

Characterisation of the livestock production system and potential for enhancing productivity through improved feeding in Rwanda

Report of a livestock feed assessment in Gicumbi district, Rutare Sector, the Republic of Rwanda

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1. Rwanda Agriculture and Animal Resources Development Board
2. Rwanda Dairy Development Project

June 2019





Investing in rural people




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Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Citation: Nathan, N., Madjild, S.A., Fabrice, S. and Mutimura, M. 2019. *Characterisation of the livestock production system and potential for enhancing productivity through improved feeding in Rwanda. Report of a livestock feed assessment in Gicumbi district, Rutare Sector, the Republic of Rwanda.* Nairobi, Kenya: ILRI.

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Acknowledgements

We thank all participants in this study for their collaboration and support towards the realization of this report. We highly appreciate the support received during the training from the Feed Assessment Tool (FEAST) facilitators, Ben Lukuyu, Alan Duncan and Melkamu Derseh, all from the International Livestock Research Institute (ILRI). We also wish to appreciate Nshokeyinka Joseph for his active support and collaboration during the field work in Gicumbi district. Our unreserved thanks also goes to the FEAST team involved in this study. Logistical support for this study was provided by Rwanda Dairy Development Project (RDDP) while the study was funded by International Fund for Agricultural Development (IFAD).

Summary

The Feed Assessment Tool (FEAST) was used to characterize the livestock production system and potential for enhancing productivity through improved feeding in Gicumbi district, Rutare, Rwanda. The exercise involved focus group discussions and subsequently, individual interviews with 16 (10 male and 6 female) farmers of the district. The results from this survey indicate that zero grazing is the dominant system because of scarcity of land. The biggest challenge in the area is insufficient fodder during dry season. This is caused by lack of skills on fodder management, utilization and conservation techniques. This can be an entry point for intervention within the village.

I. Introduction

Livestock are a key resource in Rwanda but adequate high-quality feed for the livestock population is a major constraint to achieve improved productivity. The Feed Assessment Tool (FEAST) was used to characterize the livestock production systems and locally available feed resources in Gicumbi district in Rutare, Rwanda in order to identify farming system constraints for livestock production, assess feed resources and propose suitable interventions in the district. The survey was conducted in cooperation with farmers affiliated to the Rwanda Dairy Development Project (RDDP) in collaboration with ILRI.

Gicumbi district is characterized by steep slopes and a mountainous topography. The area is hilly with lateritic soils and granites in contrast to the eastern region, which is composed of valleys with altitudes between 1,500 and 1,800 m. These environmental characteristics favour agricultural activities in Gicumbi district. Land is an important asset in Rwanda. The total cultivated land area in Gicumbi district is 54,000 ha, equivalent to 4.4% of the national cultivated land area. Land is highly partitioned. For example, the average arable land per household is 0.49 ha in Gicumbi district and 44% of its population own plots less than 0.3 ha per household (NISR 2012).

About 90% of land in this district is protected against erosion. Some of the techniques used to control erosion include terraces, ditches and tree planting (Gicumbi district 2013). However, the proportion of land irrigated is low.

Gicumbi is one of five districts in the northern province of Rwanda. It is located to the east of the province with a surface area of over 867 km². It has 397,871 inhabitants of whom 52.5 % are women, a population density of 480 households/km² above the national average of 416 households/km², while its population growth (1.0%) is below the national average of 2.6% (NISR 2012).

The economy of Gicumbi district, just as that of most districts in Rwanda, depends on agriculture. Agriculture sustains 95% of the population and contributes nearly 85% of the total produce in the district. Based on their shares, the main crops found in this district include Irish potato, beans, banana and maize.

Wheat and sorghum are major products of the district but a decline has been observed in recent years. Further, the share of vegetables and fruits is 0.4% and 1% respectively. About 77.8% of the households own farm animals that contribute considerably to the dairy production and to the welfare of the population in Gicumbi district. According to NISR (2012), the majority of the households own cattle (65.4%), followed by poultry (47.4%), goats (41.8%) and sheep (29.6%).

2. Methodology

Gicumbi district was chosen among the districts of the northern province due to its geographical characteristics and farming system. The study was conducted in two stages, initially using focus group discussion (FGD) with 15 farmers and with the aid of the FEAST FGD guide to get an overview of the farming system and identify constraints and opportunities for improving livestock production in the study site. Subsequently, individual interviews were conducted with 9 of the 16 farmers who took part in the FGD, three each from the three landholding categories (small, medium and large) of the district, to collect quantitative information on feed resources and feeding practices.

The data was processed and analyzed using FEAST to produce a report on general characteristics of the livestock production system and its potential for enhancing productivity through improved feeding.

