

Characterization of the livestock production system and potential for enhancing productivity through improved feeding in Marani sub County of Kisii County, Kenya

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Acronyms

| | |
|----------|---|
| AI | Artificial Insemination |
| CP | Crude Protein |
| DM | Dry Matter |
| EAPP | East African Productivity Project |
| ECF | East Coast Fever |
| FEAST | Feed Assessment Tool |
| FGD | Focused Group Discussion |
| GDP | Gross Domestic Product |
| HIV/AIDS | Human Immunodeficiency Virus/Acquired Immunodeficiency syndrome |
| ICIPE | International Centre for Insect Physiology and Ecology |
| KARI | Kenya Agricultural Research Institute |
| ME | Metabolisable Energy |
| PRA | Participatory Rural Appraisal |

Abstract

Marani is one of the sub-counties, forming the administrative regions of Kisii County, Western Kenya. The Feed Assessment Tool (FEAST) was used to characterize the feed-related aspects of the livestock production system in Marani Sub-County, Kisii County of Kenya. The assessment was carried out through focused group discussions and completion of short questionnaires at 2 sites, representing peri-urban and typical rural setup. Marani sub-County is characterized by mixed crop-livestock production systems. Dairy, cash crops and food crops are the primary sources of household income. Cattle are the most important livestock species. Improved crop and dairy production are constrained by inadequate technical knowledge on fodder production, processing, feeding and general livestock management; lack of credit facilities, improved breeds and high cost of health services. Other constraints are poor milk markets and inadequate land for crop and feed production. To mitigate these constraints farmers (and other stakeholders) will be required to take an integrated approach to improve livestock production through provision of technical knowledge in feeds production, processing and feeding through training and tours, improving access to AI facilities to ensure farmers can rapidly upgrade the genetic merit of their cattle holdings and access to credit facilities to enable farmers to invest in the crop and livestock production enterprises and also milk marketing strategies.

General introduction and background

Livestock farming contributes significantly to the economies of Western Kenya (Ojowi et. al., 2001 and KARI Kakamega annual, 2006) through the generation of tangible and intangible products (World, 2005). Within the region, most of the milk produced is marketed informally and is thus an important source of employment and income in rural areas from production at the household level to informal transporters and retailers in the urban centres (MoALF. 2010). In addition, a regular supply of milk improves nutritional security for many rural poor families, provides affordable nutrients to improve the well-being of those suffering from HIV/AIDS and generates more regular household income and jobs than many other farming enterprises in Eastern Africa (Nicholson et al., 2003).

The western region is considered a high dairying region because of the favourable climatic conditions and soils (Jaetzold et. al., 2009), but the productivity of its herd is much lower compared to similar regions like Central Kenya and the North Rift Valley because of its poor dairy genetic resources kept by farmers. According to estimates by Waithaka et al. (2002), only 13% of the households are keeping improved dairy cattle. There is a potential to improve production and productivity to attain the levels of other regions with similar climatic conditions. Another major constraint to increase dairy productivity in the highly populated regions of Western Kenya is the inadequate quality of livestock feeds (KARI Kakamega annual report, 2006). This is particularly critical during the dry season when dairy herds are forced to rely on low-quality feed resources, which are nutritionally deficient in energy, nitrogen, minerals and vitamins with minimal or no supplementation. Most dairy farming in this region is practised by smallholder farmers in densely populated holdings. These conditions force farmers to allocate most of the available land to food crops leaving very little for planted pasture/fodders and natural grazing. With increased crop productivity dairy cattle are therefore fed on crop residues and Napier grass (*Pennisetum purpureum* Schumacher), planted on lands averaging less than 0.2 hectares. However, Napier stunt disease caused by phytoplasma, has since mid-1990's caused forage yield reductions of up to 90% (Mulaa et al., 2010). This is currently the biggest threat to forage production and the dairy sector in the region. According to Mr Sagala of Heifer international Western Region (Personal Communication), there has been a milk yield reduction of 20-40% caused by the lack of feeds, mostly due to the stunt diseases.

The challenges call for a combination of interventions. There is a need to improve animal productivity through more intensification and utilization of crop-livestock interactions, and

promotion and adoption of genetically diverse, high yielding, and climatically adapted grasses that are tolerant to diseases. Therefore, in order to design site-specific strategies for sustainable feed supply and utilization, the current survey was conducted with the following objectives:

- To assess feed resource availability and utilization using the FEAST tool, within the context of the overall dairy value chain, at four specific sites in Western Kenya
- To determine the potential of site-specific feed interventions in selected areas

Background of Kisii County

Marani is one of the sub Counties of Kisii County, Western Kenya. It has four administrative wards and 13 sub-locations. The sub-county covers an area of 123.7 km² of which 96 km² of the land is arable. It has a human population of 113,308 consisting of 23,732 households (<https://www.kisii.go.ke/>). The annual population growth rate is estimated at 2.1%. The sub-County is characterized by a hilly topography with several ridges and valleys. The western zone lies above 1,500m above sea level, while the Eastern zone lies between 1500-1800m above sea level. The growth of cash crops such as tea, coffee, pyrethrum and subsistence crops such as maize, beans and potatoes are supported by the red volcanic soils.



Figure 3. 1: Map showing the location of Marani Sub County in Kisii County

The sub county receives a bimodal rainfall pattern which ranges from 1200 to 2400mm with average annual rainfall of 1500mm. The long rains are received between March and June while the short rains are received from September to November. The months of July and January are relatively dry. The maximum temperatures range between 21°C – 30°C while the minimum temperatures range between 15°C – 20°C. The sub-County is dominated by the Upper Midland 1 (UM1) which covers 90 km² with only 6% of the land in the Lower Midland 1 (LM1). 75% of the sub county has red volcanic soils (Nitosols) which have high organic matter content. It has only one river called Mwamogusii Isanta which is 23 km in length.

General methodology

Study sites

The study was carried out in Marani sub County (Kisii County), which are within the sub-humid zone of Western Kenya. The specific sites were Mwagichan and Sensi wards representing a typical rural setup and peri-urban communities.

Participant selection and data collection

Participants were selected by the research team comprising of local agricultural/livestock production officers, a research scientist from Masinde Muliro University of Science and Technology, and local administrators. At each site, 18 to 25 farmers were involved in the Focus Group Discussions (FGD) to provide an overview of the farming system and to identify constraints and opportunities for improving livestock production at the site. Subsequently, 9 farmers were selected from the FGD to take part in the individual interviews.

Data Analysis

The quantitative data collected during individual interviews were analyzed using the FEAST excel template (www.ilri.org/feast), a feed assessment tool that has been developed to help to design site-specific strategies for feed supply and utilization, The data were presented in tables, graphs, pie and bar charts. The qualitative data collected using the PRA group discussions were synthesized and summarized.

Specific methodology

Forty (40) farmers, 20 from Sensi and 20 Mwagichana wards of Marani Sub County participated in focus group discussions using the participatory rural appraisal (PRA) approach (Table 3.1). It is used to provide an overview of the farming system and to identify constraints and opportunities for improving livestock production in each of the selected wards, using the Feed Assessment Tool (FEAST, Duncan et al., 2012). Nine individual farmers from each PRA group were selected based on landholding size (as an indicator of wealth) with three categories ranging from small, medium and large. These farmers were interviewed individually to gather both quantitative and qualitative information.

