Value chain analysis of pasture production in Kitui County, Kenya.

A situational analysis of pasture production value chains in arid and semi-arid lands and its market dynamics, showing existing linkages and new opportunities for upscaling.





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Abstract

Livestock production remains a key source of livelihood among communities inhabiting dryland environments in Kenya, contributing significantly to the agricultural sector and national GDP (80% of Kenya is dryland, 60% of livestock herd found in arid and semi-arid lands(ASALs), 12% of Kenya's GDP, 40% of agricultural GDP and employs 50% of agricultural labour force).

A main challenge is the quantity and quality of livestock feed available and market access for farmers in this sector. Indigenous pasture farming is an innovative strategy to address this 'livestock feed gap', especially during lean dry periods. Reseeded pasture minimizes overgrazing and contributes to land restoration. However, it is found that lack of market access and organisation hinder upscaling of the pasture value chain in Kitui's ASAL. This research found that pasture farming is a new concept to many farmers in Kitui and is yet to be a common practice. Few farmers have adopted pasture farming and see the great potential. The business case for pasture production with value addition (hay, seeds, milk and meat) is evident, profits are higher and more secure compared to crop farming. Though at this moment trade in hay and seeds only happen informally.

Livestock markets, on the contrary, are well established. Pasture production provides an opportunity to strengthen these livestock markets, and at the same time provide a secure demand for animal feed. A win-win situation with enormous potential for upscaling both for livestock, as well as hay and seed production. Key aspects that need to be addressed include: training of farmers to increase pasture production, farmers to professionalize and specialize in different parts of the pasture value chain, organise markets with quality control, farmers to organise in cooperatives to improve their market position and value addition to increase profit.

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Chapter 1: Introduction

African drylands (or arid to semi-arid lands, ASALs) cover about 41% of sub-Saharan Africa landmass and about one-third of the global drylands. They are generally characterised by low erratic annual rainfall (300-600 mm) and nutrient poor soils. Extensive utilization of multiple grazing resources by different livestock species (cattle, goats, sheep and camels) in drylands remains an important way of life among agropastoral communities. Livestock are among the main assets in African drylands, helping improve the nutritional status of the community, contributing to economic growth and sustainable livelihoods. A report published by AVCD (2016) asserts that livestock production is the most promising way out of poverty into sustainable economic development and household food security and nutrition for pastoral and agropastoral communities in Kenya (AVCD, 2016).

Livestock production contributes significantly to the agricultural sector and national GDP (80% of Kenya is ASAL, 60% of livestock herd found in ASALs, 12% of Kenya's GDP, 40% of agricultural GDP and employs 50% of agricultural labour force). Livestock production is a key economic activity not only to Kitui but also to Kenya and wider SSA, where it is the most appropriate land use practice (Macharia et al., 2015). Despite livestock production being a key economic activity, factors such as scarcity of pasture, land degradation, climate change and variability are threatening the livelihoods

Land degradation, partly characterized by the lack of vegetation cover, is widely recognized as a serious problem in the dryland ecosystems affecting a quarter of the earth's surface and threatening livelihoods of more than 900 million people. Africa is particularly affected because land degradation principal processes affect about 46% of its land surface. The ASALs of Africa are particularly more vulnerable as they have fragile soils, localized high population densities, generally low input form of agriculture, scarce vegetation cover and weak soil structure. Approximately 80% of Kenya is affected by land degradation. Previous studies have estimated that approximately 30-40% of Kenya's ASALs are quickly being degraded. Decline in soil productivity, increasing rate of soil erosion and depleted vegetation cover depict degradation in semi-arid lands in Africa.

Pasture demand in Kenya is exceedingly above availability and supply (Omollo, 2017). This demand will continue rising as population and demand for livestock products are increasing day by day (LiDeSA, 2015). There is much potential that is yet to be tapped into on pasture production in the country. Omollo (2018) recognizes this unexplored potential and observes that when sufficiently exploited, pasture production can be a leading climate change adaptation strategy for those who live in dryland areas. Understanding the value chain linkages between the different players and the products of pasture and livestock farming from production stage to market stage is necessary to identify how to scale up pasture production so that its supply matches demand.

Commonly agropastoral farmers have been doing free range grazing for their cattle, but due to reasons mentioned (climate vagaries, population pressure, overgrazing) this pasture resource is being depleted. A new approach is to actively cultivate pasture on owned land holdings. This has several benefits: it allows for higher pasture yield from small land size and business opportunities for seed and hay production. Moreover, it provides greater resilience, as the grass species planted are indigenous and well-adapted to the agroclimatic conditions. It provides farmers with feed for their livestock, sustaining them through dry seasons and droughts, and allowing for a range of production and marketing strategies. Conservation of hay cushions farmers, having enough feed for a long time. Also, the direct sales of hay and seeds can generate high returns to farmers. The market dynamics in the pasture value chain are not clearly outlined, this research will provide insight into this. In order to analyse how it is characterised and what market opportunities are there for farmers in ASAL.

Chapter 2: Research Design

This chapter will give an overview of the research objectives and methods used to obtain the results presented in this study. It furthermore gives a brief background to the study area.

Problem statement

Past studies have highlighted the huge potential that pasture production has on diversifying household incomes for communities that live in ASAL areas, increased livestock productivity and improved livestock management (LiDeSA, 2015, Wairore et al., 2015). Omollo (2017) states that despite the huge potential of livestock farming, its productivity has remained small scale with inadequate production of pasture and low quality of animal produce. One of the challenges agropastoral farmers in Kitui are facing is the lack of market, or market information. Looking at the value chain of pasture, including seeds, hay, milk and beef; producers sell informally and at low prices. Little is known on market dynamics with regard to the pasture value chain. This study therefore aims gaining understanding on market dynamics around pasture and livestock farming and demonstrate roles of existing value chain linkages and new opportunities.

Objectives

To carry out a situational analysis of pasture production value chains and its market dynamics, showing existing linkages and new opportunities.

- To determine the economic benefits from improved grassland and livestock productivity
- To carry out market analysis of the livestock production sector
- To demonstrate chain linkages among different players and sectors in the pasture production sector and the effect they have on livestock production
- To identify business opportunities for scaling up local pasture production and commercialization

Research questions

- What is the contribution of established pastures on the pasture value chain products of seeds, hay, beef and milk?
- What are strategies, challenges and opportunities for farmers doing pasture production?
- What are the market dynamics of the pasture value chain? What markets are available, what are their characteristics and how are they accessed?
- What is the market potential for the pasture value chain?
- How can pasture production be upscaled in Kenya's ASAL?

Methodology

The study covered the entire Kitui County and it targeted mainly pasture and livestock farmers, brokers and traders of pasture, livestock and livestock products. The study was carried out from April till end of June.

Primary data was generated from personal interviews while secondary data was generated mainly through review of literature of relevance to this study. A total of 25 respondents selected randomly from the entire sampling frame were interviewed. The sampled population comprised of five pasture/hay farmers, five grass seed farmers, five milk farmers, five butcher owners and five livestock traders. Total respondents interviewed informally as key informant persons amounted to 38, they comprised of university lecturers, project managers from MetaMeta, Kitui County staff from the department of livestock, County council officers at Mwingi market, brokers, livestock traders, animal loaders and other market players.