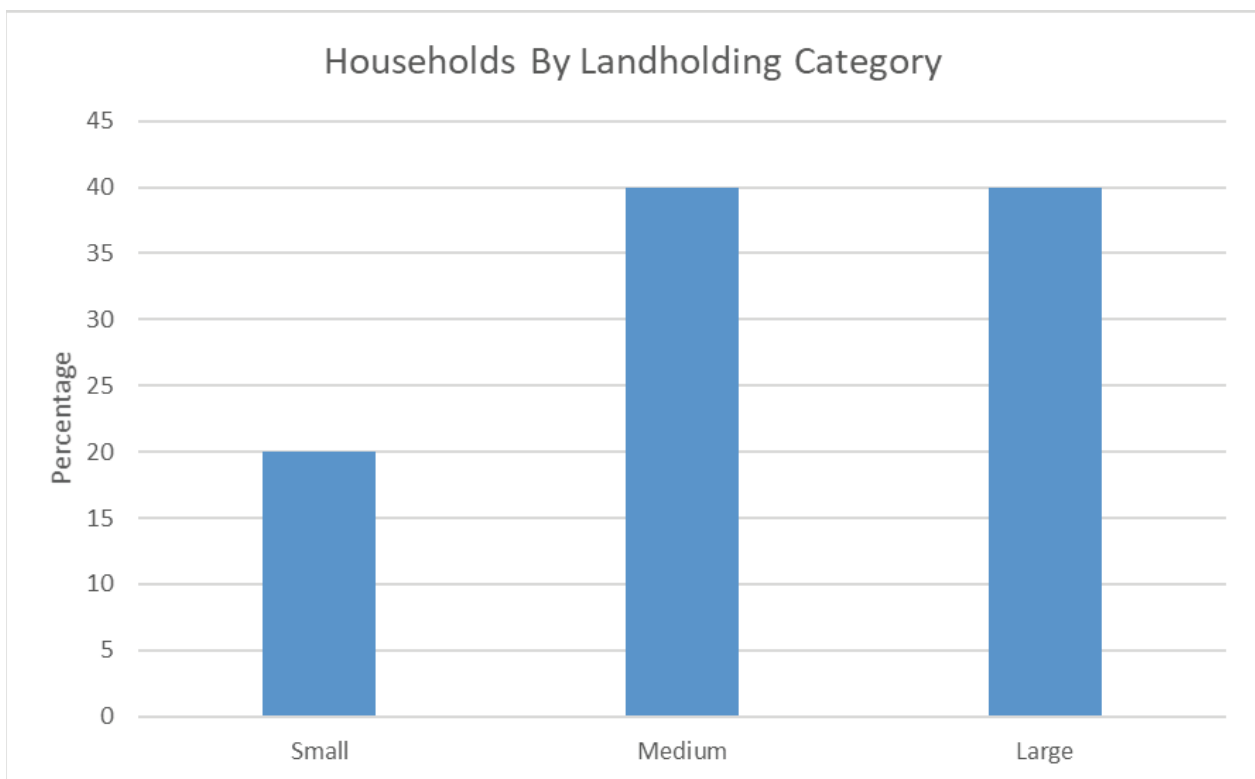
3. Results

The following are the key findings of the assessment, conclusions and ways forward.

3.1 Landholding and farming system

The farming system is primarily a subsistence mixed crop-livestock system. Farm sizes in the area are predominantly medium and large with most of the land being used for cropping (Figure 1). A typical average household size is seven people who live permanently on farm year-round. About 40% of the households in the study area have land above 2 ha, which is considered as large holding by local standards. A further 40% have land holding ranging between 0.5–2 ha, considered as medium holding, and the remaining 20% own less than 0.5 ha and are considered as small farmers.

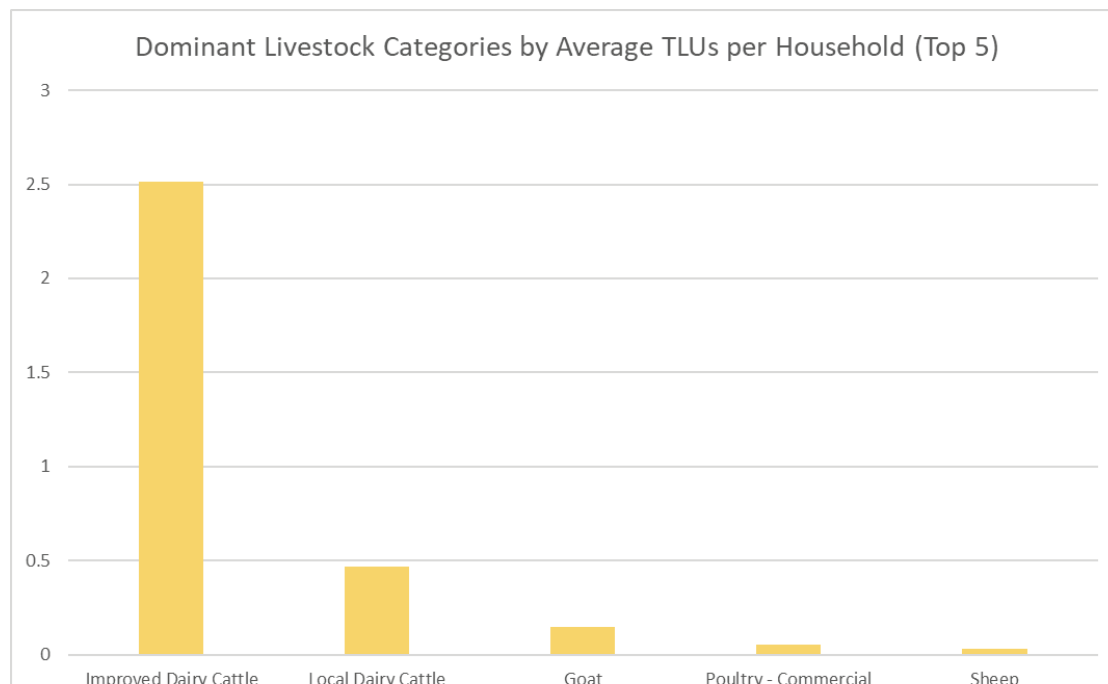
Figure 1: Landholding size of farm households in the area.



3.2 Livestock number

Smallholder farmers in Rutare Sector of Gicumbi district rear at least one of the various livestock species including cattle, sheep, goats, pigs and poultry for various purposes (Figure 2). Cattle are kept mainly for milk, manure and cash income from animal sales.

Figure 2: Average livestock species per household (TLUs) in Rutare Sector, Gicumbi district.



