Characterization of livestock production systems and the potential of feed-based interventions to improve livestock productivity in Bukira East ward of Kuria West Sub-county, Kenya

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The Feed the Future Kenya Accelerated Value Chain Development (AVCD) program seeks to widely apply technologies and innovations for livestock, dairy and staple crop (root crops and drought-tolerant crops) value chains in order to competitively and sustainably increase productivity, contributing to inclusive agricultural growth, nutrition and food security in 23 counties in the country. Supported by the United States Agency for International Development as part of the US government's Feed the Future initiative, its main goals is to sustainably reduce poverty and hunger in the Feed the Future zones of influence in Kenya.

In partnership with the International Crops for Research Institute for Semi-Arid Arid Tropics (ICRISAT) and the International Potato Center (CIP), International Livestock Research Institute (ILRI) will lead the implementation of AVCD. The three CGIAR centres will work closely with partners—county governments, NGOs, CBOs, private sector actors and other USAID-funded projects/programs, as well as leverage knowledge and best practices from academic institutions and foundations.

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Summary

The Feed Assessment Tool (FEAST) was applied in assessing livestock production system and feed resource availability and utilization in Magango, Nyatechi, Taranganya and Karosi villages in Bukira East Ward, Kuria West sub-County, Kenya. The survey was carried out using a focus group discussion with 21 farmers and individual interviewing of nine farmers. The four villages had both crop and livestock as the major sources of livelihood. Crops cultivated for cash and food included maize and beans intercrop, sweet potatoes, cassava and bananas. The major types of livestock kept in the villages included local chicken, cattle, sheep and goats. In feeding practices, grazing and cut and carry systems were dominant with high contribution to livestock diet. Key issues identified as constraints in livestock production were lack of knowledge and skills in livestock production, high incidences of livestock diseases and parasites, shortage of quality livestock feeds and shortage of Artificial Insemination (AI) services. These are potential entry points for interventions in livestock feeding systems.

Introduction

Livestock feed is often cited as the main constraint to improve productivity for smallholder farmers. Feeding practice that dominates in Bukira East is free range systems. The key issue is low productivity potential of the animals which is an implication of lack of knowledge/skills on general animal husbandry and/or high incidences of livestock diseases and parasites. This is a potential entry point for intervention in feeding strategies. Overcoming these constraints requires farmer-centered diagnosis research methodology, which involves holding focus group discussions and one-on-one interviews with farmers to get their input on local conditions, feed-related problems and potential solutions.

This study was carried out with the aim of rapidly assessing the prevailing farming and livestock production system, feed resources availability and livestock production constraints of the area in order to identify potential intervention in livestock feed resources.

Methodology

Study site

The study was carried out in Magango, Nyatechi, Taranganya and Karosi villages in Bukira East Ward in Kuria West Sub-county, which is one of the eight sub-Counties in Migori, Kenya. Altitude ranges from 1200 to 1500 meters above sea level, mean annual rainfall ranges from 1200 to 2300 mm and temperature ranges from 9^0 C to 30^0 C. The area of land which is cultivated land is approximately 298.2 km^2.

One facilitator and three technical teams conducted the survey. The facilitator carried out a two days preliminary scoping exercise for mobilization of farmers from Bukira East ward and for the formation of a technical team. The technical team comprising of two sub-County livestock officers and one student (on attachment) held a meeting with 20 farmers for a focus group discussion (FGD)

and interview with nine farmers. The nine farmers represented three land holding categories: small, medium and large scale as perceived by participants of the FGD.

Data collection and analysis

Data collection was carried out using FGD and individual interviews. A semi-structured questionnaire was used to guide the FGD. The data collection instrument for the individual interviews was structured questionnaire. Survey data analysis was carried using FEAST developed by ILRI (2015).

Results and discussion

The results were categorized into landholdings, livelihood activities, crops and cropping seasons, livestock and livestock systems, livestock feed and feeding systems, labour availability, agricultural and livestock inputs and services.

Landholdings

According to the perception of the FGD participants, about 40% of the households have medium size landholdings ranging from 0.81 to 3.6 ha. This is followed by small landholdings of less than 0.81 ha, and large size landholdings of more than 3.6 ha, respectively (Figure 1).The average family size per household was reported to be 8-10 persons in the study area.

