different kinds of goats that left the herd look reasonable compared to the number and kinds of goats that were in the herd at the beginning of the year? If not, double check your numbers.

Did the respondent fully understand your questions, and did you correctly interpret their answers? Ask for clarification if you need to, and if the respondent changes the numbers of stones in the piles, cross out the old figure and put the new numbers into the table.

Enumerators: *The next four questions ask in more detail about the goats that left the herd last year, from the beginning of the wet season in March 2018 to the end of the dry season in February 2019. Listen to the reasons that respondents give for why goats left the herd and record the number of goats that left in terms of the five categories given below. Do not ask about exits category by category.*

6. Of all the **immature male goats** that left the herd last year, how many were:

A. slaughtered by the herd managers/owners, for home use,
   in rituals and ceremonies, or other uses by the owner: _____

B. sold: _____

C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____

D. died of disease/accident: _____

E. lost or stolen: _____

F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

7. Of all the **adult male goats** that left the herd last year, how many were:

A. slaughtered by the herd managers/owners, for home use,
   in rituals and ceremonies, or other uses by the owner: _____

B. sold: _____

C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____

D. died of disease/accident: _____

E. lost or stolen: _____

F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

8. Of all the **immature female goats** that left the herd last year, how many were

A. slaughtered by the herd managers/owners, for home use,

in rituals and ceremonies, or other uses by the owner: _____

B. sold: _____

C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____

D. died of disease/accident: _____

E. lost or stolen: _____

F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

9. Of all the **adult female goats** that left the herd last year, how many were:

A. slaughtered by the herd managers/owners, for home use,

in rituals and ceremonies, or other uses by the owner: _____

B. sold: _____

C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____

D. died of disease/accident: _____

E. lost or stolen: _____

F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

SECTION 3 SHEEP

To respondent: *Choose a sheep herd that you know well. This is probably your own herd or that of cowives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual sheep.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

1. Are you telling me about a combined village and camp herd or only the village herd?
Tick correct answer:
Combined camp and village _____ OR village herd only _____

2. Use stones to show how many sheep were in this herd at the beginning of the last wet season in March 2018. **Make it clear to respondents that this pile of stones represents all sheep in the herd at the beginning of the wet season last year, March 2018.**

3. Divide the first pile of stones to show how many of the sheep in this herd were male and how many were female at the beginning of the last wet season in March 2018. These stones should refer to all sheep present at the beginning of last wet season, including those that have left the herd over the last year.

4. Now divide the pile of stones that represent male sheep into immature and adult male sheep. These stones should refer to all males present at the beginning of last wet season, including those that have left the herd over the last year.

5. Also divide the pile of stones that represent female sheep into immature and adult female sheep. These stones should refer to all females present at the beginning of last wet season, including those that have left the herd over the last year.

Enumerators: *You will now have four piles of stones representing male and female, immature and mature sheep in March 2018. Count these piles and enter the numbers in the first two columns of the following table.*

> *Then, for each of the four piles of stones – immature males, adult males, immature females, adult females – ask the respondent to divide each pile into those sheep that were in the herd in March 2018 and are still in the herd versus those that left the herd in the previous twelve months, from March 2018 to the end of February 2019.*
> > *Enter the numbers of sheep that exited the herd in the last two columns of the following table.*

	TOTAL in herd at the beginning of March 2018			**EXITS** from the herd last year from March 2018 to Feb. 2019	
	Males	*Females*		*Males*	*Females*
Immatures			*Immatures*		
Adults			*Adults*		

Double check the totals in the table. Do the numbers of the different kinds of sheep that left the herd look reasonable compared to the number and kinds of sheep that were in the herd at the beginning of the year? If not, double check your numbers.

Did the respondent fully understand your questions, and did you correctly interpret their answers? Ask for clarification if you need to, and if the respondent changes the numbers of stones in the piles, cross out the old figure and put the new numbers into the table.

Enumerators: *The next four questions ask in more detail about the sheep that left the herd last year, from the beginning of the wet season in March 2018 to the end of the dry season in February 2019. Listen to the reasons that respondents give for why sheep left the herd and record the number of sheep that left in terms of the five categories given below. Do not ask about exits category by category.*

6. Of all the **immature male sheep** that left the herd last year, how many were:
A. slaughtered by the herd managers/owners, for home use,
in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

7. Of all the **adult male sheep** that left the herd last year, how many were:
A. slaughtered by the herd managers/owners, for home use,
in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____

C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

8. Of all the **immature female sheep** that left the herd last year, how many were

 A. slaughtered by the herd managers/owners, for home use,
    in rituals and ceremonies, or other uses by the owner: _____
 B. sold: _____
 C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
 D. died of disease/accident: _____
 E. lost or stolen: _____
 F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

9. Of all the **adult female sheep** that left the herd last year, how many were:

 A. slaughtered by the herd managers/owners, for home use,
    in rituals and ceremonies, or other uses by the owner: _____
 B. sold: _____
 C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
 D. died of disease/accident: _____
 E. lost or stolen: _____
 F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

SECTION 4 CAMELS
To respondent: *Choose a camel herd that you know well. This is probably your own herd or that of cowives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual camels.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

1. Are you telling me about a combined village and camp herd or only the village herd?
    Tick correct answer:
    Combined camp and village _____   OR   village herd only   _____

2. Use stones to show how many camels were in this herd at the beginning of the last wet season in March 2018. **Make it clear to respondents that this pile of stones represents all camels in the herd at the beginning of the wet season last year, March 2018.**

3. Divide the first pile of stones to show how many of the camels in this herd were male and how many were female at the beginning of the last wet season in March 2018. These stones should refer to all camels present at the beginning of last wet season, including those that have left the herd over the last year.

