

Working Paper

Enhancing climate change development programmes in Uganda

Karamoja livestock value chain analysis for resilience in drylands

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About this paper

The research study for this working paper was conducted in partnership with the Overseas Development Institute (ODI), Makerere University and the Karamoja Development Forum. The study was funded by the Climate and Development Knowledge Network (CDKN), with support from the Netherlands Directorate-General for International Cooperation (DGIS) and the Royal Netherlands Embassy in Uganda. It aims to explore economic opportunities for investment in the development of the livestock sector in the Karamoja region of Uganda that are both inclusive and climate-resilient by:

- understanding the different actors involved in the livestock value chain, the risks they face and the options for investment to overcome these risks
- providing evidence that contributes to a paradigm shift around livestock and pastoralism in Karamoja, moving away from perceptions of a way of life characterised by poverty, drought and famine towards those of an economic activity characterised by opportunity, trade and resilience.

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Acronyms

CAHW	community animal health worker
CARIAA	Collaborative Adaptation Research in Africa and Asia
CDKN	Climate and Development Knowledge Network
CLIDE	Community Livestock-Integrated Development
DADO	Dodoto Agro-pastoralist Development
DFID	Department for International Development, UK
DVO	district veterinary officer
FEWS-NET	Famine Early Warning Systems Network
GDP	gross domestic product
ICPAC	IGAD Climate Prediction Centre
ICPALD	IGAD Pastoralism and Livestock Division
IDDRSI	Intergovernmental Authority Drought Disaster Sustainability Initiative
IDRC	International Development Research Centre
IGAD	Intergovernmental Authority for Development in the Horn of Africa
IPCC	Intergovernmental Panel on Climate Change
KIDP	Karamoja Integrated Development Plan
KRSU	Karamoja Resilience Support Unit
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NDC	Nationally Determined Contribution
NGO	non-governmental organisation
OPM	Office of the Prime Minister, Uganda
PRISE	Pathways to Resilience in Semi-arid Economies
SACCO	savings and credit cooperative
SDGs	Sustainable Development Goals
SPS	sanitary phyto-sanitary (regulations)
UGX	Ugandan Shilling
UPDF	Uganda Police Defence Force
VC-ARID	Value Chain Analysis for Resilience in Drylands
VSLA	village savings and loans association

Executive summary

Climate change will have significant impacts on economic activity and value chains in Uganda (Markandya et al., 2015). Actors in commodity value chains will be compelled to alter their production strategies if they are to maintain their production capabilities under changing conditions.

But climate change can also provide new possibilities for people and businesses – for example, to create new products and services, develop new markets and access new funding streams and finance mechanisms. Particular opportunities arise in the semi-arid Karamoja region in the northeast of Uganda, and especially in the region’s livestock sector, which accounts for around 20% of Uganda’s total livestock.

Droughts in 2006, 2007 and 2009/2010 – the latter of which affected the wider Horn of Africa region – reduced the availability of water and forage for livestock in the Karamoja region. This pressure on resources was compounded by the migration of Turkana pastoralists from Kenya, who were also affected by the drought. But Karamoja’s extensive livestock production system, which is supported by pastoralist livelihoods, is not only the most climate-resilient and culturally appropriate agricultural activity (Neely et al., 2009) but also offers significant opportunity for economic development and value addition.

Returns per hectare of land in the pastoral areas of Karamoja are estimated to be nearly seven times higher than returns from ranching systems located in south-western Uganda (ICPALD, 2013). Two of the 12 livestock markets in Karamoja alone generate approximately \$250,000 per year from livestock sales (Lwasa et al., 2016) and, in the greater Horn of Africa region, informal livestock trade was worth an estimated \$1 billion in 2010 alone (Catley et al., 2013).

Clearly, there is a growing case to be made for investment in livestock systems as an opportunity for economic development in Karamoja that is both climate-resilient and inclusive. And, now that peace has been achieved in the region after several decades of conflict, there is a window of opportunity to integrate the livestock sector into the national economy.

Investment in the livestock sector can leverage development, employment opportunities and other socioeconomic benefits for both Karamoja and Uganda, at the same time as reducing the vulnerability of pastoralists

to climate change. It can also contribute to national development priorities, including achievement of the Sustainable Development Goals through climate-resilient, inclusive economic development (SDG8, SDG13) and job creation along the value chain (SDG9). To achieve this, market participation must be improved for poor smallholders (SDG10) and for women (SDG5). This potential for climate-resilient economic development can also apply to other extensive livestock production systems supported by the semi-arid lands of sub-Saharan Africa and Central Asia.

This paper identifies and explores the economic opportunities for entrepreneurs and companies to invest in climate change adaptation to enhance the resilience of Karamoja’s livestock value chain. It considers whether there are trade-offs associated with such opportunities and, in doing so, identifies adaptation options for Karamoja through upgrading the value chain (i.e. vertical transformation) and diversification into related sectors (i.e. horizontal transformation). To do so, this research uses an innovative approach to value chain analysis – Value Chain Analysis for Resilience in Drylands (VC-ARID).¹

Extensive livestock production systems differ from other productive sectors in the ways they are structured and function. As such, new approaches are needed to understand them better and identify appropriate interventions that support, rather than undermine, these systems. VC-ARID takes into account the specific characteristics of arid and semi-arid systems, and integrates five key factors – climate risk, seasonality, informal activity, gender and production rooted in arid and semi-arid lands.

As part of the three-step VC-ARID methodology, this research maps the value chain and analyses climate risk, before identifying adaptation options for the livestock value chain in Karamoja. It builds on existing evidence and explores the opportunities for climate change adaptation from product development, through trade, transportation and consumption that could contribute to building resilience of pastoralists in Karamoja and beyond.

Across the value chain, actors including producers, traders, transporters and processors have perceived changes in temperature, rainfall and climate extremes over

¹ VC-ARID methodology has been developed under the Pathways to Resilience in Semi-arid Economies (PRISE) programme of the IDRC and DFID-funded Collaborative Adaptation Research in Africa and Asia (CARIAA programme). VC-ARID is implemented in the livestock sectors of Kenya, Senegal, Tajikistan and Ethiopia as well as the cotton sectors of Pakistan and Burkina Faso.

the past 10 years, and have experienced the impacts of these changes on their livestock. These perceived changes in climate correspond well with observed climate change trends in temperature, rainfall and extreme events (IPCC, 2013). Recurrent drought in the region is causing large losses of livestock, declines in quality and reduced trade, posing a significant barrier to commercial pastoralism. Other risks, including land tenure insecurity and conflict, as well as household shocks, only compound these.

Pastoralists are responding to these shocks and stresses by increasing their mobility and migrating in search of pasture and water resources to sustain their herds. Adaptive capacity is inherent in these traditional coping mechanisms and adaptation options can build on this. But the knowledge and financial resources needed to put adaptation measures into practice are limited.

Karamojong pastoralists experience vulnerabilities that expose them to climate risk and that also act as barriers to value addition. Poor infrastructure, inadequate service delivery and lack of appropriate regulations all reflect the relatively marginalised position of Karamoja in the national economy, and the failure to recognise the potential of the livestock sector in this region.

To achieve a necessary paradigm shift, attitudes need to change at both government and community levels. Policy-makers at national and local levels often perceive pastoralism as unproductive and instead promote alternative livelihood strategies, which may be maladaptive, while pastoralists themselves still prioritise quantity over quality in their animals.

There are several policy entry points that national and local government can harness to support the pastoral economy and livestock sector. These include the national climate policies and plans that are under way, such as the Nationally Determined Contribution (NDC), as well as regional processes like the Intergovernmental Authority on Development Drought Disaster Sustainability Initiative (IDDRSI).

Recommendations for investment

Commercialisation of livestock production

If more pastoralists move towards managing livestock as a business, they will be incentivised to upgrade and diversify the value chain. For example, individual and collective private sector actors can fill market niches including fattening lots and breeding businesses, which can improve the quality of livestock products. Diversification into commercial production of small ruminants and other livestock species can also provide inclusive adaptation options that build on traditional coping mechanisms.

The enabling environment needs to be strengthened, including provision of supporting services like credit, insurance, animal health and market and climate information. Incentives should be created for small and medium enterprises (SMEs) and larger private sector actors to enter these service delivery markets.

Attracting private sector development

Convening policy-makers and private sector actors (e.g. financial institutions, processors, transporters) in Uganda and surrounding countries (e.g. Kenya) can open dialogue around investment opportunities and options for overcoming barriers to market entry.

To incentivise private sector, demonstrations of commercial production should be implemented. Karamoja beef is regarded as high quality by consumers and could be promoted to open a niche in the market. Efforts to promote the concept of 'livestock as a business' that can complement other sociocultural values attached to livestock in the region should be coordinated. Development partners and extension officers also need to be trained to ensure they promote livelihood options that not only support subsistence, but that are also climate-resilient and economically viable. Integration of the livestock value chain should be prioritised over less appropriate land use and livelihood activities.

Market information for Karamoja

Evidence suggests that the livestock value chain is economically valuable in the region but largely linked only to local markets. Opportunities should be found to strengthen links to larger markets in Uganda as well as terminal markets in South Sudan, Kenya and possibly the Middle East, all of which are net livestock importers largely via informal trade with neighbours.

It is difficult for pastoralists to access livestock market information, making pricing a major challenge for producers. Prices at local markets are typically significantly higher than prices at terminal markets, with seasonal effects exacerbating this disparity. Introduction of a market information system would help to promote price equilibrium between markets.

Financial services for pastoralists

Support for savings and loans and microfinance institutions should be tailored to extensive livestock production and pastoralist livelihoods. This can enable enterprise, product development, branding, traceability systems, promotion and marketing to tap into markets beyond Karamoja. Efforts should also be made to assess the feasibility of implementing index-based livestock insurance in Uganda, as is already happening in northern Kenya and southern Ethiopia, and to engage Ugandan and Kenyan decision-makers in dialogue around financial services for pastoralism, including insurance.

Early warning systems

The IGAD Climate Prediction and Applications Centre (ICPAC) provides relatively innovative and timely information. Food security information is provided by the Famine Early Warning Systems Network (FEWS-NET) in the region. However, as supported by the results of this research, access to timely and appropriate weather and climate information is highly limited in Karamoja. Early warning systems should therefore be a priority area for investment.

Upgrading animal health services

Existing systems for community animal health workers (CAHW) in Karamoja should be scaled up to involve district veterinary officers (DVO), CAHW and customary leaders as well as herders in an efficient animal health service. There is already investment in this area but it will require up-scaling to ensure productivity and sustained supply to the market, particularly to support traceability and sanitary-phytosanitary (SPS) protocols.

Increasing market access

Investment in connectivity is critical for levelling the costs of transporting products, increasing access to markets and enabling growth. For example, climate-proofing the ongoing road network upgrades in Karamoja will be important to reduce the risk of damage from floods, especially the washing away of culverts and bridges, which can impede access in the wet season.

Policy frameworks to support the pastoralist economy

Several policy entry points have been identified at different scales of governance. Capacity-building is needed at sub-national levels, particularly around implementation of integrated development plans in general and with respect to livestock, as well as at regional level, through IGAD. Donors and international NGOs have organised themselves into a Karamoja Development Partners Group but this is very much an information-sharing platform rather than a coordination mechanism. Between the multilateral agencies and donors, more coordination is needed, as is increased direction from government.

Increasing tenure security

Attracting private sector investment in a commercialised livestock sector will require greater certainty around land tenure than there is currently. To support production, grazing lands need to be protected as inputs to the value chain and communal ownership with rules of temporary migration need to be enhanced. Privatisation of land should be limited to municipalities and limited areas of mining and conservation concessions. The government should harness the Land Act that recognises communal ownership to protect grazing lands to support livestock businesses.

With investments in these key areas from service delivery, infrastructure and livestock businesses around fattening, breeding, fodder production and diversification into other species and products, livestock production as practised by pastoralists in Karamoja offers a viable and sustainable livelihood.

1. Introduction

Climate change threatens development and economic growth in Uganda. Risks will increase for individuals, communities, businesses, infrastructure and assets; and will impact on all sectors of the economy (Markyanda et al., 2015). This is because climate change will compel actors in commodity value chains to alter their production strategies to maintain their production capabilities under changing conditions. However, climate change can also lead to new opportunities for people and businesses, in the form of new products and services for new markets, funding streams and finance mechanisms. Adapting to the impacts of climate change and taking advantage of opportunities arising from it, nevertheless, will require a clear understanding of the risks and available options for managing these.

