

Contribution of Milk Collection Centers in Improving Rural Household Food

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Received October 31, 2018; Revised December 13, 2018; Accepted January 31, 2019

Abstract: *The study was conducted to explore the contribution of milk collection center in improving rural household food security, Byimana sector, Rwanda. The study aim was to scrutinize the role of Milk Collection Center (MCC) for household food security and milk safety and to identify the challenges faced by farmers as well as MCC. Data were collected from 90 farmers by structured questionnaires. SPSS version 21 was used in data analysis. The results showed that the farmers get various benefits from MCC, 66.7% have market of their milk and 26.7% receive training. The major use of income earned by farmers: 33.3% money used to buy their assets and buy medical insurance and 26.7% is used to buy food needed. However, 73.3% farmers use plastics while 26.7% employ stainless steel containers in milk handling. The study found main farmers' challenge, 37.8% lack of enough capital, 26.7% deficiency of feeds. On the other hand, MCC does not receive enough quantity of milk, some farmers sell their milk to the shops & boutiques. In conclusion, MCC outstandingly contributes in food security improvement of farmers at household level. The study recommends the use of stainless steel containers and the farmers need enough trainings.*

Keywords: Food, safety, milk collection center, household

1. Introduction

Rwanda is a land-locked small country located in East-Central Africa, with a land area of 26,338 km². It is densely populated with 11.55 million people, with 447 inhabitants per square kilometer (NISR, 2016). Rwanda is classified as a developing country and the majority of Rwandans depend on small scale subsistence agriculture for their livelihoods (NISR, 2012). Approximately 39.1% of Rwanda's population lives in poverty where they need to be food secured (NISR, 2016). Agriculture has been reported to be a tool to address hunger and malnourishment issues worldwide (Pingali et al., 2006).

Official estimates showed that Rwanda has 19% of households' food insecurity due to the poor rural households that form small plots. Again, the food insecurity is caused by not possessing any cattle or bovine. Also, the causes are as a result of events such as crop failures and seasonal scarcities that decrease access to food (Republic of Rwanda, 2016). Equally

important, the stability of rural incomes, ownership of animals and failures of crops decrease access to food (RoR, 2016)

Agriculture is the significant sector that contributed to about 33% of the total gross domestic product (GDP) of Rwanda in 2014. This sector provides about 80% of employment where 90% of the country's food also pertains to agriculture (National Institute of Statistics Rwanda, 2015). The government of Rwanda realizes that the dairy subsector is imperative in terms of development of rural area, food and nutrition security of the country. It increased the number of households keeping livestock through its different programmes such as Girinka and ubudehe in order to contribute to the economic growth of the poor and increase the livelihood of resource-poor rural households (Gumira & Karinganire, 2017).

It is in that line that Milk Collection Centers (MCC) have been installed to help the farmers to have market of their cows' milk and value addition throughout the supply chain (RoR, 2009). From what

is stated above, Byimana milk collection center came in social economic activities but what is its contribution in terms of food security? It is therefore, against this background that the present researcher chose to conduct the current inquiry. To conduct this research, four objectives were set as follows:

1. To find out the benefits farmers get from Byimana milk collection center.
2. To determine how farmers use money they get from milk farming.
3. To explore the role of milk collection center in improving the milk hygiene practices.
4. To identify the challenges faced by smallholders' farmers as well as milk collection center

The findings of the study will provide valuable data not only to the researchers and academics but also to government bodies, donors and agricultural and health decision makers. On the other hand, there are many different kinds of methods for food security purposes, this study confined its investigation to milk collection centre located in Byimana sector, Ruhango District/Rwanda. Also, the research only explores the food security of dairy milk farmers pertaining to the cooperative of milk suppliers. The localized research setting means that the results are not to be regarded as representative of the country as a whole.

2. Literature Review

Food is a primary necessity for human being and everyone has the right to safe and sufficient food (Steiner *et al.*, 2008). Food security is a complex, multidimensional concept. FAO (1996) defines food security, as a state when *“all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life”*.

From the definition above, food availability means producing enough food to eat pertaining to all activities undertaken during the production of raw materials (plants and animals) that require inputs (land, fertilizer, labour, breeding animals, water and seeds) and all activities involved in the food system activities such as producing, processing and packaging, market distribution and consumption (Madeley, 2002).

