



Feed the Future Innovation Lab for Livestock Systems

Rwanda:

Animal Source Foods Production and Marketing Brief

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1. Introduction

Livestock plays a crucial role in household and national economies of Rwanda and contributes 8.8% to the national gross domestic product (GDP) (Karenzi et al., 2013). Livestock provides food and manure, draft power for crop cultivation, a store of wealth for rural people, and the main source of export revenues (Bazarusanga, 2008). The country earned US\$23,679,907 from export of live animals in 2014/2015 (SYB, 2015). Rwanda does not have a livestock master plan, but there is a National Dairy Strategy (NDS) of which the main stakeholders are the Ministry of Agriculture and Animal Resources (MINAGRI) and the Ministry of Trade and Industry (MINICOM). The NDS developed targets for milk production (by 2017 and 2020), a marketing system, and policy environment and institutional framework (MINAGRI, 2013). In this country brief, the dairy production system, main forage and feed production, marketing of milk and other dairy products, Girinka program (government's program to alleviate poverty by providing one cow per poor family), and other topics are reviewed.

2. Dairy Production and Management Practices

In Rwanda the predominant livestock production system is a smallholder crop-livestock mixed farming system with average land holding of 0.76 ha for the majority of farmers (Mutimura, 2010). Smallholder farmers keep one to three cows (Bishop and Pfeiffer, 2008; Kamanzi and Mapiye, 2012). The dominant breed of cattle raised in Rwanda is Ankole, a local zebu breed (Mutimura, 2010). Improved dairy cows account for 28% of the total cattle population and produce 82% of milk in the country (MINAGRI, 2013). The mean daily milk yield from the local-breed cow is 1.33-4.58 liters/day (Klapwijk et al., 2014). Averages age at first puberty, interval from parturition to first estrus, and calving interval were reported to be 28.42±8.78, 8.78±7.66 and 16.61±4.65 months for a pure Ankole cow; and 23.42±9.59, 8.12±8.89 and 17.83±7.91 months for an Ankole crossed with Holstein Friesian or Jersey, respectively (Bishop & Pfeiffer, 2008). Urban and peri-urban dairies are also a common livestock system in Rwanda with an average of 5.7 cows per household reared by the use of zero-grazing and cattle fed cut grass management practices (Nyiransengimana & Mbarubukeye, 2005). Dairy cattle are distributed throughout Rwanda, however, crossbred (Ankole X Holstein Friesian) and pure Holstein Friesian cows are dominant in the north and northwest parts of the country. Crossbred cows are the most preferred cows in the country albeit pure Holstein Friesian is the primary choice for larger farmers (Mutimura, 2016).

In Rwanda, there are three types of dairy cattle management systems based on feeding methods.

- **Open-grazing** – Animals freely graze on individual or communal grazing lands. This type of system is dominant in lowland Eastern Province, where 40% of the national cattle population is found and the relative availability of grazing land is superior to other areas. Grazing is also practiced in the western part of the country (Mutimura, 2016). Diminishing grazing land, however, is forcing people to gradually shift from open grazing to semi-grazing and zero-grazing, which is most common in the highland areas (Bazarusanga, 2008).
- **Semi-grazing** – The semi-grazing system is a hybrid between open-grazing and zero-grazing. It is characterized by a shortage of land that results in a farmer needing to keep his few cows in stalls. Such farmers, however, do not always have sufficient money and/or knowledge to feed their cows properly and so they may allow their herd to graze on nearby land part of the time (TechnoServe, 2008). This is a transitory state from open-grazing system to zero-grazing.
- **Zero-grazing** – The zero-grazing system is characterized by keeping animals in a shed and feeding by cutting and carrying forage and crop residues to the cows. This production system is increasing in proportion due to the shrinkage of grazing land, which has been widely turned over to crop cultivation

in response to increasing population. The Government of Rwanda (GoR) encourages zero-grazing because it avoids over-grazing and subsequently reduces land degradation. The main feed available for dairy cattle under this system is Napier grass (Mutimura et al., 2013; Mutimura, 2010; Mutimura & Everson, 2011). With regard to dairy management, a survey conducted in three districts showed that 55% of smallholders permanently housed their cattle (Bishop & Pfeiffer, 2008).