The Karamoja region in north-eastern Uganda produces approximately 20% of Uganda's livestock (ICPALD, 2013). The returns per hectare of land in pastoral areas of Karamoja are estimated to be nearly seven times higher than returns from ranching systems in south-western Uganda, although the reasons for this are not well understood and require detailed further study (ICPALD, 2013). A recent livestock value chain assessment study in Karamoja reported an annual total gross value of approximately \$250,000 in two of the 12 livestock markets in Karamoja (Lwasa et al., 2016). Different market assessments for livestock in Karamoja have been conducted but there is anecdotal evidence that these underestimate the economic value of the sector, partly because data is scarce and mostly available at regional level only. This is also the case for pastoral areas across the greater Horn of Africa region, where extensive livestock production systems were worth an estimated \$1 billion in 2010 alone (Catley et al., 2013). As such, there is a growing case to be made for investment in livestock systems as an opportunity for climate-resilient economic development. This has been indicated by emerging findings of Value Chain Analysis for Resilience in Drylands (VC-ARID) studies in Senegal, Kenya, Ethiopia and Tajikistan under the Pathways to Resilience in Semi-arid Economies (PRISE) programme.²

As practised in Karamoja, across the Horn of Africa more widely and in arid and semi-arid lands elsewhere,

pastoralism has adapted to a highly variable climate. However, the economic opportunities in the Karamoja livestock value chain have not been adequately explored in the context of adaptation to climate change. Evidence indicates that there is potential to add value to different segments of the value chain, especially for producers, while also enhancing resilience (Lwasa et al., 2016). This research study uses the VC-ARID methodology developed under PRISE, to build on this evidence, exploring the opportunities for climate change adaptations from product development, through trade, transportation and consumption that could contribute to building resilience of pastoralism in Karamoja and beyond. For policy-makers, investment in the livestock sector can help contribute to national development priorities, including achievement of the Sustainable Development Goals through climate-resilient, inclusive economic development (SDG8, SDG13) and job creation along the value chain (SDG9). To achieve this, market participation must be improved for poor smallholders (SDG10) and for women (SDG5).

The research study addresses the following question:

What are the economic opportunities for entrepreneurs and companies to invest in climate change adaptation to enhance the resilience of Karamoja's livestock value chain and are there trade-offs associated with these opportunities?

It identifies adaptation options for the livestock value chain in Karamoja through upgrading the value chain (i.e. vertical transformation) and diversification into related sectors (i.e. horizontal transformation). As such, there are two research sub-questions that guide the research:

(a) *What are the pathways for climate-resilient economic development in Karamoja's livestock sector through increasing productivity within sectors (vertical transformation) or shifting toward sectors that boost inclusive and adaptable growth (horizontal transformation)?*

2 PRISE is one of the four consortia under the Collaborative Adaptation Research in Africa and Asia (CARIAA) programme.

(b) What are the adaptation options, including investment opportunities in a climate-resilient livestock value chain for Karamoja?

To address these questions, the study adopts the VC-ARID methodology to map the value chain, assess climate risk and identify options for adaptation and investment. VC-ARID is an innovative and interdisciplinary approach to value chain analysis. It

takes into account the specific characteristics of semi-arid systems. As such, VC-ARID methodology integrates key principles that support its application in a territorial approach as developed within the PRISE programme.

The VC-ARID methodology and its application in this study is described in section 2. The results of the study are then discussed, followed by conclusions and a set of recommendations for adaptation and investment in the Karamoja livestock value chain.

2. Methodology and approach

2.1. Study area and value chain focus

The study area focuses on the Karamoja region as a whole, involving participatory research with representatives from all districts, including Kotido, Kaabong, Napak, Moroto, Abim, Adumat and Nakapiripirit. The selection of the Karamoja region for the value chain analysis was based on the following criteria: a) importance as a household livelihood asset and contribution to food, nutrition and income security asset; b) national added value; c) employment importance; and, d) their potential for economic growth in the future.

The Karamoja region was hit by droughts in 2006, 2007 and 2009/2010, the latter having affected the wider Horn of Africa region reducing availability of water and forage for livestock. This reduction of resources was compounded by the migration of Turkana pastoralists from Kenya, whose region was also affected by the drought. Both districts are largely pastoralist, characterised by temporal migration of livestock to southern areas of Bugisu land and in western Teso within Uganda. Migration of livestock is an important adaptation and coping mechanism for the pastoralists (see Figure 1). The magnitude of the drought in 2009/2010 started with lower than average rainfall in October-November 2009, extending up to February 2010. This was a shock that many pastoralists still remember. More recently, drought conditions have recurred in 2016/2017.

2.2. Value Chain Analysis for Resilience in Drylands (VC-ARID)

Extensive livestock production systems are distinct from other productive sectors in the ways that they are structured and function. Therefore new approaches are needed to understand them better and identify appropriate interventions that support, rather than undermine, these systems, such that conventional economic models do not transfer well to livestock markets. The five characteristics outlined below are particularly important to these production systems and pose specific policy challenges for livestock markets that need to be overcome. In fact, these characteristics often form the basis of adaptive capacity inherent within these systems and a better understanding of these can reveal opportunities for investment.

2.2.1. Production in semi-arid lands (SALS)



VC-ARID offers a territorial approach to value chain analysis that combines more traditional sectoral analysis with recognition of the specific characteristics and vulnerabilities of particular geographies. In this case, it is explicitly recognised that Karamoja is a semi-arid area of Uganda in which livestock production is rooted and this is the starting point for the value chain analysis. Key to the approach is the recognition that in semi-arid lands, ecological and socioeconomic variability represent key structural differences when compared to other production systems.

2.2.2. Climate risk



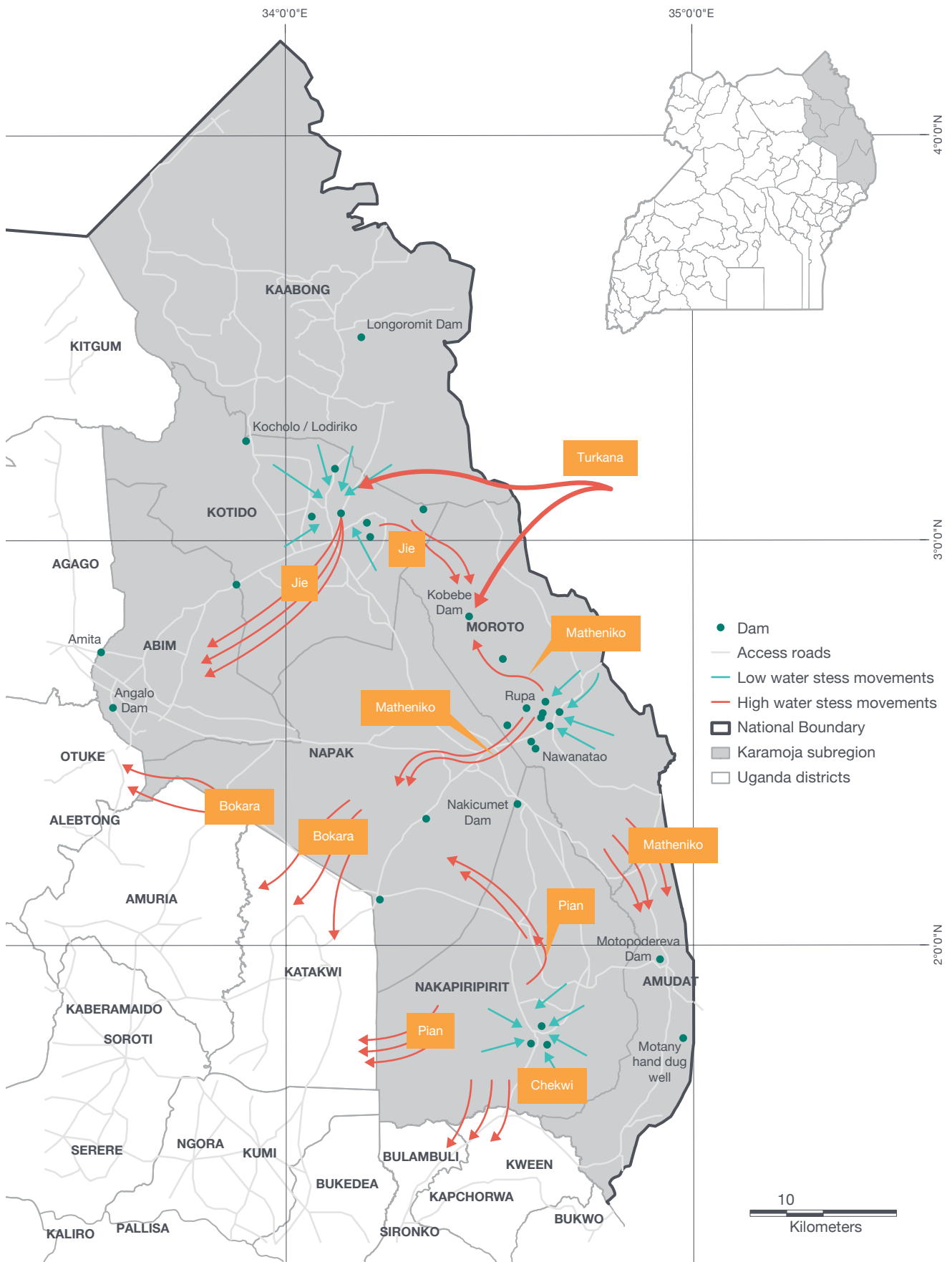
VC-ARID is novel in its approach to analysing climate risk (see Box 1 for definition of climate risk). At each step of the livestock value chain, climate risk is assessed. Also considered is the interaction of climate risk with other shocks, including conflict, disease and idiosyncratic shocks at household level. In understanding the risk at each step of the chain, it is possible to start identifying adaptation options that amount to a more climate-resilient system at sector level. Using this approach, risk assessment is accomplished at the production, input-supply and processing stages in participation with actors to identify adaptation opportunities.

2.2.3. Seasonality



While longer-term climate change and variability pose challenges, there are also intra-annual weather patterns that can affect ecological conditions and production in already highly variable systems. This has huge implications for supply and therefore the entire chain, posing problems in smoothing production over time and in response to shocks. For this reason, rainy and dry seasonal effects are explicitly considered in VC-ARID.

Figure 1. Map of Karamoja region and livestock movements during dry seasons



Source: Mugerwa et al., 2014

2.2.4. Informality



As outlined in the introduction to this working paper, there is already significant economic activity taking place in pastoral areas. However, much of this activity is informal as these areas have been relatively marginalised both politically and economically. Often, it is the informality and flexibility of trade and social networks that constitute the adaptive capacity of these social-ecological systems. Therefore, the VC-ARID methodology incorporates both informal and formal actors and value chains.

2.2.5. Gender



VC-ARID explicitly recognises the gendered roles of pastoralist livelihoods. For example in Uganda, cattle production and trading is predominantly the domain of men, whereas sheep and goats (shoats) herding and sales of milk and shoats' stock is often performed by women. Recognising these roles in the value chain allows us to explore the opportunities for diversification of the livestock value chain to include both men and women in trade associations or commercial fodder production, for example.

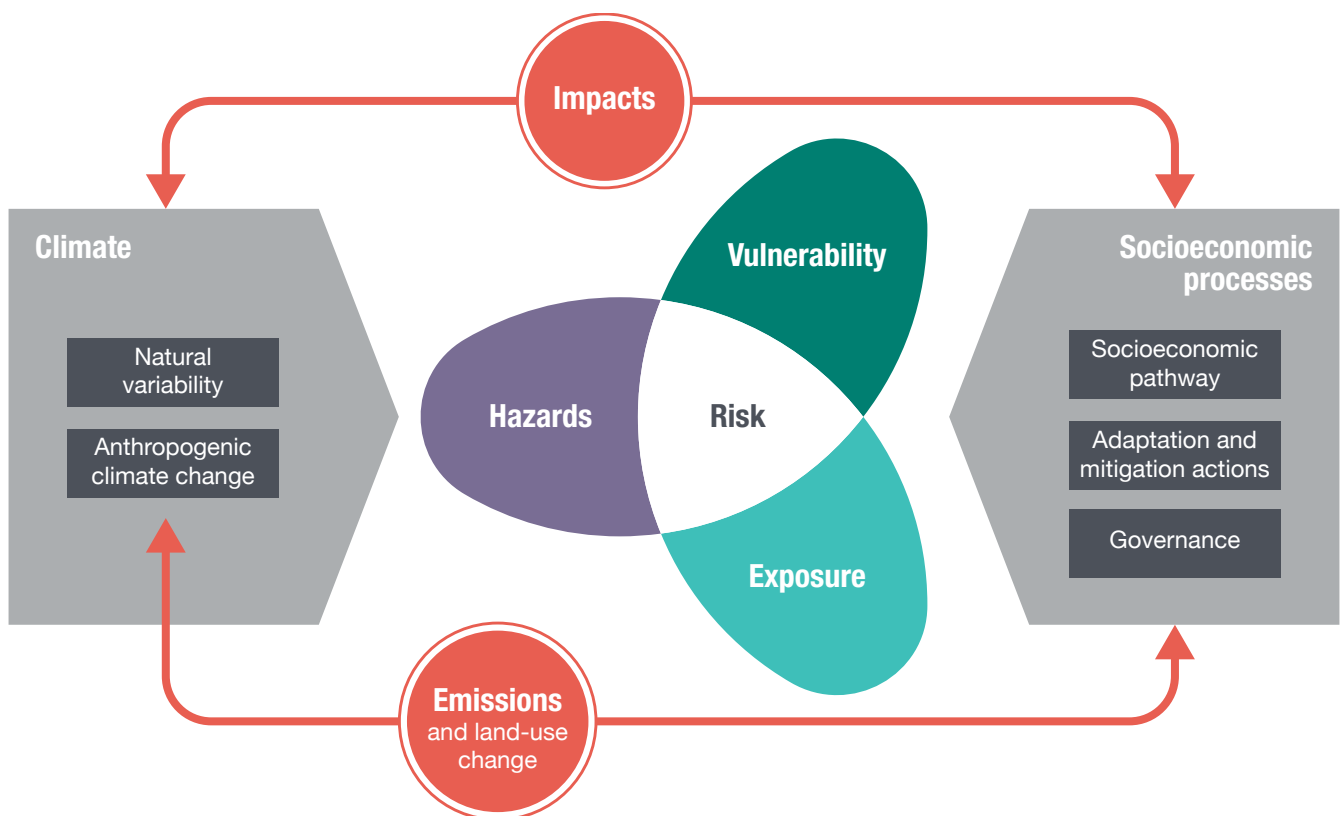
VC-ARID follows a three-step methodology, as follows:

Step 1: Mapping the value chain

Step 1 of VC-ARID conforms with the standard Value Chain Analysis,³ which considers the value capture at the different stages of product development and transformation, as well as including the additional elements described above. The approach to the assessment makes use of the multiple steps in analysis and includes consideration of the five characteristics outlined in this section.