Food access means having enough food to eat. Food access is built on three elements: (1) Affordability is the ability of households to acquire or buy food. High food prices preclude food access particularly for those with low incomes or low levels of wealth (World Bank, 2008). (2) Allocation refers to

determining the mechanisms regulating when, where and how food can be accessed by consumers. Agriculture in Sub-Sahara is concentrated in rural areas. This may result in food crises in the cities when there are inadequate transport systems to transport commodities to markets. (3) Preferences are dictated and determined by religions, social norms and values, gender, locality and tastes (Ericksen, 2008).

Food utilisation refers to biological availability and the ability to use the food for nourishment. It is achieved when food safety and nutritional values of an individual are met (Ericksen, 2008). **Food stability** also refers to the stability of these 3 dimensions mentioned above and continue to exist. Thus to be food secure all 4 dimensions must be fulfilled concurrently (FAO *et al.*, 2017)

Chronic hunger and poverty intertwine and have similar indicators. Shortages of basic needs such as food, clothing, shelter, and safe drinking water are the main indicators of poverty (Tina, 2008). Lack of access to opportunities like education and employment makes people live in poverty and hunger leading to a state of hopelessness and lack of productivity (Young, 2005).

Besides, food security has developed a number of indicators/determinants that are used in assessing/measuring food security at individual or household food availability, physical and economic access to food, food utilisation as well as stability (Leroy *et al.*, 2015). One of the measures of food security is focussing on whether a household has sufficient food or money to buy its basic needs (Bickel *et al.*, 200).

Bashir and Schilizzi, (2013) pointed out that education, farm size, technology adoption, price of inputs, household head's age and credits are determinants of the food availability aspect. In addition, factors like household income, household size, household income distribution and family structure are recognised as determinants of access aspect in food security. Then, other identified determinants of utilisation aspects include gender, dietary intake and health status. The figure 1 below portrays three aspects of food security and the factors determining each of them.

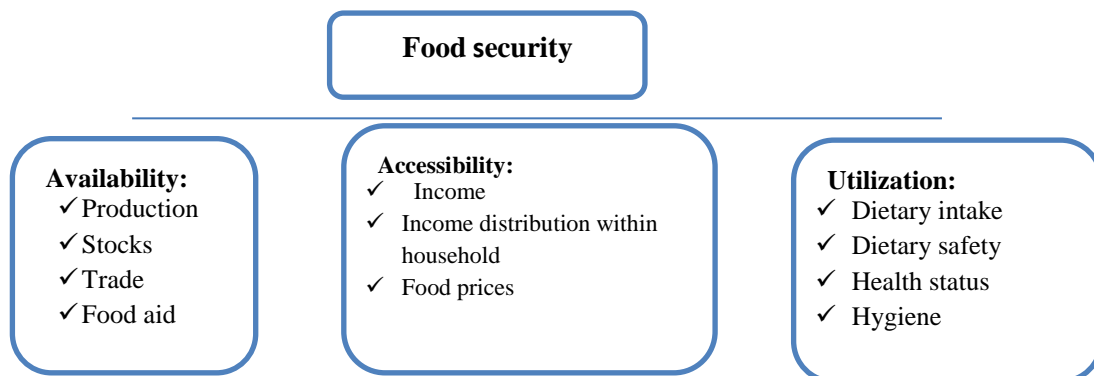


Fig.1.The conceptual model of rural household food security (adapted from Bashir and Schilizzi, 2013)

2.1 Rwanda Rural household

In Rwanda, more than 60 per cent of households cultivate farms smaller than 0.7ha, around half of farming households cultivate farms smaller than 0.5 ha, and more than a quarter cultivate less than 0.2 ha (IFAD, 2011). The main components of crops grown by households are also consumed by households themselves and the crops cultivated by households do not produce enough to cover their food needs (WFP, 2016). Equally important, the household constituents commonly are referred to as the household size, which is a good indicator and is often associated with the living standards of the household. The rural areas display most common sizes that vary between three and five individuals (NISR, 2014).