TLU=Tropical Livestock Unit

Local breeds of cattle have diminished considerably over the years due to crossbreeding. Improved crossbreds comprise mainly Friesian and Jersey breeds crossed with local breeds. Sheep and goats are raised by 20–50% of the households for quick sale when funds are required.

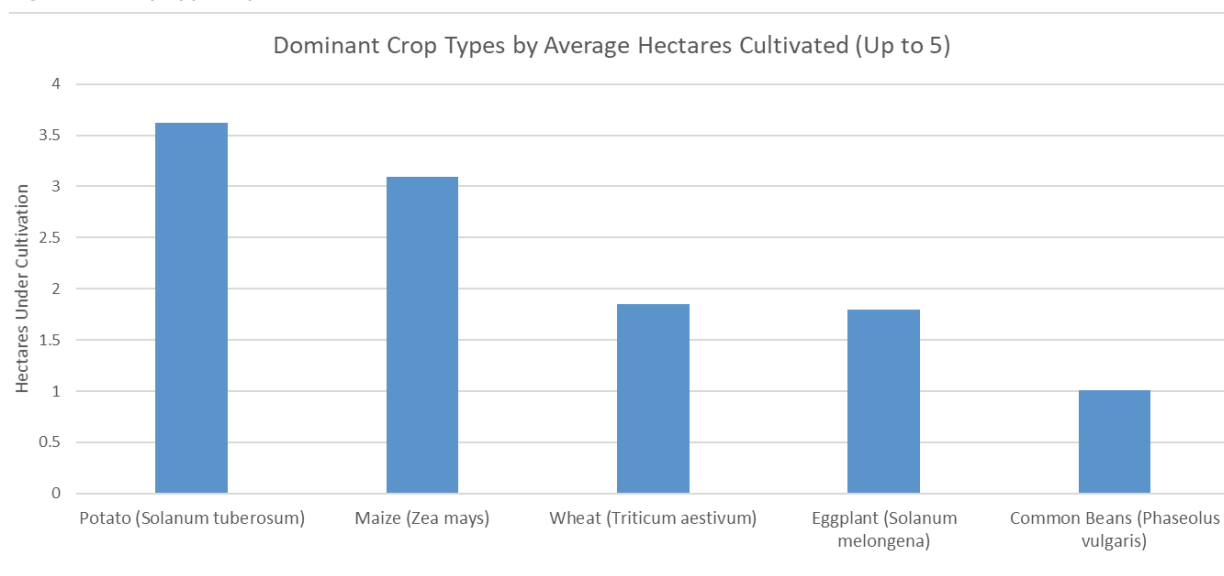
3.3 Crop and cropping seasons

Crop types by cultivated land

Households in the area commonly grow a variety of food crops including Irish potato (*Solanum tuberosum*), maize (*Zea mays*), wheat (*Triticum aestivum*), eggplant (*Solanum melongena*) and common beans (*Phaseolus vulgaris*) (Figure 3).

Irish potato, maize and wheat come in first, second and third positions respectively according to cultivated land areas.

Figure 3: Crop types by cultivated land.



Cropping seasons

Three cropping seasons occur in the area (Table I. ‘urugary’i or ‘umuhindo’ known as season A (moderate rains), ‘injagasha’ known as season B (long rains) and ‘impeshyi’ known as Season C (dry period).

Table I: Cropping season in Rutare Sector of Gicumbi district.

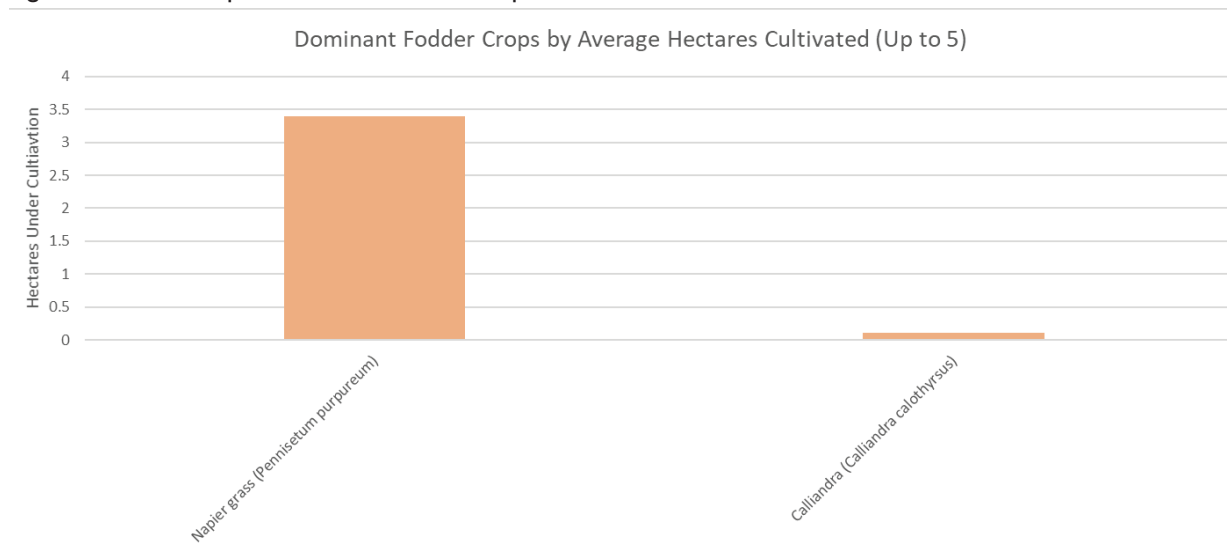
Name of season	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Season A Moderate rains (umuhindo)	■								■	■	■	■
Season B Long rains (injagasha)		■	■	■	■	■	■					
Season C Dry period (impeshyi)					■	■	■	■	■			

Farmers reported cultivating Irish potatoes, maize, common beans and cowpea during the moderate rains. Sorghum and maize are cultivated during the long rains, while legumes are cultivated in marshlands in Season C when there is no rain.