4. Now divide the pile of stones that represent male camels into immature and adult male camels. These stones should refer to all males present at the beginning of last wet season, including those that have left the herd over the last year.

5. Also divide the pile of stones that represent female camels into immature and adult female camels. These stones should refer to all females present at the beginning of last wet season, including those that have left the herd over the last year.

**Enumerators:** *You will now have four piles of stones representing male and female, immature and mature sheep in March 2018. Count these piles and enter the numbers in the first two columns of the following table.*
> *Then, for each of the four piles of stones – immature males, adult males, immature females, adult females – ask the respondent to divide each pile into those sheep that were in the herd in March 2018 and are still in the herd versus those that left the herd in the previous twelve months, from March 2018 to the end of February 2019.*
>> *Enter the numbers of sheep that exited the herd in the last two columns of the following table.*

	TOTAL in herd at the beginning of March 2018			**EXITS** from the herd last year from March 2018 to Feb. 2019	
	Males	*Females*		*Males*	*Females*
Immatures			*Immatures*		
Adults			*Adults*		

Double check the totals in the table. Do the numbers of the different kinds of sheep that left the herd look reasonable compared to the number and kinds of sheep that were in the herd at the beginning of the year? If not, double check your numbers.

Did the respondent fully understand your questions, and did you correctly interpret their answers? Ask for clarification if you need to, and if the respondent changes the numbers of stones in the piles, cross out the old figure and put the new numbers into the table.

Enumerators: *The next four questions ask in more detail about the camels that left the herd last year, from the beginning of the wet season in March 2018 to the end of the dry season in February 2019. Listen to the reasons that respondents give for why camels left the herd and record the number of camels that left in terms of the five categories given below. Do not ask about exits category by category.*

6. Of all the **immature male camels** that left the herd last year, how many were:
> **A.** slaughtered by the herd managers/owners, for home use,
>> in rituals and ceremonies, or other uses by the owner: _____
>
> **B.** sold: _____
> **C.** given to other pastoralists as loans, gifts, dowry or for other reasons: _____
> **D.** died of disease/accident: _____
> **E.** lost or stolen: _____
> **F.** total exits of immature males - add all reasons for leaving **A** to **E**: _____

7. Of all the **adult male camels** that left the herd last year, how many were:
   A. slaughtered by the herd managers/owners, for home use,
   in rituals and ceremonies, or other uses by the owner: _____
   B. sold: _____
   C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
   D. died of disease/accident: _____
   E. lost or stolen: _____
   F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

8. Of all the **immature female camels** that left the herd last year, how many were
   A. slaughtered by the herd managers/owners, for home use,
   in rituals and ceremonies, or other uses by the owner: _____
   B. sold: _____
   C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
   D. died of disease/accident: _____
   E. lost or stolen: _____
   F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

9. Of all the **adult female camels** that left the herd last year, how many were:
   A. slaughtered by the herd managers/owners, for home use,
   in rituals and ceremonies, or other uses by the owner: _____
   B. sold: _____
   C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
   D. died of disease/accident: _____
   E. lost or stolen: _____
   F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

SECTION 5 DONKEYS

To respondent: *Choose a donkey herd that you know well. This is probably your own herd or that of cowives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual donkeys.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

1. Are you telling me about a combined village and camp herd or only the village herd?
   Tick correct answer:
   Combined camp and village _____ OR village herd only _____

2. Use stones to show how many donkeys were in this herd at the beginning of the last wet season in March 2018. **Make it clear to respondents that this pile of stones represents all donkeys in the herd at the beginning of the wet season last year, March 2018.**

3. Divide the first pile of stones to show how many of the donkeys in this herd were male and how many were female at the beginning of the last wet season in March 2018. These stones should refer to all donkeys present at the beginning of last wet season, including those that have left the herd over the last year.

4. Now divide the pile of stones that represent male donkeys into immature and adult male donkeys. These stones should refer to all males present at the beginning of last wet season, including those that have left the herd over the last year.

5. Also divide the pile of stones that represent female donkeys into immature and adult female donkeys. These stones should refer to all females present at the beginning of last wet season, including those that have left the herd over the last year.

Enumerators: *You will now have four piles of stones representing male and female, immature and mature sheep in March 2018. Count these piles and enter the numbers in the first two columns of the following table.*
Then, for each of the four piles of stones – immature males, adult males, immature females, adult females – ask the respondent to divide each pile into those sheep that were in the herd in March 2018 and are still in the herd versus those that left the herd in the previous twelve months, from March 2018 to the end of February 2019.
Enter the numbers of sheep that exited the herd in the last two columns of the following table.

	TOTAL in herd at the beginning of March 2018		EXITS from the herd last year from March 2018 to Feb. 2019	
	Males	*Females*	*Males*	*Females*
Immatures				
Adults				

Double check the totals in the table. Do the numbers of the different kinds of sheep that left the herd look reasonable compared to the number and kinds of sheep that were in the herd at the beginning of the year? If not, double check your numbers.

Did the respondent fully understand your questions, and did you correctly interpret their answers? Ask for clarification if you need to, and if the respondent changes the numbers of stones in the piles, cross out the old figure and put the new numbers into the table.

