

# Characterisation of the livestock production system and potential for enhancing productivity through improved feeding in Musanze district, Republic of Rwanda

P. Celestin Hitimana<sup>1</sup>, Joseph Gasana<sup>1</sup>, Evelyne Bampiriye<sup>1</sup> and Sosthene Munyemana<sup>2</sup>

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*Patron: Professor Peter C Doherty AC, FAA, FRS*

*Animal scientist, Nobel Prize Laureate for Physiology or Medicine—1996*

Box 30709, Nairobi 00100 Kenya

Phone +254 20 422 3000

Fax +254 20 422 3001

Email [ilri-kenya@cgiar.org](mailto:ilri-kenya@cgiar.org)

[ilri.org](http://ilri.org)

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ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia

Phone +251 11 617 2000

Fax +251 11 667 6923

Email [ilri-ethiopia@cgiar.org](mailto:ilri-ethiopia@cgiar.org)

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## Summary

The Feed Assessment Tool (FEAST) was applied to characterize the livestock production system in Nyonirima Cell of Kinigi Sector in Musanze district, Rwanda focusing especially on livestock feeding. The exercise was conducted through focus group discussions and individual interviews. Nine farmers (4 male and 5 female) participated in the focus group discussion and individual interviews. Feeding of livestock in the village is mainly through a zero-grazing system. The key challenge is insufficient fodder/pasture for animals, especially in the dry season. Feed shortage is associated with shortage of land and lack of skills on forage and crop residue management, utilization and conservation. Improving existing feed supply options is suggested as a potential entry point for interventions in Nyonirima Cell.

# I. Introduction

The Government of Rwanda signed the financing agreement with International Fund for Agricultural Development (IFAD) to support Rwanda Dairy Development Project (RDDP) for six years from 2017–2022. Despite the remarkable progress in the development of the dairy sector in the country, significant challenges remain and have led to the initiation of RDDP. Key among them is low dairy productivity attributed to the still low number of improved dairy cattle and compounded by inadequate forage base, poor animal feeding practices and seasonal fluctuations in water availability.

RDPP operates in 12 districts in Nyagatare, Kayonza and Rwamagana (eastern); Ruhango, Nyanza and Huye (southern); Gicumbi, Musanze and Burera (northern); and Nyabihu, Rubavu and Rutsiro (western). The overall goal of RDDP is to contribute to pro-poor national economic growth and improve the livelihood of resource-poor rural households. Specifically, the project seeks to increase competitiveness and profitability of the dairy sector for the provision of quality products from small-scale producers to domestic and regional consumers, thus improving their livelihoods, food security and nutrition whilst building overall resilience.

To assess the livestock feed supply situation, we used FEAST to investigate available local feed resources used for cattle feeding in Musanze district, which is one of the five administrative districts of northern province.



## 2. Methodology

This study was carried out in Kinigi Sector of Nyonirima Cell in Musanze district, Rwanda using FEAST.

Musanze district is located in the northern highland part of the country at 1.50 N and 29.63 E with an altitude of 1,849 mere above sea level (masl) (Figure 1). Rainfall distribution is high compared to other regions in the country. The district is located approximately 100 kilometers from Kigali. Musanze has a population of 86,685 making it the biggest city in the northern province. The Virunga National Park and the Buhanga eco park are located there.

Figure 1. Location of Kinigi Sector where the study was conducted.



The district has an estimated 5,512 purebred, 10,714 improved/updated and 11,139 local cattle breeds (district report 2017).

Respondent farmers were selected based on land and livestock holding whereby representative farmers from small, medium and large farm holdings were nominated. The assessment comprised a focus group discussion (FGD) with 16 participants (8 female and 8 male) followed by an individual interviews with nine farmers drawn from the FGD. Three farmers represented each category of landholding (small, medium and large farms). The land size for small farm holdings is assumed to be less than 0.8 ha, for medium farms 0.8–1.4 ha and for large farms above 1.4 ha.

The site coordinates (longitude and latitude) were taken and recorded using GPS. The information provided by farmers from the FGD was summarized and recorded into the FEAST software.