Gender roles in dairy production

The average household in Rwanda has seven to eight members (Wurzinger et al., 2006, Kamanzi & Mapiye, 2012). In Rwanda, unlike the neighboring countries, only 17% of herds are owned solely by the household heads, while in most cases the ownership is in conjunction with other household members. However, decisions about herd management, breeding, and purchase or selling of cattle typically are made by the household head, mainly men (Wurzinger et al., 2006). Women are involved more in animal feeding, milk processing, and milk selling than men (Wurzinger et al., 2006; Kamanzi & Mapiye, 2012). Males are responsible for milking due to cultural belief, but a young female (not married or bearing children) can milk a cow in a family that does not have a male person (Mutimura, 2016).

Main feeds and their production

The types of feed resources available for dairy cattle vary from place to place. The major available feeds are pasture or grasses, crop residues, improved fodder, and nonconventional feeds like leaves of banana plants and kitchen leftovers (Klapwijk et al., 2014, Kamanzi & Mapiye, 2012; Mutimura et al., 2015; Nyiransengimana & Mbarubukeye, 2005). Range land is commonly used during rainy seasons (Kamanzi & Mapiye, 2012), and crop residues such as maize and sorghum stover and rice, wheat, and sugar bean straw are mainly fed to animals during dry seasons. Nonconventional feeds like leaves of banana, pulp and hulls of coffee, tops of cassava, and vines of sweet potatoes are also fed to dairy cattle (Kamanzi & Mapiye, 2012). Based on a survey that was carried out in 19 out of Rwanda's 30 districts, the main feeds used during rainy and wet seasons are Napier grass, roadside grasses, maize stover, banana peels, and sweet potato vines (Mutimura et al., 2013). The use of conserved feed such as hay and silage is low among small dairy holders and higher among dairy holders in peri-urban and urban areas (Nyiransengimana & Mbarubukeye, 2005). In addition, farmers purchase forage from neighbors, and they also use concentrates such as maize bran and commercial concentrates. Major feeds and dairy production constraints in Rwanda are summarized from three studies in Table 1.

Table 1. Summary of Major Feeds and Dairy Production Constraints in Rwanda

Districts	Available feed (by rank)	Constraints (by rank)	References
Gisagara District (Southern Province)	<ul style="list-style-type: none"> ▪ Rangeland (grasses) ▪ Crop residues (maize and sorghum stover; rice, wheat, and sugar bean straw) ▪ Improved grasses (e.g., Napier grass) ▪ Browsing (largely during dry season) and herbaceous legumes (year round) 	<ul style="list-style-type: none"> ▪ Land scarcity ▪ Shortage of forage planting materials such as seeds, seedlings ▪ Lack of knowledge on forage production and utilization ▪ Use of inappropriate dairy breeds ▪ Seasonal drought 	Kamanzi & Mapiye (2012)
Umurer (Huye District; Southern Province)	<ul style="list-style-type: none"> ▪ Grasses ▪ Parts of banana plant ▪ Crop residues 		Klapwijk et al. (2014)
Bugesera (Eastern Province) and Nyamagabe (Southern Province) Districts	<ul style="list-style-type: none"> ▪ Crop residues (parts of banana plants, sorghum and maize stover, wheat straw) ▪ Planted pastures (Napier, Guinea, Signal & Timothy grasses) ▪ Assorted weeds 		Mutimura et al. (2015)