Enumerators: *The next four questions ask in more detail about the donkeys that left the herd last year, from the beginning of the wet season in March 2018 to the end of the dry season in February 2019. Listen to the reasons that respondents give for why donkeys left the herd and record the number of donkeys that left in terms of the five categories given below. Do not ask about exits category by category.*

6. Of all the **immature male donkeys** that left the herd last year, how many were:
A. slaughtered by the herd managers/owners, for home use, in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____

C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

7. Of all the **adult male donkeys** that left the herd last year, how many were:
A. slaughtered by the herd managers/owners, for home use,
    in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

8. Of all the **immature female donkeys** that left the herd last year, how many were
A. slaughtered by the herd managers/owners, for home use,
    in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

9. Of all the **adult female donkeys** that left the herd last year, how many were:
A. slaughtered by the herd managers/owners, for home use,
    in rituals and ceremonies, or other uses by the owner: _____
B. sold: _____
C. given to other pastoralists as loans, gifts, dowry or for other reasons: _____
D. died of disease/accident: _____
E. lost or stolen: _____
F. total exits of immature males - add all reasons for leaving **A** to **E**: _____

SECTION 6 PLOUGHING
1. In the wet season last year, how many days did the cattle in this herd plough ?
For this household, including cowives days ploughing _____
For other people without payment days ploughing _____
For other people paying in cash, beer
or another way days ploughing _____
In total days ploughing _____

Enumerators: In Abim District or other farming districts where cattle are used heavily for ploughing, ask question 1 by the month, and use the following table to record responses.

Alternate question one:

1. In the wet season last year, for each month from April to August, how many days did the cattle in this herd plough:

For this household, including cowives
For other people without payment
For other people paying in cash, beer or some other way

Months	Days of ploughing by cattle		
	For own household	For others, no payment	For others, with payment
April			
May			
June			
July			
August			
TOTALS			

2. In this area, how much does it cost to rent a team of cattle to plough for one day?

Uganda shillings per day _____

3. In the wet season last year, how many days did the donkeys in this herd plough

For this household, including cowives days ploughing _____
For other people without payment days ploughing _____
For other people paying in cash, beer
or some other way days ploughing _____
In total days ploughing _____

4. In this area, how much does it cost to rent a team of donkeys to plough for one day?

Uganda shillings per day _____

SECTION 7 DONKEY WORK
1. What kinds of jobs other than ploughing do your donkeys do? Tick YES or NO.

Transport of people   YES   _____   NO   _____

Transport to the home of harvested crops   YES   _____   NO   _____

Transport of water   YES   _____   NO   _____

Transport of building materials. YES _____ NO   _____

Transport of goods to and from market   YES   _____   NO   _____

Other work (specify) _____

THE PRODUCTIVITY AND ECONOMIC VALUE OF LIVESTOCK IN KARAMOJA:

PATCH FOR MODULE 1

Interview number   Offtake_____
Name of enumerator   _____
Date of interview   _____
Sub-county and District   _____
Number of respondents   _____
Gender of respondents   _____

1. Last year (from the beginning of the wet season in March 2018 to the end of the dry season in February 2019) what livestock species did you keep in your herd?
Tick yes or no.

Cattle   yes _____   no _____

Goats   yes _____   no _____

Sheep   yes _____   no _____

Camels   yes _____   no _____

Donkeys   yes _____   no _____

CATTLE

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many cattle did you sell?

Number of cattle sold: _____

2. How many of the cattle that you sold were:

	Number	Price UGS
Immature male cattle:	_____	_____
Adult male cattle:	_____	_____
Immature female cattle:	_____	_____
Adult female cattle:	_____	_____

3. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many cattle did you buy? Tell us about all the cattle you bought with money from any source, including money that you received from selling other animals.

Number of cattle bought: _____

4. How many of the cattle that you bought were:

	Number	Price UGS

Immature male cattle:	_____	_____
Adult male cattle:	_____	_____
Immature female cattle:	_____	_____
Adult female cattle:	_____	_____

GOATS

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many goats did you sell?

Number of goats sold: _____

2. How many of the goats that you sold were:

	Number	Price UGS
Immature male goats:	_____	_____
Adult male goats:	_____	_____
Immature female goats:	_____	_____
Adult female goats:	_____	_____

3. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many goats did you buy? Tell us about all the goats you bought with money from any source, including money that you received from selling other animals.

Number of goats bought: _____

4. How many of the goats that you bought were:

	Number	Price UGS
Immature male goats:	_____	_____
Adult male goats:	_____	_____
Immature female goats:	_____	_____
Adult female goats:	_____	_____

SHEEP

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many sheep did you sell?

Number of sheep sold: _____

2. How many of the sheep that you sold were:

Number	Price UGS

Immature male sheep: _____   _____
Adult male sheep: _____   _____
Immature female sheep: _____   _____
Adult female sheep: _____   _____

3. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many sheep did you buy? Tell us about all the sheep you bought with money from any source, including money that you received from selling other animals.

                              Number of sheep bought: _____

4. How many of the sheep that you bought were:

	Number	Price UGS
Immature male sheep:	_____	_____
Adult male sheep:	_____	_____
Immature female sheep:	_____	_____
Adult female sheep:	_____	_____

CAMELS

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many camels did you sell?

                              Number of camels sold: _____

2. How many of the camels that you sold were:

	Number	Price UGS
Immature male camels:	_____	_____
Adult male camels:	_____	_____
Immature female camels:	_____	_____
Adult female camels:	_____	_____

3. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many camels did you buy? Tell us about all the camels you bought with money from any source, including money that you received from selling other animals.

                              Number of camels bought: _____

4. How many of the camels that you bought were:

	Number	Price UGS
Immature male camels:	_____	_____

Adult male camels: _____ _____
Immature female camels: _____ _____
Adult female camels: _____ _____

DONKEYS

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many donkeys did you sell?

Number of donkeys sold: _____

2. How many of the donkeys that you sold were:

	Number	Price UGS
Immature male donkeys:	_____	_____
Adult male donkeys:	_____	_____
Immature female donkeys:	_____	_____
Adult female donkeys:	_____	_____

3. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many donkeys did you buy? Tell us about all the donkeys you bought with money from any source, including money that you received from selling other animals.