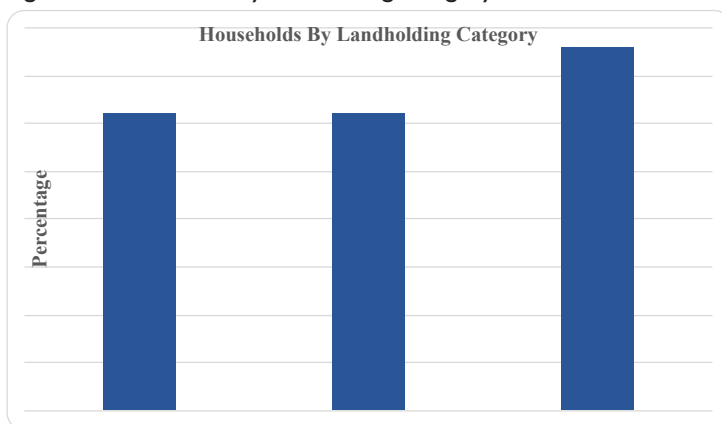
## 3. Results

The following are the findings of the assessment and conclusions for further action.

### 3.1 Landholding and farming practices

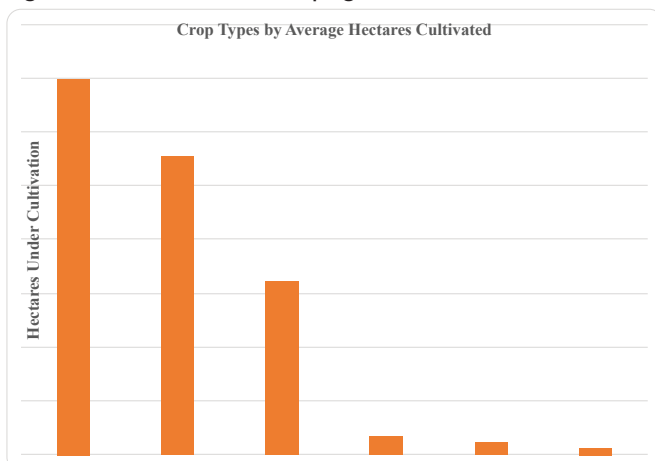
The farming system is primarily a subsistence-based mixed crop-livestock system. Farm sizes in the area are around 1.5 ha on average with most of the land being used for cropping. More than 35% of households own small farms while the proportion of households who own medium and large farms is similar (Figure. 2). A typical family has eight people who live permanently on the farm.

Figure 2. Households by landholding category in Musanze district



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

Figure 3. Dominant food crops grown in the area



Most farmers in the area cultivate Napier grass (*Pennisetum purpureum*) with coverage areas averaging less than 0.1 ha and setaria grass (*Setaria sphacelata*) with coverage areas averaging less than 0.07 ha land.

## 3.2 Cropping seasons

According to rainfall distribution at Kinigi Sector in Musanze district there are two growing seasons (Table 1). The short rainy season is from September–February, whereas the long rainy season is from March–August. There is no pronounced dry spell period observed in the district.

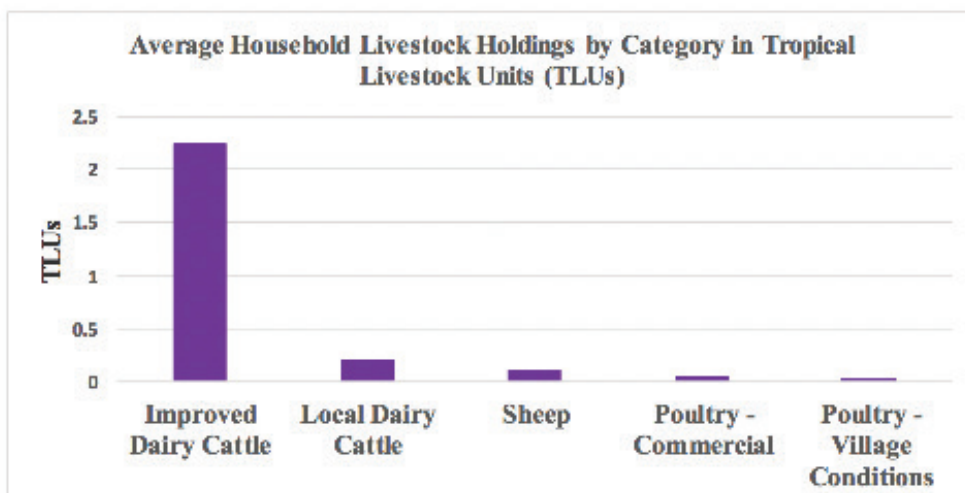
Table 1. Growing seasons in Musanze district