Support services and use of new technologies/practices

The government provides an artificial insemination (AI) extension service for dairy holders. In line with its policy to improve milk production, the government heavily subsidizes AI costs to replace local bull service (Lukuyu et al., 2009; MFEP, 2012). Furthermore, the government dropped the value-added tax (VAT, 18%) for processed animal feeds and input products, which reduces costs on the domestic market and benefits farmers thereby improving livestock production and competitiveness (MFEP, 2012). Rwanda also has better veterinary services coverage compared with the neighboring countries (Wurzinger et al., 2006). There are more than 1,000 agro-veterinarian shops throughout the country, which provide services for dairy producers (MINAGRI, 2013). In Rwanda, the adoption of new technologies by farmers depends on availability and expected profit from such technologies. The shortage of land and the need to increase livestock products and income generally facilitates acceptance of new technologies (Mutimura, 2016).

Use of manure and waste

Animal wastes are collected in a pit and put on crop lands as a fertilizer (Kim et al., 2011). Manure is also used for biogas production for households (Hilton, 2014). Some households sell manure to generate extra income (Lukuyu et al., 2009).

Key bottlenecks in dairy production

The major constraints of dairy production in Rwanda are shortage of land, poor quality and quantity of feeds, poor genetic traits of cows, prevalence of diseases, lack of knowledge in dairy management, and lack of capital (Iraguha et al., 2015; Mwabonimana et al., 2015).

- **Shortage of land** – Rwanda is the most densely populated country in the world with 434 people/km² (SYB, 2015), and the average land holding per household is 0.76 ha for the majority of farmers (Mutimura, 2010). Scarcity of available land seriously affects animal feed production in the country (Kamanzi & Mapiye, 2012).
- **Limited availability and low quality of feeds** – The main feeds available for dairy cattle are unimproved natural pasture and crop residues (Lukuyu et al., 2009). During dry season the availability of feed decreases, and crop residues become the main feed resource available. Indeed, there is lack of storage facilities and proper technologies to improve efficiency of crop residue utilization (Klapwijk et al., 2014). Inadequacy of forage planting materials such as seeds and seedlings, and lack of knowledge on forage establishment, management, conservation, and utilization were also reported to limit feed production (Kamanzi & Mapiye, 2012).
- **Poor genetic traits** – An important factor impacting the poor production and reproductive performance of dairy cattle in Rwanda is poor genetics. With regard to dairy management, a survey conducted in three districts showed that 82.3% of smallholders still use bulls to naturally breed their cows (Bishop & Pfeiffer, 2008). Despite the GoR's AI program, the country does not have a clear breeding program, and improved dairy cows account for less than one-third of the total dairy cows in the country (28%) (MINAGRI, 2013). Research in the area of genetics, reproduction, and genetic conservation are also limited (Mutimura, 2016).
- **Lack of capital** – Distribution of livestock through the Girinka program provides needed productive assets to the rural poor and manure for farming. However, some farmers in the program experience a shortage of feed for their high yielding cows that consume large amounts of feed. Farmers consider that lack of capital is one of the limiting factors for forage production and expansion to meet the growing need for livestock feed (Klapwijk et al., 2014).
- **High prevalence of diseases** – Cattle diseases such as East Coast Fever (ECF), anaplasmosis, mastitis, brucellosis, gastrointestinal helminthes, foot and mouth diseases (FMD), blackleg, and lumpy skin disease (LSD) are common in Rwanda (Mutimura, 2016). Besides their direct effect on production, these diseases impair improvement of dairy cattle in the country because high-yielding improved cows are more susceptible to tick-borne diseases (such as ECF and anaplasmosis) and mastitis than local breeds (Iraguha et al., 2015; Paling et al., 1991). For

instance, prevalence of subclinical mastitis in crossbred cows was 56.40% compared to 25.60% in Ankole cows (Iraguha et al., 2015). Mastitis reduced the lactation period from 305 days to 245 days and resulted in financial losses per cow/year/lactation of RWF 23,800 for discarded milk, RWF 19,950 for increased veterinary services, and RWF 9,600 for treatment (RWF 774.41=US\$1) (Mwabonimana et al., 2015).