Initial consultations were held with key actors in Karamoja, including DFID and Mercycorp, in Entebbe in the week commencing 20 February 2017. This was useful for gathering relevant materials for this working paper and gaining support from stakeholders in Karamoja to participate in the research via these networks. A workshop was held in Moroto, Karamoja on 1 March 2017 focused on validating Step 1 and gathering data via focus group discussions for Step 2 (see below). Each of the five focus group discussions were composed of a mix of women, elders, non-governmental organisation (NGO) representatives and other participants. The workshop was attended by 21 representatives of communities from across the districts of Karamoja (Kotido, Kaabong, Napak, Moroto, Abim, Adumat and Nakapiripirit) as well as representatives of relevant community-based

Figure 2. Climate risk



Source: IPCC, 2014, Summary for Policymakers: 3.

Figure 3. VC-ARID methodology



Source: Carabine & Simonet, 2017: 8.

organisations involved in land, livestock and peace-related issues. These included the relevant Karamoja Interest Groups, Community Livestock-Integrated Development (CLIDE), and the Dodoth Agro-pastoralist Development Organisation (DADO). Representatives included elders, herders and women. Participants were selected by the Karamoja Development Forum based on their geographical representation, gender, age and membership of key groups involved with the management of livestock in Karamoja. During the workshop, the project and results of Step 1 were presented in plenary, five discussion groups were held and these were reported back in plenary at the end of the workshop.

Step 2: Assessing climate risks

Key climate hazards identified for the Karamoja region are prolonged dry spells, drought and seasonal flooding (Levine, 2010). The predominant livelihood in Karamoja is pastoralism and the population, their livestock and natural resources are particularly exposed to these hazards, particularly in the case of covariate shocks such as drought and dry spells. The propensity for Karamojong pastoralists, their livelihoods and their assets to be adversely affected by these hazards is also high, as they are relatively politically marginalised, have suffered protracted periods of conflict and insecurity, have limited access to services and are highly dependent on natural resources for their livelihoods.

Currently, pastoralists are coping with climate risk by practicing temporary migration, selling their assets and turning to alternative incomes, many of which are not climate-resilient (e.g. charcoal burning, timber sales). Other risks that interact with climate risk include conflict and insecurity in the region and animal disease outbreaks, which undermine livestock production. For example,

insecurity in Karamoja leads to reduced mobility, herding in larger numbers and moving to markets in large groups or shifting from livestock production altogether. But there are possibilities of adaptations that are climate-resilient, which are explored for investment opportunities. For example, there are marketing opportunities associated with temporary migration provided that pasture and water resources are available and accessible. There are also opportunities related to the input level of the value chain, for example managing ecosystem services, that can contribute to transformation of the live animal into high-quality meat products. However, seasonality remains an important factor, with prices fluctuating with changes in supply and demand (see Figure 4).

A semi-structured survey was conducted with value chain actors, including producers, traders, processors and transporters. The purpose of the survey was to capture perceptions of climate risk at each step. Building on the data already collected along the value chain, which includes information about fattening, production costs, transportation costs, prices and market locations, this questionnaire focused on perceived climate change and responses to this over the past 10 to 15 years, vulnerabilities to climate extremes, responses to identified climate and other shocks and future climate change (see Appendix 1 for data collection tools).

The survey was implemented in two out of seven districts in Karamoja, Nakipiripirit and Amudat. Sampling was undertaken particularly in five sub-counties including the two town councils of Amudat and Nakapiripirit, in order to take advantage of the markets taking place on survey days. These locations were selected for their representativeness as areas with high numbers of livestock-holding households as well as for logistical reasons. First, enumerator training was conducted for 10 enumerators (five per site) and data

collection tools were finalised. On 3 and 4 March 2017, 60 respondents were interviewed (30 per site). These included a total of 24 producers (i.e. pastoralists), 12 processors, 18 transporters and 6 traders. By proportion 40% of the interviewed respondents were producers, 30% transporters, 20% processors and 10% traders. The interviewees were selected using purposive sampling, strategically targeting designated market days (Friday) and market locations (Karita, Amudat and Loregae, Nakapiripirit) where large numbers of actors across the entire value chain could be found. Two research assistants from Makerere University (one per site) and the project team supervised the survey. The tools were written in English but translations were later prepared in the local language.

In addition, the projections of average temperature, rainfall and extremes for each region (as outlined in the IPCC's Fifth Assessment Report) were considered alongside this primary data on perceived climate changes, impacts and vulnerabilities to qualitatively assess climate risk at each step up to 2050.

Step 3: Identifying options for adaptation and investment

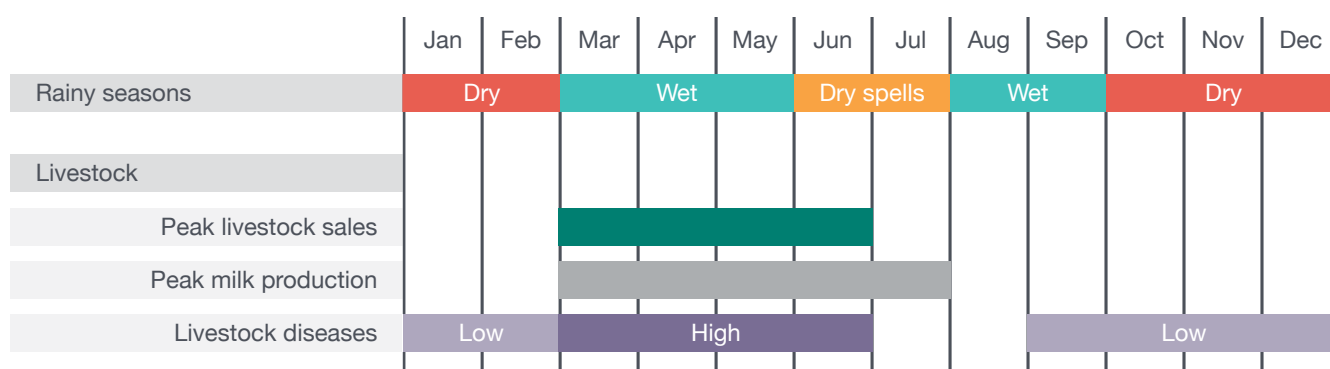
Adaptation measures identified by actors were examined in Step 2 to explore specific options for addressing climate risk and trade-offs associated with transformation at each level of the livestock value chain. This involved identifying: 1) measures to manage climate risk that also have the

potential for value chain promotion and upgrading; and, 2) opportunities for public and private sector investments in value chain transformation and services. During this step, final findings were drawn from the survey results and the research team worked together with stakeholders and actors in the value chain to identify potentially viable adaptation options. Particular attention was given to the modalities of access to and use of information in decision-making on climate-resilient interventions, including early warning information, market information, traditional knowledge and opportunities for learning about new practices.

A second workshop was held on 11 April 2017 after completion of the data collection and analysis. The workshop targeted a wider range of stakeholders, including development partners and government officials. The aim was to report back on the findings of Steps 1 and 2 and to discuss how concrete adaptation options can be brought forward in Step 3. During another round of focus group discussions, participants were asked to consider the following questions:

1. What can pastoralists do to enhance their livestock business?
2. What can be the roles for traders and transporters in upgrading the value chain?
3. What do processors need to do to enhance their livestock business?

Figure 4. Seasonal calendar in Karamoja in a normal year



Source: Levine, 2010

3. Results and discussion

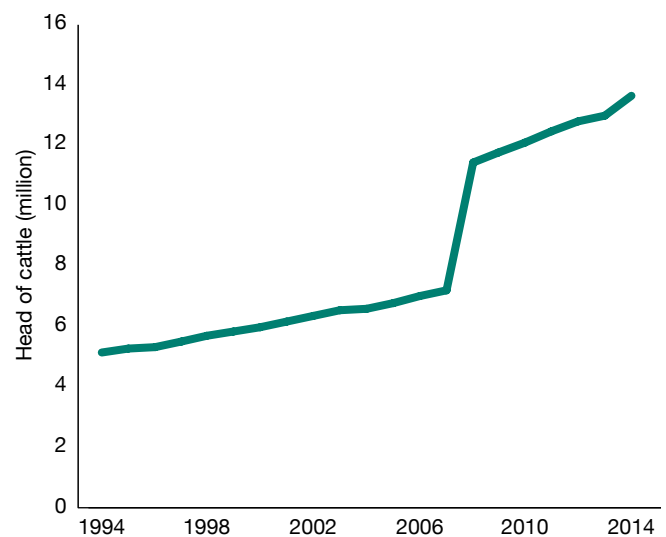
Available livestock statistics indicate that cattle production in Uganda has increased significantly since 1994, with a boost in production from 2007 (see Figure 5). Similar figures are not available for Karamoja but official figures estimate current cattle numbers at approximately 2.3 to 2.7 million head (Uganda Bureau of Statistics, 2016 cited in Lwasa et al., 2016), or a fifth of the nation's livestock production (ICPALD, 2013).

There are tacit indications that national governments in the Horn of Africa underestimate the contribution of livestock to their economies through trade; even though livestock trade driven by pastoral production systems in the region is estimated at \$1 billion for 2010 alone (Catley et al. 2013). While exports of cattle in Uganda appear to have risen in line with production, these have been unstable in recent years (see Figure 6), relative to the Africa region. In 2011, the Horn of Africa region suffered a severe drought shock, which may explain the sharp decline in exports at this time, as well as the slight increase in imports to meet demand. As high export and import volatility is correlated with drought, these trends indicate a lack of capacity to cope efficiently with shocks. This limited ability to cope is indicative of significant structural inefficiencies, as well as the predominance of informal trade in this sector.

One study (ICPALD, 2013) has shown that if informal economic activity in the livestock value chain were considered, the sector could have contributed as much as 87% more to Uganda's GDP than government estimates for 2009. This contribution to GDP would be more than the contribution of cash crops or fishing, and would

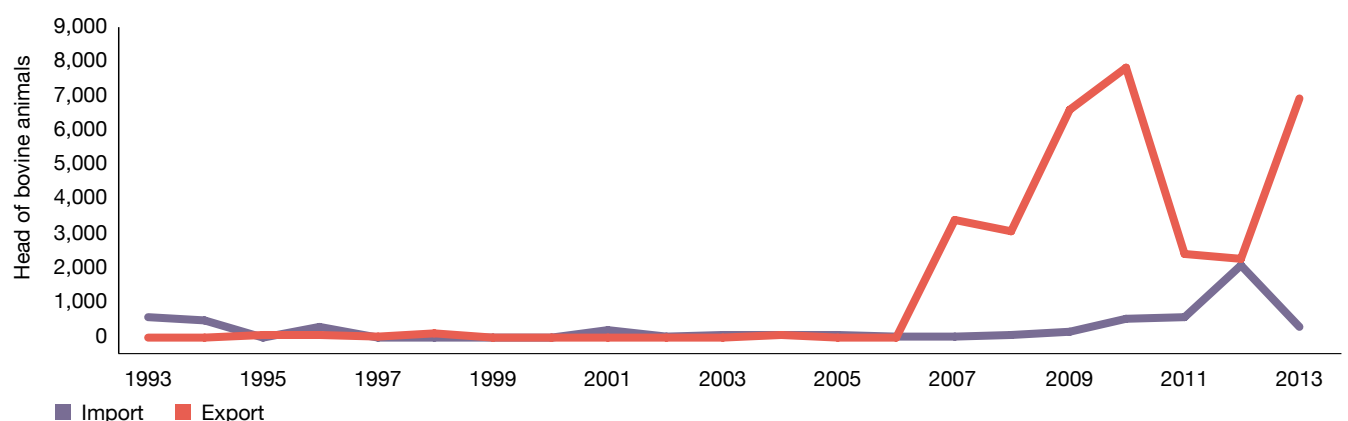
approximate 25% of the value of food crop production in the economy. In Uganda, it is known that there is a significant informal internal and cross-border livestock trade, which supports the livelihoods of pastoralists and those supplying supporting services. For example, the informal financial services for livestock that provide sources of credit and insurance are a robust risk-spreading mechanism in Uganda because the formal sector is still limited in rural areas (ICPALD, 2013). The value of these services is substantial but not captured by national accounts.