Name of season	Jan	Feb	Mar	April	May	June	July	August	Sept	Oct	Nov	Dec
Short rain	A	A							A	A	A	A
Long rain			B	B	B	B	B	B				

## 3.3 Livestock management practices

The households in the area raise a range of livestock species including cattle, sheep and poultry for various purposes. Improved dairy cattle are by far the most dominant owned by the majority of rural households in Musanze district (Figure 4). Cattle are kept mainly for milk and income generation from animal sales and manure. On average, most households have two or three milking cows. In addition, a few households have sheep for income and manure while poultry are kept by a few households for eggs, income and manure.

Figure 4. Average livestock holdings per household in Nyonirima (TLUs)

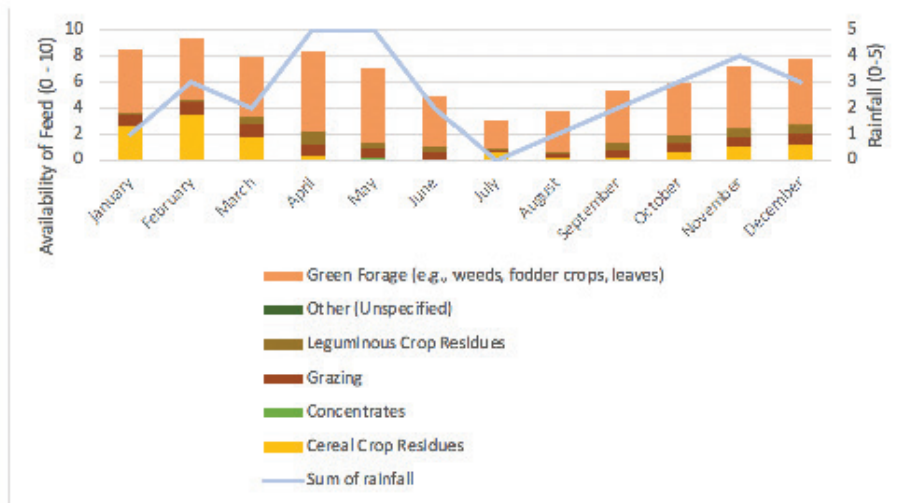


TLU=tropical livestock unit 3.4 Availability of feed resources

### 3.4 Availability of feed resources

Collected forages (green forages) are the primary feed resources for feeding cattle in the area. Equally important for cattle feeding is cultivated forage cut and carried throughout the year due to available soil moisture in the area. Crop residues are fed in the months after cereal harvest