Interviewing method was used as the main method of data collection for the study. Semi-structured questionnaires were used to gain insight on opinions and experiences of farmers on pasture production procedures. Field observation was done at farms and markets, to observe significant features of production and roles of market players for instance. Secondary data involved review of literature from existing sources of records from relevant government institutions and other relevant research reports. Triangulation of data was carried out to capture different phenomenon of the research subject to help build a clear understanding on relationships and linkages of different aspects of pasture production.

Chapter 3: Pasture production in Kitui County

This chapter provides a short background on Kitui County and information on current activities in pasture production and livestock keeping.

3.1 General background

Kitui County is located in the east part of Kenya in SSA, it covers a total area of 30,496.4 Km2 and has a population of 1,012,709 which is projected to reach 1,176,650 in 2022 (KNBS, 2009). The County is characterized by relatively high levels of poverty where the level of absolute poverty is estimated at 47.5 percent compared to the national average of 36.1 percent in 2016 (Kitui CIDP, 2018).

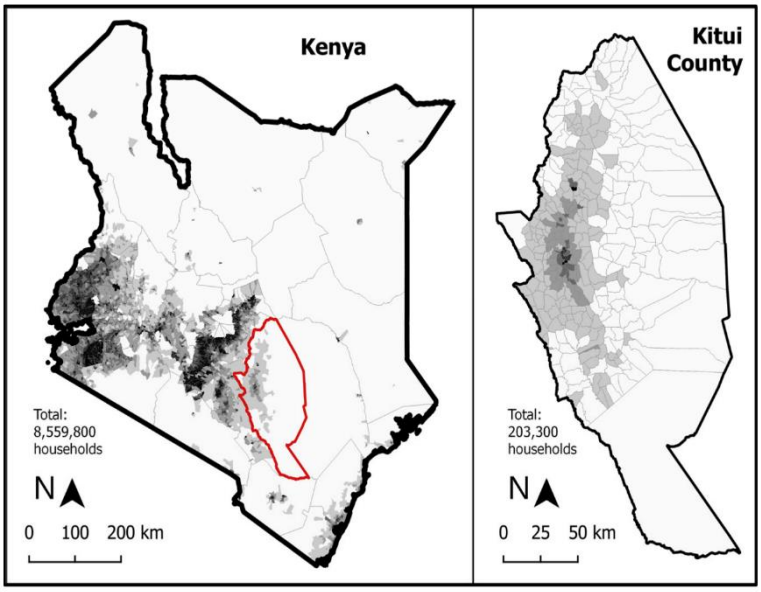

Figure 1 location of Kitui County

Kitui County is classified as Arid to Semi-Arid Land (ASAL), which form up to about 80% of Kenya. ASALs in Kenya are often characterized by limited and scarce permanent water sources. The rainfall in these environments range from 900 mm in ACZ IV (transitional zone) to 450 mm in ACZ V (Biamah, 2005). Rainfall occurrence is primarily bimodal, with rains between March and May, while the more reliable rains occur from October through to December. Rehabilitation of degraded lands in these rangelands is very difficult due to the high deficits in soil moisture, resulting in low germination of seeds and seedling mortality.

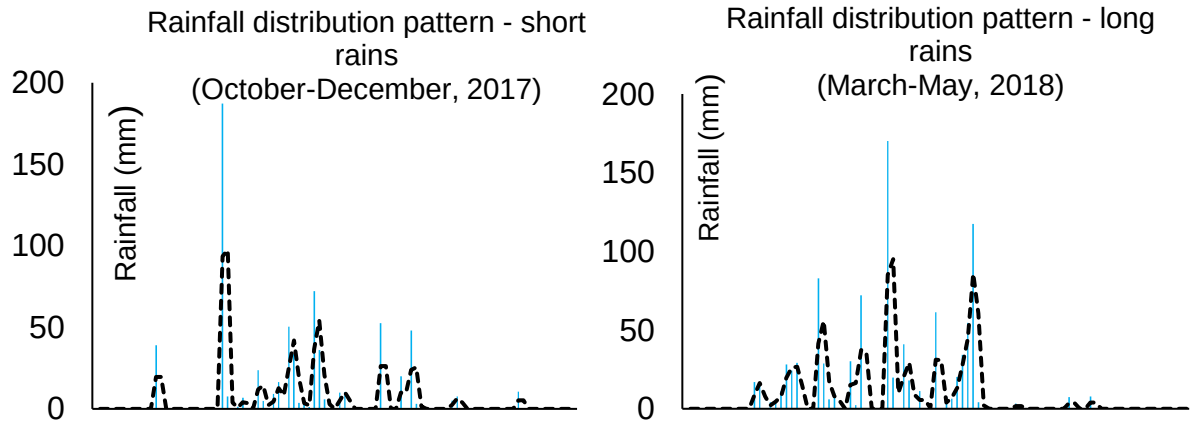

Figure 2 rainfall distribution patterns exemplary for Kitui County

Agriculture is the main economic activity practiced by dwellers of Kitui County. Livestock rearing and subsistence farming are the main forms of agriculture practiced. The main types of animals reared include chicken, goats, sheep, donkeys and cattle. Over 85% of the County's population lives in rural areas and the average population density is sparse with 44 persons/km2 while the average land

holding size is 12 ha per person. Majority of Kitui inhabitants (87.3%) derive their livelihoods from agriculture and rely on family labour for agricultural production (Kitui CIDP, 2018).

Main issues that communities face, deal with livestock keeping comprise of droughts, severe hunger, malnutrition, broad loss of livelihoods, lessened resilience, lack of access to finances and markets, limited availability of animal healthcare extension services, high illiteracy and low technical capacity and lack of integrated policies among the counties on natural resource management (AVCD, 2016). Other unique challenges include, wealth inequities leading to varied cash needs, unequal access to local and national markets, fact that livestock (producers) need cash during the dry seasons when prices for livestock are lowest and livestock sale methodologies that benefit brokers more than the producers (AVCD, 2016).

3.2 Pasture production and livestock keeping sectors

Annual average production levels for livestock products in the county consist of 3,077 tonnes of beef, 1466.6 tonnes of goat meat and 4.2 million litres of milk against an estimated potential local demand of 32, 120 tonnes of beef and goat meat and 100.4 million litres of milk (Kitui CIDP, 2018). A publication from ASDSP (2014) reports that livestock products in Kitui County were valued at Kenyan shillings 916 million in the year 2013 and this figure is expected to have increased immensely by now. Out of the 916 million, beef production contributed about 241 million while milk production contributed about 78 million Kenya shillings (ASDSP 2014). Beef had the highest economic value (241 million) out of all livestock products in the County (ASDSP 2014).

Figure 3 pastureland where sheep are feeding (June 2019), cows being fed on maize stalks and grass (February 2019)

Livestock keeping is not only an economic activity, but a way of life passed down from their predecessors. Traditionally, livestock ownership was regarded as a sign of wealth. The more animals you owned, the richer you were considered to be and with that, one could marry many wives and be elected as a leader. Livestock farming had strong characteristics of social, religious and economic value. Presently, livestock functions are majorly tied to economic use with dowry payment being the only widely practiced social use.

Food availability for both people and animals has decreased, and people have to spend more money to access food for themselves and their animals. Availability of land has also decreased with time due to population increase. This has limited the practice of moving animals from place to place to find pasture. Farmers have resorted to intensification to produce more within a small portion of land. In the days to come, respondents were of the view that livestock farming will purely be an economic activity where social attachments to livestock keeping will be no more. Currently, people of Kitui still have deep attachment to their animals and they only dispose (sell) them when they have no other option of accessing finances.