The Sensi site is crossed by a tarmacked road from Kisii to Marani market centre, while Mwagichana is a typical rural area accessed by an earth road (not accessible during the heavy rain seasons).

Table 3. 1. Group composition of farmer representatives

| Site | Men | Women | Total |
|-------------------------|--------|-------|--------|
| Sensi ¹ | 13 (6) | 7 (3) | 20 (9) |
| Mwagichana ¹ | 14 (5) | 6 (4) | 20 (9) |

¹Sub-County administrative wards

The number of individuals interviewed in parentheses

Results and discussions

Overview of farming system

Mixed crop-livestock farming is widely practised in the sub-County. The high and reliable rainfall coupled with moderate temperatures and good soils is suitable for growing crops like tea, coffee, pyrethrum, maize, beans and bananas as well as dairy farming. About 78% of the county is arable of which 57% is under crop. Agriculture is therefore, an important part of the livelihood strategy of the people of Marani.

Marani sub-County is dominated by small scale farming households. In both Sensi and Mwagichana majority of the farmers had landholding of less than 0.25 hectares and less than 10% of owned more than one hectare (Table 3.2). Despite the small landholdings farmers grow 9-10 crops (Figure 3.2 a & b and 3.3 a & b) on the same piece of land with the dominant crops being intercropped maize/beans, coffee, bananas and vegetables (assorted). The households surveyed had approximately 6-8 (range 4-10) people per household at both sites.

Table 3. 2. Average land sizes owned by different categories of farmers in Sensi and Mwagichana wards, Marani sub-County

| Category of farmer | Sensi Ward | | Mwagichana Ward | |
|--------------------|-------------------------------|----------------|--------------------------|----------------|
| | Range of land size (hectares) | %of households | Range of land (hectares) | %of households |
| Small farmer | ≤0.25 | 60 | <0.25 | 70 |
| Medium farmer | 0.25 – 0.5 | 30 | 0.25 – 0.5 | 20 |
| Large farmer | 0.5 - 3 | 10 | >1 | 10 |

Cropping seasons

Marani experiences four different cropping seasons spread quarterly over the year. The rainfall season '**Risimeka**' is from March to June and from September to December. The main dry season is called '**Tindacha**' from January to February when almost no precipitation takes place. Finally, '**Omwobo**' distinguishes a transition from July to September (low/start of rainfall season) (Table 3.3).

Land owned by farmers is not enough for all their farming activities. Inter-cropping is practised especially for cereal crops and beans. All agricultural activities are rain-fed except for 10% of farmers from Mwagichana ward who practise bucket irrigation on vegetables (during the dry season). Labour is generally available and is mostly required during the rainy season for land preparation, planting and harvesting. Labour costs KES 100 – 150 (\$1.25 – 1.88) plus food. Due to small landholdings, there is no mechanized farming, and as a result, land preparation costs KES 2,400 (\$24) per hectare. There is high rural-urban migration of male youth (70%) in search of better livelihoods.

Table 3. 3. Cropping seasons occurring in Marani

| Season | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Dry (Tindacha) | | | | | | | | | | | | |
| Long Rains (Risimeka) | | | | | | | | | | | | |
| Short dry (Omwobo) | | | | | | | | | | | | |
| Short Rains (Monugo) | | | | | | | | | | | | |

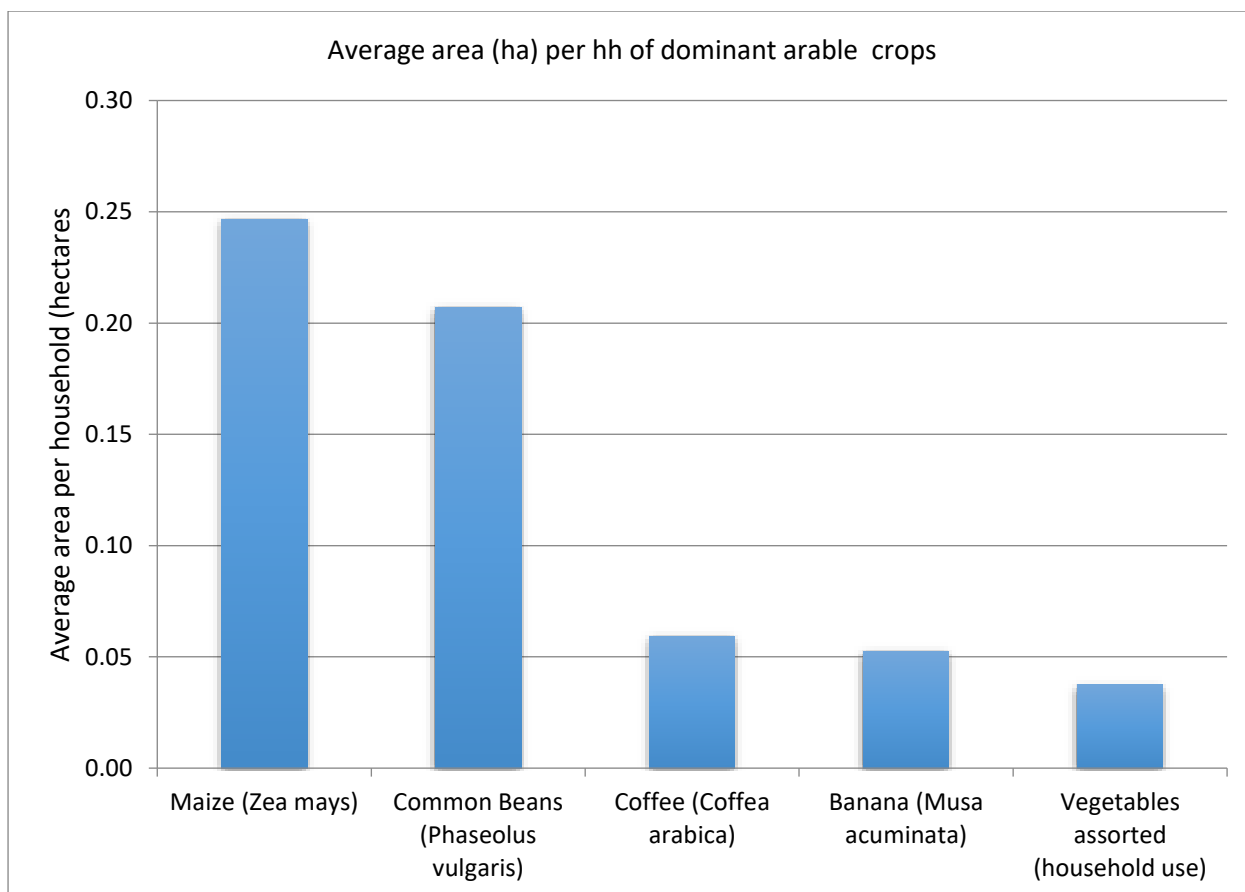


FIGURE 3. 2: AVERAGE AREA (HA) PER HOUSEHOLD OF DOMINANT ARABLE CROPS AS PERCEIVED BY FARMERS FROM SENSI WARD IN MARANI SUB-COUNTY.