Figure 5. Production of cattle in Uganda 1994-2014



Source: FAOSTAT, 2017

Figure 6. Import–export trends for bovine animals in Uganda 1993-2013



Source: FAOSTAT, 2017

As stated in the introduction to this working paper, the Karamoja region produces approximately 20% of Uganda's livestock (ICPALD, 2013). Indeed, the returns per hectare of land in pastoral areas of Karamoja are estimated to be nearly seven times higher than returns from ranching systems in south-western Uganda (ICPALD, 2013). Despite several studies, the knowledge about contributions of livestock to the national pastoral economies is inadequate; and there are strong indications that these contributions are grossly undervalued. Participants in the first workshop reported that the weekly market in Moroto generates 20,000 Ugandan Shilling (UGX), or approximately \$5, in tax revenue for the municipality per cow sold, with an average of 80 to 90 cows sold per week. Therefore, livestock is already a significant revenue earner in an area with limited local economic development.

Step 1: Mapping the value chain

The value chain mapping presented in Figure 7 is informed both by review of secondary documents and collection of primary data from the field through structured interviews using questionnaires and focus group discussions to capture support functions, constraints and opportunities that influence the value chain. Interviews were conducted with key stakeholders along the value chain. Derived estimates for product value along the chain are based on indicators including: total costs; price per unit; gross sales value; profit margin; profit per unit of production; costs per unit of production; and, profit as a proportion to gross value (Lwasa et al., 2016).

Extensive livestock systems, such as those that operate in the Karamoja region, are characterised by marketing chains that feature long distances, numerous phases of weight gain due to feeding regimes, multiple categories of traders and transactions, a multitude of processing stages, and a variety of employment-creating services and inputs (Rich et al., 2011). By serving a variety of consumers, the delivery of livestock products through markets exploits the potential of creating multiplier effects for development interventions (Rich et al., 2011), in which each actor in the chain makes a profit (Pica-Ciamarra, 2005).

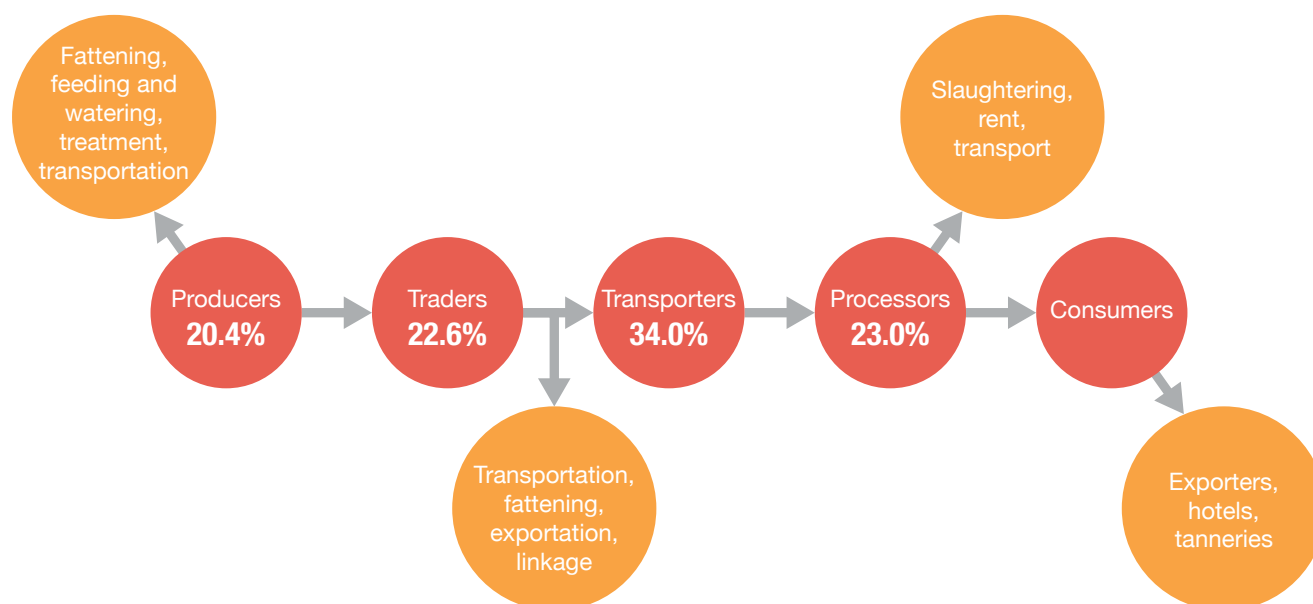
In the case of live animals, the farmers acquire calves or bulls for fattening and treat the animals after a period ranging from six months for sheep and goats (shoats), to several years for bulls. Depending on the reason for selling, the animals are put on weekly livestock markets in designated locations (Table 1) where buyers and sellers negotiate on prices directly or via brokers/traders.

Table 1. Main livestock markets in Karamoja

District	Location
Abim	Bartanga, Mak-lati
Kotido	Kanawat, Nakapelimoru
Kaabong	Komuria, Kapedo
Moroto	Naitakwae, Koodonyo
Napak	Kangole
Nakapiripirit	Namalu, Loregae
Amudat	Amudat town centre, Karita

Source: Karamoja Development Forum

Figure 7. Karamoja general livestock and meat value chain mapping (including share of value added)



Source: Lwasa et al., 2016

Live animals are sold to traders or processors with the latter transforming the product by slaughtering and selling meat, offal and other products to consumers. Consumers include hotel operators, household consumers and buyers of skins and hides. These skins and hides are then often sold to traders who take them to tanneries outside Karamoja.

The process is not linear because there are loops between processors and herders as well as herders and consumers. There is also significant seasonal variation as well as informal economic activity, such as selling livestock outside designated market days. Thus the market flows give a broader picture for estimating the value at every stage, comparing costs and market values. An important aspect in the value chain analysis is the under-estimation of costs at production level because all inputs, including time for grazing, are not valued in monetary terms.

With respect to Step 1, we learned that there are several informal pathways in the livestock value chain that had not been recognised previously. For example, there is significant local, informal trading that takes place between leaders of kraals (livestock holding areas) and other herders at producer/local trading level. The role of women was also not well captured in the traditional value chain analysis approach. Through the explicit consideration of gender in the VC-ARID methodology, it appears from participants that women do play a role in the management and sales of livestock that may be important to consider in developing adaptation options. For example, in some cases there is joint ownership of the animal between a kraal leader and his wife such that the decision to sell an animal must be agreed. These findings point to sources of adaptive capacity in the value chain to inform Step 3 – identifying adaptation and investment options. As such, the value chain mapping has been consolidated from the five versions constructed by workshop participants and updated to include the characteristics of the VC-ARID methodology. These are presented in Figures 8 and 9.

Broadly, actors in the livestock value chain include:

- producers, who in the case of livestock, are often the owners;
- traders, who collect livestock from kraals, and on market days, complete transactions;
- transporters, including those who trek the animals on foot or ferry them on trucks outside Karamoja (e.g. Mbale or Kenya);
- processors, which include slaughterers; and
- consumers of meat and skins / hides, who constitute much of the Karamoja population but are not widely spread outside the region.

Table 2 presents the survey sample by value chain actor. It is important to note that these actors are Karamojong regardless of categorisation, so many are active at more than one level of the largely informal value chain. For example, the majority of traders are also producers. All respondents were asked the same set of questions (see Appendix 1).

Table 2. Sample size by value chain actor

Actor	Frequency	Proportion (%)
Producer	24	40
Trader	6	10
Transporter	18	30
Processor	12	20
Total	60	100

The survey results demonstrate the current functioning of the value chain with respect to inputs, production, support and enabling services and transportation and market access. These are discussed in the following sections. Results are presented for the full sample size (n=60) spanning all actors.

3.2.1. Inputs and production

Feeding systems for livestock in the region are still very dependent on natural pasture, which is also influenced by weather and climatic conditions. When questioned about the services that support their production, the majority of actors interviewed (87%, n=60) acknowledged that access to grazing areas was key.⁴ Access to grazing areas is possible when needed as reported by 63% of the respondents and only 5% replied that they do not have access to such grazing areas. This is attributable to the fact that in both districts surveyed (which are indicative of the Karamoja region as a whole), there are communal grazing areas accessible by all, with only a few restricted areas around mining zones and conservancies. Only 3% of respondents reported having access to fodder and improved animal feed, with 78% reporting no access.⁵ That said, only 39% were satisfied with their access, with 33% partly satisfied and 12% not satisfied.

Another key input for livestock production is water; 90% of the respondents acknowledged access to water for animals.⁶ The water is available from natural sources but also complemented by valley dams that have been constructed to harvest rainfall and storm run-off to provide water during dry periods. One example is Morurita valley dam, located in Amudat district, accessible to herders from around the sub-counties. Although there

4 8% did not respond to the question.

5 17% missing values.

6 10% missing values.

are other valley dams in the region, these are not spread optimally, presenting a challenge to some herders who have to trek long distances with animals for watering. A quarter of the respondents noted that water is sometimes not available when needed. Although some pay to access the dams for water, many do not have to pay for accessing water. Nonetheless, only 28% are satisfied with access to water, with 40% partly satisfied and 15% not satisfied.

Veterinary inputs are widely accessible with 90% of the respondents acknowledging that they have access to drugs for livestock. This signifies improvement after several years of investing in animal health services by different actors, including extensive training of community animal health workers in the region. However, when asked whether the drugs are available when needed, 51% of the respondents acknowledged timely availability while 30% reported delayed availability. Some respondents get the drugs from government agencies directly while 5% receive the drugs from the weekly markets.

3.2.2. Support and enabling services

Product development for the market depends on the enabling functions or support services that are the basis of efficient production systems, including veterinary services, financial services, market and early warning information.

Veterinary services

Disease surveillance and vaccination services appear to be functioning through community institutions for managing animal health, whereby kraal leaders and herders are part of the system for disease surveillance. The majority of respondents (63%, n=60) acknowledged access to this system for disease surveillance and vaccination but a sizeable proportion of the sample (23%) reported that they do not have access. A total of 40% of respondents across the value chain are satisfied with the disease surveillance and vaccination services provided, while a similar proportion of those who responded to this question are not satisfied.

Disease surveillance is not only relevant for producers in the value chain, it is equally important for traders and transporters as it affects the quality of the product. However, there are restrictions on disease surveillance imposed by the administration. Local government are mandated to regulate disease outbreaks and quarantines are usually imposed on animal movement when this is reported, affecting all levels of the value chain. In response to disease outbreaks, different livestock programmes, in partnership with the private sector, have supported drug access systems.

Other services like artificial insemination for product enhancement is of limited use in the surveyed districts. Only 1.7% of the respondents knew about artificial insemination, illustrating that local breeds are still the main products of the livestock value chain.

Financial services

Most respondents (70%, n=60) reported that they have no access to financial services and only 25% reported that they did. Access to financial services is vital at all stages of the value chain from production to final sale of live animals or transformed products like meat. Financial services like loans and credit can enable enhancement of the products along the value chain and expansion of business. This seems to be a critical issue in enhancing the adaptation of the livestock value chain and can determine how other enabling services like drugs, improved breeds and costs for transportation to markets with higher value can be better provided. Of those responding, 48% emphasised that financial services are not available when needed.

Market information

As regards market information, most respondents reported that they do have access to this information (68%, n=60), while 30% do not have access. Market information is vital for determining the value at which producers and traders can sell live animals. Among the respondents, 55% reported that this is available in a timely manner, 10% reported that it is delayed and 21% reported that it is not available at all. Around a third (33%) of the respondents were satisfied with the market information and 25% partly satisfied. Access to market facilities is also important and is paid for in the range of 2,000 to 10,000 UGX per respondent. This cost mainly covers access to the gazette area, where exchange of live animals and products takes place, and is in addition to the dues paid to the local government who manage the market. Every district has one major physical market where live animals are exchanged and the majority of respondents (68%) reported having access to the market facilities. Regarding satisfaction levels, 56% reported that they were satisfied with the facilities and 11% reported being partly satisfied. This relatively high level of satisfaction could be related to the upgrading of markets with support from institutions working in the region.