In the County pastureland and rangeland occupy 1,048,728 hectares which is estimated to be 80% of the County (Kitui CIDP, 2018). In order to encourage the livestock sector in ASALs to grow more, the government of Kenya has intervened by promoting pasture production to counter scarcity of pasture (which often leads to conflicts), increase resilience of ASAL communities to climate shocks and providing alternative source of livelihoods (Lugusa et al, 2016). Standing hay and browse are the main feed components, where livestock are fed by grazing in the fields or animals are brought hay to feed in their sheds. Zero grazing is less widely practiced in the County compared to free range. Animals are fed on grass, hay, straws, maize and sorghum stocks. Pasture is only available during months of January, April, May, June, November, and December.

After the rain season, livestock owners often have to sell part of their herd as a coping mechanism during drought. To keep animals in good conditions they need to invest in hay, concentrates or renting of pastureland. At present, demand of grass and animal pasture is higher than what is currently available. This is mostly because livestock producers rely solely on grass that grows naturally and so there is a need to actually grow pasture to close the gap of low pasture availability and enable farmers to sustain their animals even during dry seasons.

3.3 examples of common practices in pasture and livestock farming

Communal land use system:

In areas like Ukasi, Ngomeni and Tseikuru you find a unique land use system locally known as “Kyengoni” which are areas reserved for livestock grazing only. This is a traditional land use system that has been in existence for long. “Kyengoni” is a vast communal land where only grazing takes place with no farming or permanent settlements. However, small huts are set up by herdsmen but only to last them for the grazing period after which they are abandoned. There is no regulation of any sort in these grazing areas and therefore livestock herders just come in and leave when they want to. This unique land use system is widely used more so along the Kitui – Tana River County boarder. Both Kamba, Orma and Somali herders make use of these communal grazing lands and the pasture is generally sufficient for grazing at most times if it has rained averagely well but in case they exhaust all the pasture, they move to other communal grazing lands.

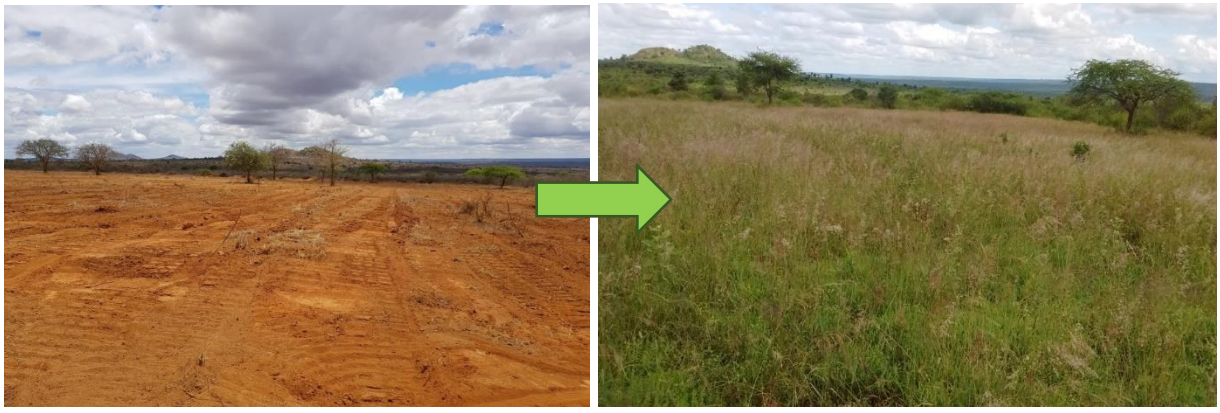

Figure 4 before and after reseeding of a piece of land in Kitui County

Renting out pasture land - a case study:

My land is about 30 acres in size. I normally get approached by many people to rent out pastureland to them especially other Kamba from regions of Mwingi. They bring their livestock during months of august, September and October. By this time, they usually have already exhausted their pasturelands. Before determining on how much I'll be paid, we normally survey the pastureland to be rented and check on the size of the grass, coverage of the grass (acreage) and how bushy the grass is. Normally, I charge 10,000 Ksh for my 30 acre land (The grass is usually 2 feet tall and bushy). Most of my customers graze about 40 cows within the 30 acre land for two months (September and October) and then leave after exhausting the grass. When I rent out portions of my land, I rent out 20 acre land for 7,000 Ksh for two months. When I rent out less than 10 acres or less, I rent it out for 3,500 Ksh. Within those two months of renting, grass is usually exhausted completely, and it's only replenished after rains. From my experience, only those who have cattle above thirty in number pay to use pastureland.

Main challenges we face in this trade include; (1) after landowner rents out pasture and rains fail, his cattle suffer; (2), cows that come bring pests and diseases from their areas and pass them to our livestock; (3) those who want to hire pastureland face hostility from locals in the areas; (4) in some cases livestock owners are taken by land owners to survey only the parts where the grass is well established and therefore they overvalue the pasture. The livestock owner cannot then graze his cattle for the time period that he had planned on. Some livestock owners who go to new areas might be duped by brokers who rent out land that does not belong to them and then disappear. When the landowner finds cattle grazing his/her land unauthorized, the livestock owners are chased away.

For me, I have never rented out my land to the Somali herders. We (people of Ukasi) are enemies with them. A while back, from the year 2015 going backwards; we used to rent out pastureland to them. When one would rent out their land to the Somali, they would not observe the boundaries and they would even graze on neighbouring fields where crops are planted. We met as a village and decided no more renting of pasture to the Somali and we therefore stopped. If I was to rent out my 30 acre land to the Somali, I would charge them triple (Ksh 30,000) what I charge my neighbours and Kamba (10,000) from other parts of the County. I would charge them more because once you rent out land to them, they overgraze their animals and leave the land almost bare.

Chapter 4: Seed, hay and livestock production characteristics

This chapter delves into the details of pasture farming and the production of seeds, hay and animal products. It discusses on the grass species, feeding value and main benefits; on the methods of baling and conserving hay, and animal fattening and sales.

4.1 Grass species

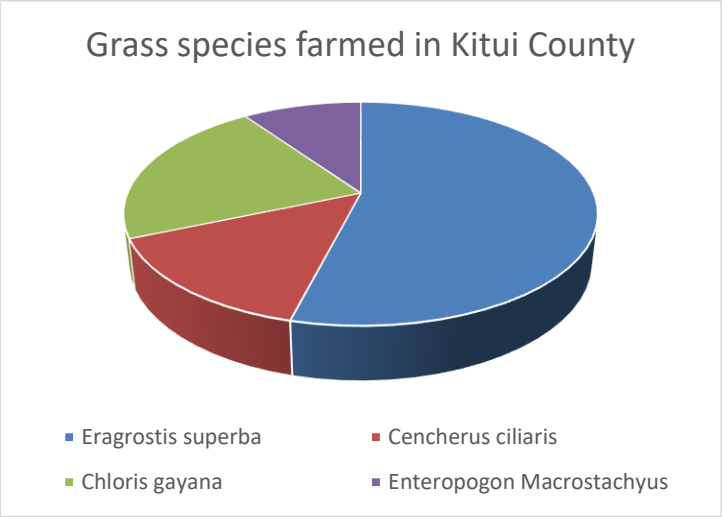

Figure 5 grass species farmed in Kitui County

Main grass species planted by farmers interviewed are *Eragrostis superba ("Mbeetwa"), Cenchrus ciliaris ("Kiema uvuny'e"), Cynodon dactylon* (*"Ikoka"), Panicum maximum ("Mbwea"), Brachiaria,* Napier grass*, Boma Rhodes and Chloris gayana.* Other common species planted are *Panicum maximum, Brachiaria, Napier grass, Boma Rhodes* and *horsetail.*

Reasons given by farmers why they prefer these grass species are as follows;

- They are resistant to dryness of Kitui
- They have more nutrients and are rich in protein (i.e. they are good for fattening of animals and enable cows to give more milk).
- More productive and one can harvest 5 times more than wild grass
- They are perennials, once the grasses have been established in an area, the farmers will keep on harvesting grass for about 7 years without having to plant again.