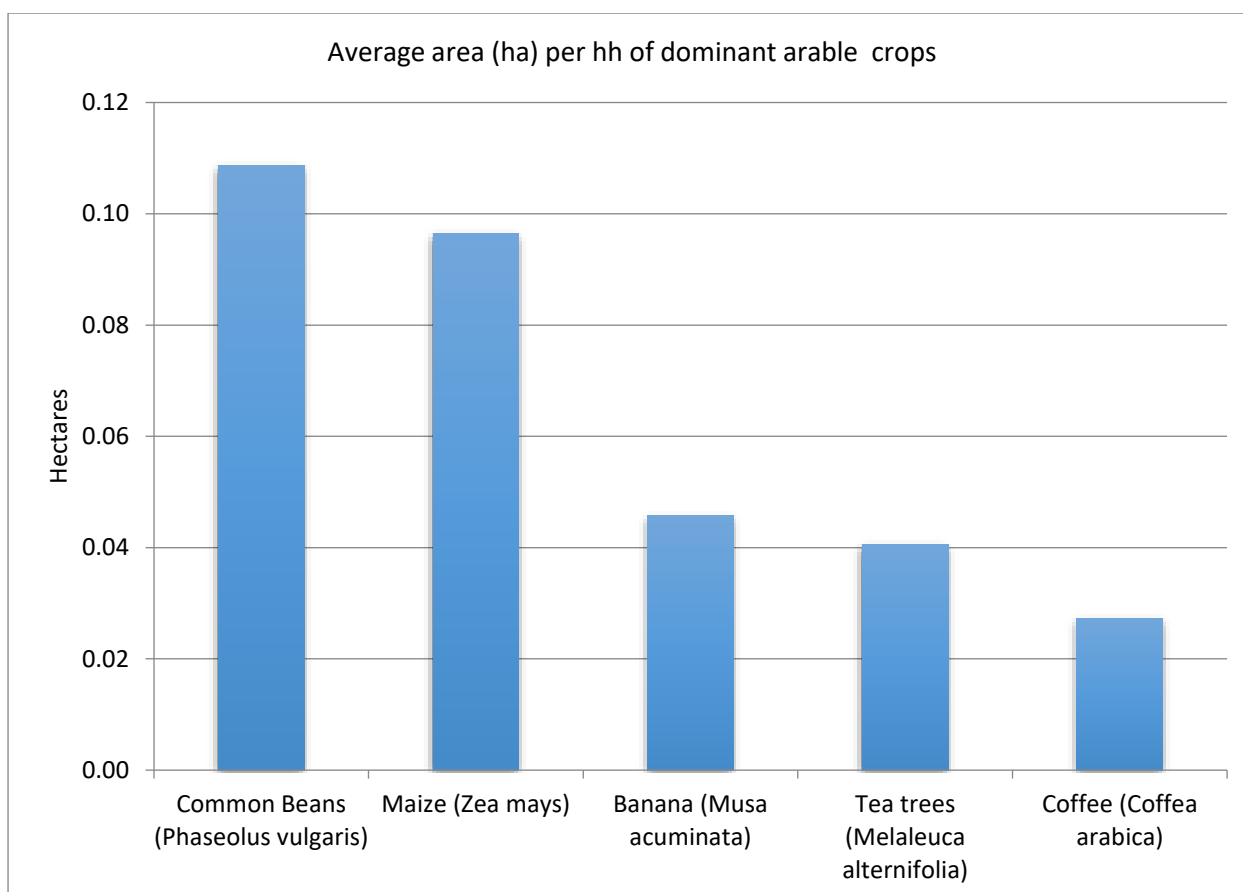


FIGURE 3. 3: AVERAGE AREA (HA) PER HOUSEHOLD OF DOMINANT ARABLE CROPS AS PERCEIVED BY FARMERS FROM MWAGICHANA WARD IN MARANI SUB-COUNTY

Livestock production

Livestock production forms an integral part of agriculture and almost every farming household keeps ruminants and indigenous chicken (sub-County Annual Report, 2012). Improved dairy cattle form approximately 70% of the cattle population and the population has increased from 13,850 in 2008 to 19,566 by 2012 (Table 3.4). Common dairy cows are Zebu-crosses with Friesian, Jersey and Aryshire, and in-between breeds. Indigenous cattle are East African Zebu and their numbers have been declining (Table 3.4). The increase in improved dairy cattle suggests the importance farmers attach to dairy farming in the sub-County.

In terms of livestock improvement, most of the farmers use locally available bulls which are of low quality. Only a few farmers use artificial insemination (AI) due to the high cost. The AI costs range from KES 1200 to 1500 (\$ 12.5 to 18.75). AI service providers are from outside the sub-County and these include MOLSHED A.I. from Kisii Central and ENOCHEM A.I. from Kisii town.

TABLE 3. 4. LIVESTOCK POPULATION TRENDS

| Type of livestock | Class | Years | | | | |
|-------------------|---------------|-------|-------|-------|--------|-------|
| | | 2012 | 2011 | 2010 | 2009 | 2008 |
| Cattle | Dairy/Crosses | 19566 | 17766 | 16210 | 15,320 | 13850 |
| | Zebu | 6780 | 7068 | 7440 | 7640 | 8970 |
| Poultry | Indigenous | 27070 | 29920 | 34000 | 30000 | 35000 |
| | Layers | 2740 | 2930 | 3440 | 3200 | 3900 |
| | Ducks | 200 | 200 | 210 | 200 | 270 |
| | Turkeys | 20 | 25 | 30 | 30 | 57 |
| | Geese | 20 | 20 | 30 | 35 | 60 |
| Goats | Local | 4810 | 5500 | 5600 | 5210 | 5980 |
| | Dairy/crosses | 77 | 80 | 86 | 83 | 70 |
| Sheep | Local | 3640 | 3120 | 3270 | 3150 | 1948 |
| Pigs | - | 12 | 0 | 0 | 0 | 0 |
| Donkeys | - | 760 | 780 | 860 | 814 | 780 |
| Emerging | Guinea Fowl | 12 | 10 | 10 | 10 | 6 |
| Rabbits | Crosses | 180 | 180 | 280 | 304 | 300 |
| Beehives | KTBH | 570 | 525 | 515 | 460 | 305 |
| | Langstroth | 70 | 65 | 60 | 45 | 29 |
| | Local | 120 | 120 | 120 | 82 | 90 |

Source: Marani Sub-County (Kisii County) Department of livestock annual report 2008 to 2012

Milk production trends and marketing in Marani sub-County

Milk production is an important means of regular income generation. Most of the milk is produced from crossbreed dairy cows followed by purebreds and both account for 75% of the breeds (Tables 3.5). There are no organized milk marketing channels. Almost all milk produced in the district sold through hawking and the rest at the farm gate. The milk price ranges from KES 50- 60/liter (\$ 0.48- 0.58) in rural and urban areas.