- **Poor management** – In Rwanda, a significant difference was not observed between local and crossbred cows (Ankole cross with Holstein Friesian or Jersey) in terms of reproductive performance. This lack of difference was attributed to poor husbandry practices that do not favor realization of optimal performance of the improved cows (Bishop & Pfeiffer, 2008). In a survey conducted in three districts of Eastern Province, 89% of farmers failed to observe standing heat (estrus) and 95% of them did not keep records (Chatikobo et al., 2009).
- **Water shortage** – Cattle trek long distances in search of water, a situation that becomes more severe during dry season (Lukuyu et al., 2009). A 2007 survey in Eastern Province noted that the major sources of drinking water for cows were communal dams or rivers (Chatikobo et al., 2009).

3. Marketing and Exports

Milk production

Milk production in Rwanda has been increasing. National milk production increased from 372,619 MT in 2010, 503,130 MT in 2012, to 706,030 MT in 2014 (SYB, 2015). The GoR has a goal to produce 810,000 MT of milk by 2017 to keep pace with population growth and to be on track for an annual milk consumption of 80 liters per person per year by 2020 (MINAGRI, 2013).

Marketing system actors and profits

Actors in dairy product marketing are MINAGRI, the Ministry of Trade and Industry (MINICOM), the Rwanda National Dairy Platform (RNDP), dairy producers, transporters, milk collection centers (MCCs), processors, retailers, and consumers. Farmers sell milk to transporters, who are basically traders and use either bicycles or vehicles to transport milk. Bicycle transporters take milk from small farmers to milk shops or consumers, whereas vehicle transporters collect milk from MCCs and sell to processors. On the other hand, some farmers pay transporters to take their milk to MCCs or retailers. In Rwanda, milk retailers include bicycle milk traders who sell milk door to door, milk shops that sell only milk or tea, and ordinary shops that sell milk and other household items (Karenzi et al., 2013). The proportions of profit made along the milk value chain are 15% for input providers; 62% (open-grazing system) or 28% (semi-grazing system) or 44% (zero-grazing system) for dairy farmers; 15-25% for transporters; 6% for cooling system owners; 16% for processors; 10% for raw milk sellers; and 15-20% for boiled milk sellers and processed goods sellers (TechnoServe, 2008).

Market information and the role of government

The sources of market information are the GoR agencies, local business centers, and MCCs (Mutimura, 2016). The GoR is building MCCs equipped with cooling facilities to encourage milk production cooperatives. An MCC has one tank and sustains itself by revenue generated from milk sold in its own milk shop or to transporters. The farmer pays a one-time fee to be a member of the cooperative that runs the MCC. A member has a vote and, in some MCCs, gets higher prices per liter for their milk than nonmembers (TechnoServe, 2008).

Major markets

- **Domestic** – Milk—mostly sold fresh but sometimes also fermented—is sold by farmers to cooperatives, local restaurants, and neighbors (Kamanzi & Mapiye, 2012). In urban areas, there are milk shops that receive milk either from producers or transporters and sell to consumers

(Karenzi et al., 2013). In Rwanda, the predominant milk marketing system is informal and less than 20% of milk is sold through formal marketing system (MINAGRI, 2013).

- **Export** – Until very recently, domestic milk production did not satisfy the national demand, and so milk was being imported. However, since 2012, surplus milk has been produced and export of milk to neighboring countries has been gradually increasing (Karenzi et al., 2013). The revenues obtained from milk export were US\$6.55 million in 2012/2013, US\$10.38 million in 2013/2014, and US\$15.04 million in 2014/2015 (SYB, 2015). Rwanda has a goal to earn US\$18 million to US\$20 million by 2017 through export of surplus milk to neighboring countries. The high production cost of milk in Rwanda affects its competitiveness in some East African markets, such as Ugandan and Kenyan markets (MINAGRI, 2013). Rwanda has identified the Democratic Republic of Congo and Burundi as potential importers of Rwandan milk, as both these countries have underdeveloped milk production and higher processing costs than some other East African markets (MINAGRI, 2013).
- **Key bottlenecks for domestic marketing and exporting** – Domestic milk marketing is constrained by poor road infrastructure and the shortage of transportation from smallholders to consumers. Transportation of milk is mainly done on bicycles, and research has found that about 35% of the raw milk is lost from spoilage before reaching the market or being processed (ADF, 2011). Additionally, this means the milk yields a lower price at market.