4.2 Pasture production strategies

Division of land among respondents interviewed favours crop production which is always allocated the biggest sub-division of land followed after by land allocated for pasture. Pasture farming is an idea most farmers never knew before. They were used to the traditional way of allowing natural pasture to grow by itself. The biggest challenge pasture farmers are facing in Kitui is low and erratic rainfall whereby for those who planted grass, it did not grow because of lack of enough moisture. The second biggest challenge is high expenses incurred by farmers to access seeds whereby not only are the seeds expensive to buy but they are sourced from far-away areas and therefore farmers incur huge transportation costs. Third biggest challenge is lack of knowledge.

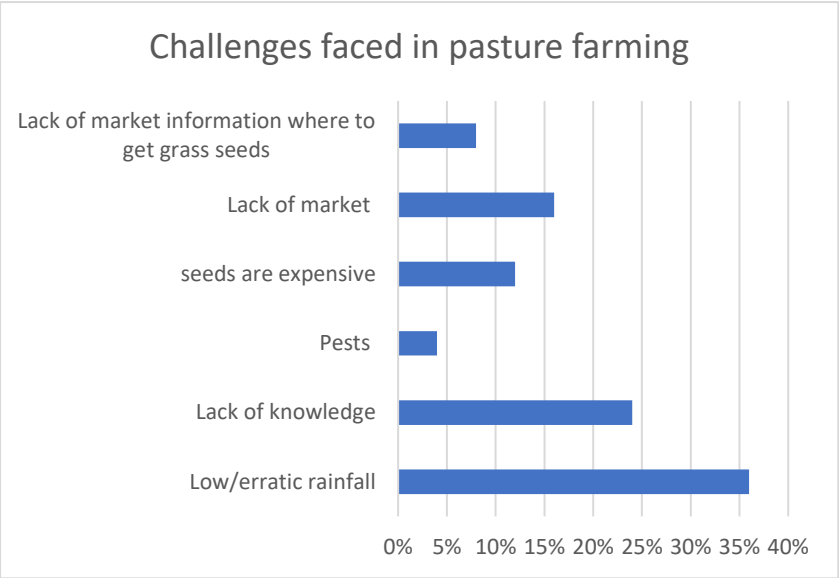

Figure 6 challenges faced in pasture farming

Majority of pasture farmers (56%) do not harvest grass. Instead, they allow their livestock into the fields to graze. For those that harvest grass, most of them (67%) use the grass for feeding their animals and store the forage for future use during dry spells. Only 33% of those who harvest grass, sell. Those that sell, mostly use observation to determine value of the feeds they sell and only a few make bales of grass for sale. However, sorting, bulking, packaging (baling) and proper storage are value addition measures that guarantee farmers to get more profit.

On average a bale of hay is sold locally for 250 Ksh in Kitui County, a price of 300 Ksh is also observed. Peak months for production of pasture are the two rainy seasons in Kitui, often planting in the first short rain season (Oct-Dec) is preferred, because in case of scanty rains this will be supplemented by the long rains (Mar-May) starting shortly after.

Peak seasons for sale of hay and pasture is during months of March, August, September, October and November. This is so because these months are usually the driest before the rains start. September and October months attract the highest prices because apart from them being the driest months in the year, they are the times when people clear vegetation to prepare room for crops for the next planting season. Also, land preparation activities for farming start at this time and therefore bulls feed a lot.

Figure 7 on the left African Foxtail/Buffel grass; on the right bailing of hay

4.2.1 Role of road water harvesting in pasture farming

Generally, pasture farming in the County is of small-scale nature where people produce mostly to cater for the needs of their animals. The nature of pasture farming that is being practiced in Kitui is small scale with use of simple tools and application of simple technologies. Majority of farmers use ox plough and hand-held hoes for land preparation, soil conservation and water harvesting technologies like construction of deep trenches, terraces, trench bunds and diversion of water from roads into farms are applied in pasture farming.

Majority of farmers interviewed practice pasture farming using road water harvesting. Those who practiced water harvesting experienced higher productivity in the pasture farming than those who did not. Main reasons are to enhance soil moisture distribution and prolonged availability to ensure survival and increased productivity. The fact that those farmers who have been exposed to road water harvesting have adopted it and incorporate it in most of their farming activities shows that they have experienced improved production from using the technology.

Figure 8 preparing road water harvesting diversion and collection structures in pasture land

Figure 9 look-out of pastureland with trench slowing down water to infiltrate over longer time and prolong availability of soil moisture

4.3 Seed production strategies

All respondents interviewed reported that they have never sold grass seeds. This is due to the fact that pasture farming is relatively new, hence farmers are yet to establish themselves to start selling. A few have made their first harvest of seeds, however they are only willing to sell after they first establish their own pastures. Farmers can harvest an average of 30 kg of grass seeds per acre, on average 3 kg is used to plant grass on one acre.

The biggest challenge farmers face are the expenses. A kilogram of *Cenchrus ciliaris* goes for 900 Ksh, while for *Eragrostis superba*, *Chloris roxburghiana* and *Chloris gayana* go for 800 Ksh. This amount is expensive for farmers who are yet to establish themselves. High transportation costs also add a big burden to farmers. Another major challenge is that they lack information where to buy the seeds and often they don't get the seeds in time. When they try to source locally, the production is too low, and they don't get the quantities they want. To get the right quantities they have to buy from Makueni County and incur huge transportation costs.

Figure 10 example of harvesting and drying of grass seeds

4.4 Livestock production strategies

Main livestock breeds reared by livestock producers for cattle are the Zebu which constitutes 97% of all breeds in the County while Boran and Sahiwal breeds account for only 3% (Kitui CIDP, 2018). Breeds for goats are, the small east african, galla and torgenberg; while breeds for sheep are black headed Persia and red maasai (Kitui CIDP, 2018). Indigenous cattle breed from Kamba community is the zebu while from the Somali community are the boran and sahiwal breeds. Boran, zebu and Sahiwal breeds are mainly kept for beef, they are also used to plough the land and pull carts. Milk production of these breeds is generally low, below 10 litres/day. Weight of Boran and Sahiwal is on average 350-400 kg, of Zebu it is 250-300kg.

Figure 11 top left: Zebu bull, top right: Boran bull, bottom left: Sahiwal bull, bottom right: Galla male goat

Cattle slaughterhouses are located in Kitui, Mwingi, Kabati and Mutomo towns (Kitui CIDP, 2018). County livestock populations as at 2017 were; 6,664 for dairy cattle, 471,917 for beef cattle, 3,970 for dairy goats and 1,128,773 for goat meat (Kitui CIDP, 2018).