3.4 Forage crops cultivated

The main forage crop grown by most farmers for feeding cows in Rutare Sector is Napier grass (*Pennisetum purpureum*), while *Calliandra calothyrsus* is grown by a few farmers (Figure 4). Crop residues from maize, wheat, eggplant, common bean and sorghum are also used by farmers as a feed resource. Farmers attribute the small land sizes allocated for forage production to lack of awareness about the importance of forage crops.

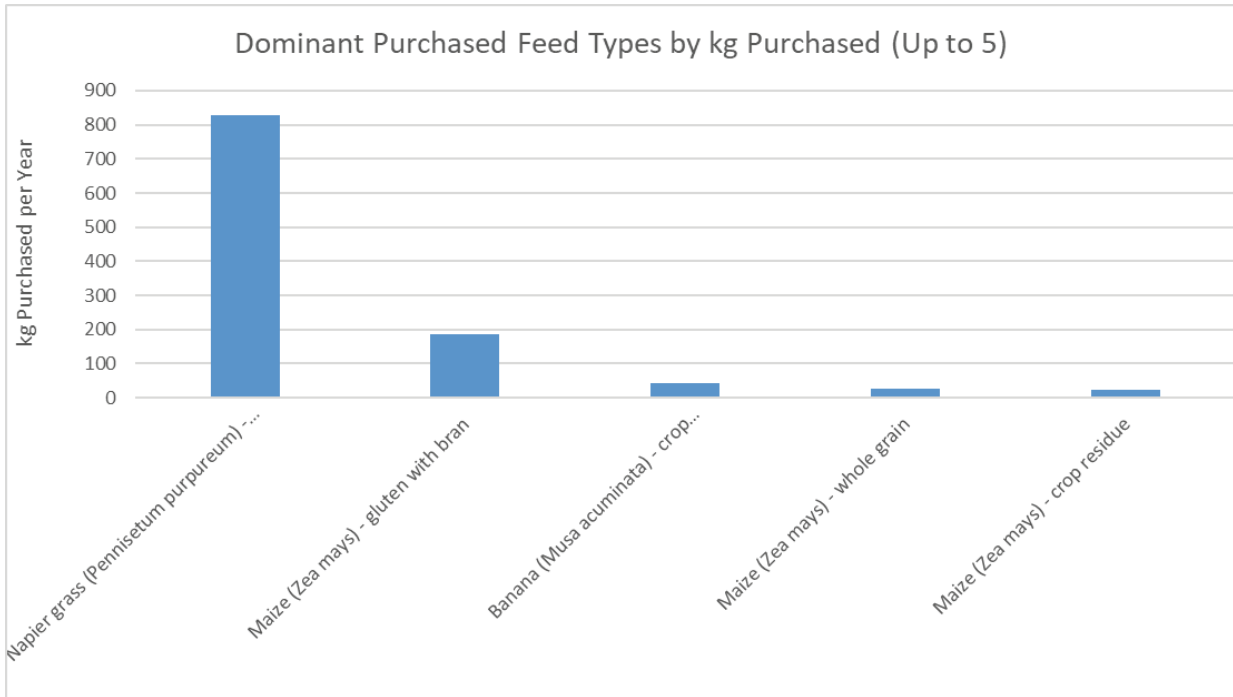
Figure 4: Fodder crops and total land size occupied.



3.5 Feed purchased per household by feed type

Figure 5 shows the quantity and type of feed purchased in kilograms per household in Rutare Sector of Gicumbi district. Napier grass is the most purchased feed, followed by maize bran mainly for feeding lactating cows during dry seasons.

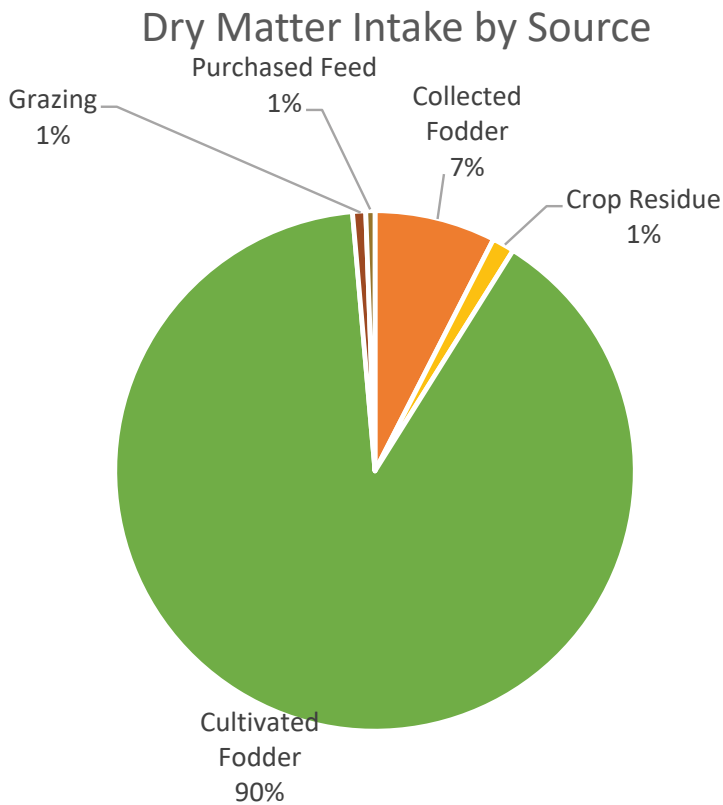
Figure 5: Feed purchased per household by feed type.