Weather and early warning information

Another key service for enabling the livestock value chain is information regarding weather. This information is vital for the producers, transporters and traders, but may be not as important for the processors. Producers need weather information, particularly early warning information, to determine the decisions regarding grazing and migration if necessary. Only 31% of the respondents acknowledge access to an early warning system and information regarding weather conditions.

Only 23% of the respondents (n=60) reported that early warning information on weather is available on a timely basis and 35% said it is not available. Some respondents reported that this information is delayed and 5% reported that it is not easily available. Of those who access early

warning information, 20% are satisfied with the information and 5% are not satisfied. The information is received largely through public media, and as a result, no payments are made in exchange for the early warning information.

3.2.3. Transportation and market access

Most respondents reported transporting live animals for a distance of between 1 km and 35 km, with these distances covered by all actors in the value chain. For producers, the kraals tend to be located remotely from the location of the home. Traders tend to try to buy the animals directly from or close to kraals to obtain a cheaper price and then transport these mainly on-the-hoof or by truck. Transporters move live animals long distances to the final markets where they are sold. Only a few respondents transport animals by truck and these are mainly the larger traders from outside the region. Processors within the region use motorcycles and wheelbarrows to carry meat to their processing units. The costs for transportation differ depending on the mode of transportation, between 2,000 and 20,000 UGX per animal. But the quality of roads and routes used is important in influencing the transportation costs. Among respondents, 41% reported that the roads are fair and 24% reported the roads as being poor or bad. Transportation to markets has an influence on how far the producers and traders can go to access those markets where the value of the animals could be priced higher.

3.2.4. Commercialisation of the value chain

At the workshops that took place in March and April 2017, the communities and stakeholders underscored the importance of livestock with key statements such as *‘livestock is close to our life’* and *‘inside my bloodstream’*. Several members of the community cancelled another workshop in order to attend instead. These decisions indicated a strong sense of motivation to contribute to the search for tangible options for adaptation and climate-smart investments in the livestock value chain.

Overall, it was clear that the level of commercialisation of the livestock sector in Karamoja is low but burgeoning. Many stakeholders noted the need to shift the mindsets of both policy-makers and pastoralists. Policy-makers at national and local levels tend to perceive pastoralism as unproductive and instead promote alternative livelihood strategies; that may be maladaptive, whereas pastoralists themselves still prioritise quantity over quality in their animals. Participants appreciated the need to reduce herd sizes and to increase productivity through investing in higher quality animals. It was also noted that expansion of arable agriculture over the past decades has aggravated grazing pressure and intensified the demand for stock reduction and herd productivity improvement in the Karamoja region.

Figure 8. VC-ARID Karamoja cattle value chain

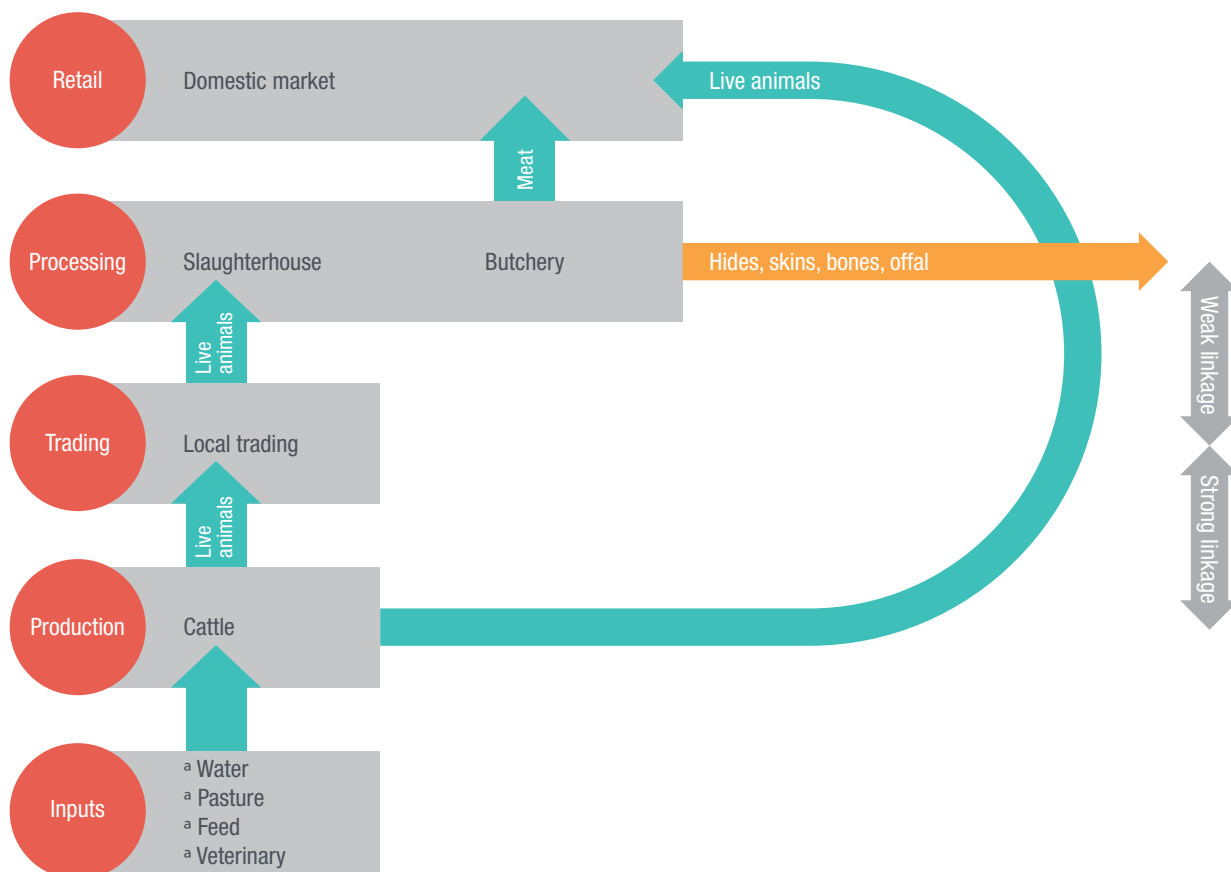
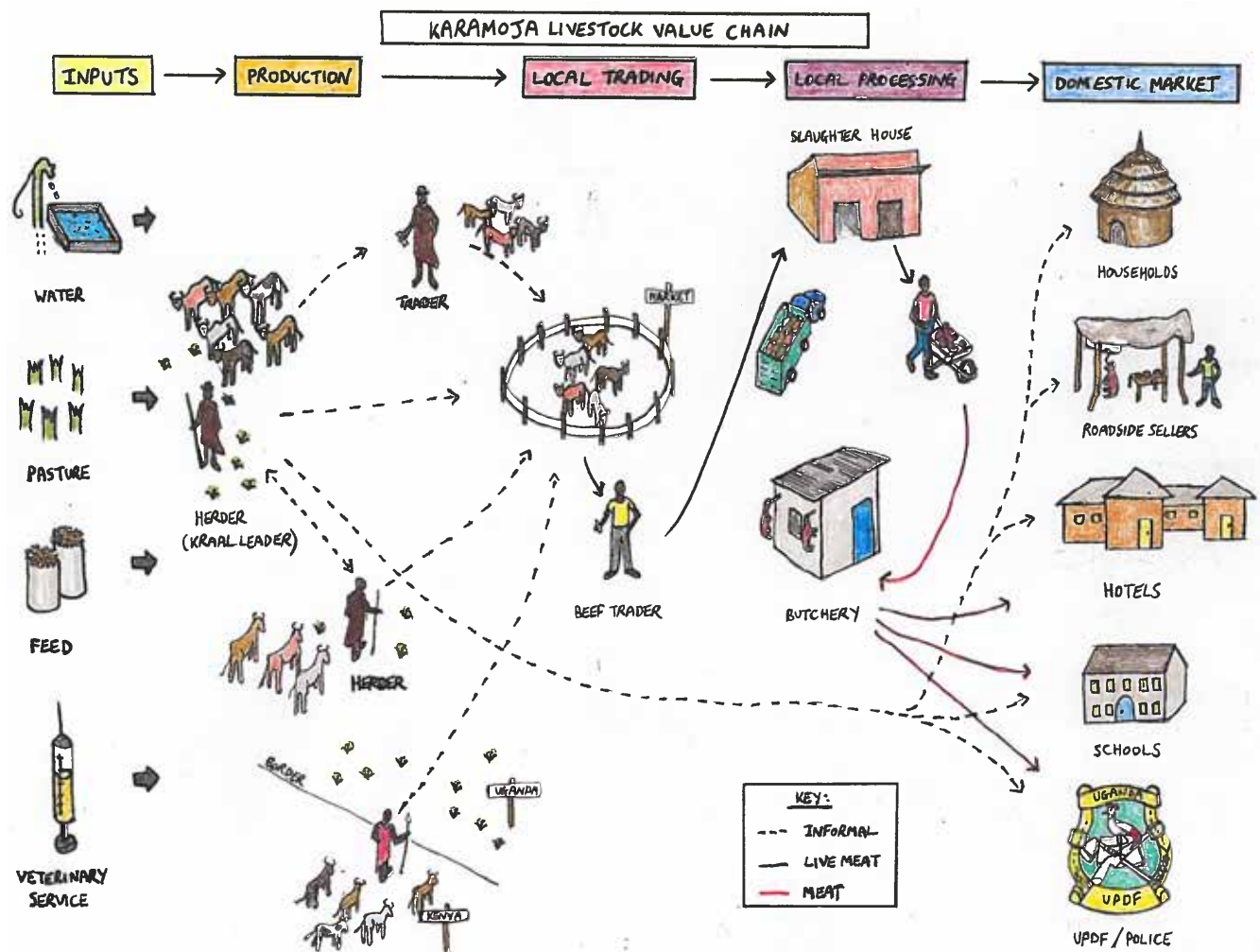


Figure 9. VC-ARID Karamoja interactive value chain mapping



Step 2: Assessing climate risks

From the first workshop, we learned that climate risks are perceived primarily as extreme events, mainly drought, and are not viewed as distinct from other risks including environmental degradation, land use change and conflict. The issue of land tenure in particular was closely linked to the experience of and responses to drought. Conflict was discussed as a significant covariate shock that affects the Karamojong in times of drought. Primarily, this occurs when Turkana and Pokot herders cross the border from Kenya in search of pasture and water for their herds.

Existing coping mechanisms and adaptive capacity centre around selling animals when times are difficult, trading with neighbours and relying on social networks and reciprocity to cope with idiosyncratic shocks. Participants also described food preservation techniques employed by households to avoid slaughtering animals. Alternative livelihood activities, such as seeking employment in urban centres and burning charcoal, were

also cited as strategies for managing climate risk. Several examples of local knowledge in predicting weather were provided, including strong winds as signifying above-average heat conditions. One participant explained that *'in Karamoja when rain is coming the mountains become closer'*, due to atmospheric moisture acting as a magnifying lens. However, early warning systems and access to climate information seem to be limited.

The focus group discussions yielded lists of clear, tangible options for improving the livestock system in Karamoja and some of these are related to climate change adaptation. These include: protection of grazing corridors through secure land tenure; provision of water infrastructure such as dams; strengthening of agro-pastoral systems such that crops can be produced in rainy seasons and fodder stored; better livestock pricing using weighing scale systems; diversification of livestock products; access to credit; improved marketing; better transportation and access to markets; capacity development for pastoralists just emerging from a protracted period of conflict and

civil war; robust stakeholder engagement and stronger policies from government to support livestock production and pastoralism; and, promotion of peace and security to enable mobility and new settlements to be opened up. Across the participants, there was strong criticism of current stakeholder engagement processes in policy processes and planning. It was felt that national and local government, as well as international NGOs and donors, are not adhering to community consultation processes such that interventions are not joined up and knowledge is not transferred between stakeholders. Incorporating customary knowledge and institutions into decision-making was mentioned as an important principle of strengthening stakeholder engagement.

The survey implemented in Amudat and Nakapiripirit has also revealed information about how climate and other risks are perceived and experienced by actors in the value chain, as well as some of the measures taken by these actors to respond to and manage risk.

3.2.5. Perceptions of climate risk

Respondents were asked about climate risks experienced in the last 10 years as well as their experience of a particular drought event that is known to have occurred in the region. What is reported here are changes in rainfall, temperature and extreme events as perceived by respondents (as opposed to objective climate observations), as well as the impacts experienced and actions taken to manage climate risk.

Rainfall trends

The majority of respondents (88%, n=60) noted that there has been a change in rainfall patterns. Of these, 40% have perceived this change as a reduction in rainfall while 10% have perceived prolonged dry spells and 5% have noted floods due to extreme rainfall events. Only 10% did not note any change in rainfall in the past 10 years. Of those who perceived changes in rainfall, 82% reported impacts on their livestock. Most of these (20%) reported impacts on livestock due to inadequate water and pasture, followed by loss of livestock (10%), loss of condition of livestock (10%), difficulties accessing markets (10%) and reduced market prices (10%).