Majority of residents from Mutomo, Tseikuru, Mwingi, Ukasi and Kisasi are actively engaged in livestock farming and trading. Consequently, livestock markets near these areas trade in huge numbers of livestock and hence the most established livestock markets in Kitui are found in those areas. Most households in these areas buy weak animals, fatten them and then sell animals at a higher price.

4.4.1 Small-scale livestock keeping

In Kitui, the livestock sector is dominated by small scale producers. Generally, most households keep two bulls, one donkey and few goats. Bulls are kept mainly for farming and breeding. Goats are

mainly kept for their meat and milk. Cows are kept for providing milk mainly for sale and domestic consumption. Value addition to cow milk is done by fermenting the milk into sour milk (mala). Majority of production systems are extensive with ruminant and mixed species production, livestock are grazed in the fields, mainly on standing hay and browse.

The role of livestock to household's food security is difficult to quantify in monetary terms (Kivunzya, 2018). As a result, its contribution is most times underestimated. At household level, sale of live animals, milk, meat, hides, fee generated from draught power and transport services provide income for the household and thus increasing food security (Kavili, 2013). Also, livestock act as cash reserves, reduce risks associated with crop production and in mixed farming systems livestock represent liquid assets that can be realized whenever the farmer wishes (Charlotte et al., 2002; Kivunzya, 2018). Livestock farming when integrated with crop farming provides efficiency in production where animals use crop residues as feeds, while animal manure is used as fertilizer on crops.

Livestock farming therefore offers more stability and it can be relied on and that is why it has become a more preferred livelihood choice compared to crop farming. The Akamba, being agropastoral farmers, they have always valued both crop and livestock farming. However, within the last twenty years; when climate change impacts have been felt greatly, consistent crop failure has caused most families to engage more on livestock related activities and less crop farming. Additionally, livestock can be moved depending on availability of pasture and water and also because they can be disposed (sold) and bought depending on prevailing market situations (Kivunzya, 2018).

4.4.2 Livestock maintenance expenditure

Expenditure on maintenance of livestock is necessary for animal fatteners and livestock producers to avoid losing animals to diseases and droughts and improve on livestock quality. The total monthly expenditure amounts to 15,050 Ksh.

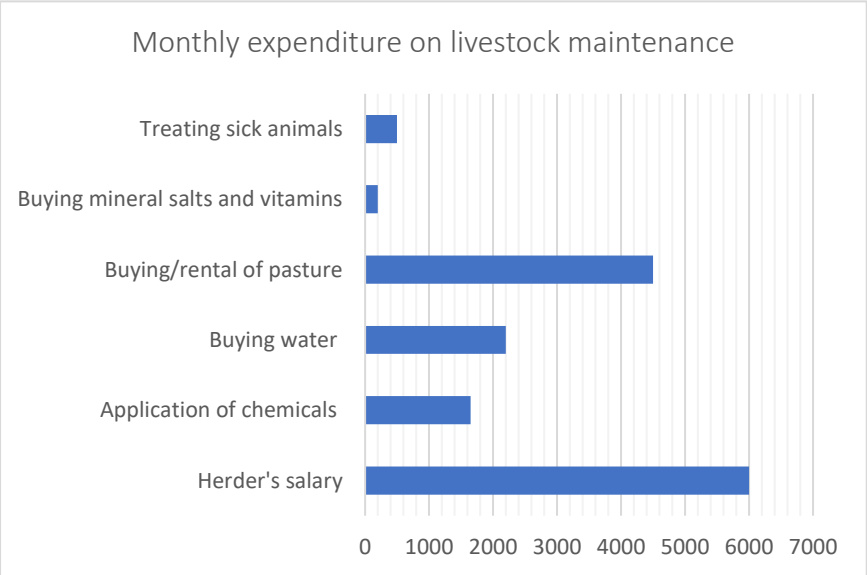

Figure 12 monthly expenditure on livestock maintenance

Weight of animals, quality and value decrease greatly due to lack of pastures as a result of droughts. Droughts also increase animal susceptibility to diseases and eat into household income. Deaths of animals reduces livelihood support, food security and results to losses.

4.5 Gaps and opportunities

Presently, pasture farming in Kitui is not in a place where it can be commercialized. Even more, pasture production for feeding animals in the home is not enough and is yet to be established. However, Kitui County has got ample potential for pasture and livestock production as a business.

Musimba et al, (2018) reported that Eragrostis superba gives a dry matter yield of up to three tonnes per hectare per year, Cenchrus ciliaris gives about 5 tonnes of dry matter per hectare per year, and Chloris roxburghiana gives about 3.5 - 4.5 tonnes of dry matter per hectare per year. Average land size in the County is 6 acres (2.43 hectare). Consequently, 6-10 tonnes of hay can be produced per household per year and with a bale of hay (15kg) going for 250 Ksh, this means hay sales of 100,000 – 166,667 Ksh can be achieved per year.

Increasing the quality of animals increases its market value. Livestock producers can increase value of animals by over 10,000 Ksh just by fattening. When feeds are enough, cattle multiplication will not be a worry and therefore producers can make more profits. Kitui County has the potential of growing its red meat and livestock trading sector to be a leading sector in the country. Mwingi and Kitui towns are centrally located such that they can receive animals from different parts of the county and those of pastoralists (who come to graze and trade) beyond and allow easy access of wealthy buyers who come from urban centers like Nairobi and Thika. There is also an opportunity for animal fattening business which is not much practiced in the county due to pasture scarcity. With pasture farming, animal fatteners can be buying thin animals, they feed and fatten them to add more muscles and weight. They then can sell and make huge profits.

Chapter 5: Market dynamics of seeds, hay, milk and beef production

This chapter will firstly look into contribution of pasture management and livestock keeping to household food security. And thereby also look at the production strategies followed linked to market access and organisation. It looks specifically at the products of seed, hay, milk and beef in terms of production and marketing.

5.1 Market outlook

Livestock markets are well established and organized in the County. Hay and grass seeds markets do not exist. This is attributed to pasture farming being a new practice which is yet to be widely established, though demand is there, there is no steady supply. Average distance to markets was found to be 10 km. For those involved in livestock trading, the distances are longer as producers, traders and brokers seek to reach established livestock markets for their animals to be bought at good prices. All these challenge present opportunities for growth and upscale. Table 1 below gives a brief outlook on market dynamics. Annex 1 gives a detailed overview.

Table 1 brief outlook on market dynamics

Type of farmer	**Type of markets accessed by farmer**	**Unit**	**Price (Ksh) {Averagely}**
Sale grass seeds	-	1 Kg of grass seeds	800
Sale of grass/hay	other livestock farmers	1 bale of grass	250
sale of livestock	Brokers, neighbors, other livestock farmers	1 animal/cow/bull (Mature)	25,000
sale of livestock	Brokers, neighbors, other livestock farmers	1 goat (Mature)	5,000
sale of livestock	Brokers, neighbors, other livestock farmers	1 donkey (Mature)	10,000
sale of livestock	Brokers, neighbors, other livestock farmers	1 Sheep (Mature)	4,000
sale of milk	Neighbors	1 liter of milk	60
sale of meat	Other butchers, meat consumers	1 Kg of meat	500

5.2 Livestock market dynamics

Sale of livestock is a key economic activity in Kitui. Within the past one year, majority of pasture farmers interviewed sold: goats (51% of animals sold were goats), followed by cows (20%), bulls (19%), sheep (7%) and then donkeys (3%). Most of the goats sold, get into the meat market and butchers make big profits. The cattle sold end up in big cities like Nairobi and Thika where they are slaughtered for meat.