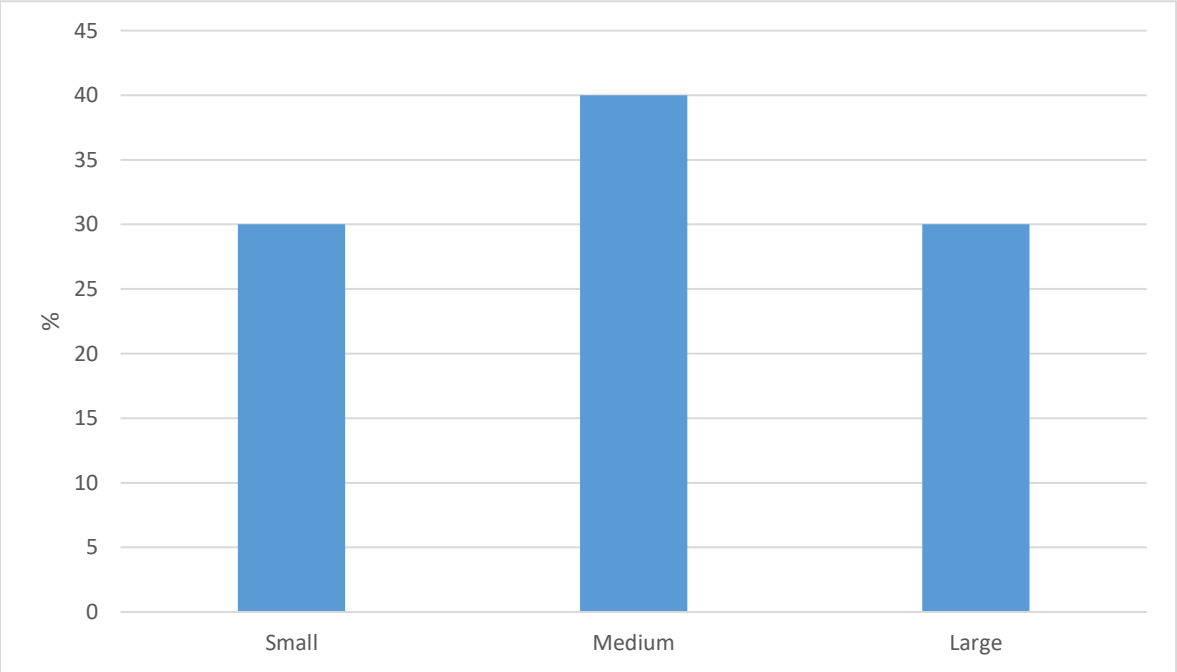

Figure 1: Proportion of households owning small, medium and large landholdings in Bukira East

Livelihoods activities

Crop and livestock production are the two main contributors to livelihoods of the households in the ward. Crop and livestock production contributes to 52% and to 29% of the household income, respectively (Figure 2). Among the crops grown, maize and beans are used for both household consumption and income generation whereas sweet potatoes are mainly grown for sale. Livestock production contributes to household food and income from the sale of animals and animal products. Draught cattle are used as sources of draught power and manure for soil fertility restoration. Dairy cows serve as a source for milk, manure, replacement of breeding stock and paying of bride price. The main uses of sheep and goats in the village include generation of cash, meat, breeding stock and manure production. The importance of keeping chicken is for household consumption of chicken meat and sale of eggs for cash.