Figure 5. Available feed sources utilized by farmers throughout the year

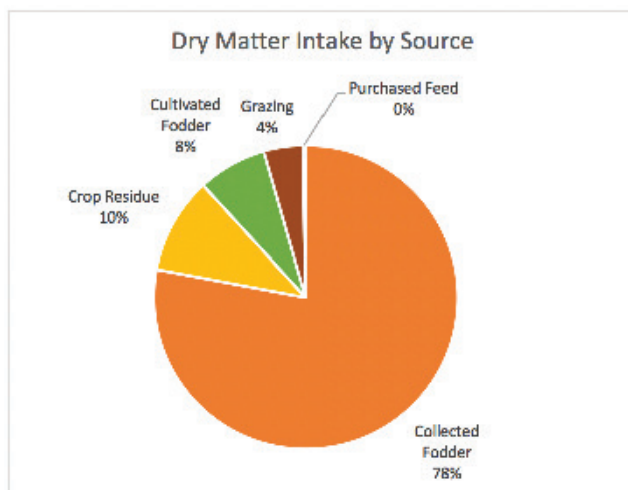


### 3.5 Contribution of feeds to total dietary composition

Collected forages contribute the largest proportion of the feed base on a dry matter (DM) basis in Nyoirima (Figure 6). About 78% of the DM consumed by cattle is derived from collected forage. Crop residues and cultivated fodder each contribute to 10% and 8% of the DM intake, respectively. Farmers in the area appear to be self-reliant and purchased feeds are not used to any great extent in the feeding of cattle. Sources of metabolisable energy (ME) largely mirror those for DM (data not shown) and collected fodder continues to be the most important with about 79% of the ME of cattle being met from collected fodder. Crop residues and cultivated fodder contribute similar amounts of ME (8–9% of total ME supply each).

Crude protein (CP) is also mostly supplied from collected fodder (77%), with cultivated fodder providing the second largest component of CP supply (10%) for cattle feeding (data not shown).

Figure 6. Contribution of different feed sources to total dietary composition of cattle feeding in Musanze

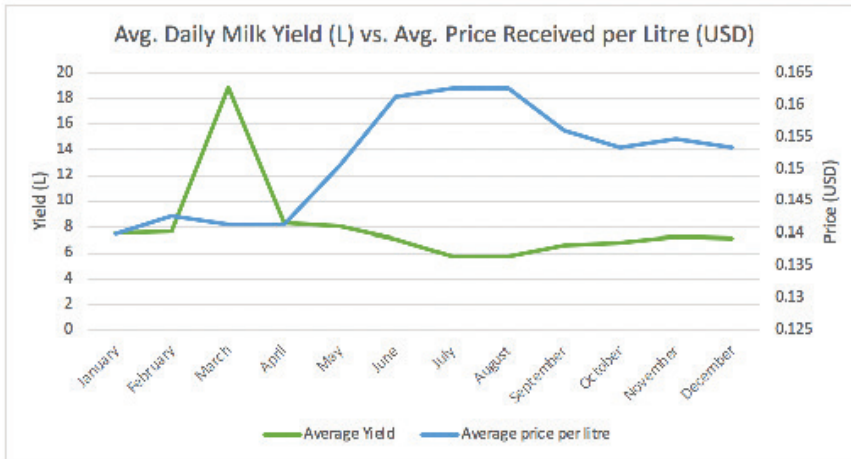


### 3.6 Milk production and price

Generally, there is consistent year-round milk production in the area due to stable soil moisture that supports almost year-round green fodder production (Figure 7). The dry period is short, lasting for 1–2 months in June and July. The price of milk does not fluctuate widely as it is controlled by the forum composed by Ministry of Trade and Industry (MINICOM) and the platform of Ministry of Agriculture and Animal Resources (MINAGRI).

Milk production declines drastically during the dry period from June–September, during which period prices increase by about 25% on the informal market.

Figure 7. Variations in milk yield and price of milk



## 4. Problems, issues and opportunities

### 4.1 Problems

The major problems faced by farmers in Nyonirima are ranked in Table 2. Low prices paid for fluid milk in the area is a clear indication of the absence of a strong dairy value chain that encourages competition in milk marketing. The largest fluid milk buyers are milk collection centers that monopolize milk prices and keep prices low. These centers do not buy milk of grade II due to lack of market.

Table 2. Problems and proposed farmer solutions for dairy business in Musanze district

Problem (in order of importance)	Main problem	Proposed farmer solutions
1	Lack of milk market	Empowering milk collection centers in the area
2	Problem in forage conservation techniques	Conducting training on forage conservation
3	Forage theft	Offering local security and enforcement of bylaws
4	Lack of bovine artificial insemination services	Mobilizing and increasing number of inseminators
5	Lack of adequate cowsheds	Promoting mindset change

The above problems and suggested solutions were also analyzed from the context of availability of land, labor, credit, skills and other factors. This was done using the intervention ranking analysis module of FEAST which prioritizes multiple interventions given these and other factors such as capacity to mitigate the core constraint, relevance to dairy and relevance to the overall farming situation of the district. Considering these factors, promoting improved cultivated fodder for use in the form of cut-and-carry system appears to be the best-bet solution to the current feed related dairy production issues in Musanze district as shown in Table 3.