In 2016, Consolidated Approach for Reporting Food Security Indicators (CARI index), has reported that in Rwanda about 80 percent of households are food secure whereas food insecurity is counted at 20 percent (WFP, 2016). However, farming land is static while the increase of livestock production is possible. It is from these reasons government of Rwanda has provided a pathway out of poverty for smallholders and among the programmes implemented is “one cow per poor family known as Girinka” started in 2006 (RoR,2016). This program intended to reduce poverty through dairy cattle farming that is very significant for livelihoods and food security improvement due to the fact that it increases milk consumption, income generation and agricultural productivity through the use of manure as fertilizer (RoR, 2015)

2.2 Milk Hygiene

Milk is a white liquid synthesized by cells within the mammary gland. It is generally sterile when secreted into the alveoli of the udder. Although, beyond this stage of milk production, some bacterial contamination can normally occur either from within the udder or from outside the udder (Ndungu et al., 2016). For the small sector, poor hygiene practices have been stated to be the leading cause for poor productivity as well as income losses for the smallholder, specifically at farm level. Equally important, contamination of microorganisms are caused by unsanitary conditions that are associated with dirty udders before milking, insufficient or reduced teat sanitation, poor hygiene of a milking person, inadequate cleaning of milking equipment as well as milk cooling system (Pantoja et al., 2009). Other elements include the health of the cow, milking environment and quality of cleaning water (Nada et al., 2012).

In addition, during milking as well as transportation, farmers use plastic jerry cans which are not easy to clean. These plastic containers are often used for milk transporting mostly by bicycles as well as motor bike transporters (Ndungu et al., 2016). Therefore, the use of plastic containers in milk chain i.e. equipment and storage vessels can be the sources of contamination due to the fact that plastic materials are less hygienic in handling when compare to the use of aluminium cans (Kurwijila, 2006). The problem is that the cost of these aluminium containers is higher than that of plastic containers and farmers choose to use plastic materials which could contribute to milk quality deterioration (Gemecu et al., 2015).

In Rwanda, milk production has increased due to the growth in cattle population and to ensure the traded milk safety standards, the government of Rwanda in 2015 passed a Ministerial Order regulating the collection, transportation and selling of milk. From this new regulation, all milk sold in the whole country has to firstly be collected at Milk collection centers for quality testing before being marketed (RoR, 2016). This system is intended to improve market access and enhance milk wholesomeness in the milk supply chain (Balinas, 2014).

2.3 Constraints and opportunities

In many countries there are some opportunities especially government as well as NGOs programs supporting rural dairy farmers. The research conducted by Bahita and Hailay (2018) in Eastern zone of Tigray region found that the training of dairy farmers equips farmers with improved practices that facilitate to adopt new technology particularly in the sector of dairying so that the training can effectively contribute to the farmers' livelihoods as well as the national economy. Seifu and Doluschitz (2014) highlighted that, farmers advantages are not only technical supports but also high demand of milk and milk consumption tradition in the society.

However, the study conducted in Botswana on the analysis of constraints and opportunities in dairy production by Baliyan & Gosalamang (2016) points out that the major constraints for rural dairy farmers are high feed costs, lack of technical support, shortage of dairy related technologies, and development of transportation systems. Also, the same findings were found by Seifu and Doluschitz (2014) who emphasized that the challenges to the dairy sector are pertaining to numerous socio-environmental factors. Constraints to the milk producers include feed shortage, lack of dairy related information services, lack of technical support, and high capital investment. Again, the milk traders reported having limitations of delaying milk delivery due to the poor roads and transportation systems, lack of milk cooling & storage facilities, poor quality of milk supplied from rural areas and inappropriate handling of milk including milk storage vessels (Geleti et al., 2014).

3. Research Methodology

In this research, descriptive design was embraced. Thus, the study used only ninety farmers of a cooperative society and structured questionnaires were applied. Also, key informant (Manager) of Byimana Milk collection center was interviewed. He supplied information on: What they do to help the

milk suppliers to have food security, the points to be considered during milk handling in order to ensure safety and suitability of milk at all stages of milk chain and on the challenges he meets in his daily work. For the data analysis, all the collected data were coded and entered in the computer. By using the Statistical Package for Social Sciences (SPSS) software version 21 computer program, the following was examined. Descriptive statistics such as frequencies, distribution and percentages were used to summarize the data. The data analysed included demographic characteristics of the respondents as well as research questions.