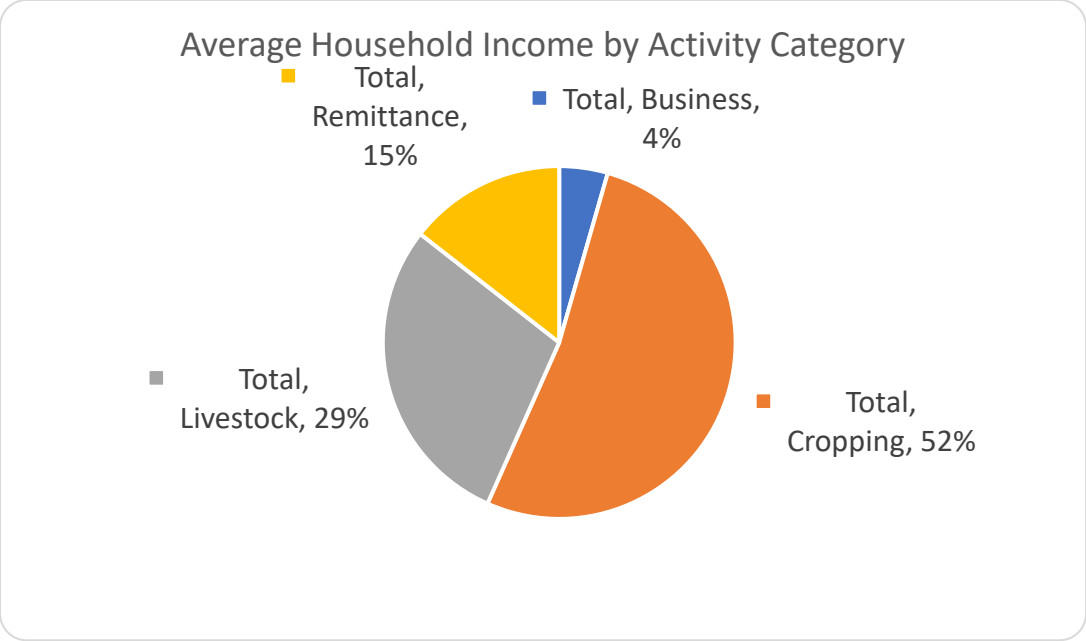

Figure 2: Household income sources in Bukira East

Crops and cropping seasons

The area receives bi-modal rainfall during the long (*Itaparari*) rainy season from February to June and short (*Omwopo*) rainy season from September to December. The highest rainfall is received during April and May with little or no rainfall recorded in the months of January and July. There are two cropping seasons that correspond to these two seasons. Maize is the main crop grown followed by beans, sweet potatoes, cassava and sorghum. In addition, groundnuts and bananas are grown in the area (Figure 3). Farmers in Bukira East do not have access to irrigation water or irrigation facilities to support off season crops in months of January and July.

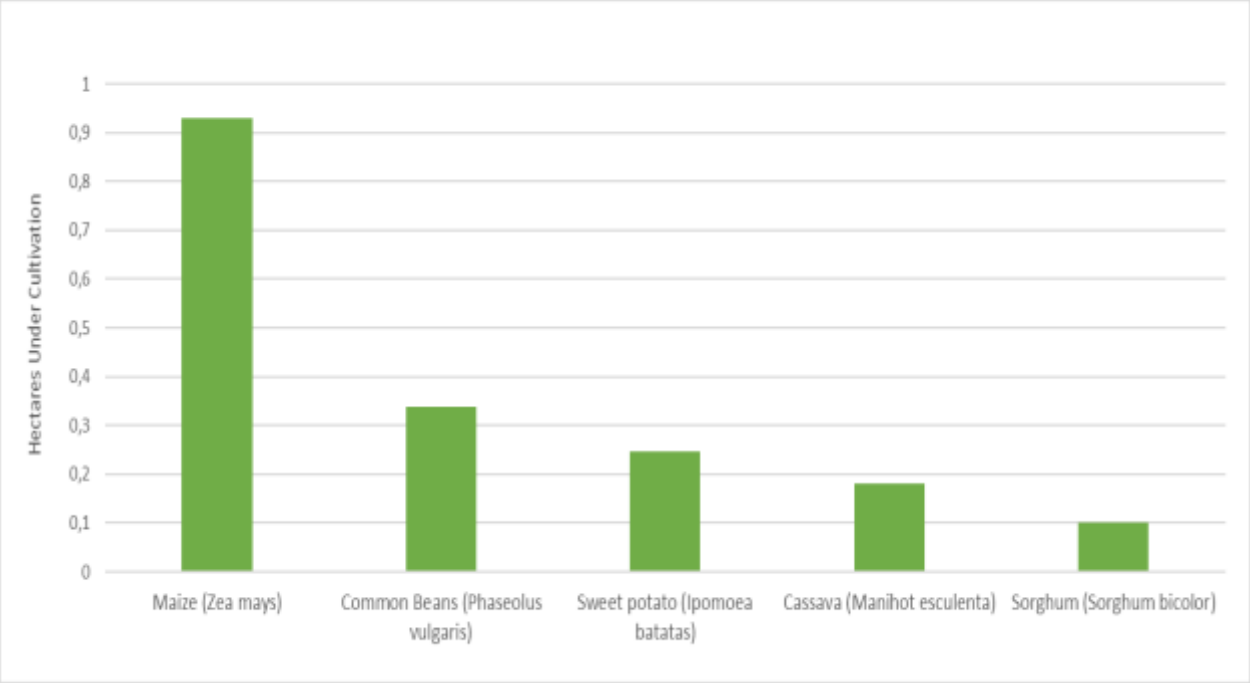

Figure 3: Dominant crops grown by the households in Bukira East

Livestock management

Livestock species raised in the area include local dairy cows, improved dairy cows, sheep, goats and village family poultry. Cattle are owned by 30-70% of the households who keep dominantly indigenous Wetende and Sahiwal breeds. Sheep and goats are owned by 30-40% of the households while poultry are owned by almost every household in Bukira East (Table 1).