Table 3. Intervention Analysis Report for Nyonirima (Musanze district). Scores are out of 20 and derive from the intervention ranking analysis module of FEAST.

Intervention	Mitigate core constraint	Relevance to commodity	Relevance to Farm system	Match context attributes	Production impact
Grasses for cut-and-carry (cut from cultivated fodder field under rainfed)	20	20	20	16	20
Supplementation with energy-rich supplements, e.g. molasses	19	20	20	15	20
Short duration/annual fodder crops (e.g. oats, maize and sorghum)	20	20	20	13	20
Irrigated fodder production (grasses, maize and sorghum)	20	20	20	12	20
Supplementation using protein by-products, e.g. from meat, blood and bone, fish, fish and legume leaf meal)	19	20	20	12	20

## 4.2 Potential interventions

### Feed and feeding related constraints (2, 3 and 5)

#### 1. Training on forage conservation

There is potential to conserve excess forage that occurs during the wet season through silage and hay making.

- Introduction of silage bags for conserving excess green forage as silage by mixing with molasses and urea
- Introduction of proper haymaking practices suitable under smallscale farming.

#### 2. Forage theft

Theft which involves harvesting forages which do not belong to the harvester could be due to the weakness of some farmers to plan for year-round cattle feeding.

- Theft can be avoided if such farmers are supported to promote intensive backyard forage production to increase availability of forages.
- Supporting such farmers to plant suitable fodder shrubs for feeding as leaf meal and herbaceous legumes on conservation structures along fences and niches that farmers do not use for crop production could be useful.
- Offer local security and enforce bylaws.

#### 3. Lack of adequate cowshed

Currently there are no adequate cowsheds in Nyonirima and there is a need to motivate and support farmers to build additional cowsheds. Cowshed hygiene should also be improved in order to mitigate hygiene related disease problems. RDDP provided farmers with the opportunity to improve their cowsheds by covering up to 50% of the cost of construction in the form of grant.

### Non-feed related constraints (1 and 4)

#### 4. Insufficient milk market

- Advocacy for investors in milk processing to mitigate the low price for milk in the area
- Empowerment of milk centers in the area to de-regulate the price of milk and collaboration with milk industries without intervention of third party
- Establishment of dairy cooperatives which would be managed by farmers themselves

Lack of bovine artificial insemination services:

Artificial insemination (AI) would facilitate the genetic improvement of dairy cows in the area. It will also help minimize the risk of brucellosis associated with communal bull services. More needs to be done to convince farmers about the benefits of AI for improving the overall cow and herd level productivity.

- More private sector actors should be encouraged to invest in AI services.
- Encourage additional investment in improving the capacity of inseminators.

#### 5. Conclusion and recommendations

- Fluid milk marketing is the main contributor to the household income in this subsistence based mixed-crop livestock system.

- Low milk price was reported as a major constraint to farmers' ability to invest in feed and feeding improvement of their dairy herd.
- The main constraint to the further intensification and development of dairying in the area is lack of feed, especially in the dry season.
- Farmers consider AI services costly. As a result, they rely on the use of bulls rather than use of AI services.



## Recommendations

- To overcome the challenges of milk market, milk collection centers should be encouraged to establish small scale processing units to increase the value of raw milk. Consequently, farmers will have access to reliable market.
- Milk consumption in schools and hospitals should be encouraged to increase the number of milk buyers.
- Regulation of zero grazing should be encouraged and controlled. Awareness creation and law enforcement are needed to avoid forage theft.
- Inter cropping within cropped area should be encouraged (planting forage on boundaries of cropped plots).
- Capacity building of farmers in conservation of forage and crop residues should be supported.
- Increasing the number of veterinarians and private animal health professionals will enhance important services related to artificial insemination, improving dairy sector in the area.