Number of donkeys bought: _____

4. How many of the donkeys that you bought were:

	Number	Price UGS
Immature male donkeys:	_____	_____
Adult male donkeys:	_____	_____
Immature female donkeys:	_____	_____
Adult female donkeys:	_____	_____

THE PRODUCTIVITY AND ECONOMIC VALUE OF LIVESTOCK IN KARAMOJA

QUESTIONNAIRE FOR MODULE 2: REPRODUCTION, DAIRY AND BLOOD PRODUCTION

Interview number   Milk-_____
Name of enumerator   _____
Date of interview   _____
Sub-county and District   _____
Number of respondents _____
Gender of respondents   _____

1. What livestock species do you milk in your herd, including the animals of cowife/s?
Enumerators: *Tick correct option.*

Cattle   YES _____   NO _____   DO NOT KEEP _____
If 'YES', ask questions in **section 1** on cattle.
If 'NO' or 'DO NOT KEEP', skip this section.

Goats   YES _____   NO _____   DO NOT KEEP _____
If 'YES', ask questions in **section 2** on goats
If 'NO' or 'DO NOT KEEP', skip this section.

Sheep   YES _____   NO _____   DO NOT KEEP _____
If 'YES', ask questions in **section 3** on sheep.
If 'NO' or 'DO NOT KEEP', skip this section.

Camels   YES _____   NO _____   DO NOT KEEP _____
If 'YES', ask questions in **section 4** on goats.
If 'NO' or 'DO NOT KEEP', skip this section.

Donkeys   YES _____   NO _____   DO NOT KEEP _____
If 'YES' ask questions in **section 5** on donkeys.
If 'NO' or 'DO NOT KEEP', skip this section.

2. What livestock species do you bleed in your herd, including the animals of cowife/s?
Enumerators: *Tick YES or NO. If YES to any question, go to **section 6** on blood production.*

Cattle   YES _____   NO _____
Goats   YES _____   NO _____
Sheep   YES _____   NO _____
Camels   YES _____   NO _____
Donkeys YES _____   NO _____

SECTION 1 CATTLE
To respondent: *Choose a cattle herd that you know well. This is probably your own herd or that of your co-wives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual cattle.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd, that is men's cattle, women's cattle and the cattle for the herd boys altogether. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

Enumerators: *In all blanks, enter yes/no, a zero, a number, or a dash for no data.*

1. Are you telling me about a combined village and camp herd or only the village herd?
   Tick correct answer:
   Combined camp and village _____   OR   village herd only   _____

Enumerators: *If respondents feel comfortable beginning with stones for the entire herd, let them do so and then discard the stones representing male cattle, and work only with the pile of stones standing for adult females.* **Make it clear to respondents that the pile of stones representing adult females refers to adult females in the herd at the beginning of the wet season last year, March 2018.**

2. At the beginning of the wet season last year (March 2018), how many adult female cattle were in this herd?   Number of adult females   _____

Enumerators: *The next three questions will ask the respondent to divide the pile of stones that represent all adult females into three separate piles.*

3. Last year, how many adult female cattle gave birth in the wet season (from March to October 2018)?   Number giving birth   _____

4. Last year, how many adult female cattle gave birth in the dry season (from November 2018 to February 2019)?   Number giving birth   _____

5. Last year (March 2018 to February 2019), how many adult females (including those old enough to give birth for the first time) did not give birth to a calf?
                                    Number of adult females not giving birth   _____

Enumerators: *After receiving an answer to questions 3-5, discard the stones for the adult females that did not give birth last year, and collect into one pile all the stones for cows giving birth last year. Then use these stones to ask the next question.*

6. Last year, how many of the adult female cattle giving birth were men's cows, cows for herd-boys, or women's cows?

Enumerators: *If the cows were not divided this way tick the last option – cows not divided*.

                                    Number of men's cows   _____
                                    Number of herd-boy's cows   _____
                                    Number of women's cows   _____

Milking cows not divided   _____

7.   How much milk did one good milking cow usually give for human use if she gave birth in the wet season in **April/May of last year**? If she has not yet stopped giving milk, tell us how much you think she will continue to give and for how long.

Enumerators: The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2020) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec.

Beginning of white milk production (after colostrum)
Millilitres white milk per milking   morning   _____
                                                  evening   _____
For how many months or days did good cows giving birth April/May produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?   Days   _____
                                                  OR months _____

Peak (or increased) milk production
Millilitres per milking   morning   _____
                                                  evening   _____
For how many months or days did good cows giving birth April/May produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?   Days   _____
                                                  OR months _____

Declining milk production
(from the time milk yields start to fall until milking stops)
Millilitres per milking at the start of the decline   morning   _____
                                                  evening   _____
After they started to decline, for how many days or months did milk yields fall until milking stopped, and all milk was left for the calf?
                                                  Days   _____
                                                  OR months _____

8.   Last year, how much milk did one good milking cow usually give for human use if she gave birth in the dry season in **January/February**? If she has not yet stopped giving milk, tell us how much you think she will continue to give and for how long.

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation*.

(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2020) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec.

Beginning of white milk production (after colostrum)
Millilitres white milk per milking   morning   _____
                                         evening   _____

For how many months or days did good cows giving birth January/February produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?   Days   _____
                                         OR months   _____

Peak (or increased) milk production
Millilitres per milking   morning   _____
                                         evening   _____

For how many months or days did cows giving birth January/February produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?   Days   _____
                                         OR months   _____

Declining milk production
(from the time milk yields start to fall until milking stops)
Millilitres per milking at the start of the decline   morning   _____
                                         evening   _____

After they started to decline, for how many days or months did milk yields fall until milking stopped, and all milk was left for the calf?   Days   _____
                                         OR months   _____

9. Last year from the beginning of the wet season in March 2018 until the end of the dry season in February 2019, how many calves died before their mother stopped milking?   Number of calves that died   _____

SECTION 2 GOATS
To respondent: *Choose a goat herd that you know well. This is probably your own herd or that of your co-wives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual goats.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

Enumerators: *In all blanks, enter yes/no, a zero, a number, or a dash for no data.*

1. Are you telling me about a combined village and camp herd or only the village herd?
Tick correct answer:
Combined camp and village _____   OR   village herd only   _____

Enumerators: *If respondents feel comfortable beginning with stones for the entire herd, let them do so and then discard the stones representing male goats, and work only with the pile of stones standing for adult females. **Make it clear to respondents that the pile of stones***

representing adult females refers to all adult females in the herd at the beginning of the wet season last year, March 2018.