3.6 Sources of biomass for feeding

The main source of dry matter for livestock in Rutare Sector is cultivated fodder contributing 90% of the total dry matter intake, followed by collected fodder (7%), grazing (1%), purchased feed (1%) and crop residues (1%) (Figure 6). The proportional contributions are almost the same for metabolisable and crude protein by feed resource (data not shown).

Figure 6: Contribution of the different feed resources to dry matter availability.



3.7 Livestock production practice

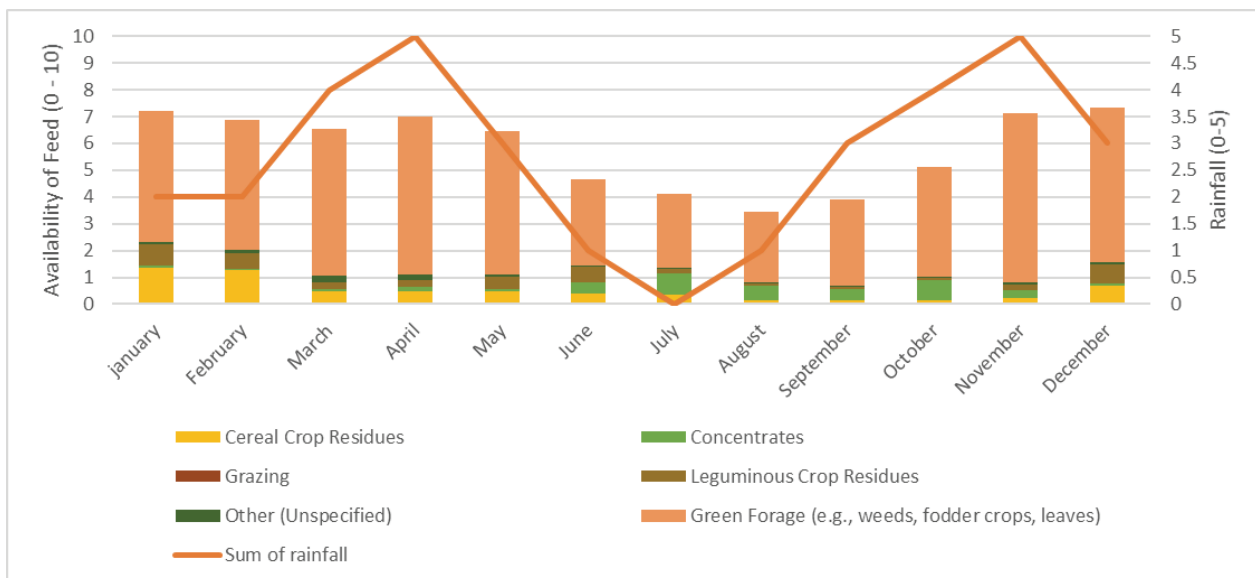
Livestock production focuses mainly on specialized dairy production. Improved dairy crossbreeds, crossbreeds of Friesians and a few Jerseys, dominate livestock holdings as shown in Figure 2. Milk produced on farm is sold at the local market and at the milk collection centre known as IAKIB (Impuzamashyirahamwe y’Aborozi ba Kijyambere ba Byumba) at an average price of Rwandan Francs (RWF) 180 (USD0.20) per litre.

Management of cows varies from farmer to farmer. More affluent farmers keep their cattle in confined cowsheds throughout the day and feed them cultivated fodder and concentrate mixes, while less affluent farmers mainly depend on collected fodder to feed their cattle. Generally, households with larger land holdings tend to graze cows while those with smaller land holdings confine their cows in a small fenced area (sometimes with a cowshed). Sheep and goats are normally tethered in homesteads and along the roadside for grazing. The common feeding strategies for cattle in the study area include green fodder and/or crop residues, especially maize stovers. Artificial insemination (AI) services are readily accessible for all farmers in the area from the public sector and private veterinary service providers. It is the preferred method of reproduction with more than 70% of cattle keepers using this technique. The cost per service depends on the distance and varies between RWF3,000–15,000 (USD3.4–17). About 20% of the farmers use improved bulls for breeding through natural mating. The cost of a bull service is approximately RWF3,000 (USD3.4) per successful service.

3.8 Availability of major feed resources during the year

The diet fed to livestock is primarily composed of green forages, cereal and leguminous crop residues and concentrates (Figure 7). The contribution made by the different feed sources to the diet varies throughout the year. During the main part of the moderate rains (season A) from April–June and part of the main rainy season from September –November, green forages, legumes and grazing make up the largest part of the diet. During the dry season (July–August), crop residues constitute a considerable part of the diet of animals.

Figure 7: Major feed sources through the year.



Farmers reported that green forage is the major source of feed for livestock, especially cattle. Particularly, a French Cameroon variety of Napier grass cultivated throughout the year, contributes to 90% of the forage fed to animals. All farmers reported the availability of the French Cameroon Napier grass variety which is cultivated on progressive and radical terraces or on specific land allocated for forage production. The only fertilizer used is organic manure from dung of animals.

3.9 Average price of major livestock species and milk by month

The price of cattle varies with season. It has been shown that in November, the price of cattle is very high because of a seasonal fluctuation in the price of meat, which farmers attributed to the rise in demand for meat during end of year festivities (Figure 8). A fluctuation in milk yields was also reported by farmers with higher yields seen in the earlier months of the year compared to the later part of the year. This drop, as the farmers explained, is due to scarcity of forage during the drier months of the year. Milk prices also vary seasonally with noticeable peaks during the earlier months of the year and also in October and do not depend on milk yields (Figure 9).