Figure 13 Mwingi livestock market

It was found that most sales of livestock are done during the months of January, May and September which is attributed to opening of schools where sales help pay for school fees. Also, during these months, livestock prices drop significantly because of flooding of market with animals as farmers are usually desperate to get money fast. Most respondents reported that they buy livestock mostly during the month of December for festivities. Peak periods for sale of meat within the County is normally from dates 25th to 5th of every month. On these dates most meat customers have received their salaries and hence they comfortably buy meat, as it is regarded as more of a luxury food. The lowest periods of sale are from 9th to 15th of every month. On these dates people usually don't have much money on them. People get advance on 15th date of the month and sales start to pick from there.

5.2.1 Livestock market stakeholders

Livestock markets are viewed to be reliable, while for meat sales the reliability is seen as low. The butcheries share that they are dependent on the availability of cash flow on locals. For example, if there are delays in monthly payments of those in the employment sector, their trade goes down. Livestock markets are stable with established patterns of operations throughout the year, so buying and selling of animals is exploited in a time period which favours them. The main stakeholders in livestock business are livestock producers/animal fatteners, local brokers, major brokers also called traders, county council, animal transporters and loaders.

Livestock producers own the animals which are brought to market centres for trading. They are not regular participants in the market and they only go to markets to buy or sell animals. Their main focus is usually animal fattening at home. Often, they just rear livestock and sell as they are, without fattening strategy. As a result, they lack complete information of how markets work. More often than not, they are exploited by brokers.

Major brokers or traders are licensed middlemen who operate on a large capital base. On market days they arrive with a lot of money and bring big trucks to buy animals from livestock producers and brokers. They buy best quality animals and supply to big cities.

County council collects revenue at livestock markets. Fees vary for type of animal, and whether the sell is within or outside the county.

Loaders are people who carry out the manual work of loading animals in and off trucks. Loaders earn an average of 500 Ksh per loaded truck.

Local brokers are middlemen who link buyers and major brokers to livestock producers. They normally operate on no or very little capital base. They arrive at markets with no animals and with no money and go home having made huge profits. They are always there each and every market day and therefore they know all the aspects of how the markets work. They agree on a price for an animal, then look for a buyer and negotiate a higher price. The difference is their profit. Averagely they make about 2,000 Ksh per every cow/bull (mature) they broker and 800 Ksh per every goat they sell.

Animal transporters walk animals to markets, they are paid by producers and brokers. Animals are normally walked over long distances to get to market centres. For instance, walking animals from Tseikuru to Mwingi can cost 500 Ksh.

Figure 14 overview of stakeholders involved in livestock markets

5.2.2 Livestock market dynamics

Major factors that determine prices of animals are gender, weight, size and breed. Horns are a minor determinant, cattle with long horns are sold for 1000 Ksh less each, if you consider sales of 30 cattle per year you would lose 30,000 Ksh. Male animals always fetch higher prices, because they have

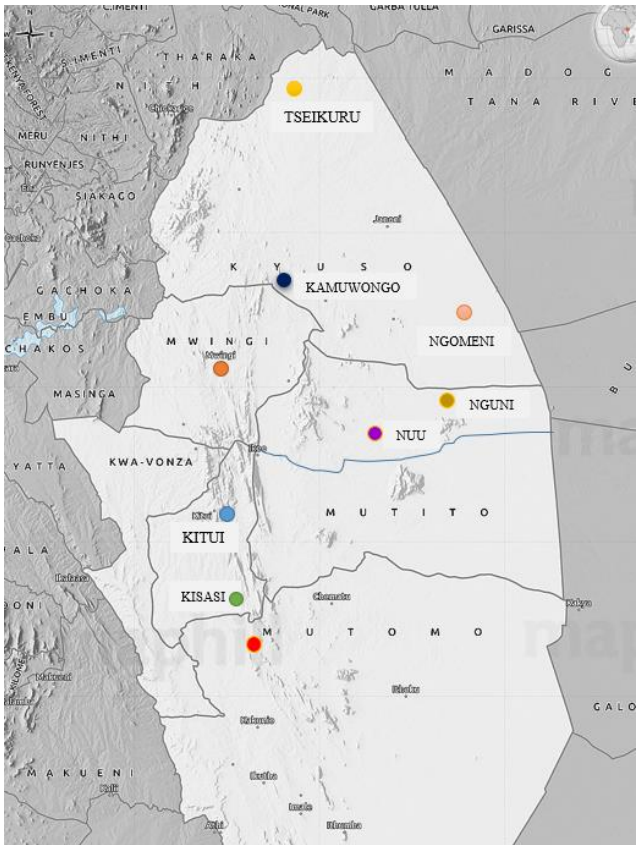

Figure 15 Geographical spread of livestock market centres in Kitui County

more muscle, therefore more meat. Most of the animals traded in Mwingi Market come from Tseikuru area and Garissa County. Mwingi provides an avenue to meet and trade animals and is the biggest livestock market centre in Kitui County.

On a normal market day, about 1600 animals pass by the Mwingi market. On a single market day, Mwingi hosts about 600 cattle, 750 goats, 60 donkeys and 100 sheep. Of cattle, about 100 are sold to buyers who ship them outside the county while about 150 cows are sold locally; for goats this is 300 and 350 respectively. In total about 1000 animals are traded with total transactions amounting to 12 million Ksh per day. This makes Mwingi one of the biggest livestock markets in the country. Annex 2 shows livestock populations and money transactions that take place in Mwingi market on a single market day.

Livestock production and selling is an attractive business to get into. It's an economic stronghold which can thrive under the harsh climatic conditions of Kitui County. Though it is also a risky business, especially when you are new to the scene. Also, livestock producers often do not weigh their animals when selling and rather sell them off when they urgently need money, this means often animals are sold for a low price compared to their value.

5.2.3 Meat sales from goats and cows

Slaughtering of animals is conducted at slaughterhouses located in major towns of the County. Some of the main customers and buyers of livestock producers are traders who own butcheries. On an average, a butchery owner in the County buys seven medium sized goats per week. This means that a butchery sells one medium sized goat per day. Cattle meat is not liked as much as goat meat and therefore only few butcheries and major supermarkets in the County sell cattle meat. For the few butcheries that sell cattle meat, they sell an average of about two small sized cattle per week. Presently, there are no active red meat cooperatives in the County.

In Kitui which has two market days, most butchery owners buy animals on both market days of Tuesday and Thursday. Butchers and livestock traders usually keep in close touch with each other and this ensures consistent supply of animals to butchers at fair prices. On Tuesdays, they buy three goats, and on Thursdays they buy four goats, lasting them the whole week. The animals are slaughtered daily at Kitui slaughterhouse. The goats are bought on market days because it's convenient for meat sellers to buy in bulk hence encountering lower costs and also because it's easier to access good quality animals during market days.

In Kenya, it's a requirement that animals can only be slaughtered at places licensed as slaughterhouses where meat is inspected and stamped if passed for human consumption (fee

amounts to 160 Ksh. Transportation fee of the meat from the slaughterhouse to butchery is an average of 50 Ksh. Average price for one kilogram of goat meat is 510 Ksh while for cattle meat it is 480 Ksh. Butchery owners buy a middle-sized goat for 5000 Ksh which gives them about 22 Kgs of meat after being slaughtered (equals 11,220 Ksh of sales from 1 goat). For cattle, a small sized animal gives about 80 Kgs of meat after slaughter (equals 38,400 Ksh of sales from 1 cow). Figure 16 gives an overview of average expenses and earning in Ksh per week for Butchery owners.