TABLE 3. 5: MILK PRODUCTION AND REVENUE ESTIMATES OVER THE YEARS

| Breed | <i>Milk Production</i> (thousands of litres) ² | | | | | |
|-----------------------------|---|-----------|-----------|-----------|-----------|-----------|
| | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 |
| Pure Dairy breeds | 5,500.0 | 6,546.0 | 6,856.4 | 6,746.5 | 6,842.4 | 8,268.0 |
| Crosses | 7,100.2 | 8,246.4 | 8,173.2 | 7,686.4 | 7,789.5 | 7,730.1 |
| Zebus | 2,040.2 | 2,124.0 | 2,046.4 | 2,156.2 | 2,246.2 | 1,353.2 |
| Total | 14,640.40 | 16,916.40 | 17,076.00 | 16,589.10 | 16,878.10 | 17,351.30 |
| Revenue (US\$) ³ | 9150 | 10573 | 10673 | 10368 | 10549 | 10845 |

²The cost of milk is estimated to be US\$ 0.625 (KES 50) per litre of milk.

³US\$ is equivalent to KES 80

Source: Marani Sub-County (Kisii County) Department of livestock annual report 2012

Livestock feeds and feeding

Due to the small landholdings, the dairy animals are kept under semi-zero grazing, where they are tethered in the homestead during the day and provided with feed, or under zero-grazing with feed. Natural pasture and Napier grass make the bulk of livestock feeds in the area (Table 3.6).

Supplementation is mainly done through the use of maize stover and banana pseudo-stems. Among the leguminous fodder crops, there were 1200 trees of Calliandra (*Calliandra calothyrsus*) and 20,000 of Sesbania (*Sesbania sesban*) on only 26 farms, while 0.08 ha of Desmodium (*Desmodium intortum* and *D uncinatum*) was on only at 3 farms (in 2012). Sweet potatoes are planted on 27 ha, as tubers for human food and the vines as used as a protein supplement for dairy cattle.

Commercial concentrates (dairy meal) is also restricted to high yielders (>10 litres/day) because of the high cost of KES 32 (\$ 0.4) per kg and KES 160 (\$ 2) per kg of dairy minerals. Lack of adequate planted leguminous forage and high cost of commercial concentrates suggest a deficiency in protein among the feeds offered to dairy in the sub-County. Forage conservation is rarely practised mainly due to inadequate availability of forage throughout the year. Agricultural residue,s mainly maize stover, bean straws and chewing sugarcane tops, are fed directly.

TABLE 3. 6. FORAGE TYPES AND AGRICULTURAL BY-PRODUCT TRENDS IN MARANI SUB-COUNTY

| Feed type | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------------------------|--------|--------|--------|--------|--------|--------|
| Forage | | | | | | |
| Improved pasture (ha) | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Napier grass (ha) | 336 | 380 | 416 | 1,520 | 1560 | 1,650 |
| Natural pastures (ha) | 4,080 | 420 | 404 | 1,010 | 1,000 | 900 |
| Fodder shrubs (Number) | 10,000 | 21,000 | 23,000 | 30,000 | 30,000 | 35,500 |
| Desmodium (ha) | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.08 |
| Sweet potato (ha) | N/A | N/A | N/A | N/A | N/A | 27 |

Source: Marani Sub-County (Kisii County) Department of livestock annual report 2012; N/A Refers to data not available

Table 3.7: Proportion of farmers owning different species of livestock, average herds per household (HH) and use in Marani sub-County

| | | Sensi Ward | | Mwagichana Ward | |
|---------------------|--|----------------------------|------------------------------|----------------------------|------------------------------|
| Livestock species | Use | HHs owning the species (%) | Animals per HH (average no.) | HHs owning the species (%) | Animals per HH (average no.) |
| Improved dairy cows | Milk, manure, meat and breeding stock sale (income), dowry | 60 | 2 | 10 | 1 to 2 |
| | | | | | |
| Local dairy cows | Milk, manure, meat and breeding stock sale (income), dowry | 0 | 0 | 60 | 1 to 2 |
| | | | | | |
| Sheep | Meat and sale for income | 1 | 2 | 40 | 4 to 5 |
| | | | | | |
| Local Goats | Meat and sale for income | 60 | 2 | 60 | 4 to 5 |
| | | | | | |
| Dairy goats | Sale for income, milk, meat, manure | - | - | 10 | 2 to 3 |
| | | | | | |
| Indigenous poultry | Eggs, meat, manure and sale for income | 100 | 5-10 | 90 | 10 to 15 |
| | | | | | |
| Commercial poultry | Eggs, meat, manure and sale for income | 5 | 50-100 | ≤10 | 50 to 100 |
| | | | | | |
| Donkey | Sale for income, draught power | 2 | 1 | 10 | 1 to 2 |
| | | | | | |
| Rabbits | Meat, Sale for income | 2 | 3 | - | - |
| | | | | | |
| Fish | Meat | 10 | 100 | - | - |
| | | | | | |
| Bees | Honey | 10 | 10 | - | - |
| | | | | | |
| Ducks | Sale, meat, eggs | - | - | <10 | 4 |

Source: Marani Sub-County (Kisii County) Department of livestock annual report 2012