Table 1: Percentage of households who own livestock in Bukira East

Livestock species	Proportions of household (%)	Average No. of animals
Local dairy cows	70	3
Improved dairy cows	40	1
Fattening/draught cattle	30	2
Sheep	30	2
Goat	40	4
Poultry village condition	100	5

Households own different livestock species. Indigenous cattle breeds are the most dominant with an average size of two TLU/household (Tropical Livestock Unit). The second most dominant livestock kept by households are improved cows (Figure 4). Zero grazing is practiced in 40 the households applying the system of cut-and-carry of fodder. 20 households have good sheds for their animals, i.e.

shades made of timber, concrete floor and iron sheet roofs. All these households tie their animals and feed them under a tree during the day and confine them in the sheds in the evening.

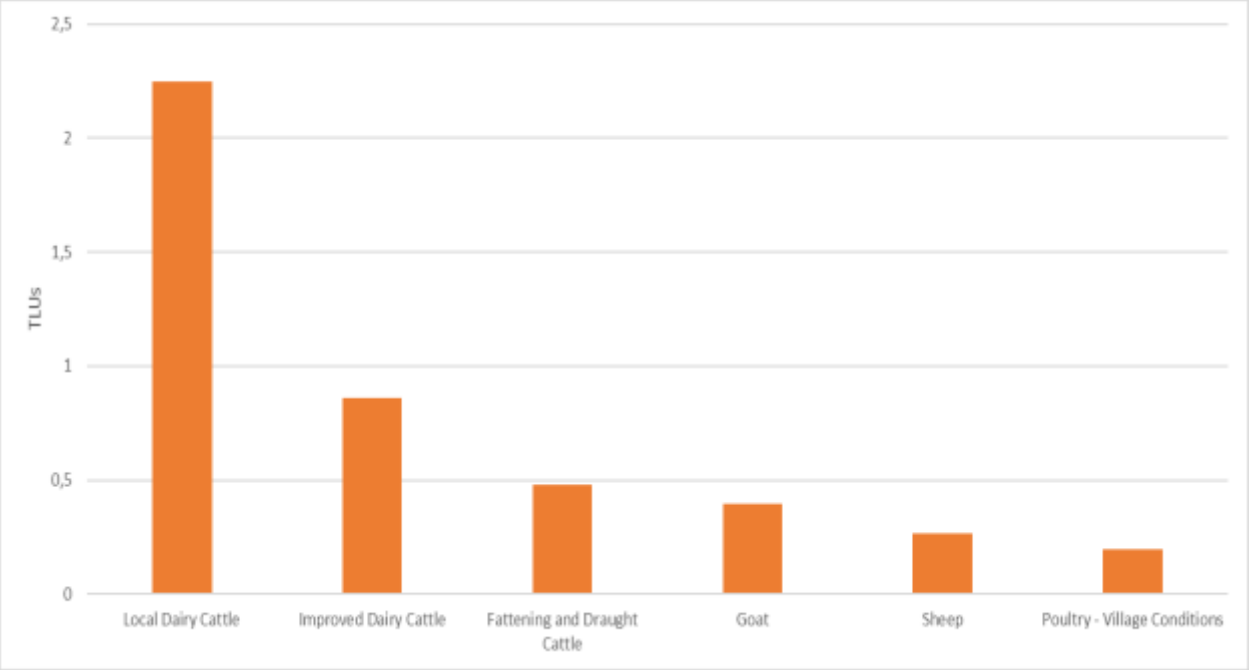

Figure 4: Average livestock holding by type (TLU/household)

Ownership pattern for each class of livestock show that from cattle, the most dominant are local dry cows followed by local lactating cows and heifers. The average ownership for improved dairy cows, goats and bulls is 0.4 TLU/household.

Livestock ownership pattern based on landholdings shows that the highest numbers of poultry are owned by households with less than 0.8 ha farmland size. Landholding appears to have insignificant influence on the number of other large livestock owned by households.

Availability and dietary composition of livestock feeds

Availability of feed resources

Grazing on natural pasture contributes to the main source of livestock feed throughout the year. It is most abundant during the crop growing season and least abundant during dry periods (Figure 5). Quantity of green forage is constant throughout the year although it is not adequate.

Other sources of feeds utilized are crop residues and collected fodder. Maize stover is the main crop residue available during the post-harvest period in August and December. The usual practice of farmers is to let cattle feed on these resources on the farm leading to poor utilization and

substantial loss due to trampling. Most households do not even know how to efficiently utilize the crop residues obtained from beans.

Farmers in Bukira East make little use of concentrate feeds for lactating dairy cattle and calves. There is poor knowledge on the nutritional benefits of concentrate feeds and their high cost and the lack of supply are deterring farmers from using concentrate feeds in dairy feeding systems.