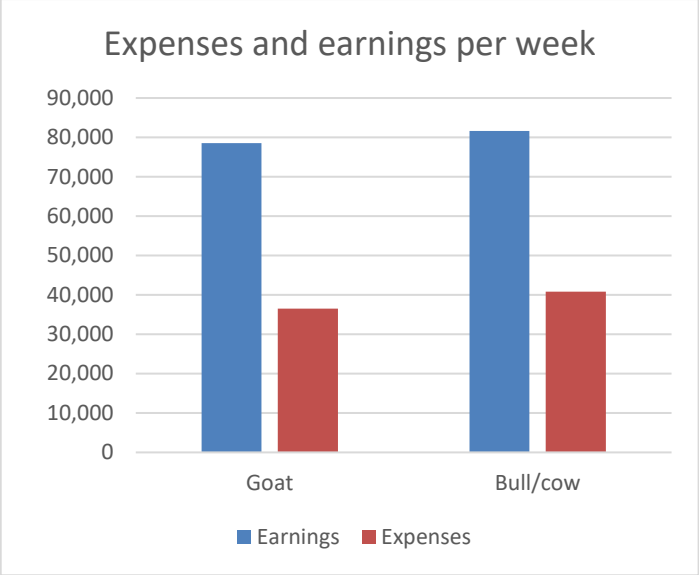

Figure 16 expenses and earnings per week in Ksh for butchery owners

Total profit made by meat sellers selling goat meat is slightly higher (42,070 Ksh per week) compared to cow meat (40,800 Ksh). Though fewer cattle are consumed locally, most of them are bought by traders and brokers who go to sell to urban centres. Major challenges faced by butchery owners include too few customers to sell the meat within short time. As a result, losses are incurred, as people do not want to buy stale meat, and there is a lack of proper refrigeration systems to keep the meat fresh for longer periods.

5.3 Dairy market

All respondents interviewed who rear cows for milk production, do it for domestic use and commercial purposes. However, the dairy sector in Kitui is very small, due to low production there are only two organized milk cooperatives. Milk producers within the county consume the milk they've produced and sell to their immediate neighbours. On average farmers have one cow for milk production, giving 7 litres daily. Household consumption is 1 litre per day, leaving 6 litres to be sold at 60 Ksh per litre. Therefore, dairy farmers make an average of 360 Ksh per day on days when they sell milk.

The only value addition done on milk is fermentation to make sour milk (Maziwa Mala) which is eaten alongside ugali and is a local delicacy. A milk cooperative also makes yoghurt. Farmers earn an extra 10 Ksh from selling sour milk.

Main sources of feed for the dairy cattle comprise of free-range grazing, planted grass, cut pastures and crop residues. Droughts reduces milk yields and increase livestock mortality rates (Amwata, 2004). Demand for milk in the county is increasing with population growth. A little while back, milk suppliers from Meru and Embu Counties used to supply milk to Mwingi and other parts of the County but stopped with time because of the restrictions involving trading of milk from one County to another. This has therefore left a gap to be filled. The major source of milk for the County is packaged milk from the established milk cooperative bodies which supplies country wide. This milk does not get to the rural parts where transport network is poor. Local production can help bridge this gap.

Chapter 6: Cost-benefit analysis – Pasture vs Crop

This cost benefit analysis compares the costs for the production of three typical food crops (maize, green grams and pigeon peas) with two grass species (African foxtail and Maasai love grass). On an acreage of one acre.

It becomes very clear that the profit and income you can make from grass is much higher compared to these three crops. Especially when you think of the reduced costs for grass in the continuing years, as grass can remain for 5-20 years. So, land preparation and weeding only take place in the first and second year.

Grass can give you an average income of 63375 KSH on a yearly basis. Maize, green grams and pigeon peas have a highest possible income of 12900 KSH. Showing the big potential of grass, especially because it can do much better under dry conditions with scattered rainfall.

Table 2 annual yield and income comparison crop vs. grass for a 1-acre field

Annual yield and income comparison for a 1-acre field					
	Crop type			Grass species	
Activity	**Maize**	**Green grams**	**Pigeon peas**	**African Foxtail**	**Maasai Love grass**
Input costs					
Preparation, planting and management					
Land Preparation	2500	5000	0	2500	2500
Seed purchase	1500	2200	100	3000	3000
Sowing labour	2000	2000	500	1000	1000
Weeding labour	1500	1500	0	1000	1000
Chemicals	1500	3000	1000	0	0
Fertilizer/manure	3000	6000	0	0	0
Harvesting and storage					
Harvesting	3000	6000	2000	0	0
Post Harvesting	2000	4000	2000	0	0
Hay cutting and baling	0	0	0	4000	4000
Seed harvesting	0	0	0	5000	5000
Gunny bags (90kg)	500	600	200	1000	1000
Total input costs	**17500**	**30300**	**5800**	**17500**	**17500**
Output and sales					
Produce					
Seeds in kg	-	-	-	35	50
Hay in bales of 15 kg	-	-	-	200	250
Cereals/pulses in bags of 90 kg	10	12	4	-	-
Sales (KSH)					
Seed sale (800 ksh/kg)	-	-	-	28000	40000
Hay sale (250 ksh/bale)	-	-	-	43750	50000
Cereals/pulses sale (30, 40, 20 ksh/kg respectively)	27000	43200	7200	-	-

Total sales	**27000**	**43200**	**7200**	**71750**	**90000**
Total income					
Total income (KSH) (total sales – total input costs)	**9500**	**12900**	**1400**	**54250**	**72500**
	Highest possible: 12900			**Average = 63375**	

* the rates on input costs for grasses are here described as annual costs, however perennial grasses can remain for 5-20 years at same production levels. Therefore, the total income on grasses will only increase with years to come.

** For green grams it is possible to get 2 harvests in one year, for maize and pigeon peas you would get 1 harvest per year.

*** Pigeon peas are nearly always intercropped with another main crop, mostly maize, therefore the costs for land preparation coincide with the preparation costs of maize.

Chapter 7: Conclusions and recommendations

First of all, pasture production as an active cultivation practice on farmland is a new venture for agropastoral farmers in Kitui County. Previously, free range grazing was done, on owned land or by hiring land. To date only few farmers produce pasture with the aim of fattening animals, selling hay or producing seeds. Currently, those who produce pasture use it to be grazed by their own animals, or pastureland is being rented out. There are almost no specific strategies in place where farmers do specialization, timing or value addition of products in the pasture value chain.

As a result, both for seeds and hay, there is no established market available where farmers can commercially trade their produce. So far, sales happen to neighbours. But, looking at the ever-high demand for hay and high prices, the potential for such a market is evident.

Livestock markets, on the contrary, are well developed and are economic strongholds in the county. Livestock keeping has a long history and cultural importance, though despite its importance and large sums of money being traded, it is not very formalized, and a limited number of people are making big profits. Especially the livestock producers themselves do not strategically plan and time their activities in order to benefit from market dynamics. Keeping livestock has important cultural values and is not yet seen purely as economic activity, though respondents indicate they expect this to happen.