There are problems in the areas of milk processing, storage, and marketing as well (Mutimura, 2016). For instance, there is a shortage of cooling facilities, and although MCCs have been created, they do not cover enough of the milk-producing regions. There also is a lack of markets for processed milk due to its higher price when compared to informally sold milk (TechnoServe, 2008; MINAGRI, 2013; Mutimura, 2016).

4. Processing (Traditional and Modern Systems)

In Rwanda, milk is traditionally processed to *kivuguto*, a lacto-fermented (soured) milk. Raw or boiled milk is fermented for two to three days in a wooden jar, *icyansi*, and then *kivuguto* is either used in liquid form or further processed (i.e., churned) into butter (*kimuri*) and buttermilk (*amacunda*). *Kimuri* is heated with some natural perfuming additives for cosmetic purposes or preserved for 6 to 12 months and used for cooking (Karenzi et al., 2013). Milk processing and marketing are largely the responsibility of women (Kamanzi & Mapiye, 2012).

Modern milk processing is done with only a small proportion of the produced milk. The primary processed dairy products are pasteurized milk, skimmed milk, cream, flavored milk, fermented milk and yogurt, ultra-high-temperature processed (UHT) milk, cheeses such as Gouda, butter, and ice cream (Karenzi et al., 2013). In 2013, there were about 25 milk processing factories throughout the country with a total capacity of 160,000 liters per day; however, they performed at only 15% to 20% of their capacity (MINAGRI, 2013).

Consumption trends and preferences

In Rwanda, milk is either consumed fresh or fermented, and most people prefer fermented milk (Karenzi et al., 2013). Fermented milk is consumed alone or with meals (Kamanzi & Mapiye, 2012). In 2013, the annual average consumption of milk and milk products was 40 liters per person per year; nevertheless, the GoR has a goal to increase milk consumption to 80 liters per person per year by 2020 (MINAGRI, 2013). To address the problem of severe child malnutrition, a “One cup of milk per child” program was started in 2010 in six pilot districts. A half a liter of milk per child is provided in nursery and primary schools twice a week. In September 2014, 80,000 children in 100 schools benefitted from this program. Evidence of the benefits included increases in enrollment, attendance, and cognition; declines in dropouts; and improvement in child nutrition and health (MINAGRI, 2016).

5. Major Programs and Projects

Girinka program - One Cow per Poor Family

The One Cow per Poor Family program—called “Girinka,” which translates as “may you have a cow”—was started in 2006 with the goal of reducing child malnutrition rates and increasing household incomes of vulnerable poor families. The program’s goal is to distribute improved heifers to 350,000 families across the country by 2017. Households that receive the cows then pass on the first female offspring to the next resource-poor family, and the cycle continues. To be considered for Girinka, a family has to show that it does not have other sources of income, is able to care for the animal and construct a cowshed, and has a plot of land to support the cow (i.e., 0.25 to 0.75 ha). Thirty percent of the heifers are allocated for women. The number of vulnerable families that have benefited from this program has reached 203,000, and many more families eagerly wait to be benefitted by this program. The GoR Agriculture Board has coordinated the program under the auspices of the Ministry of Agriculture, with these additional partners: Ministry of Local Government (representing districts, sectors, cells, and Imidugudu/villages); Ministry of Finance and Economic Planning; local NGOs; and international organizations, such as Heifer International Program, Send a Cow, and World Vision (MINAGRI, 2016). (See <http://rwandapedia.rw/explore/girinka> for more information).

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