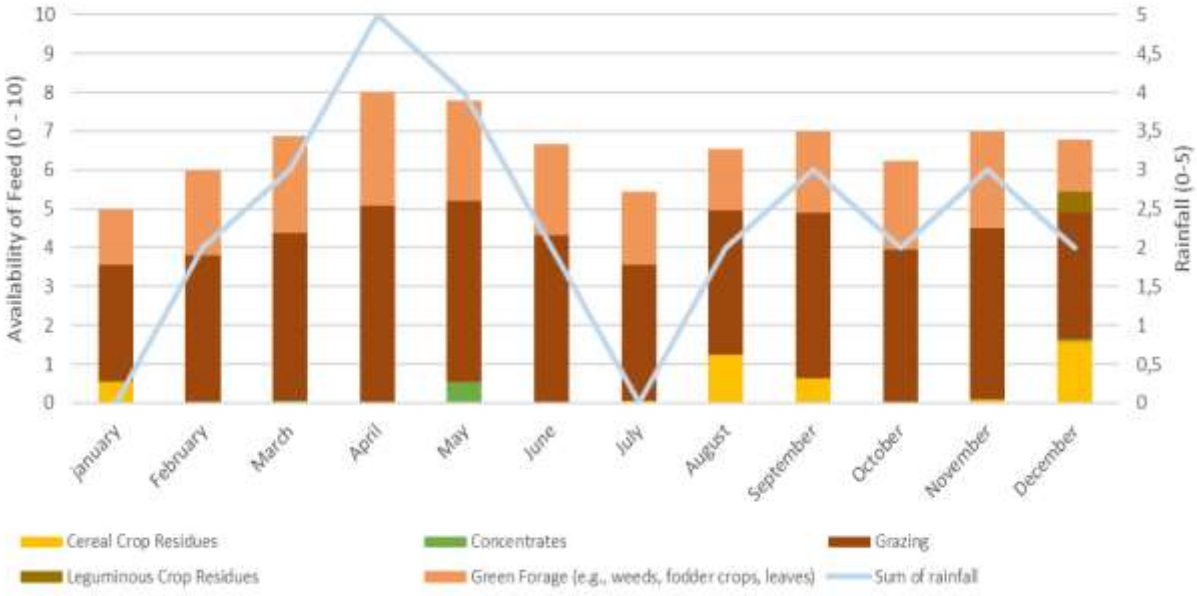

Figure 5 : Available feed sources utilized by farmers in Bukira East

Dietary composition

The survey indicated that grazing is the major contributor to livestock feed supply, constituting to about 49% of the total dry matter (DM). Cultivated fodder, mainly Napier grass, is the second most important contributor to livestock feed supply, contributing to 35% of the total DM. The contribution of crop residues and collected fodder to the total DM supply was 6% and 9%, respectively (Figure 6).

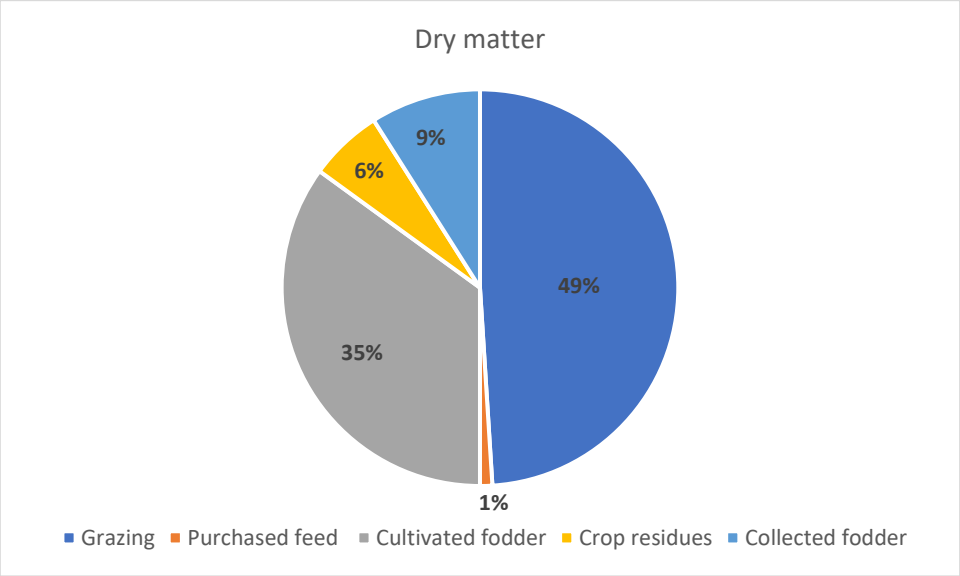

Figure 6: Contrbution of different feeds to dry matter (DM) intake in Bukira East

In terms of metabolisable energy (ME) supply, grazing and cultivated fodder contributed to48% and 35% of the total dietary ME (Figure 7). Crop residues and purchased feeds contributed to the least ME.