Figure 8: Average price of major livestock species in USD by month.

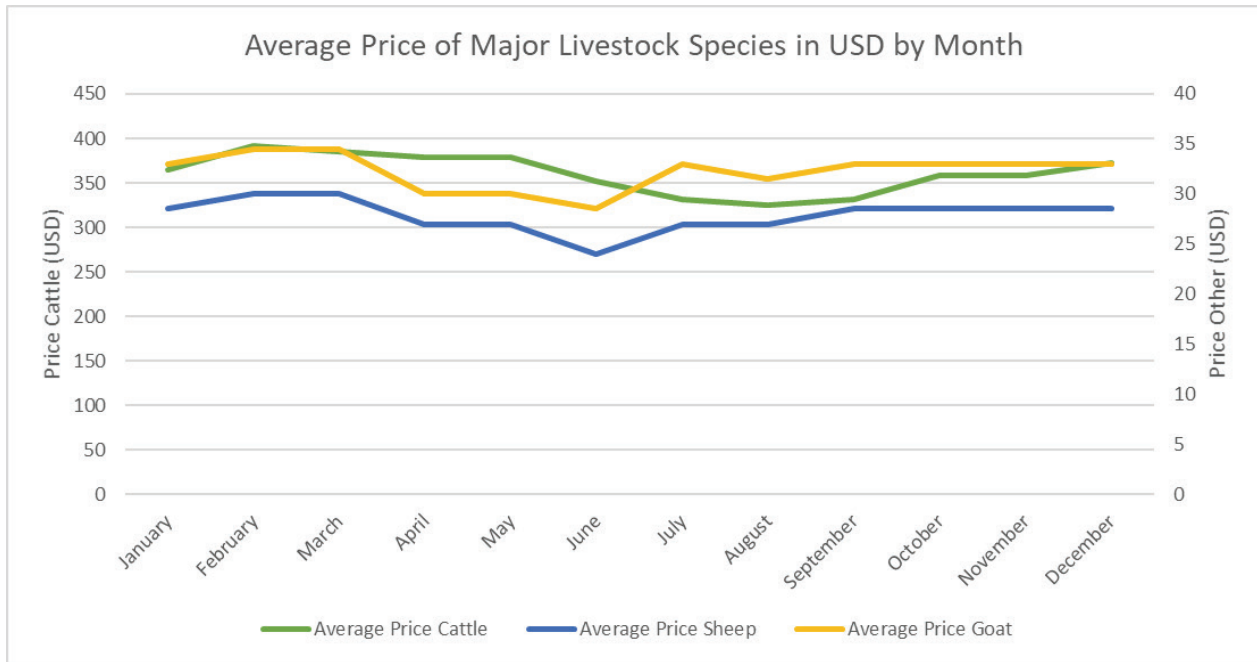
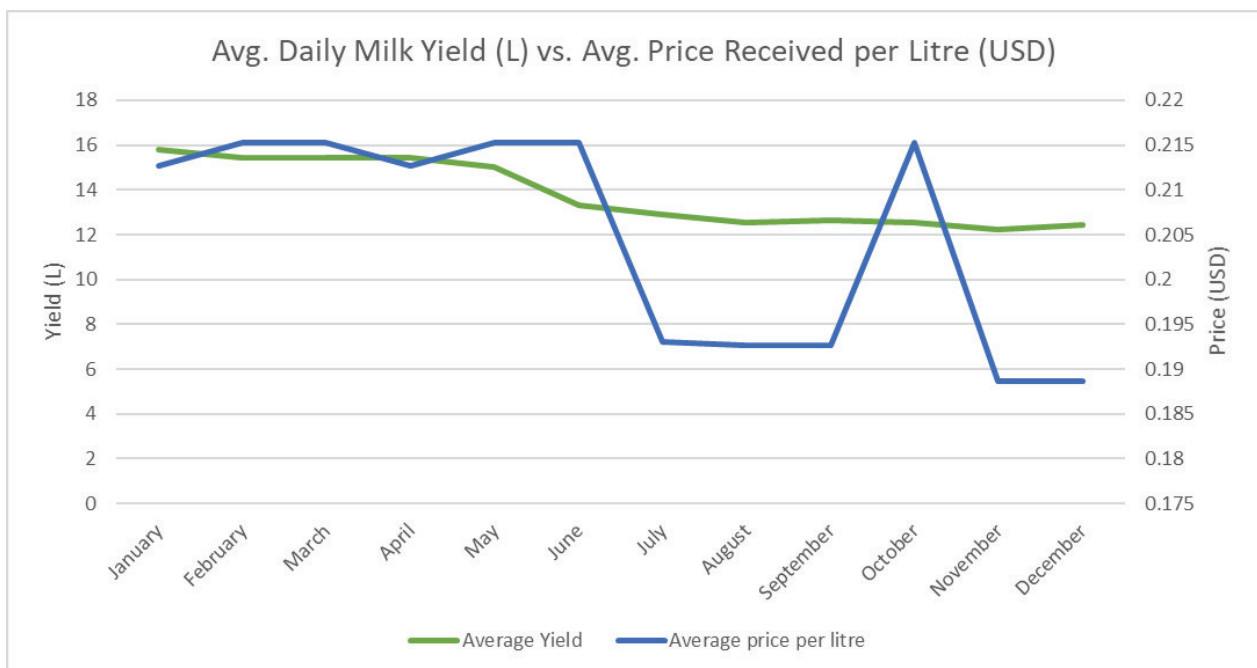