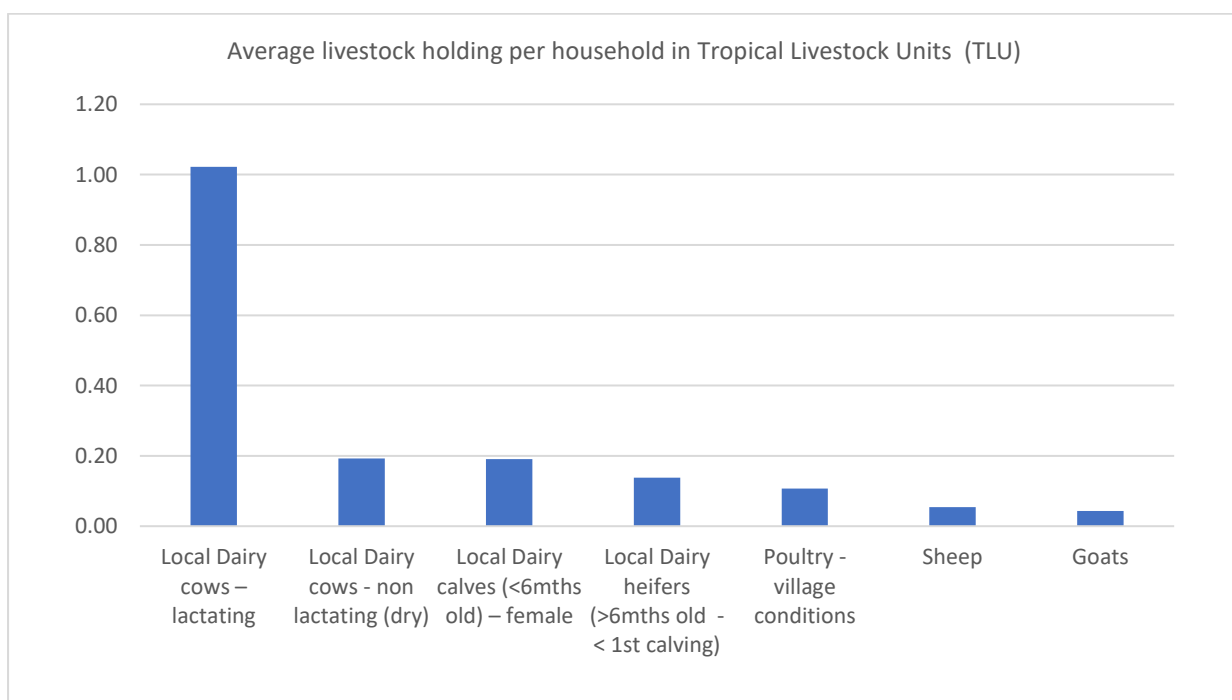
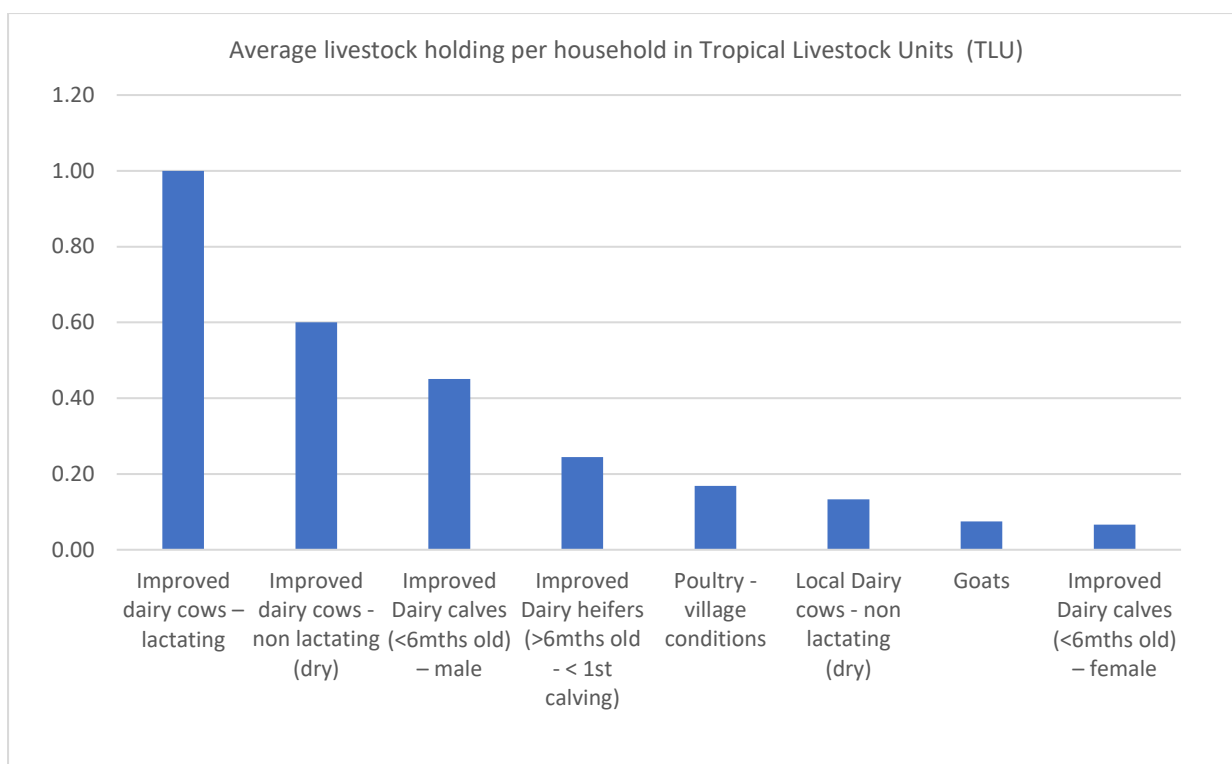


Figure 3. 4: Average livestock holdings (in tropical livestock units, TLU) per household of dominant species in Sensi ward (above) and Mwagichana ward (under), Marani sub-County

Generally, livestock input services, such as feeds and veterinary drugs, are available but were reported to be costly. Both private and government veterinarians are mainly involved in vaccinations, while private veterinarians provide animal health services to farmers in Marani. Veterinary services are generally available but not easily accessible, and they are costly for most farmers (Table 3.10). For example, treating East Coast Fever (ECF) costs farmers KES 3,000 (\$37.5) per treatment and milk fever KES 2500 (\$31.25).

Table 3. 7: Common cattle diseases and their cost of treatment in the sub county

| Disease | Cost per treatment (KES)* |
|------------------------------|---------------------------|
| East Coast Fever | 3000 (\$37.5) |
| Bovine Anaplasmosis | 1200 (\$15) |
| Enteritis | 1200 (\$15) |
| Milk fever | 2500 (\$31) |
| Salmonellosis | 800 (\$10) |
| Metabolic disorders | 200 (\$2.5) |
| Bacterial pneumonia scouring | 200 (\$2.5) |

* Cost in US dollars (\$) in parenthesis

Source: Source: Marani Sub-County (Kisii County) Department of livestock annual report 2012

Artificial Insemination (AI) services are lacking as there are no private AI providers in the sub-County itself. However, farmers can readily access the services from Kisii town which is 20-40 km away. The cost of semen for single insemination is KES 1,200-2,000 (\$15-25) per single dose depending on the breed, and KES 1,000 to 1,500 (\$12.5 to 18.75) for repeat service. In addition, farmers pay KES 1,000 to 1,500 (\$12.5 to 18.75) for AI service/transport depending on distance. The rates of a repeat are high (up to 3 times). Improved bulls are mainly used for breeding at a cost of KES 200-300 (\$2.5-3.750) per service, while local bulls are offered at KES 100 (\$1.25). Farmers with high yielders fear using bulls because of diseases.

Agricultural and livestock inputs (farm implements, crop seeds, fertilizers, herbicides, pumps, acaricides, feed supplements) are readily available from agro-vets and from big agro-vet stores, KFA and cereal boards from the nearby Kisii town. There is generally credit from institutions for crop or livestock production from the neighbouring Kisii town. These institutions are usually banks, SACCOs, Vision Point, Youth Fund and Women Fund, but the majority of farmers fail to access the credit due to lack of collateral and high interest rates. Within the sub-County farmers have access to a few small self-help credits and saving groups (e.g. Merry-go-rounds, Table banking) but they do not offer them capital to invest in commercial farming. Income is mainly obtained from crop, livestock and small businesses. These businesses include fishing and service provision. Few farmers have land title deeds, and this contributes to a lack of collateral for accessing loans to invest in farming.

Feed types and feeding systems

About 20% of the farmers who keep improved cattle stall-feed their animals with cut and carry grasses that are manually chopped with a 'panga' (local machete) or with a motorized chopper. Feed for the improved animals is often supplemented with concentrates, such as dairy meal, maize bran and minerals. The rest of the farmers who keep improved cattle (80%) collect feed for stall feeding, but rarely chop the feeds. Animals are mostly kept in sheds, however, some keep improved cattle under a tree, and return them to the sheds at night. Whereas, local cattle are mainly tethered under the shade and also provided fodder through the cut and carry system, or they graze in any open land along roadsides. Both men and women participate in feeding livestock, including also the tethering of animals further away from the farmstead.