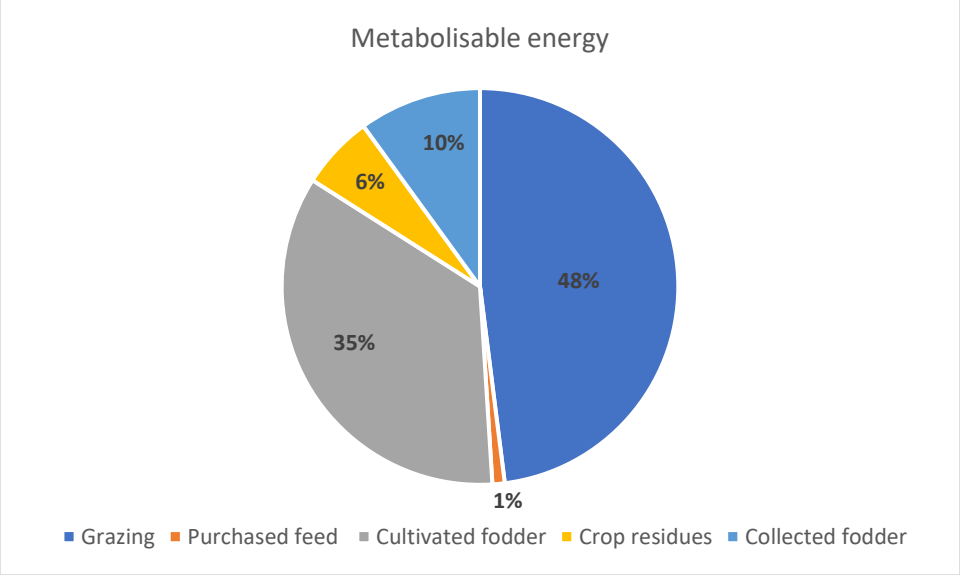

Figure 7: Contrbution of different feeds to total metabolisable energy intake in Bukira East

Of the total crude protein (CP) intake, about 46% is contributed by Napier grass (Figure 8). The contribution of grazing to total CP intake is about 39%.

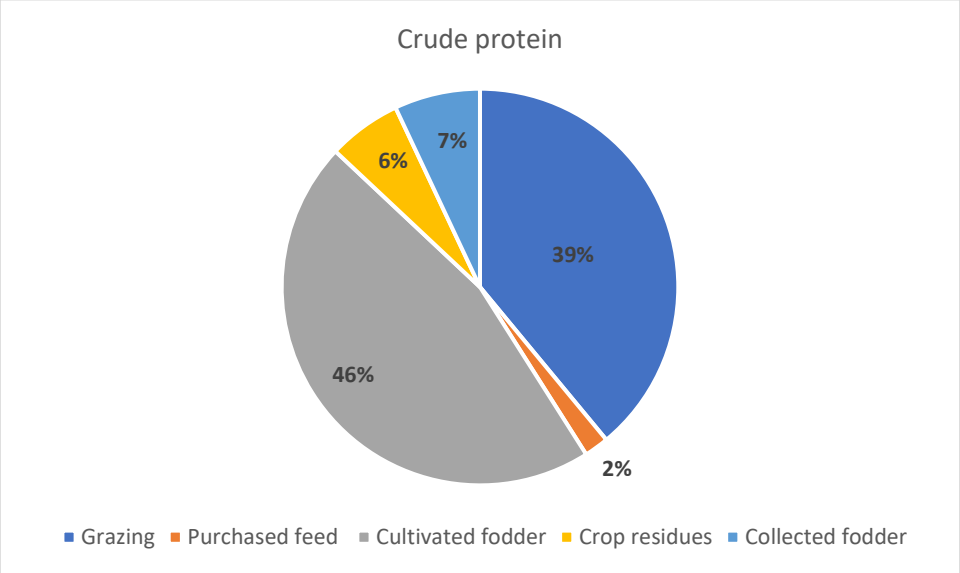

Figure 8: Contrbution of different feeds to total crude protein (CP) intake in Bukira East

Cultivated fodder

Fodder crops such as Napier grass (*Pennisetum purpureum*), Rhodes grass (*Chloris gayana*) and fodder trees are the major types of forages grown and fed to improved dairy cattle (Figure 9). The quantity of planted Napier grass is not adequate so many households that keep dairy cattle supplement it with harvested fodder or grazing on open land. This practice exposes most of these improved dairy cattle to tick-borne diseases. It was noted that about 30% of the households with improved dairy cattle occasionally produced surplus Napier grass during the month of April and May when rainfall is at its peak. All the households keeping dairy cows had Napier grass although only 40% of them had the recommended minimum land size. There were only 5 households who planted Rhodes grass and many households do not know how to establish and utilize it. About 10 households had limited fodder trees and none had pasture legumes.