2.   At the beginning of the wet season last year (March 2018), how many adult female goats were in this herd?   Number of adult females   _____

Enumerators: *The next four questions will ask the respondent to divide the pile of stones that represent all adult females into four separate piles.*

3.   Last year (March 2018 to February 2019), how many female goats gave birth twice?
                              Number of goats giving birth two times   _____

4.   Last year, how many female goats had a kid only in the wet season (March to October 2018)?   Number of goats giving birth   _____

5.   Last year, how many female goats had a kid only in the dry season (November 2018 to February 2019)?   Number of goats giving birth   _____

6.   Last year (March 2018 to February 2019), how many female goats (including those old enough to give birth for the first time) did not give birth to a kid?
                              Number of adult females not giving birth   _____

7.   Last year, how much milk did one good milking goat usually give for human use if she gave birth in the last wet season in **April/May**?

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec

Beginning of white milk production, after colostrum is finished but before the kid is grazing
Millilitres white milk per milking   morning   _____
                                                              evening   _____
For how many months or days did good goats giving birth April/May produce this level of milk for human use?   Days   _____
                                                              OR months   _____

Milk production after the kid begins to graze until milking stops because all milk is left to the kid:
Millilitres per milking   morning   _____
                                                              evening   _____
For how many months or days did good goats giving birth April/May produce this level of milk for human use?   Days   _____
                                                              OR months   _____

8. Last year, how much milk did one good milking goat usually give for human use if she gave birth in the dry season in **January or February**?

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec

Beginning of white milk production, after colostrum is finished but before the kid is grazing
Millilitres white milk per milking   morning   _____
       evening   _____
For how many months or days did good goats giving birth January/February produce this level of milk for human use?   Days   _____
       OR months   _____

Milk production after the kid begins to graze until milking stops because all milk is left to the kid:
Millilitres per milking   morning   _____
       evening   _____
For how many months or days did good goats giving birth January/February produce this level of milk for human use?   Days   _____
       OR months   _____

9. Last year from the beginning of the wet season in March 2018 until the end of the dry season in February 2019, how many kids died before their mother stopped milking?
       Number of kids that died   _____

10. Last year from the beginning of the wet season in March 2018 until the end of the dry season in February 2019, how many goats had twins?
       Number of twin births   _____

SECTION 3 SHEEP
To respondent: *Choose a sheep herd that you know well. This is probably your own herd or that of your co-wives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual sheep.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

Enumerators: *In all blanks, enter yes/no, a zero, a number, or a dash for no data.*

1. Are you telling me about a combined village and camp herd or only the village herd?
Tick correct answer:
Combined camp and village _____   OR   village herd only   _____

Enumerators: *If respondents feel comfortable beginning with stones for the entire herd, let them do so and then discard the stones representing male sheep, and work only with the pile of stones standing for adult females.* **Make it clear to respondents that the pile of stones representing adult females refers to all adult females in the herd at the beginning of the wet season last year, March 2018.**

2. At the beginning of the wet season last year (March 2018), how many adult female sheep were in this herd?   Number of adult females   _____

Enumerators: *The next four questions will ask the respondent to divide the pile of stones that represent all adult females into four separate piles.*

3. Last year (March 2018 to February 2019), how many female sheep gave birth twice?
Number of sheep giving birth two times   _____

4. Last year, how many female sheep had a kid only in the wet season (March to October 2018)?   Number of sheep giving birth   _____

5. Last year, how many female sheep had a kid only in the dry season (November 2018 to February 2019)?   Number of sheep giving birth   _____

6. Last year (March 2018 to February 2019), how many adult females (including those old enough to give birth for the first time) did not give birth to a lamb?
Number of adult females not giving birth   _____

7. Last year, how much milk did one good milking sheep usually give for human use if she gave birth in the last wet season in **April/May**?

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec

Beginning of white milk production, after colostrum is finished but before the lamb is grazing
Millilitres white milk per milking   morning   _____
                                                       evening   _____
For how many months or days did good sheep giving birth April/May produce this
level of milk for human use?   Days   _____
                                                OR months   _____

Milk production after the lamb begins to graze until milking stops because all milk is left to the lamb:

Millilitres per milking   morning   _____
                                                          evening   _____

For how many months or days did good sheep giving birth April/May produce this level of milk for human use?   Days   _____
                                                          OR months   _____

8.   Last year, how much milk did one good milking sheep usually give for human use if she gave birth in the dry season in **January or February**?

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec

Beginning of white milk production, after colostrum is finished but before the lamb is grazing

Millilitres white milk per milking   morning   _____
                                                          evening   _____

For how many months or days did good sheep giving birth January/February produce this level of milk for human use?   Days   _____
                                                          OR months   _____

Milk production after the lamb begins to graze until milking stops because all milk is left to the lamb:

Millilitres per milking   morning   _____
                                                          evening   _____

For how many months or days did good goats giving birth January/February produce this level of milk for human use?   Days   _____
                                                          OR months   _____

9.   Last year from the beginning of the wet season in March 2018 until the end of the dry season in February 2019, how many lambs died before their mother stopped milking?
                                    Number of lambs that died   _____

10.   Last year from the beginning of the wet season in March 2018 until the end of the dry season in February 2019, how many sheep had twins?
                                    Number of twin births   _____

SECTION 4 CAMELS
To respondent: *Choose a camel herd that you know well. This is probably your own herd or that of your co-wives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual camels. We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village*

herd. If you do not know about the camp herd, tell us and we will talk only about the animals in the settlement.