Napier grass is the dominant fodder crop grown in Sensi and Mwagichana, though planted on 0.05 to 0.08 ha, due to the limited land size (Figure 3.5). In addition, Sensi ward has small portions of forage beet (*Beta vulgaris*). A few trees of Calliandra are grown in both wards. These feeds are inadequate and farmers in Mwagichana ward rely on purchased feeds, mainly Napier grass, Lucerne (50%) and Rhodes grass hay (25%), while those at Sensi only purchase additional Napier for supplementation. In addition, farmers at Sensi purchase commercial concentrates (dairy meal) to provide protein feeds

while those at Mwagichana do not. Crop residues also form the bulk of the feed, especially maize stover; bean haulms, finger millet straw, and banana pseudo-stems and sweet potato vines. Except for banana pseudo-stems and sweet potato vines, the rest of the crop residues are only available during the dry season after harvest. Occasionally, crop by-products are treated with molasses before feeding.

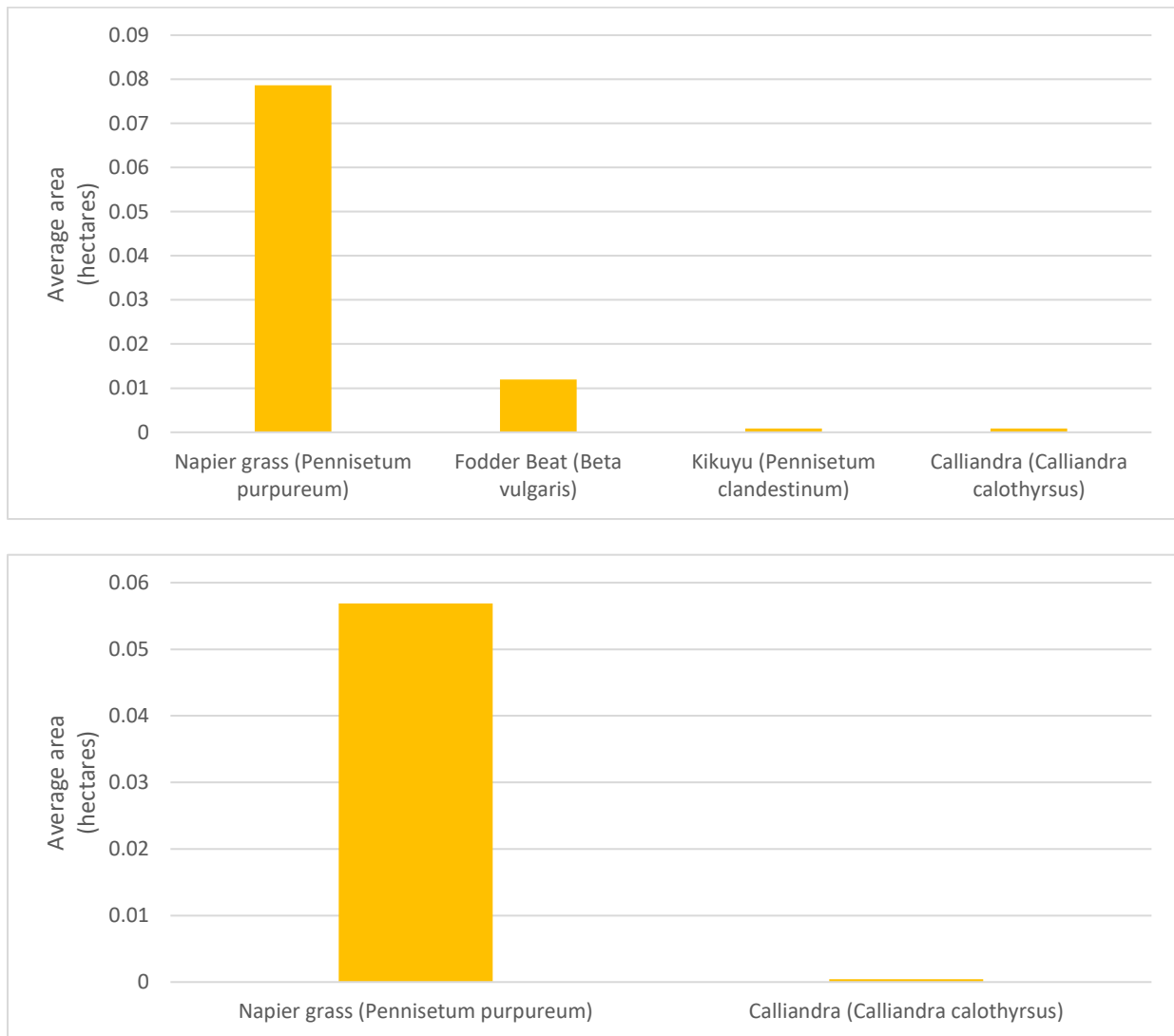


Figure 3. 5: The dominant fodder crops grown in Sensi ward (above) and Mwagichana ward (under), Marani sub County

In Sensi ward, crop residues, cultivated fodder and naturally occurring and collected feeds/grazing contribute almost equally to the DM (24-26%) and ME (21-28) content of the diet. In Mwagichana, the biggest contribution of DM (57%) and ME (58) comes from planted fodders followed by naturally occurring and collected feeds (Figures 3.4 and 3.5). Trends in the contribution of CP% were similar to those of DM% and ME for the two sites (Figure 3.6). Purchased feeds contributed to 1% at Sensi and to 3% at Mwagichana, an indication that farmers in Marani do not purchase adequate concentrates, especially protein.

Green feed (planted or collecting naturally occurring forages) and crop residues were the most available feeds. Green feed is available throughout the year but with high quantities during the wet season April to November (Figure 3.9). Crop residues were also available throughout the year but with the highest quantities after cereal and legume harvests (July to September and December to February). Availability of crop residues throughout the year can be attributed to banana pseudo-stems and vegetable wastes that do not necessarily follow the cropping season. Farmers in Sensi ward purchase more concentrate feeds throughout the year than Mwagichana, and this could be attributed to the fact that there were more improved cattle in Sensi than Mwagichana. However, what farmers refer to as concentrate feeds are predominately commercially mixed rations (dairy meal) and maize.