Most respondents, especially producers, have managed these risks by travelling longer distances in search of water and pastures (31%, n=60). Others have shifted production to sheep and goats (6%), which require less pasture and water, reduced the number of animals in the kraals (8%) or sold the animals that were about to die due to lack of water and pastures (5%). However, a notable proportion (23%) did nothing in response to perceived changes in rainfall, which signifies the level of climate risk that value chain actors are able to manage currently. Reasons provided include that respondents have no knowledge about ways in which to deal with changes in weather conditions.

Temperature trends

With respect to temperature, most respondents (92%, n=60) reported perceived changes as either heat waves and increased temperatures (77%), general fluctuations in temperatures (7%) or windy and hot days (2%). Of those who perceived a change in temperature, 87% reported effects on their livestock. These included drying of pastures and water dams (38%), disease outbreaks (11%), loss of condition by animals (11%) and long distances trekked in search of water and pastures (7%). However, a small minority (3%) reported a positive effect on prices for meat during these periods when decreased supply causes prices to increase.

In order to manage changes in temperature, respondents move the animals to areas with more pasture and water (32%). This is a traditional practice of seasonal migration that has maintained the livestock system in a variable climate. A few people (3%) have reported that they have planted trees in their areas to try to combat increasing temperatures, while others vaccinate the animals against diseases known to occur during dry periods (5%). However, a large proportion of respondents do nothing in response to perceived changes in temperature (38%). Reasons provided for this lack of action include lack of support or knowledge, or acceptance that this is a natural occurrence to be endured.

Extreme events

Almost all (98%) of the respondents (n=60) reported that extreme weather events have affected their livestock. Of these shocks, drought has been the most significant (57%, n=60), followed by floods (17%), dry spells (8%) and out-of-season rains (3%). In the past 10 years, respondents reported that livestock has been affected by these events between four and seven times. The impacts of these shocks on livestock have included death of animals (26%), reduced prices of animals (13%), increasing diseases (11%) and slowdown in business as result of the effects (5%).

Again, the most widely practised response to these extreme events is migration of animals to areas with pastures and water. For example, animals move from Karamoja to Teso and Acholi lands. Conflict is a risk associated with increased movement and although traditional methods for managing migration and resolving potential conflicts remain, recent changes in administration, security issues in the region and activities like mining, have affected traditional mechanisms for resolving conflicts. Because Karamoja experiences higher rainfall relative to Turkana in Kenya, pastoralists also migrate into Karamoja from that side and onwards to Teso or Acholi land.

3.2.6. Observed climate change in East Africa

The perceived changes in temperature, rainfall and extreme events correspond well with the observed changes in climate. According to the IPCC, there has been a significant increase in temperature in southern parts of eastern Africa since the early 1980s, with seasonal averages rising in many areas. Reduced rainfall has been observed in eastern Africa between March and May-June in the past 30 years and droughts and storms have become more frequent in the past 30-60 years (IPCC, 2013).

3.2.7. Responses to the 2009/2010 drought

When referring to the 2009/2010 drought that affected the Karamoja region, most respondents reported that their livestock businesses had been impacted (80%, n=60). In response, 30% did nothing while 35%, especially traders and processors, said that they had had to cease business activities for a period of time. A few reported that they had sold off animals (8%), while some traders (2%) reported increased activity during that period.

Most respondents did not get any warning on the drought (75%) and for those who did receive the early warning information, it was via government. Since the drought, only 30% have changed their businesses by keeping fewer numbers of animals (8%), moving or migrating animals to other areas for pasture and water (8%) or getting more regular treatment for animals (3%). Half of respondents have not made any changes. Only 8% have reported receiving support during and after the drought. The type of support received was mainly provision of water dams and some food relief for affected households. But of those who reported having received support, only 5% reported that the support enabled their business to recover.

Respondents have reported that few improvements have been implemented since the 2009/2010 drought. Improvements that have occurred include provision of water dams, mass vaccinations and other animal health services. For example, the community animal health workers' programme has seen a growth in the number of community-based individuals who can support producers with veterinary information and technical support. Most respondents reported that climate change adaptation action should include construction of more water dams, opening of new markets, better provision of drugs, improved extension services and development of livestock as a business.

3.2.8. Vulnerabilities

As well as reporting vulnerability to climate change and climate variability, there are other factors that contribute to vulnerabilities. Since the last drought, respondents reported experiencing conflict (70%, n=60), increased price of inputs, particularly drugs (62%), disease outbreaks (82%) and household problems⁷ (60%). The most significant shocks reported by respondents include insecurity (16%), livestock disease (43%), rise in food prices (7%) and a combination of these covariate and idiosyncratic risks. Responses to manage risk have included buying drugs, reporting insecurity issues to authorities, selling animals and shifting production to goats. Nearly half of respondents reported that they do not receive help from any source (48%), while small numbers seek help from government (11%) or from relatives and friends (7%). This implies that there is a limited range of actors that can offer support in the event of a major shock.

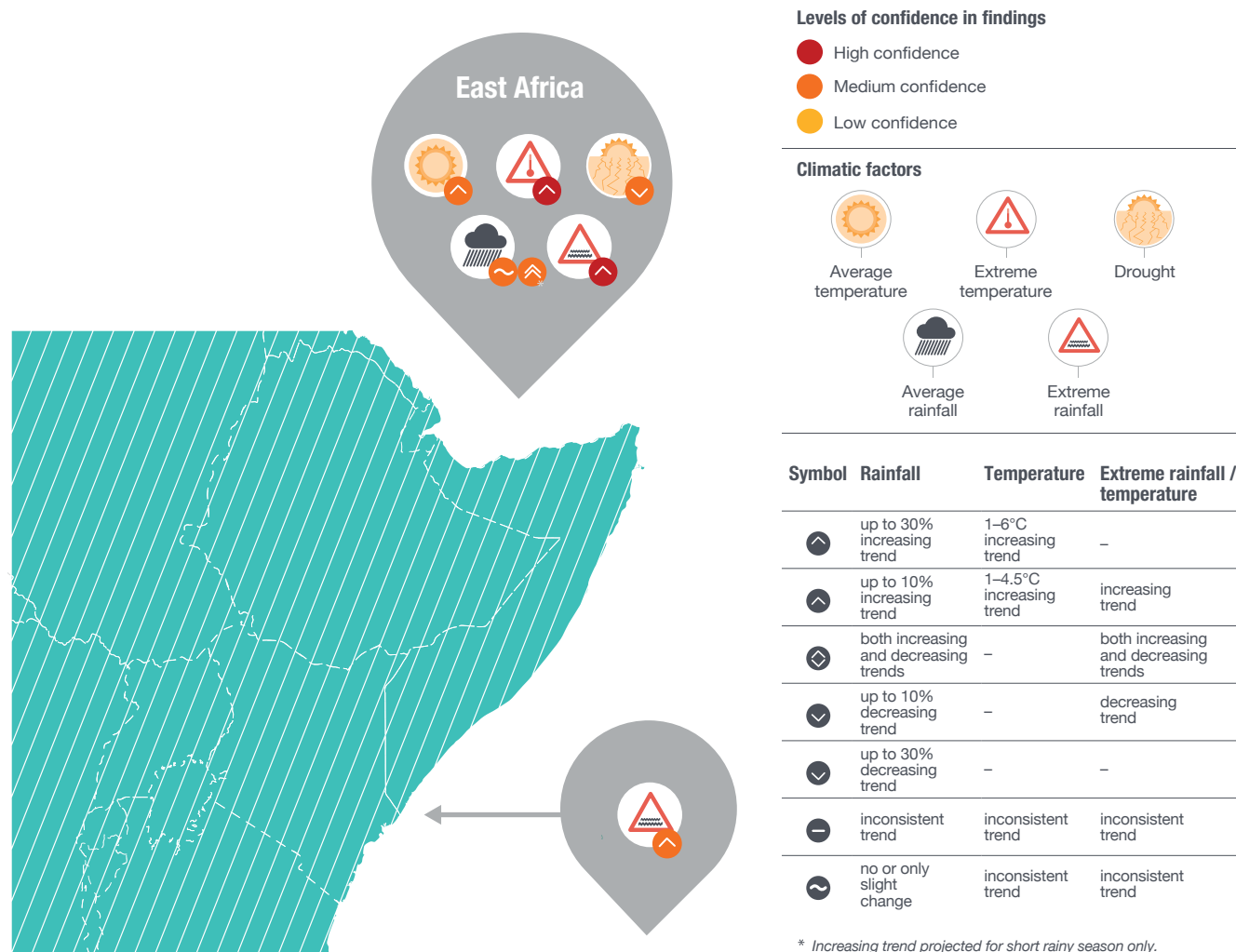
3.2.9. Future climate change

Climate projections for medium- to high-emissions scenarios indicate that maximum and minimum temperatures over equatorial East Africa will rise and that there will be more warmer days (compared to baseline temperatures) by 2050-2100 (IPCC, 2013). Regional rainfall projections suggest that most parts of Uganda will be drier in the dry season by the end of the century (IPCC, 2013). It is likely that there will be more extreme rainfall over the region by 2050 and an increase in frequency of hot days in the future (IPCC, 2012). Figure 10 indicates projected future trends in temperature, rainfall and extreme events for East Africa.

When asked whether they would be better able to cope with a drought like 2009/2010, 55% of respondents answered no and 42% answered yes. For those that answered yes, the reasons provided were construction of water points (13%), improved animal health services (8%) and improved livestock breeds (3%). Nonetheless, respondents stated that more watering points are required to manage future droughts (33%) and access to markets (3%) and services (3%) need to be improved.

⁷ Defined as sickness, death of household member or livelihood failure.

Figure 10. East Africa future climate trends



Source: Carabine et al., 2014

Step 3: Identifying options for adaptation and investment

During the workshop focus groups and survey, a range of value chain actors and key stakeholders were asked to recommend adaptation options to help them manage the risk they are experiencing and to develop income-generation opportunities.

Several concrete recommendations have emerged that were supported across the research participants. These include establishing farms for fattening (which could be managed by women’s groups or cooperatives) for short production cycles (approximately eight months). At the same time, production of fodder for local use and national and international trade can take place. It has been proposed that this take place in parallel with the development of

kraal-based businesses that aim to add value to cows traded with South Sudan and more profitable markets located further away. The potential of ‘fifth quarter’ products such as horns, hides and yoghurt should also be explored.

Another option identified was diversification into other livestock species such as goats, which can have the added benefits of clearing grass residues and reducing wildlife risk and the need for burning in the dry season. To enable such transformation of the value chain, infrastructure and transportation regulations will need to be improved and border crossings made more efficient for trade.

During the course of the research, these options were developed and refined into a set of recommendations to take forward for consideration. Table 3 outlines the options identified.

Table 3. Adaptation and investment options for the Karamoja livestock value chain

Value chain actor	Options
Producers	<ul style="list-style-type: none">• Formation of producer associations• Capacity-building in entrepreneurship skills• Technical training on livestock selection, breed improvement and multiplication• Improved livestock husbandry• Improved pasture production and management• Measures for fodder/pasture conservation• Soil and water conservation• Promotion of water harvesting technologies• Identification of untapped markets for livestock products (meat, milk, hides, skins)• Measures for improving livestock quality and sales• Advocating for favourable livestock policies via local civil society• Creation of linkages and coordination with development partners• Improved technical support from extension staff, opinion leaders and community-assisted health workers• Mechanisms for learning and sharing information• Improved access to financial services and credit (Savings and Credit Cooperatives (SACCOs), village savings and loans associations (VSLA), micro finance)• Promotion of public-private partnerships• Improved processes for stakeholder participation in decision-making• Development of niche activities that include women (e.g. fodder production, fattening)
Traders and transporters	<ul style="list-style-type: none">• More formalised travel permits, quarantine and traceability for animals• More formalised trade/business options• Provision of specialised transportation for animals (i.e. trucks)• Formation of trader cooperatives to access services, especially credit facilities• Provision of holding and resting grounds on routes to terminal markets (e.g. at Jinja)• Establishing market information systems• Further research regarding the value of local markets but also externally to Karamoja• Initiatives for capacity-building• Advocating for bye-laws on taxation and other related issues• Creating linkages to producers and systems for aggregating animals for sale
Processors	<ul style="list-style-type: none">• First priority for product development should be beef, due to competitive advantage in the region• Formal mandate from government to operate• Capacity to conduct fattening at processing sites to increase quality• Provision of premises, infrastructure and facilities• Better certification and Sanitary and Phytosanitary (SPS) inspection with veterinary officers• Improved slaughtering practices• Explore potential of Karamoja branded beef and possibility of developing cold meat chain with packaging• Improved transportation services• Diversification of livestock products to include skin, hides etc. with appropriate practices• Conduct a milk market survey in order to best provide cooling equipment

4. Conclusions

The workshops revealed that the local cash economy is not well developed at producer level, as there is still a high level of dependence on aid assistance and relatively few household costs that require cash in the remote areas of Karamoja. However, livestock is currently the biggest revenue generating activity in the area (via local market tax receipts). Clearly, there are opportunities to expand market access and participation as well as integration of the local markets with larger markets in Kenya, South Sudan and within Uganda where there is demand and greater value addition. Supply in Karamoja could potentially benefit from the annual influx of herds from Turkana, in Kenya, in search of forage, which is more abundant on the Uganda side in the dry season. Currently, this in-migration is understandably the cause of tension and resource conflict between the Karamojong and Turkana herders.