Enumerators: *In all blanks, enter yes/no, a zero, a number, or a dash for no data.*

1.   Are you telling me about a combined village and camp herd or only the village herd?
Tick correct answer:
Combined camp and village _____   OR   village herd only   _____

Enumerators: *If respondents feel comfortable beginning with stones for the entire herd, let them do so and then discard the stones representing male camels, and work only with the pile of stones standing for adult females.* ***Make it clear to respondents that the pile of stones representing adult females refers to adult females in the herd at the beginning of the wet season last year, March 2018.***

2.   At the beginning of the wet season last year (March 2018), how many adult female camels were in this herd?   Number of adult females   _____

Enumerators: *The next three questions will ask the respondent to divide the pile of stones that represent all adult females into three separate piles.*

3.   Last year, how many adult female camels gave birth in the wet season (from March to October 2018)?   Number giving birth   _____

4.   Last year, how many adult female camels gave birth in the dry season (from November 2018 to February 2019)?   Number giving birth   _____

5.   Last year (March 2018 to February 2019), how many adult females (including those old enough to give birth for the first time) did not give birth?
                          Number of adult females not giving birth   _____

6.   Last year, how much milk did one good milking camel usually give for human use if she gave birth in the wet season in **April/May**? If she has not yet stopped giving milk, tell us how much you think she will continue to give and for how long.

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec.

Enumerators: *Camels that give birth in the wet season may continue to give a wet season milk yield for some months in the following dry season. Also, camels that give birth in the dry season can continue to give a dry season milk yield for some months in the following*

wet season. In the next questions you should ask about these extended periods when milk yields remain constant even if there is a change in the season.

Wet season milking after giving birth

Number of daytime milkings	_____
Number of night-time milkings	_____
Total litres of milk from daytime milkings	_____
Total litres of milk from night-time milkings	_____

For how many months or days did these camels produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?

Days	_____
OR months	_____

Dry season milking

Number of daytime milkings	_____
Number of night-time milkings	_____
Total litres of milk from daytime milkings	_____
Total litres of milk from night-time milkings	_____

For how many months or days did these camels produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?

Days	_____
OR months	_____

7. Last year, how much milk did one good milking camel usually give for human use if she gave birth in the dry season in **January/February**? If she has not yet stopped giving milk, tell us how much you think she will continue to give and for how long.

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec.

Enumerators: *Camels that give birth in the wet season may continue to give a wet season milk yield for some months in the following dry season. Also, camels that give birth in the dry season can continue to give a dry season milk yield for some months in the following wet season. In the next questions you should ask about these extended periods when milk yields remain constant even if there is a change in the season.*

Dry season milking after giving birth

Number of daytime milkings	_____
Number of night-time milkings	_____
Total litres of milk from daytime milkings	_____
Total litres of milk from night-time milkings	_____

For how many months or days did these camels produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?

Days	_____

OR months   _____

Wet season milking

Number of daytime milkings   _____
Number of night-time milkings   _____
Total litres of milk from daytime milkings   _____
Total litres of milk from night-time milkings   _____
For how many months or days did these camels produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?
                                       Days   _____
                                       OR months   _____

8.   Last year from the beginning of the wet season in March 2018 until the end of the dry season in February 2019, how many camel calves died before their mother stopped giving milk?

                     Number of camel calves that died   _____

SECTION 5 DONKEYS

To respondent: *Choose a donkey herd that you know well. This is probably your own herd or that of your co-wives. We are not interested in who this herd belongs to, only that you know it well enough to speak accurately about it. We will use stones to stand for individual donkeys.*

We want to know about this herd at the beginning of the wet season last year – 2018 – and in this last dry season. We would like you to tell us about the combined camp and village herd. If you do not know about the camp herd, tell us and we will talk only about the donkeys in the settlement.

Enumerators: *In all blanks, enter yes/no, a zero, a number, or a dash for no data.*

1.   Are you telling me about a combined village and camp herd or only the village herd?
        Tick correct answer:
        Combined camp and village _____   OR   village herd only   _____

Enumerators: *If respondents feel comfortable beginning with stones for the entire herd, let them do so and then discard the stones representing male donkeys, and work only with the pile of stones standing for adult females. **Make it clear to respondents that the pile of stones representing adult females refers to adult females in the herd at the beginning of the wet season last year, March 2018.***

2.   At the beginning of the wet season last year (March 2018), how many adult female donkeys were in this herd?   Number of adult females   _____

Enumerators: *The next three questions will ask the respondent to divide the pile of stones that represent all adult females into three separate piles.*

3. Last year, how many adult female donkeys gave birth in the wet season (from March to October 2018)? Number giving birth _____

4. Last year, how many adult female donkeys gave birth in the dry season (from November 2018 to February 2019)? Number giving birth _____

5. Last year (March 2018 to February 2019), how many adult females (including those old enough to give birth for the first time) did not give birth?
Number of adult females not giving birth _____

6. Last year, how much milk did a good milking donkey usually give for human use if she gave birth in the wet season in **April/May**? If she has not yet stopped giving milk, tell us how much you think she will continue to give and for how long.

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2021) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec.