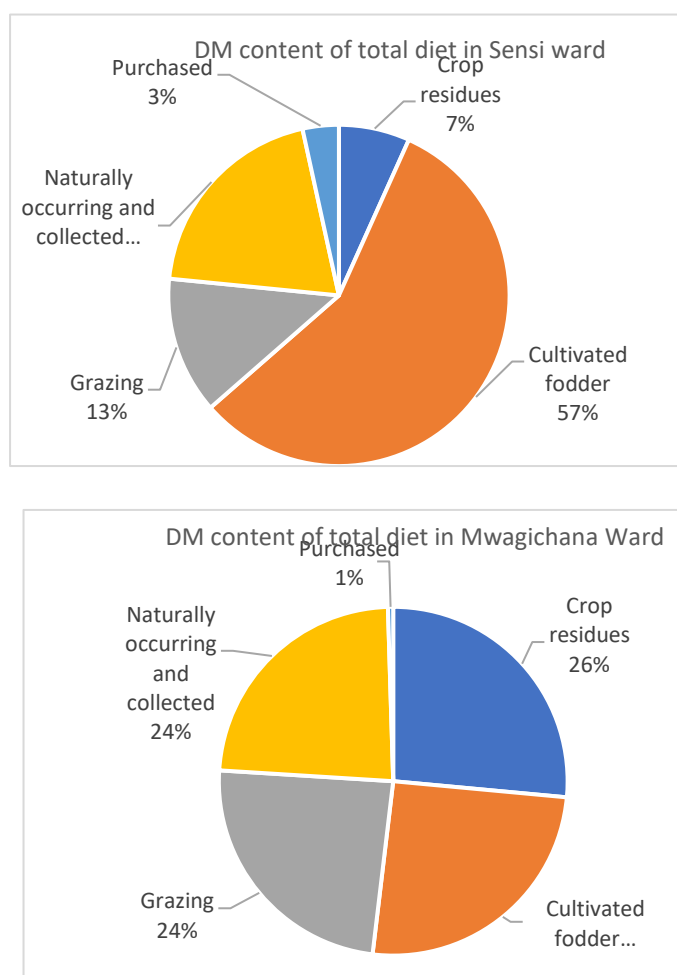


Figure 3.6: Types of feed and their contribution to DM content to total diet in Sensi ward (above) and Mwagichana ward (below), Marani sub-County

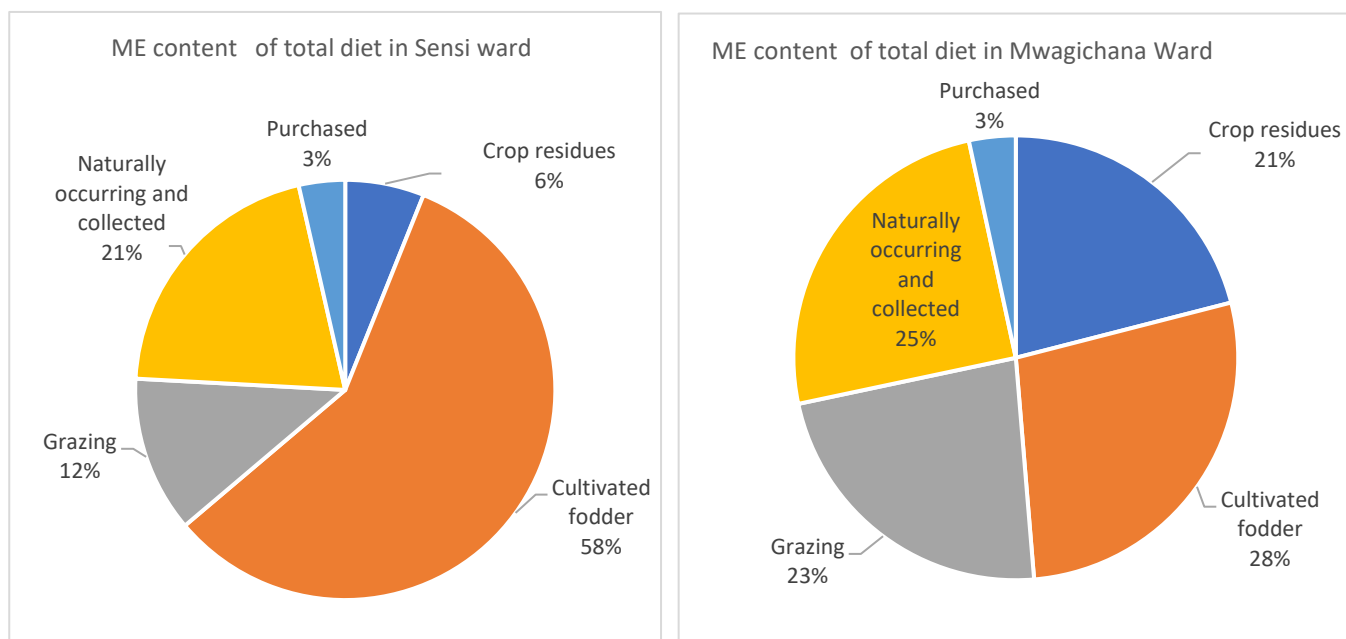


Figure 3.7: Types of feed and their contribution to ME content to total diet in Sensi ward (left) and Mwagichana ward (right), Marani sub-County

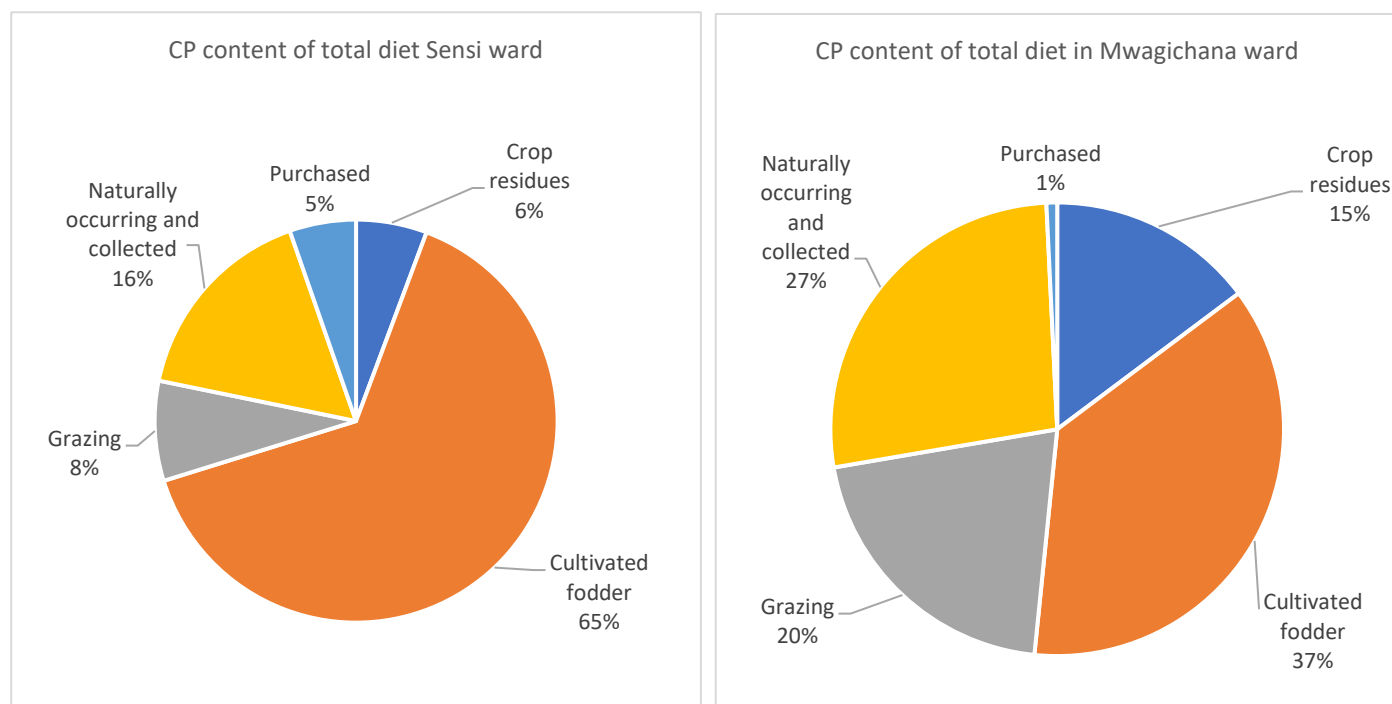


Figure 3.8: Types of feed and their contribution to CP% content to total diet in Sensi ward (left) and Mwagichana ward (right), Marani sub-County