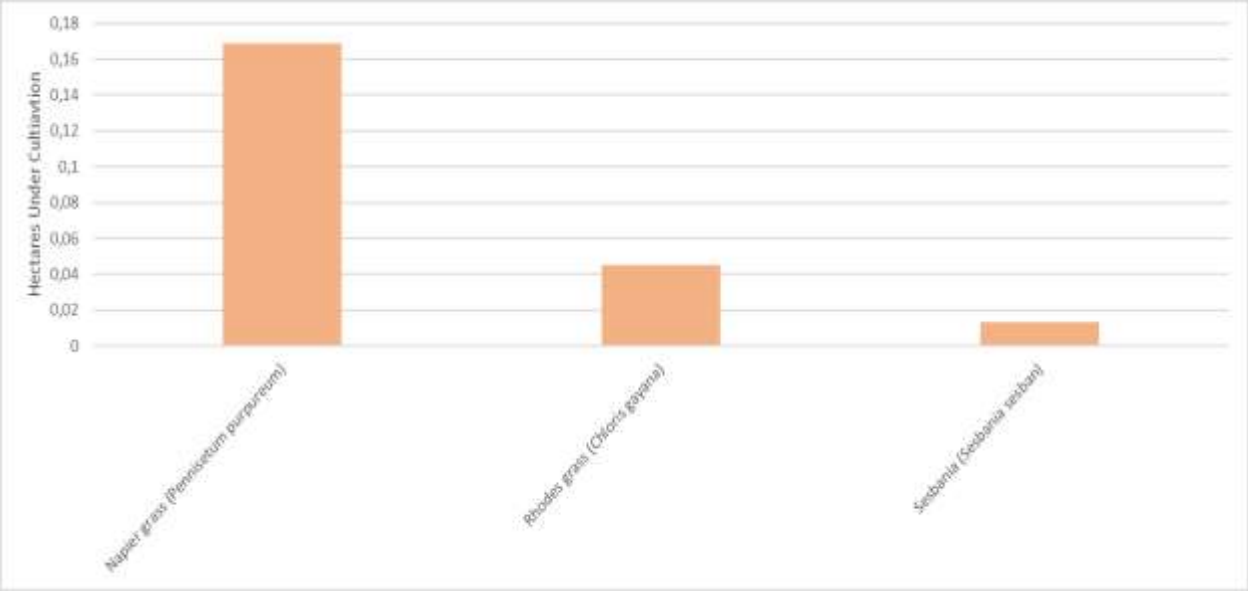

Figure 9: Dominant fodder crops by average hectares cultivated in Bukira East

Dairy meal is the only purchased feed resource used in the area and its contribution to livestock diet is negligible. Less than 15% of the households with improved dairy cows use dairy meal as a supplementary feed, and most of the households had no knowledge about the quantities of concentrate feeds needed to stimulate milk production.

Labour availability

Labour is an important factor that determines the productivity of agricultural enterprises of a given household. Labour shortage was reported to be a common problem in Bukira East ward particularly during the peak harvest, planting and weeding seasons. The average daily cost of labour was reported to be KES 300 to KES 500 (US $3 to US$4) with similar payment rate across gender. It was indicated that family labour is declining as many children are leaving the villages for education, marriages and employment opportunities. This makes labour unaffordable to many households. The

elders indicated that such out migration of the young and able-bodied members of their community is contributing to the declining agricultural productivity in the villages. It was noted that labour for hire is provided by people from the neighboring communities.

Livestock inputs and services

Agricultural and livestock inputs are available from local sellers in the nearby area located at a maximum distance of 10 km. It was indicated that agricultural inputs such as fertilizers, agricultural equipment, concentrate feeds, acaricides, vaccines and veterinary services are not available as there are few traders in the area. Fertilizer is available in the cereal stores but most farmers are unable to purchase the required quantity because of the high price.

Access to credit service for investment into livestock enterprises is still inadequate. Credit providers (Commercial bank and Kenya Women Trust Fund) are available in the area but do not offer credit for crop/livestock production. Although credit facilities are available from microfinance institutions, most farmers do not use the services as they demand guarantee in the form of collateral and other risk factors involved. The credit services provided through table banking are group based and inadequate for engagement in livestock production.

There is a shortage of extension officers who would give advice in livestock production including prevention/control and treatment of diseases, also provision of AI services.