Beginning of white milk production (after colostrum)
Millilitres white milk per milking   morning _____
                                                                evening _____
For how many months or days did good milking donkeys giving birth April/May produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?   Days _____
                                                                OR months _____

Peak (or increased) milk production
Millilitres per milking   morning _____
                                                                evening _____
For how many months or days did good milking donkeys giving birth April/May produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?   Days _____
                                                                OR months _____

Declining milk production
(from the time milk yields start to fall until milking stops)
Millilitres per milking at the start of the decline
                                                                morning _____
                                                                evening _____
After they started to decline, for how many days or months did milk yields fall until milking stopped?   Days _____
                                                                OR months _____

7.   Last year, how much milk did one good milking donkey usually give for human use if she gave birth in the dry season **January/February**? If she has not yet stopped giving milk, tell us how much you think she will continue to give and for how long.

Enumerators: *The following chart is to help you calculate the length of the beginning, middle and end periods of the lactation.*
(2018) May June July Aug. Sept. Oct. Nov. Dec.
(2019) Jan. Feb. March Ap. May June July Aug. Sept. Oct. Nov. Dec.
(2020) Jan. Feb. March Ap. May June July Aug. Sept Oct. Nov. Dec.

Beginning of white milk production (after colostrum)
Millilitres white milk per milking   morning   _____
                                                                                       evening   _____
For how many months or days did good milking donkeys giving birth in January/February produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?
                                                                                       Days   _____
                                                                                       OR months   _____

Peak (or increased) milk production
Millilitres per milking   morning   _____
                                                                                       evening   _____
For how many months or days did good milking donkeys giving birth January/February produce this level of milk for human use? If they are still producing at this level, how long do you expect this to continue?
                                                                                       Days   _____
                                                                                       OR months   _____

Declining milk production
(from the time milk yields start to fall until milking stops)
Millilitres per milking at the start of the decline
                                                                                       morning   _____
                                                                                       evening   _____
After they started to decline, for how many days or months did milk yields fall until milking stopped?   Days   _____
                                                                                       OR months   _____

8.   Last year from the beginning of the wet season in March until the end of the dry season in February 2019, how many new donkey colts died before their mother stopped milking?
                                                      Number of colts that died   _____

SECTION 6 BLOOD
1.What types of animals – species, and their age and sex – did you bleed last year?

CATTLE
Adult female cattle   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____ amount 3rd bleeding ____

Immature female cattle   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Adult male cattle   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Immature male   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

GOATS
Adult female goats   tick YES ___ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Immature female goats   tick YES ___ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Adult male goats   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Immature male goats   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

SHEEP
Adult female sheep   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Immature female sheep   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Adult male sheep   tick YES ___ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

Immature male sheep   tick YES ____ OR NO _____   If yes, times per year _____
amount 1st bleeding _____ amount 2nd bleeding _____   amount 3rd bleeding _____

2. Do you bleed pregnant animals? Tick YES or NO: YES _____ NO _____

THE PRODUCTIVITY AND ECONOMIC VALUE OF LIVESTOCK IN KARAMOJA:

PATCH FOR MODULE 2

Interview number   Milk_____
Name of enumerator   _____
Date of interview   _____
Sub-county and District   _____
Number of respondents   _____
Gender of respondents   _____

1. What livestock species in your herd do you milk?
Tick yes or no.

    Cattle   yes _____   no _____   do not keep   _____
    If 'yes', ask questions on cattle.
    If 'no' or 'do not keep, skip this section.

    Goats   yes _____   no _____   do not keep   _____
    If 'yes', ask questions in on goats
    If 'no' or 'do not keep', skip this section.

    Sheep   yes _____   no _____   do not keep   _____
    If 'yes', ask questions on sheep.
    If 'no' or 'do not keep', skip this section.

    Camels   yes _____   no _____   do not keep   _____
    If 'yes', ask questions on camels.
    If 'no' or 'do not keep', skip this section.

    Donkeys   yes _____   no _____   do not keep   _____
    If 'yes', ask questions on donkeys.
    If 'no' or 'do not keep', skip this section.

CATTLE

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many of your adult female cattle gave birth? By adult female cattle we mean all females that gave birth in previous years and those that gave birth for the first time last year. We would like you to tell us about the combined camp and village herd, that is men's cattle, women's cattle, and cattle for the herd boys altogether.

            Number of cattle giving birth: _____

2. Of the cattle that gave birth last year, how many would you call 'good milking cows' and how many are 'poor' or 'weak' milking cows?

Good milking cows   _____   Poor milking cows   _____

3. I would like you to compare the milk produced by good and poor milking cows that give birth in the **wet season in April or May**. If possible, compare cows that gave birth last year, but if this is not possible, think back to years in which both good and poor milking cows both gave birth in your herd in the wet season, from March to October.

At the beginning of white milk production (after colostrum) how much milk did a good or poor milking cow produce at the evening milking?

Millilitres of white milk at the evening milking in the wet season:

Good milking cow: _____   Poor milking cow: _____

4. I would like you to compare the milk produced by good and poor milking cows that give birth in the **dry season in January/February**. If possible, compare cows that gave birth last year, but if this is not possible, think back to years in which both good and poor milking cows both gave birth in your herd in the dry season, from November to February.

At the beginning of white milk production (after colostrum) how much milk did a good or poor milking cow produce at the evening milking?

Millilitres of white milk at the evening milking in the dry season:

Good milking cow: _____   Poor milking cow: _____

GOATS
1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many of your adult female goats gave birth? By adult female goats we mean all females that gave birth in previous years <u>and</u> those that gave birth for the first time last year. We would like you to tell us about the combined camp and village herd.

Number of goats giving birth: _____

2. Of the goats that gave birth last year, how many would you call 'good milking goats' and how many are 'poor' or 'weak' milking goats?

Good milking goats   _____   Poor milking goats   _____

3. I would like you to compare the milk produced by good and poor milking goats that give birth in the **wet season in April or May**. If possible, compare goats that gave birth last year, but if this is not possible, think back to years in which both good and poor milking goats both gave birth in your herd in the wet season, from March to October.