In general, the direct impacts of climate change on the quality and quantity of production and prices are well understood at producer level. However, there is limited knowledge on how to adapt to climate risk beyond current coping mechanisms. Taking into consideration the climate projections up to 2050 of increasing temperatures, increasingly variable rainfall and increased frequency, severity and duration of drought, it can be assumed that these pressures will only increase, as well as being exacerbated by other socioeconomic and environmental risks. Where adaptation action is identified, producers have limited capacity to put this into practice, due to lack of knowledge, financial resources or both.

The VC-ARID mapping has revealed that there is a disconnect between producers and terminal markets, either national or international, that leads to incommensurate price inequalities. Thus producers receive unfavourably low prices and incur high transactional costs. This can result in unequal distribution of the added value along the chain (as can be seen in Figure 7). The disconnect indicates that there are opportunities for efficiency improvements along the chain by supporting greater vertical integration (e.g. through an improved enabling environment), while retaining the important characteristics of the production system that maintain adaptive capacity.

Currently, there is limited access to the benefits of international trade and export markets for the Karamoja region. Participants described low conflict periods in the 1960s and 1980s when large-scale trade was facilitated

between Karamoja and South Sudan and Kenya, when the economic conditions were more conducive to trade. However, it was noted that since this time the Ugandan market in general has become much more liberalised and new strategies for market development will need to be explored.

Constraints to value addition include poor infrastructure, inadequate provision of inputs, limited access to markets for producers and lack of appropriate regulations. This is reflective of the relatively marginalised position of Karamoja in the national economy. Another significant constraint in the value chain is access to and use of relevant knowledge, primarily around climate and price information. The majority of participants in the research cited that they did not have access to these types of information. Many of the characteristics that contribute to the resilience of the value chain, including access to grazing, informal trading activity and conflict resolution are key to managing climate and other risks. These forms of local knowledge should be complemented by other information systems to ensure an upgrading of the value chain that is both inclusive and climate-resilient.

Upscaling the value chain from national to international can be considered as a means of leveraging economic development. Exports can be key drivers of national economic growth and there are identified terminal markets in Juba, South Sudan and Nairobi, Kenya where demand for livestock products is not being met. Providing the disconnect between producers and markets can be overcome, livestock can be considered as a key pillar of the local and national economies in the future through improved connection to international markets.

Similarly, there is significant potential to upgrade processing facilities to add value and provide additional socioeconomic benefits including employment opportunities. The implication is that there are opportunities for upgrading the value chain, which could address some of the constraints at production and international market levels. For example, by harnessing the opportunities of urban growth, the beef value chain could be developed to meet increasing demand through vertical integration. There appears to be a competitive advantage for Karamoja beef, for which consumers reportedly have a preference due to its quality. Clearly, there are significant opportunities to improve the enabling environment for these sectors in ways that are also climate-resilient and inclusive.

5. Recommendations

A number of recommendations have emerged as a result of this research, generated together with stakeholders in Karamoja. In this section, we present specific investment options for the public and private sectors, as well as the donor community, with the potential to deliver adaptation and development co-benefits. These are organised under options for overcoming barriers to value chain integration.

5.1. Commercialisation of livestock production

Pilot demonstration of several identified market niches:

1. **Fattening lots:** identify kraals that already have castrated bulls; identify markets from outside Karamoja region; determine optimum fattening period; and improve inputs to ensure quality of bulls. Fattening would require several inputs for the business to thrive: hay and other improved feed; salt licks; animal health monitoring; and water. If a good source of bulls can be developed for fattening, the quality of meat would increase and higher prices fetched. Contractual fattening with processors could be considered to develop an extended market for bulls. Processors taking part in two VC-ARID studies being conducted in Kenya have stated a desire to see an equilibrium between extensive livestock production in pastoral herds and feeding lot systems, whereby livestock are fed intensively. In this way, they see supply can be smoothed during dry spells and drought, which will ultimately reduce prices enabling opportunities for export and entry of low-income consumers into the market. There is an opportunity to promote start-up feedlots, perhaps through development partners in the short term and private–public partnership longer term.
2. **Breeding:** simultaneously develop a livestock breeding value chain to sustain the supply of animals for fattening. Building on restocking and the livestock support systems in the region, local breeds adapt well to the climate and thus breeding with enhanced crossed breeds that are not exotic has a potential for business enhancement in Karamoja. For example, Borana cattle are an optimum breed for producing premium meat. Rather than state-managed breeding, an opportunity lies in private sector-led breeding in the region. Investment would be required to test out with a selection of breeders some of whom are already in business at kraal level. Technical support from agricultural research institutes could also inform this step.
3. **Fodder production:** organised production of hay and feed crops as inputs to fattening could also be another value chain linked to the fattening and beef value chains. Hay can be processed for storage and feeding during dry conditions and fed to animals for fattening, which would help to smooth the supply of live animals to market during these periods. There are wetter areas in Karamoja that can be considered as sites for hay production, including in Abim and Teso. This would make use of the extended wetlands by mixing indigenous grasses with wetland vegetation while supporting extensive livestock production. This is a more sustainable option than converting land use to other agricultural crops that are less drought-resistant and more input-intensive than livestock. Limited hay production is already occurring on the higher slopes of Mount Moroto but this is mainly for zero-grazed cattle. This burgeoning business can be stepped up to support feedlot businesses.
4. **Small ruminants and other livestock species:** potential to develop the market for sheep and goats, a possible opportunity for women and youth groups to gain employment as well as kraal herders. Goats require different conditions and timescales for production and mixing the composition of household herds in this way has been a strategy used by pastoralists in East Africa for managing environmental uncertainty. In Karamoja, there is already a growing business in camels and donkeys that is shaping investments and these products need to be studied further for feasibility and sustainability of production to supply the market. However, different livestock species have potential for negative environmental impacts if not managed appropriately (particularly goats, which are browsing herbivores). Stocking capacity for livestock species including cattle is needed through a study that would assess the dynamics of biomass and water in relation to livestock numbers. A controversial issue is the livestock numbers in Karamoja. Determining appropriate numbers of livestock should be a priority and the results of this census would then be related to the seasonal availability of biomass to determine the maximum stocking capacity for the region. This would help to ensure development of the sector is sustainable.

There is also a need to strengthen the enabling environment, including provision of supporting services like credit, insurance, animal health and market and climate information. Incentives should be provided to incentivise small and medium enterprises (SMEs) and larger private sector actors to enter these service delivery markets. Private sector actors and companies (e.g. financial institutions, processors, transporters) in Uganda and surrounding countries (e.g. Kenya) should be convened with government to discuss investment opportunities and options for overcoming barriers to entry in the market. Viable business cases should be developed to determine the business growth strategy, costs and targeted number of producers in the initial stages of piloting. In particular, knowledge about the implications on costs of inputs to these four value chains would be required, although evidence from similar initiatives in Kenya suggest there is profit to be made, providing the costs of market entry by private sector actors and companies can be managed.

5.2. Attracting private sector investment

Demonstrations of the above investment options should be implemented, complete with explanation of the processes of: product development (in this case beef); business plan development; capitalisation (financial services needed); risk assessment (including climate); insurance services (innovative transfer of risk); branding (traceability); collective marketing (to ensure stable prices); promoting the product; pricing the product; advertising the product; and, accessing consumer markets. There is leverage in the quality of beef from the region, which differs in taste from other beef in Uganda; if promoted this could open a niche on the market. Identification of markets beyond the Karamoja regional market and business plan development to ensure sustained supply of animals to the markets are both critical. Investment requirements include resources in order to plan and execute a long-term mindset change campaign through demonstrations that clarify the above processes.

5.3. Raising awareness at producer level

In order for individual actors to enter into these business opportunities, there needs to be a coordinated effort to promote the concept of 'livestock as a business' that can complement other sociocultural values attached to livestock in the region. Encouraging pastoralists to manage a proportion of their herd for commercial trading, alongside their traditional herd is a step towards shifting to production of higher quality, lower quantity herds that can boost productivity while maintaining the pastoral way of life. There are various ways to do this including a learning exchange between Karamojong stakeholders and counterparts in Turkana. This activity has been undertaken as part of this research, convened by the Karamoja Development Forum and the Kenya Markets Trust.

To build on this, there should be some investment in maintaining the dialogue between these neighbouring regions, including demonstration pilots. Discussion of this issue in existing platforms including elders' council meetings, Interest Group meetings and Karamoja cultural day can be introduced to initiate a process of mindset change. The investment would be a long-term investment over a period of more than three years. Development partners and extension officers also need to be trained to ensure they promote livelihood options that not only support subsistence, but are also climate-resilient and economically viable. Integration of the livestock value chain should be a priority over less appropriate land use and livelihood activities.

5.4. Market information for Karamoja

A survey of the livestock value chain in two districts of Napak and Moroto shows that annually, the gross sale value of livestock through these markets is estimated at approximately 812,000,000 UGX for cows, bulls and oxen. But an estimated 34% of the profits go to transporters who double as traders with producers gaining 20% on their investments. Yet these two are not the largest of the livestock markets in the region.

Indications are that the livestock value chain is economically valuable in the region but largely links to local markets and limited destinations outside the Karamoja region only. Opportunities should be explored to strengthen links to larger markets in Uganda as well as terminal markets in South Sudan, Kenya and possibly the Middle East, all of which are net livestock importers. Tapping the potential of these markets would require the breeding and fattening value chains to be enhanced and systematically developed by the business community.

Currently it is very difficult for pastoralists to access livestock market information. Pricing is therefore a major challenge to producers because prices at local markets are typically significantly higher than prices at terminal markets, with seasonal effects exacerbating the disparity. The price differences are due to distortions in livestock markets, including both physical and informational factors. Lack of price integration is partially explained by transportation costs, but there are also differences in the condition of animals at different markets depending on the distance travelled and access to feed and other facilities such as resting grounds, veterinary services and water supply.

Introduction of a market information system would help to promote price equilibrium between markets. Evidence shows that mobile phone ownership can increase the prices gained at local markets (Butt, 2015). Telecommunications infrastructure and mobile phone ownership is relatively high in Karamoja and this mode of communication can form the basis of market (and other) information systems in the region.

5.5. Financial services for pastoralists

Support to SACCOs, VSLAs and microfinance institutions can enable enterprise, product development, branding, traceability systems, promotion and advertising to reach out to the expanded market beyond the region and several cities where animals are currently sold. There are ongoing programmes by different actors in the region targeted at providing financial services, but to date these have not been tailored sufficiently to support extensive livestock production and pastoralist livelihoods that are structurally different to other agricultural systems. A study on the capital for these programmes, gap assessment and liquidity assessment would be useful to determine the investment needed to promote livestock enterprise.

Index-based livestock insurance is a product that is being implemented at a national level in Kenya after pilot programmes in northern Kenya and southern Ethiopia. Efforts should be made to assess the feasibility of implementation in Uganda and to engage Ugandan and Kenyan decision-makers in dialogue around financial services for pastoralism, including insurance.

5.6. Early warning systems

The IGAD Climate Prediction and Applications Centre (ICPAC) provides relatively innovative and timely information in 10-day and monthly intervals and for particular extreme events and their likely impacts. Food security information is provided by the Famine Early Warning Systems Network (FEWS-NET) in the region. However, as supported by the results of this research, access to timely and appropriate weather and climate information is highly limited in Karamoja. This should be a priority area for investment.

There is a need for installation of weather observation equipment in the appropriate locations. The UK Met Office is planning a project on forecasting focused on the Karamoja area and this would be an opportunity for synergies and collaboration of similar programmes.

5.7. Upgrading animal health services

The systems for community animal health workers (CAHW) in Karamoja have taken root and there is now a need to scale these up to involve district veterinary officers (DVO), CAHW and kraal leaders as well as herders in an efficient animal health service. There is existing investment in this area but it will require up-scaling to ensure productivity and sustained supply to the market, particularly to support traceability and SPS protocols.

Expanding the CAHW system would require additional training and development of field-based kits for diagnosis of simple health complications and first-line treatment by kraal leaders and herders. Capital is needed to improve disease surveillance, information flow and communication mechanisms to respond to disease outbreaks and treatment

needs. In Kenya, private sector investment in veterinary services has had early successes and evidence suggests pastoralists are willing to pay for improved products (Wellspring Development et al., 2014).