It is likely that professionalization of livestock production and increased pasture production will coincide, as they strengthen each other. At the moment livestock producers source for hay and seed outside the county. The livestock sector will profit from higher quantity and quality of feed nearby, enabling farmers to strategize their livestock production better and also create higher value for their animals. This in turn will attract more buyers from elsewhere, bringing in more demand and likely higher prices.

This study concludes that there is enormous potential to exploit business opportunities in the pasture value chain in Kitui County. There are a few key challenges to be addressed in order to unlock this potential.

1. *Increase local pasture production*. Active cultivation of grass means that farmers first need to be convinced and taught how this can be done. Knowledge sharing is necessary in order for farmers to learn the benefits and best practices of pasture cultivation.
2. *Professionalization*. Additionally, farmers can specialize in different parts of the pasture value chain, e.g. in seed production, hay production, animal fattening or dairy production. If farmers specialize in each of these, then the input costs for production can be kept low, outputs are increased, higher quality is attained, and market trade will be triggered. In the end enabling more people to make a living.
3. *Market organization*. Markets are rather informal in nature, scattered and dictated by a few who know the dynamics and make big profits. Proper organization of farmers, e.g. in cooperatives and quality control measures can aid sellers to get a higher value for their livestock.
4. *Value addition*. An important step is to do value addition, this will make transport and bulking easier and increase the profit made from the basic product.

In the next paragraph recommendations are made how this can be achieved.

7.1 Recommendations

Supporting local farmers through trainings on pasture farming, provision of high-quality seeds and creating an avenue for farmers to link and learn from each other. Each locality should have pioneer pasture farmers teaching the other farmers in the locality. This will increase quantity and quality of pasture production.

- Specifically, a focus can be put on land rehabilitation in light of increasing climate change resilience. Take for instance the 'Kenygoni' communal lands, these can be reseeded with the communities.
- At the same time the business opportunity of pasture production should be stressed, this is likely to trigger strategic pasture farming.
- These farmers should be linked to other pasture farmers or markets, in order to buy inputs and sell outputs.
- Promote methods of water harvesting and soil conservation integrated with pasture cultivation and management.

Professionalization of different parts of the pasture value chain and value addition options:

- Pasture production: increase land size, consider mechanisation, invest in quality seeds, implement road water harvesting, fence off land and make bales of the hay.
- Seed production: focus on seeds in high demand, ensure quality (through testing) and sell in appropriate containers/sacks.
- Animal fatteners, meat production: e.g. do timely purchase, fattening and sales of animals according to market dynamics.
- Dairy production: e.g. through production of sour milk (mala) which fetches higher price than normal milk.

Pasture and livestock farmers can organize themselves into cooperatives where it will become easier for them to access government services such as extension services, accessing credit facilities, collective marketing of their produce and easy access to market information.

Professionalization of markets through weighing of produce and animals and quality control.

- Introduction of weighing machines at markets
- Farmers to combine efforts on transport and bulking feed

Look at the opportunity to open a slaughterhouse in Kitui County for value addition, then make sales to regional, national and international markets.

ASAL agricultural policy should focus a great deal on pasture production. This should be integrated in policies at the various levels of government (national, county).

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Annex 1: Price dynamics among different animal types in Kitui County

Animal type	Male				Female			
	Age of animal			Price (Ksh) per unit	Age of animal			Price (Ksh) per unit
Cattle	Steer (Never ploughed)	Breed	Kamba	18,000	Heifer (Young cows that have never given birth)	Breed	Kamba	11,000
			Somali	20,000			Somali	15,000
		Weight	Thin	15,000		Weight	Thin	11,000
			Fat	20,000			Fat	15,000
		Type of horns	Long horns	19,000		Type of horns	Long horns	14,000
			Short horns	20,000			Short horns	15,000
	Young bulls (Just starting to plough/ have not matured fully	Breed	Kamba	25,000	Heifer (Young cows that have only given birth once)	Breed	Kamba	18,000
			Somali	35,000			Somali	20,000
		Weight	Thin	20,000		Weight	Thin	15,000
			Fat	35,000			Fat	20,000
		Type of horns	Long horns	34,000		Type of horns	Long horns	19,000
			Short horns	35,000			Short horns	20,000
	Bull		Kamba	45,000	Cow		Kamba	30,000

	(Fully mature)	Breed (Big/huge size)	Somali	60,000	(Fully mature after several births)	Breed (Big/huge size)	Somali	40,000
		Breed (medium size)	Kamba	40,000		Breed (medium size)	Kamba	25,000
			Somali	50,000			Somali	35,000
		Weight (Big/huge size)	Thin	40,000		Weight (Big/huge size)	Thin	25,000
			Fat	60,000			Fat	40,000
		Weight (medium size)	Thin	35,000		Weight (medium size)	Thin	20,000
			Fat	50,000			Fat	35,000
		Type of horns (Big/huge size)	Long horns	58,000		Type of horns (Big/huge size)	Long horns	38,000
			Short horns	60,000			Short horns	40,000
		Type of horns (medium size)	Long horns	48,000		Type of horns (medium size)	Long horns	33,000
			Short horns	50,000			Short horns	35,000
Goat	Young (Small in size)			3,500	Young (small sized/Never given birth)			3,000
	Mature (Mature but middle sized)			8,000	Mature (Mature but middle sized)			5,000
	Mature (Big/huge in size)			13,000	Mature (Big/huge in size)			7,000
Donkey/ Camels	Young (Small in size/)			7,000	Young (Small in size)			6,000
	Midlife (middle sized/can carry 20-liter jerry cans)			11,000	Midlife (middle sized/can carry 20-liter jerry cans)			10,000
	Mature (Medium to large in size)			15,000	Mature (Medium to large in size)			13,000

Annex 2: Market transactions that take place in Mwingi livestock market centre

Number of **cattle** sold for export outside the County	Number of **cattle** traded locally within the county	Number of **goats** sold for export outside the County	Number of **goats** traded locally within the county	Number of **donkeys** sold for export outside the County	Number of **donkeys** traded locally within the county	Number of **Sheep** sold for export outside the County	Number of **sheep** traded locally within the county
100	150	300	350	20	30	20	30
Average price of one cow/bull	Average price of one cow/bull	Average price of one goat	Average price of one goat	Average price of one donkey	Average price of one donkey	Average price of one Sheep	Average price of one Sheep
25,000	25,000	5,000	5,000	10,000	10,000	4,000	4,000
Value of cattle traded outside the County	Value of cattle traded within the County	Value of goats traded outside the County	Value of goats traded within the County	Value of donkeys traded outside the County	Value of donkeys traded within the County	Value of Sheep traded outside the County	Value of sheep traded within the County
2,500,000	3,750,000	1,500,000	1,750,000	200,000	300,000	80,000	120,000
Total						**10,200,000**	
Total animals traded on one market day							**1000**
Tax levied by County council on **cattle** sold for export outside the County	Tax levied by County council on **cattle** sold locally within the County	Tax levied by County council on **goats** sold for export outside the County	Tax levied by County council on **goats** sold locally within the County	Tax levied by County council on **donkeys** sold for export outside the County	Tax levied by County council on **donkeys** sold locally within the County	Tax levied by County council on **sheep** sold for export outside the County	Tax levied by County council on **sheep** sold locally within the County
150	100	70	40	150	100	70	40
Money earned by county government per market day							
15000	15000	21000	14,000	3,000	300	1400	1200
Total							**70900**