At the beginning of white milk production, after colostrum is finished but before the kid is grazing, how much milk did a good or poor milking goat produce at the evening milking?

Millilitres of white milk at the evening milking in the wet season:

Good milking goat: _____   Poor milking goat: _____

4. In the wet season, do you milk poor milking goats after the kid begins to graze?

                                                      yes _____   no _____

5. Do you milk poor milking goats that give birth in the dry season?

                                                      yes _____   no _____

If the answer to question 5 is 'yes' then ask
6. I would like you to compare the milk produced by good and poor milking goats that give birth in the **dry season in January/February**. If possible, compare goats that gave birth last year, but if this is not possible, think back to years in which both good and poor milking goats both gave birth in your herd in the dry season, from November to February.

At the beginning of white milk production, after colostrum is finished but before the kid is grazing, how much milk did a good or poor milking goat produce at the evening milking?

Millilitres of white milk at the evening milking in the dry season:

Good milking goat: _____   Poor milking goat: _____

7. In the dry season, do you milk poor milking goats after the kid begins to graze?

                                                      yes _____   no _____

SHEEP
1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many of your adult female sheep gave birth? By adult female sheep we mean all females that gave birth in previous years <u>and</u> those that gave birth for the first time last year. We would like you to tell us about the combined camp and village herd.
                              Number of sheep giving birth: _____

2. Of the sheep that gave birth last year, how many would you call 'good milking sheep' and how many are 'poor' or 'weak' milking sheep?

Good milking sheep   _____   Poor milking sheep   _____

3. I would like you to compare the milk produced by good and poor milking sheep that give birth in the **wet season in April or May**. If possible, compare sheep that gave birth last year, but if this is not possible, think back to years in which both good and poor milking sheep both gave birth in your herd in the wet season, from March to October.

At the beginning of white milk production, after colostrum is finished but before the lamb is grazing, how much milk did a good or poor milking goat produce at the evening milking?

Millilitres of white milk at the evening milking in the wet season:

Good milking sheep: _____   Poor milking sheep: _____

4. In the wet season, do you milk poor milking sheep after the lamb begins to graze?

                                                                      yes _____   no _____

5. Do you milk poor milking sheep that give birth in the dry season?

                                                                      yes _____   no _____

If the answer to question 5 is 'yes' then ask
6. I would like you to compare the milk produced by good and poor milking sheep that give birth in the **dry season in January/February**. If possible, compare sheep that gave birth last year, but if this is not possible, think back to years in which both good and poor milking sheep both gave birth in your herd in the dry season, from November to February.

At the beginning of white milk production, after colostrum is finished but before the lamb is grazing, how much milk did a good or poor milking sheep produce at the evening milking?

Millilitres of white milk at the evening milking in the dry season:

Good milking sheep: _____   Poor milking sheep: _____

7. In the dry season, do you milk poor milking sheep after the lamb begins to graze?

                                                                      yes _____   no _____

CAMELS
1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many of your adult female camels gave birth? By adult female camels we mean all females that gave birth in previous years <u>and</u> those that gave birth for the first time last year. We would like you to tell us about the combined camp and village herd.

                              Number of camels giving birth: _____

2. Of the camels that gave birth last year, how many would you call 'good milking camels' and how many are 'poor' or 'weak' milking camels?

Good milking camels   _____   Poor milking camels   _____

3. I would like you to compare the milk produced by good and poor milking camels that give birth in the **wet season in April or May**. If possible, compare camels that gave birth last year, but if this is not possible, think back to years in which both good and poor milking camels both gave birth in your herd in the wet season, from March to October.

At the beginning of white milk production (after colostrum) how much milk did a good or poor milking camel produce from all their daytime milkings combined?

Millilitres of white milk in the wet season from all daytime milkings combined:

Good milking camel: _____   Poor milking camel: _____

4. I would like you to compare the milk produced by good and poor milking camels that give birth in the **dry season in January/February**. If possible, compare camels that gave birth last year, but if this is not possible, think back to years in which both good and poor milking camels both gave birth in your herd in the dry season, from November to February.

At the beginning of white milk production (after colostrum) how much milk did a good or poor milking camel produce from all their daytime milkings combined?

Millilitres of white milk in the dry season from all daytime milkings combined:

Good milking camel: _____   Poor milking camel: _____

DONKEYS

1. Last year (from the beginning of the wet season in March 2018 until the end of the last dry season in February 2019) how many of your adult female donkeys gave birth? By adult female donkeys we mean all females that gave birth in previous years and those that gave birth for the first time last year. We would like you to tell us about the combined camp and village herd.

                              Number of donkeys giving birth: _____

2. Of the donkeys that gave birth last year, how many would you call 'good milking donkeys' and how many are 'poor' or 'weak' milking donkeys?
Good milking donkeys   _____   Poor milking donkeys   _____

3. I would like you to compare the milk produced by good and poor milking donkeys that give birth in the **wet season in April or May**. If possible, compare donkeys that gave birth last year, but if this is not possible, think back to years in which both good and poor milking donkeys both gave birth in your herd in the wet season, from March to October.

At the beginning of white milk production (after colostrum) how much milk did a good or poor milking donkey produce at the evening milking?

Millilitres of white milk at the evening milking in the wet season:

Good milking donkey: _____   Poor milking donkey: _____

4. I would like you to compare the milk produced by good and poor milking co donkeys that give birth in the **dry season in January/February**. If possible, compare donkeys that gave birth last year, but if this is not possible, think back to years in which both good and poor milking donkeys both gave birth in your herd in the dry season, from November to February.

At the beginning of white milk production (after colostrum) how much milk did a good or poor milking donkey produce at the evening milking?

Millilitres of white milk at the evening milking in the dry season:

Good milking donkey: _____   Poor milking donkey: _____