4. Results and Discussion

The following questions guided the study: (1) What are the socio-demographic characteristics of the respondents in terms of gender, age, marital status and education? (2) What are the advantages obtained by the dairy farmers? (3) What do farmers use the money they get from supplying milk to Byimana milk center? (4) Which material are used during milking, milk handling and transportation to BMCC? (5) What challenges do farmers encounter as they deliver milk to the milk collection centers? Results of this research are discussed based on research questions as follows:

4.1 What are the socio-demographic characteristics of dairy farmers in this study?

The first research question about demographic characteristic of respondents, a total of 90 smallholder dairy farmers were interviewed in this inquiry. Among the respondents, female encompassed 66.7% while male comprised 33.3%. These respondents were from different ages, marital status and educational levels. The majority of the respondents belonged to the group age of 26-50years, this shows that 53.4 % of interviewees were in potential productive age. According to the educational level, 10 (11.1) % have never been to school, 54 (60.0%) attended primary education, 11 (12.2%) have attended vocational training programmes, 13 (14.4%) have attended secondary education and 2 (2.2%) have attended tertiary education. In this study, 100% of all respondents are married that means that single persons do not get involved in dairy farming (Table 1).

Table 1: Demographic characteristics of respondents

Parameter	Category	f	%
Gender	Female	60	66.7
	Male	30	33.3
Age	26-30 years old	6	6.7
	36-40 years old	36	40.0
	41-45 years old	6	6.7
	46-50 years old	12	13.3
	Above 50 years old	30	33.3
Marital status	Married	90	100
	Single	0	0
Education	Never been to school	10	11.1
	Primary school	54	60.0
	vocational training	11	12.2
	secondary school	13	14.4
	University	2	2.2

4.2 What benefits do farmers get from Byimana milk collection center?

In response to this research question, the following were the advantages received by the dairy farmers from milk collection center and are led by the market access where 66.7 % (60) of the rural household dairy farmers reported that they sell their milk to Byimana milk collection center. This is one of the targets of milk collection center, they were set to guarantee the rural dairy farmers that they have market of their milk. i.e. either selling or buying the milk when needed (Balinas, 2014).

The installation of Byimana milk collection center stimulated the rural dairy farmers to boost up their milk production and augmented also the milk sales that improved the source of household income. These are acknowledged as determinants of food access as well as availability aspects in food security (Bashir and Schilizzi, 2013).

Table2: Advantages farmers get

Category	f	%
The farmer sells milk to Milk Collection Center	60	66.7
The farmer buys milk from Milk Collection Center	6	6.7
Milk Collection Center provides trainings to farmer	24	26.7
Milk Collection Center gives materials to farmer	0	0

Apart from market access, the respondents have confirmed that Byimana milk collection center does not provide any material to the rural dairy farmer. However, there is a dairy farmer training provided that was argued and appreciated by 26.7% (60) of respondents and 6.7% (6) farmers buy milk from

MCC. The manager of Byimana MCC said “MCC provide training on personal hygiene and hygiene of materials used in milking a cow as well as milk transportation” In agreement with these findings, Pantoja et al.(2009) reported that the milk quality production is positive fundamentally associated with the maintenance of hygienic standards particularly hygiene of a milking person, milking equipment as well as cooling system after milking. Bahita and Hailay (2018) supported the view that farmer training improves on new technology in terms of animal husbandry, feeding techniques and so on.

4.3 What is the use of money received from Byimana MCC?

The money received from selling milk has really assisted household dairy farmers in tackling household problems. The findings on use of income in a household. 33.3 % (30) of respondents unveiled that the use of income in a family is predominantly directed to buy medical cover known as *mutual de santé* of household members and the same percentage (33.3%) (30) has also emphasised that the income received from selling their milk is used to buy household assets.

Furthermore, 26.7% highlighted that the income provided by selling milk is very important in purchasing the food that are needed in the household while only 6.7 % stressed that this income is partaken in payment of school fees of their children.

When a household has an access to income, it will engage in different opportunities like children education (Young, 2005), and acquiring various basic needs like building shelter, buying cloths, foods and other assets (Tina, 2008).