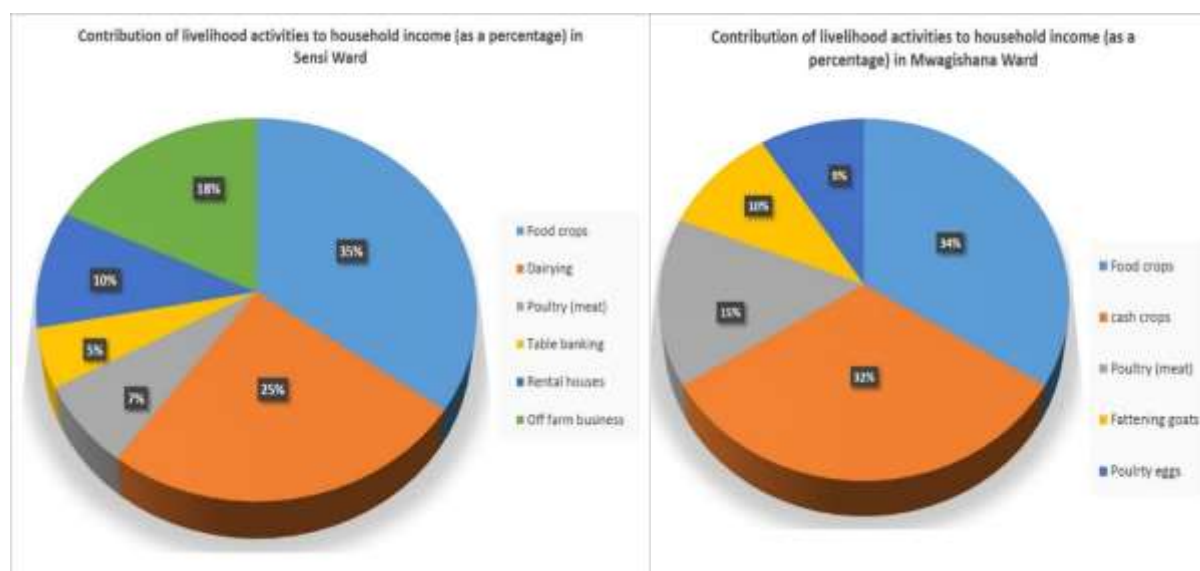


Figure 3. 9. Available feed resources in Sensi ward (top) and Mwangichana ward (bottom), Marani sub-County

Major income sources

In Sensi ward, the main contributors to income were dairy (42%) followed by cash crops (mainly tea 40%) and off-farm business (Figure 3.10). In Mwagichana, food crops followed by cash crops were perceived to be the main contributors to income. Among the livestock, poultry for both sale of meat and eggs contributed to 21% and 17% respectively. The respondents did not perceive dairy as a major contributor to their income and this could be attributed to the predominantly local cattle in the area.

Figure 3. 10: Contribution of livelihood activities to household income (as a percentage) in Sensi ward (left) and Mwagichana ward (right), Marani sub-County



Challenges and opportunities

Overall, the main issues that farmers face in the farming systems are listed in Table 3.9. Inadequate technical knowledge on fodder production, processing, feeding and livestock management were considered priority problems in both Sensi and Mwagichana wards. In Sensi ward, lack of improved breeds was priority number 2, while Mwagichana it was lack of credit facilities to invest in crop and livestock production (Table 3.9). Costly animal health services were priority number 3 across the two sites. In Sensi, milk marketing was a problem as farmers have more improved breeds/household and produce slightly more milk than Mwagichana.

A lack of credit facilities is also a clear constraint to the further development of crop and livestock production in Marani. This may be linked to a lack of collateral and farmer unfriendly conditions by the creditors. Farmers in Marani do not have adequate animal health services and the services are only accessed from Kisii where the transport costs are high. Artificial Insemination (AI) services could help disseminate improved genetics; however, the service is not reliable within the area and is costly to farmers. As a result, a lack of technical knowledge is also a clear constraint to the development of livestock production. Farmers' perceptions of potential solutions to their problems are shown in Table 3.9. The list of potential solutions suggests that farmers expected solutions to come from outside instead of engaging themselves in finding them.

TABLE 3. 8. PAIRWISE RANKING OF MAIN PROBLEMS IN LIVESTOCK PRODUCTION AND PROPOSED SOLUTIONS BY FARMERS FROM SENSI AND MWAGICHANA WARDS

| Challenges | Ranking in Sensi ward | Ranking in Mwagichana ward | Possible solutions |
|---|-----------------------|----------------------------|---|
| Lack of/difficulty to reach milk markets | 4 | - | <ul style="list-style-type: none"> • Ensure milk quality • Set up a milk cooling plant • Organize milk transport together |
| Lack of improved breeds | 2 | 5 | <ul style="list-style-type: none"> • Train and provide initial capital for local A.I. services providers • Acquire improved breeds • Address issues of dairy cattle fertility |
| Inadequate technical knowledge on fodder production, processing, feeding and livestock management | 1 | 1 | <ul style="list-style-type: none"> • More technical knowledge in feeds production, processing and feeding through training and tours • Reduce costs of feeds by procuring them together (cooperative) <ul style="list-style-type: none"> • Training in record keeping |
| Costly animal health services | 3 | 3 | <ul style="list-style-type: none"> • Preventive strategies through effective tick control by the revival of communal dips and routine hand spraying • Vaccination campaigns • More technical knowledge in animal health services including hygiene |
| Lack of credit facilities to invest in crop and livestock production | - | 2 | <ul style="list-style-type: none"> • Merry-go-round • Provide affordable credit facilities • Institute farmer-friendly collateral for loans |
| Inadequate land for feed production | - | 4 | <ul style="list-style-type: none"> • Family planning • Practice zero grazing • Credit facilities to hire land and invest in feed production |

Ranking: 1= Most important problem in terms of farmers priority and 5= Least important problem

Conclusions

Marani sub-County is characterized by mixed crop-livestock production systems. Dairy, cash crops and food crops are the primary sources of household income. Cattle are the most important livestock species. Improved crop and dairy productions are constrained by inadequate technical knowledge on fodder production, processing, feeding and general livestock management; lack of credit facilities, improved breeds and high cost of health services. Other constraints are poor milk markets and inadequate land for crop and feed production. To mitigate these constraints farmers (and other stakeholders) will be required to take an integrated approach to improve livestock production through (i) provision of technical knowledge in feeds production, processing and feeding through training and tours, (ii) improving access to AI facilities to ensure farmers can rapidly upgrade the genetic merit of their cattle holdings, (iii) access to credit facilities to enable farmers to invest in the crop and livestock production enterprises and also milk marketing strategies.

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