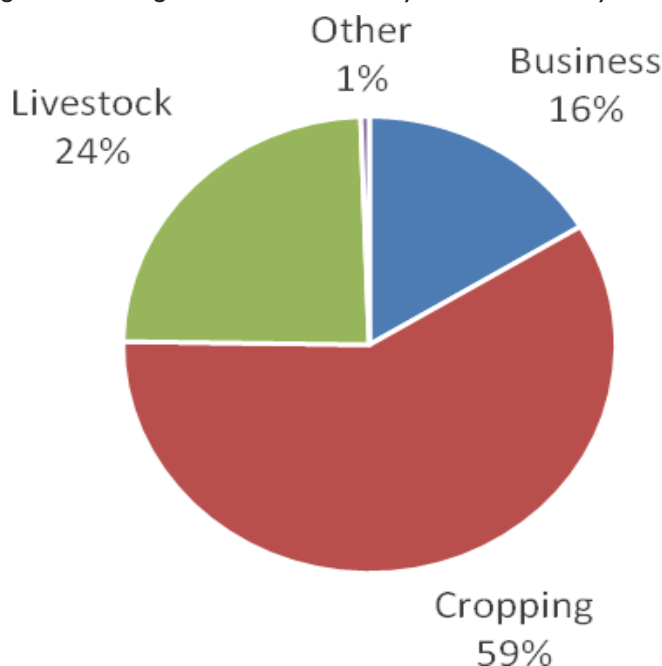
Figure 9: Average. daily milk yield (l) vs. average price received per litre (USD).



3.10 Market of the milk and source of household income

Farmers reported having two ways of marketing the milk they produce. Milk is either taken to the milk collection centre managed by a farmers' cooperative or sold by individual farmers at the farm gate as fresh milk or in processed form. Crop production contributes to almost 60% of the household income, while livestock and businesses make up for the remainder (Figure 10).

Figure 10: Average household income by livelihood activity.



3.11 Gender

Farmers noted that there is no gender disparity in the daily labour rates for various farm activities.

3.12 Problems, issues and opportunities

According to farmers, Napier grass is reported as the major source of feed for their cattle and its availability greatly determines the level of milk production. The main constraint to milk production in the study area is the low price of milk and lack of market outlets for produced milk. Farmers indicate that if they can get a fair price for their milk, they will be able to meet the various demands of dairy production.

Animal health is the second constraint mentioned by the farmers with the main diseases being tick-borne diseases, which decrease the production and productivity of their animals.

Lack of inseminators and sexed semen are further constraints raised by farmers. Farmers indicated that it is also hard to easily find an inseminator and that it is usually not easy to afford sexed semen when needed because it is very expensive.

Lack of improved forage seeds is another constraint raised by farmers. Farmers reported that with fair and reasonable milk prices, this and other constraints can be overcome. Although not listed as a major problem, the costs of concentrate feeds is considered to be very expensive and this increases the cost of milk production. A summary of problems and farmer proposed solutions is shown in Table 2 and the intervention ranking analysis is shown in Table 3

Table 2: Farmers' rankings of problems and proposed solutions within the production systems.

Problem (in order of importance)	Main problem	Proposed farmer solutions
1	Lack of markets for milk	Construction of small milk processing plant
2	Low price of milk	Increase of price of milk up to RWF250 per litre
3	Low quality and variability in feed supply	Make improved forage seed available to the farmers
4	Lack of sexed semen	Make sexed semen available to the farmers
5	Diseases	Good management of cattle

Table 3: Key interventions for Rutare Sector, Gicumbi district. Scores are from the FEAST intervention ranking analysis and are out of 20.

Key interventions	Mitigate core constraint	Relevance to commodity	Relevance to farm system	Match context attributes	Production impact
Grasses: for cut and carry systems (cut from cultivated fodder field under rain-fed)	19	20	20	14	20
Irrigated fodder production (grasses, maize and sorghum)	20	20	20	13	20
Supplementation with energy-rich supplements, e.g. molasses	17	20	20	15	20
Short duration/annual fodder crops (e.g. oats, maize, sorghum and vetch)	19	20	20	13	20
Supplementation using protein by-products, e.g. from meat, blood and bone, fish, legume leaf meal, biofuel co-products, oil seeds, poultry litter, etc.	17	20	20	13	20

3.13 Potential interventions

In order to deal with the constraint of lack of market opportunities for milk the Government of Rwanda with different partners can:

- Encourage and facilitate the involvement of private investors to invest in a small/medium-scale milk processing plant(s) in the area where there is sufficient quantity of milk including Gatwaro Sector in Gicumbi district. This will guarantee a ready market and farmers will be able to engage and expand their dairy production activities. This can be from tax exemptions or moratoriums to private investors.
- Cultivate other forage species such as grasses like *Chloris gayana*, *Cenchrus ciliaris*, *Panicum maximum*, *Panicum coloratum* and others.
- Encourage forage conservation in times of abundant production through silage or hay making and other conservation techniques. This will help alleviate dry season feed shortages and enable farmers to produce more milk during the dry season when milk prices are high hence increasing milk income. Simple on-farm methods of silage production should be considered. The use of polythene bags or small-scale silage pits may be viable options.

Currently, 90% of the purchased feeds are Napier grass and feed ingredients. Attempts to make supply chains effective and improve access to concentrates will enhance usage amongst farmers. However, as the price received per litre of milk is relatively low, the extra expense of additional concentrate feeds is unlikely to be offset by potential increases in milk yields that may be achieved with higher levels of concentrate feeding.

Improvement of animal health services will require regular training of farmers on animal health care practices. To mitigate the high incidence of animal disease, efforts need to be made to increase the number of local drug shops, service providers and education on control of diseases and vaccinations. Some of these are outside the scope of what farmers can change themselves and will need institutional interventions to solve them.