5.8. Increasing market access

There is an ongoing government programme to upgrade the road network in the Karamoja region. It will be important to invest in climate-proofing this new infrastructure to reduce the risk of damage from floods, especially the washing away of culverts and bridges. Connectivity is critical to level the costs of transporting products, increasing access to markets and enabling the growth of the business and market. However, in order for access to market to be effectively increased, the direct and indirect positive and negative impacts of climate-proofed infrastructure on the pastoral economy should be assessed (Carabine et al., 2015).

In Karamoja, there are three large water dams, several smaller dams and multiple water tanks using different technologies for collecting and storing water. The three large dams are located at Kobebe in Moroto, Moruita in Nakapiripirit and Lokitela'angitak in Napak. Constructing additional water dams instead of water tanks targeting livestock is an adaptation option that was discussed at some length with stakeholders and merits further attention. Water tanks can support small-scale irrigation and household use but livestock production needs sustainable water sources and the topography and hydrology of Karamoja appears to lend itself to larger water infrastructure than other arid and semi-arid lands in the wider region. For example, the option of assessing the feasibility of cascading dams along the major rivers especially from Moroto, Napak, Toror and Kadam would offer useful information for decision-makers about capturing excessive run-off during the rainy season.

Locating the feasibility of dams through a suitability assessment can identify whether there are other confluences of rivers that can be dammed for water storage. The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) has conducted such an assessment in Kotido but there are issues regarding land titles. Reforms to communal land ownership and the Land Act could help to overcome this barrier. Nonetheless, it will be important that long-lived infrastructure is not maladaptive in the long term under changing hydrological regimes (Jones et al., 2015).

5.9. Policy frameworks to support the pastoral economy

In terms of policy entry points, there are several that have been identified in consultation with stakeholders through this project and other research related to this working paper. The first is at subnational level, either Karamoja region or district levels. There is clearly a need for capacity-building at these levels, particularly around

implementation of integrated development plans in general and with respect to livestock. The second entry point is within the development partner group. Donors and international NGOs have organised themselves into a Karamoja Development Partners Group but this is very much an information-sharing platform rather than a coordination mechanism. Across the multilateral agencies and donors, there is recognition that there is little coordination between these and minimal steer from government, even though several are engaged in livestock-related programmes. The following are specific policy options for strengthening the enabling environment for the livestock sector.

1. **Karamoja Integrated Development Plan (KIDP):** there is a need for the planning process to be strengthened at regional and district level. Investments from donors and development partners need to be better coordinated around a vision or organising framework set together with the local government. The KIDP is seen as a planning process under which this could occur. The Office of the Prime Minister (OPM) unit responsible for developing the plan have agreed that technical support for the implementation of the plan would be very helpful in strengthening their relationship with partners and strengthening horizontal and vertical institutional arrangements.
2. **Karamoja Resilience Support Unit (KRSU):** related to the first point is a general demand for an improved evidence base around the livestock value chain. The KRSU is a partnership with Tufts University to act as a 'clearing house' for data and evidence relating to Karamoja. Development partners agree that technical support within the OPM to broker evidence and ensure government priorities are addressed would be useful, provided this facility responds to user needs with appropriate, usable evidence. Others felt such support should bridge the OPM and Climate Change Department. In practice, technical support should be grounded firmly in the existing knowledge management structures in country.
3. **District-level governance structures:** decentralisation in Uganda is relatively weak and there are opportunities for strengthening capacity at district level. Technical support is needed for the districts and the OPM based in Moroto, working closely with them and other partners

to strengthen the KIDP from the bottom up and create a roadmap for activities that support the livestock value chain.

4. **IGAD Drought Disaster Resilience Sustainability Initiative (IDDRSI):** there is an unexploited opportunity for drawing on this regional initiative to support coordination, policy and planning at national and even district levels, as well as promoting better integration between line ministries. Doing so would have the considerable advantage of opening avenues for regional cooperation and learning around drought risk management e.g. with Kenya, Ethiopia and other member states. Implementation of the IDDRSI should consider implications for the pastoral economy (Carabine et al., 2015). There is an IGAD focal point staff member who has recently taken up post in Moroto to advance the implementation of Uganda's IDDRSI Country Programming Paper at district level.

5.10. Increasing tenure security

Insecurity of land tenure is a significant barrier to economic development in the Karamoja region and wider arid and semi-arid lands. Attracting private sector investment in a commercialised livestock sector will require greater certainty than there is currently. To support the production level, there is a need to protect grazing lands as inputs to the value chain and to enhance communal ownership with rules of temporary migration, learning from traditional mechanisms of kraal and elders' consultation on migration routes and destinations (ideally within the Aromar system). Privatisation of land should be limited to municipalities and limited areas of mining and conservation concessions. The government should harness the Land Act that recognises communal ownership to protect grazing lands for the livestock business.

Investment is needed to facilitate the re-opening of grazing lands through a consultative and transparent process. Given the variable nature of the climate in the region, ranching is suitable only in limited areas to the west of the region and this form of land tenure should not be extended further into the more arid areas of Karamoja. Free range grazing with traditional rules and mechanisms combined with proper health care for animals can enhance the livestock business in the region.

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Annex A: data collection tools

VC-ARID step 2 livestock producer / trader questionnaire

Identifying climate risk

Enumerator name: _____

Area: _____

Actor: (producer / trader) _____

Respondent name: _____

A. Supporting services

[Service]	A1. Do you have access to [Service]? 1 = Yes 2 = No 0 = Do not know	A2. Is [Service] available when needed? 1 = Timely availability 2 = Delayed availability 3 = Not easily available 4 = Not available	A3. How satisfied are you with delivery of [Service]? 1 = Satisfied 2 = Partly satisfied 3 = Not satisfied 4 = Not available	A4. Do you pay for [Service]? 1 = Yes 2 = No 0 = Do not know	A5. If yes, how much do you pay for [Service]? Enter cost in UGX per cow, shoat or visit (Specify)	A6. From where do you obtain the services? 1 = Government 2 = County government 3 = Agro vet shops 4 = Group ranch 5 = Weekly market 6 = Other, specify 0 = Don't know
Drugs for livestock					Visit Cow Shoat	
Disease surveillance and vaccination					Visit Cow Shoat	
Artificial insemination					Visit Cow Shoat	
Access to grazing areas					Visit Cow Shoat	
Fodder and improved animal feed					Visit Cow Shoat	
Access to water for livestock					Visit Cow Shoat	
Early warning information					Visit Cow Shoat	
Financial services (e.g. loans)					Visit Cow Shoat	
Market information (prices and quantity in market)					Visit Cow Shoat	
Market facilities (e.g. enclosure, ramps)					Visit Cow Shoat	

-
- A7. What is the distance to your nearest livestock market?
 - A8. What is your main means of transport for getting to this market?
 - A9. How much does this cost?
 - A10. What is the quality of the road / route?

B. Climate change

Long-term rainfall trends

- B1. In the last 10 years, do you feel that there have been any changes with regards to rainfall patterns?
- B2. If yes, how have rainfall patterns changed?
- B3. If yes, has this affected your livestock? How?
- B4. What changes have you made to manage this?
- B5. If you have not made any changes, why not?

Long-term temperature trends

- B6. In the last 10 years, do you feel that there have been any changes with regards to temperature?
- B7. If yes, how has temperature changed?
- B8. If yes, has this affected your livestock? How?
- B9. What changes have you made to manage this?
- B10. If you have not made any changes, why not?

C. Climate extremes

General trends

- C1. Has your livestock been affected by climate / weather shocks in the last 10 years? [drought, floods, heat waves, out of season rains, storms, delayed rains]
- C2. If yes, which have been the most significant shocks affecting your livestock production / trading?
- C3. How many times has your livestock been affected by these events in the last 10 years?
- C4. What are the main consequences of these events on your livestock production / trading?
- C5. How did you cope with these events?

Specific shock event

- C6. During the drought of 2009/2010, was your production and income affected?
- C7. What did you do to respond / cope with the drought?
- C8. Did you get an early warning before the drought struck your area?
- C9. If yes, who gave you this information?
- C10. Have you changed the way you manage your livestock since the drought?
- C11. If yes, what have you done?
- C12. Did you receive any support during or after the drought?
- C13. If yes, what type of support did you receive from whom?
- C14. Did this support enable you to recover from the drought?

Future climate shocks

- C15. If such a drought like 2009/2010 were to happen again, would you now be able to cope in your livestock production / trading?
- C16. What improvements have there been in your area since 2009/2010 that makes your livestock better able to cope with drought?
- C17. What more needs to be done to help your livestock to reduce the impact of drought?

D. Other shocks

- D1. Has your production / trading been affected by the following shocks in the last 10 years?
 - 1. Insecurity / conflict / cattle rustling
 - 2. Sharp rise in food / input prices
 - 3. Livestock disease outbreak / death
 - 4. Large decrease in price of livestock
 - 5. Household problem (sickness, death, livelihood failure)
 - 6. Reduction of regular assistance (e.g. NGO / government support, remittances)
- D2. Which of these shocks have been most significant for your production?
- D3. How did your household deal with this?
- D4. To whom did you turn for help?

VC-ARID step 2 livestock processor / transporter questionnaire

Identifying climate risk

Enumerator name: _____

Area: _____

Actor: (transporter / processor) _____

Respondent name: _____

A. Supporting services

[Service]	A1. Do you have access to [Service]? 1 = Yes 2 = No 0 = Do not know	A2. Is [Service] available when needed? 1 = Timely availability 2 = Delayed availability 3 = Not easily available 4 = Not available	A3. How satisfied are you with delivery of [Service]? 1 = Satisfied 2 = Partly satisfied 3 = Not satisfied 4 = Not available	A4. Do you pay for [Service]? 1 = Yes 2 = No 0 = Do not know	A5. If yes, how much do you pay for [Service]? Enter cost in UGX per cow, shoat or visit (Specify)	A6. From where do you obtain the services? 1 = Government 2 = County government 3 = Agro vet shops 4 = Group ranch 5 = Weekly market 6 = Other, specify 0 = Don't know
Drugs for livestock					Visit Cow Shoat	
Disease surveillance and vaccination					Visit Cow Shoat	
Artificial insemination					Visit Cow Shoat	
Access to grazing areas					Visit Cow Shoat	
Fodder and improved animal feed					Visit Cow Shoat	
Access to water for livestock					Visit Cow Shoat	
Early warning information					Visit Cow Shoat	
Financial services (e.g. loans)					Visit Cow Shoat	
Market information (prices and quantity in market)					Visit Cow Shoat	
Market facilities (e.g. enclosure, ramps)					Visit Cow Shoat	

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- A7. What is the distance to your nearest livestock market?
 - A8. What is your main means of transport for getting to this market?
 - A9. How much does this cost?
 - A10. What is the quality of the road / route?

B. Climate change

Long-term rainfall trends

- B1. In the last 10 years, do you feel that there have been any changes with regards to rainfall patterns?
- B2. If yes, how have rainfall patterns changed?
- B3. If yes, has this affected your livestock business? How?
- B4. What changes have you made to manage this?
- B5. If you have not made any changes, why not?

Long-term temperature trends

- B6. In the last 10 years, do you feel that there have been any changes with regards to temperature?
- B7. If yes, how has temperature changed?
- B8. If yes, has this affected your livestock business? How?
- B9. What changes have you made to manage this?
- B10. If you have not made any changes, why not?

C. Climate extremes

General trends

- C1. Has your livestock business been affected by climate / weather shocks in the last 10 years? [drought, floods, heat waves, out of season rains, storms, delayed rains]
- C2. If yes, which have been the most significant shocks affecting your livestock business?
- C3. How many times has your livestock business been affected by these events in the last 10 years?
- C4. What are the main consequences of these events on your livestock business?
- C5. How did you cope with these events?

Specific shock event

- C6. During the drought of 2009/2010, was your business affected?
- C7. What did you do to respond / cope with the drought?
- C8. Did you get an early warning before the drought struck?
- C9. If yes, who gave you this information?
- C10. Have you changed the way you manage your livestock business since the drought?
- C11. If yes, what have you done?
- C12. Did you receive any support during or after the drought?
- C13. If yes, what type of support did you receive from whom?
- C14. Did this support enable your business to recover from the drought?

Future climate shocks

- C15. If such a drought like 2009/2010 were to happen again, would you now be able to cope in your livestock business?
- C16. What improvements have there been in your area since 2009/2010 that makes your livestock business better able to cope with another drought?
- C17. What more needs to be done to help your livestock business to reduce the impact of drought?

D. Other shocks

- D1. Has your livestock business been affected by the following shocks in the last 10 years?
 - 1. Insecurity / conflict / cattle rustling
 - 2. Sharp rise in input prices / costs
 - 3. Livestock disease outbreak / death
 - 4. Large change in price of livestock
 - 5. Household problem (sickness, death, livelihood failure)
 - 6. Reduction of regular assistance (e.g. NGO / government support)
- D2. Which of these shocks have been most significant for your business?
- D3. How did your business deal with this?
- D4. To whom did you turn for help?



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