Key challenges and suggested interventions

The participants of the FEAST discussion identified several challengesto livestock production and prioritized them through a pair-wise ranking exercise (Table 2). Lack of knowledge and skills in livestock production was identified as the primary limiting factor followed by high incidences of livestock diseases and parasites, shortage of quality livestock feeds and shortage of A.I services, in decreasing order of priority.

Table 2: Major challenges and suggested interventions by farmers

Challenges	Suggested interventions
Lack of knowledge and skills in livestock husbandry practices	Capacity building of farmers on livestock husbandry through demonstration, field day and farmer courses Provide extension services
High incidences of diseases and parasites	Regular spraying Routine vaccinations Clinical services
Poor quality feeds	Planting of Napier grass Planting of improved pasture Concentrate feeding Feed conservation as silage and hay
Inadequate A.I services	Provision of AI equipment and kits along with the technician at the site level.

Main diseases highlighted by farmers include East Coast Fever, anaplasmosis, babesiosis, heart water, trypanosomiasis, and mastitis and worm infestation. The veterinary service providers are limited and usually not easily accessible.

Bulls are commonly used for reproduction because of inadequate access to A.I services in the area. The use of improved bull for service costs KES 100 to KES 500 (US $ 1 to US $5) depending on the breed of the cow to be served. Most farmers keeping local cattle use the services of local bulls which mate randomly in the fields resulting in inbreeding. A.I services was available to only 30% of the respondents having both local and improved cattle. The major problems experienced were related to heat detections and the accessibility of the A.I service itself. Over 70% of the farmers were not able to detect heat at the right time and 50% of the farmers who reported to the inseminator that their cows required insemination waited for the inseminator in vain.

The improved dairy animals did not have adequate supplies of Napier grass as most households had less than 0.4 ha of land planted for Napier. In most cases, improved cattle were at times grazed in open fields exposing them to tick-borne diseases. The forages were also of poor quality and not supplemented with commercial rations. Land under leguminous forage was negligible and was mainly fodder trees. These fodder trees were seldom used to feed dairy cattle but more common to feed goats thatnormally browse on them. Households with local dairy cattle were adopting tethering of cattle as opposed to the traditional grazing in open fields subjecting cattle to inadequate quantities of pastures. Besides, the households that practiced open grazing complained of reducing

areas for grazing. In some cases, the cattle were grazed between the farms under crops which required a herder.

Opportunities for improving livestock feeds

The high rainfall regime and warm climate can be an opportunity to increase the production of fodder and pastures and maximize productivity per unit area. Farmers can be encouraged to plant fodder and develop feed conservation skills. Ample opportunities exist to make use of the large quantities of crop residues resource as feeds during times of scarcity.

The proximity of the villages to the Migori-Kehancha road (which is almost complete) will offer another advantage for accessing agricultural input and for marketing agricultural products. Furthermore, the availability of locally adapted livestock breeds such as Wetende and Sahiwal cattle with a high growth rate potential is another opportunity for enhancing livestock production and productivity, by applying appropriate feeding and management practices. Additionally, the subsidized AI service provided by the state department of veterinary services, Migori County and ILRI for genetic improvement of the livestock resources can further enhance animal productivity.

The County government of Migori currently gives dairy production and management a high priority which presents an opportunity for integrating improved growth of food and fodder crops.

Conclusions

Crop and livestock production are the major means of livelihood for the farmers in Bukira East ward. Although Napier grass is widely grown in the village, the quantity produced does not match the population of improved dairy cattle. Feed conservation is not a common practice among the households keeping improved dairy cattle. Alternative sources of crude protein such as fodder trees and legume pasture (Desmodium Spp) are lacking. Furthermore, crop residues are poorly utilized through direct field grazing leading into high wastages. Commercial feed supplementation is also practiced by only a few households.

Keeping improved dairy cattle in zero grazing can be very rewarding to small holder farmers. It can provide a range of benefits, including nutritious milk for home consumption, extra milk for sale and manure to help maintain soil fertility for crop farming. Additionally, growing protein-rich fodder crops and pasture legumes not only helps boost production of milk and saves money on buying a commercial dairy meal or other concentrates, but will also further boost soil fertility.

Annexes

1. Context attribute scores

S/No.	Context Attribute	Score (0-4)	Reference
1	Availability of cash	2	Question 1.8 FEAST discussion guide
2	Availability of input delivery	2	Question 1.10 FEAST discussion guide
3	Availability of knowledge	2	Based on facilitator's best judgement
4	Availability of labour	3	Question 1.6 FEAST discussion guide
5	Availability of land for fodder cultivation	3	Question 1.9 FEAST discussion guide
6	Availability of water during the growing season	3	Question 1.5.2 FEAST discussion guide

References

ILRI. 2015. Feed Assessment Tool (FEAST) data application user manual. Nairobi: ILRI