Table 3: The uses of money acquired from MCC)

Category	f	%
To buy some household assets	30	33.3
To buy other foods needed	24	26.7
To pay school fees for the children	6	6.7
To pay medical insurances of the family members	30	33.3

The benefits to the rural household dairy farmers were also confirmed by the overall manager of Byimana Milk collection center, Mr. Emmanuel Rusagara who explained that the dairy farmers do not get only market access of their milk but they also gain from training received, particularly on milk handling practices, grass planting and grass keeping during dry season and how the farmers save money through Umurenge Savings and Credit Cooperative Organization (SACCO).

4.4 Which material used during milking, milk handling and transportation to BMCC?

In this survey, table 4 shows that most of the respondents (73.3 %) use plastic vessels for milking and milk transport to the milk collection centers while 26.7 % of rural dairy farmers apply stainless steel in milk chain. However, nobody uses either wooden nor calabash container.

Table 4: Milking equipment and milk handling MCC

Category	f	%
Plastic	66	73.3
Stainless Steel	24	26.7
Wooden	0	0
Calabash	0	0

These results coincided with the findings of research done by Ndungu et al. (2016) who stressed that farmers generally utilize plastic containers during milking, storage of milk as well as transportation. However, the use of plastic containers in milk chain may be the source of milk contamination due to the fact that proper cleaning of plastic containers is difficult to attain. There are sticky residue on the vessels and the vessels tend to hold smells and tastes (Kurwijila, 2006).

4.5 What are the challenges faced by smallholders farmers as well as milk collection center?

In this study, the rural dairy farmers have pointed out the different challenges during production practices. The major challenges, according to dairy farmers' responses, were reported in the following sequences: firstly, 37.8% (34) reported that they had the challenge of lack of enough capital. Secondly, shortage of feeds, especially during dry season, was indicated by 26.7% (24) respondents. These findings concurred with the results of Seifu and Doluschitz (2014) who emphasized that the major constraints of rural dairy farmers were primarily reported to be not only lack of financial and technical support but also the farmers suffer from finding sufficient cows' feeds.

Thirdly, during this inquiry, 18.9% (17) of respondents reported that they have the challenges of inadequate transport facilities of milk to Byimana milk collection centre and they received the insufficiency of extension support.

Table 5: Challenges faced by farmers during dairy farming

Category	f	%
Lack of enough capital	34	37.8
Lack of feeds	24	26.7
Inadequate extension support	15	16.7
Inadequate transport facilities	17	18.9

On the other hand, the challenges faced by Byimana Milk collection center was confirmed by the manager who observed that MCC has a capacity of receiving the milk up to 1,200liters/day. Unfortunately, only 500L/day is available. Also, the farmers add water into milk and avoid selling it to the MCC looking for high prices. However, MCC does not set the price, it is set by the Ministry of commerce. So, the farmers have a tendency to go to sell their milk in Muhanga town where the price of milk private sellers is high.

5. Conclusion and Recommendations

This study explores the contribution of Milk Collection Centers (MCC) in improving rural household food security and Byimana milk collection center was the case to examine.

The findings clearly indicate that the MCC provides profit to the Byimana farmers in terms of market (selling and buying milk) and providing training in dairying sector. The money and skills received from MCC are the source of farmers' assets, foods, medical insurance and school fees of their children and these are very importance to attain food security at household level. The research also found that farmers most use plastic containers during milk handling when comparing to the use of stainless steel.

On the other hand, dairy farmers face different challenges, among them are insufficiency of investment, lack of cows' feeds, and inadequacy of extension support as well as transport facilities. These challenges are not only limited to the farmers but also to the MCC where it does not obtain enough quantity every day which is derived from diverse causes. Among them, the price is set by the ministry of commerce and is the same in the whole country. When the milk price rises, the farmers sell their milk to the private milk sellers and is always high. Overall, the following issues need to be addressed:

1. The ministry of commerce should permit MCC to set the prices of milk according to the price available on the market
2. MCC has to keep teaching and facilitating milk handling to be done in stainless steel containers in order to improve the proper hygiene of milk.
3. The ministry of agriculture should avail enough veterinarians in order to engage in provision of drugs and offer mobile or on call home treatment for confined cows.
4. MCC should provide training on feeds preservation.

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