Key issues

- Lack of forage seeds or splits for establishing high yielding forages
- Limited animal health services providers
- Limited availability of sexed semen
- Low and unreliable milk price throughout the year

Ways forward

- Initiate community-based seed production either through livestock farmer field school or interested people as a business
- Enhance training on simple silage making and other conservation techniques on farms
- Enhance efficient concentrate feed delivery chains to farmers and train farmers on optimum concentrate usage, as well as homemade ration formulation
- Improve animal health service delivery amongst farmers
- Improve farmer training on proper disease prevention and control measures

Conclusion

In Gatwaro sector, milk is the main contributor to household income in this subsistence based mixed crop-livestock system.

Most farmers keep improved cattle. Milk prices are generally unstable and vary throughout the year due to seasonal fluctuation in the availability of feed, with insufficient feed during the dry season despite high biomass production during the wet season.

The main constraint to the further intensification and development of the dairy industry in the area is lack of market for milk, especially in the wet season where there is high milk production and the demand is very low, caused by lack of stable market in the area. It would be useful to encourage private companies to establish milk processing facilities in the area in order to eliminate the problem of overproduction of milk.

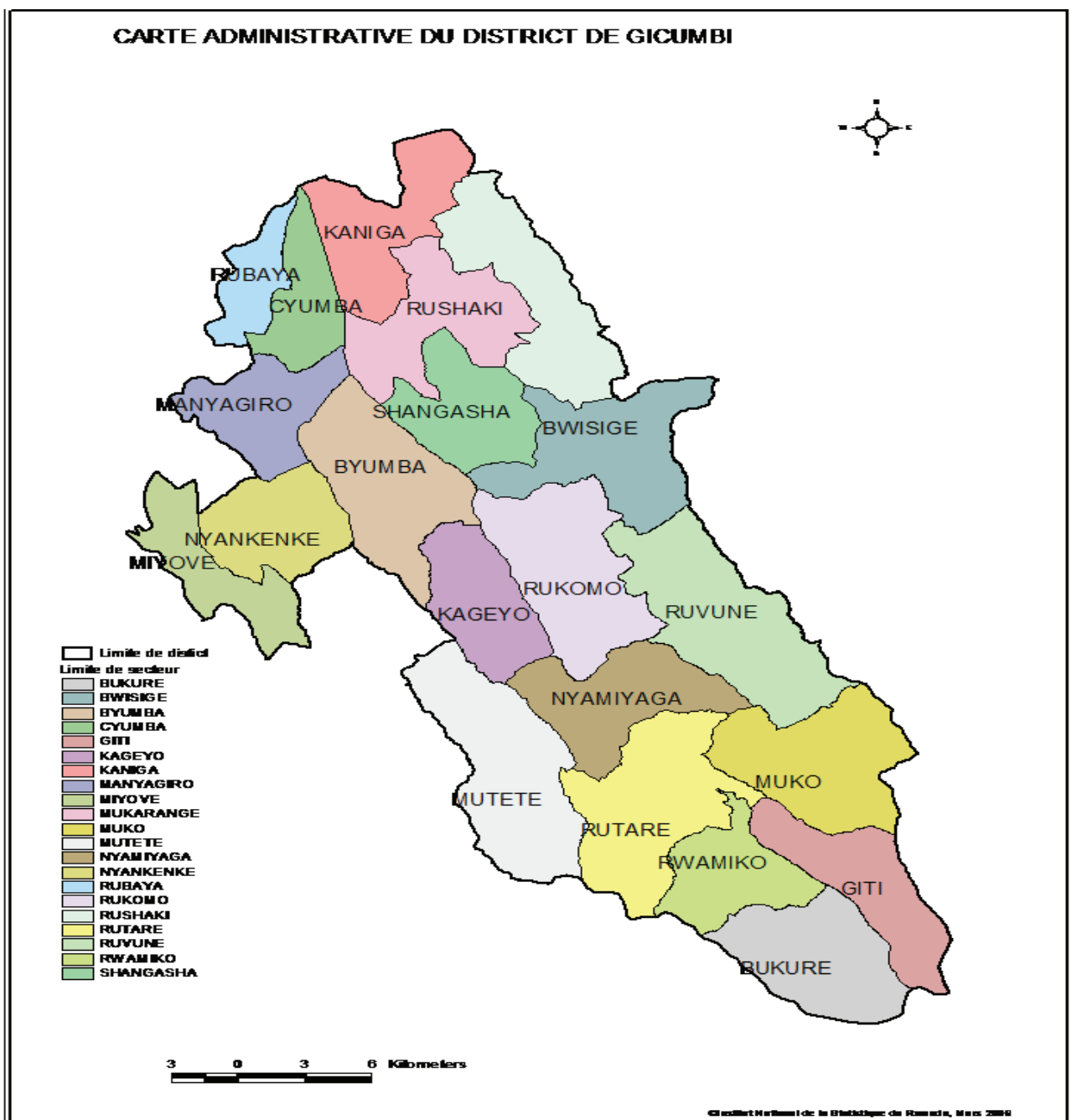
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Appendix

Appendix I. Administrative map of Gicumbi district



Appendix 2. Research team

Sn.	Name	Institution and function	Gender
1	Mupenzi Mutimura	RAB, senior research fellow and ruminant nutrition	Male
2	Semahoro Fabrice	RAB, assistant research fellow	Male
3	Sindayigaya A. Madjild	RDDP, LFFS specialist	Male
4	Ndayambaje Nathan	RAB, animal production technician	Male
5	Munganyese Florence	RDDP, field officer	Female



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