THE EFFECTS OF RWANDA DAIRY DEVELOPMENT PROJECT ON DAIRY VALUE CHAIN IMPROVEMENT IN NYANZA DISTRICT, RWANDA

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EXECUTIVE SUMMARY

Rwanda dairy sector has helped out to solve some challenges in the country although remarkable progress in development of the dairy sector in the country, significant challenge still remain like weak dairy value chain system which is as a result of the following (i) low milk productivity attributed to the still low number of improved dairy cattle and compounded by inadequate forage base, animal feeding practices and seasonal fluctuations in water availability; (ii) limited support services (vet, extension, inputs) and an inadequate knowledge to manage dairy cattle; (iii) limited organization of farmers for effective collective action in marketing of milk and access to inputs/services; (iv) inadequate development and management of milk collection, processing and marketing infrastructure for supply of good quality milk to the domestic and regional markets; (v) limited access to finance for dairy value chain actors, especially women and youth; and (vi) a nascent policy and institutional framework, with the need for specific laws, regulations and capacity development of key institutions to encourage the growth of the industry (RDDP detailed report 2016).

Agriculture plays a major role in Rwanda economy and dairy sub sector is an important sector in achieving development in Rwanda. After the end of Girinka project which is one cow per family in encouraging the poor to own a cow, the Rwanda dairy development project was introduced in 2016 to encourage more ownership of cow per households and the use of dairy product by the population. This research therefore will assess the effect of Rwanda Dairy Development Project on the diary value chain improvement. Rwanda Dairy Development Project (RDDP) is a six years project by the government of Rwanda that officially started in May 2017 with the overall goal of contributing to pro-poor national economic growth and improving the livelihood of resource-poor rural households focusing on food security, nutrition and empowerment of women and youth in a sustainable and climate-resilient dairy value chain development. The main objectives of the study is to assess the effect of Rwanda dairy development project on dairy value chain improvement in Nyanza district, Rwanda with the view of achieving the following objectives: To determine the dairy value chain actors in Nyanza District from production to consumption, to examine the structure of the management of the Rwandan diary value chain system, to Identify constraints and challenges faced by value chain actors, examine the effect of

RDDP on the activities and performances of dairy value chain actors. The sample size was given as 356 people who were selected randomly across 10 sectors in Nyanza.the sectors are Busasamana, Busoro, Cyabakamyi. Kibirizi, Kigoma, Mukingo, Muyira, Ntyazo, Nyagiozi and Rwabicuma. Questionnaires were randomly administered to 200 dairy farmers, 6 dairy processors, 50 dairy marketers and 100 dairy consumers in Nyanza district which covers all the value chain actors in the study area. Secondary data was used in getting information about Rwanda Dairy Development Project. Data collected from the identified dairy value chain actors were encoded into SPSS IBM 21. Descriptive statistics such as mean, frequency, percentages and standard deviations were used in each objectives.

The study shows that the mean age of dairy producers, processors, marketers and consumers are 45, 37, 42 and 34 respectively which means that the dairy value chain actors in Nyanza district are adult with little or no youth involving in dairy production. The distribution of the respondents according to their gender was observed that there were more male dairy producers than female dairy producers; amounting to 74.5% and 25.5% respectively. It was observed that there were more female dairy processors than male dairy processors; amounting to about 67% and 33% respectively. Among the marketers, it was obtained that 42% were males, while 58% were females. Among the consumers, 47% were males and 53% were females with more females consuming more milk than the male. Most of the producers are married, amounting to 75% and educated with more of the respondent having completed primary school along the value chain actors. Majority of the producers, marketers, and consumers are into dairy cattle keeping as their primary occupation while for processors have business as the major primary occupation. The study enquired from the producers about their milking processes, quantity of milk consumed by producers, quantity sold to various sources in wet and dry seasons and total quantity of milk sold in the previous year. It was obtained that the dairy producers could milk as low as 1 cow per day, while they could also milk as much as 5 cows per day, altogether averaging not more than 1 cow on daily basis among the producers. It was also revealed that the consumption of produced milk among producers could be as low as 1 liter per day at both wet and dry seasons, while the consumption in wet season is as high as 20 liters per day, with a higher consumption in dry season reaching up to 27 liters per day. The amount of raw milk sold, among the producers, in the wet season of previous year was observed to be as low as 90 liters and ranging up to 10,000

liters at its peak; thus, an average sale of about 1,300 liters was obtained among the producers. The amount of raw milk sold among the producers, in the dry season of the previous year was observed to be as low 30 liters and rising up to 7,800 liters at its peak; thus, an average of about 710 liters of raw milk production was observed among the producers. Average distance from point of production to the nearest milk collection centers to the various producers is about 2.2 km; while generally, some farmers produced at distance not more than 1 km to the milk collection centers, some had their production at distance up to 10 km from the milk collection centers. Selling price can be as low as 160 RWF and as high as 200 RWF; with an average selling cost of about 179 RWF and 181 RWF in wet and dry season respectively. The various types of processed products the processors make are natural fermented milk amounting to about 83% of the producers; about 67% of them indicated they produced “Packed fermented milk”; about 17% stated they produced “Pack pasteurized milk”; while about 17% also reported to produce “Yoghurt”. The dairy processors run their processing productions with 80% operating on a small scale production, while only 20% reported to process dairy on large scale.

The value chain system is organize as 82% of the dairy farmer operate on a zero grazing system. For animal treatment, 84% practice home visitation of veterinary doctors to treat their cattle, while the remaining practice self-medication on drugs for their reared cattle. The impacts of RDDP in Nyanza district are establishments of 21 farmer field school group around a hub model milk collection center with 568 members. All the FFS groups have been equipped with a package equipment that facilitate field learning such as breeding calendar, breeding records card, weighing band, measuring tape, plastic sheeting, salopettes, gum boot etc. and an establishment of a learning plot of at least 0.5 Ha each for practical of all lessons learned. Cows were vaccinated against different diseases. 8663 cows was vaccinated against black quarter disease, 6301 was vaccinated against LSD, 2124 was vaccinated against brucellosis, 184 cows were vaccinated against ECF, two standard communal shed was designed and provided for feed storage, 4231 (86.7%) cows have been inseminated using artificial insemination for genetic improvement through the artificial insemination campaign, provision of seed multiplication plot with at least 5 Ha for seed multiplication , RDDP has also make sure all the milk collection center in Nyanza district is operational with the average milk collected per year increased by 10% and the organization of producers (MCC Coops, Unions) and other Value Chain.

In conclusion, the dairy value chain in Nyanza district are the producers who are the dairy farmers, the milk collection centers, processors, marketers and the final consumers. Rwanda dairy sector is organized and coordinated by the government introducing cooperatives and milk collection centers which make easy sale of milk produce by the dairy farmers. All the dairy value chain are linked together and negative effect on one will affect the other links in the chain. It was found out that the producer and the dairy processors are still the weakest actors in the dairy chain in the study area. Rwanda dairy value chain system is well structured, managed and regulated by the government. Majority of the dairy farmers, operate on a small scale farming and thus reduced the amount of milk needed by the processing unit to process for Rwanda population and export. The major constraint in Rwanda dairy value chain is that majority of the farmers are also either not educated or primary school leaver so they don’t have much information to improve the quality and quantity of milk produced by cow. The roads leading to the milk collection centers are very bad and this discourages the farmers from milking and transporting their milk to the

milk collection center especially during raining season which directly affect the processor from getting enough milk for processing so, operating below their capacity. The effect of Rwanda dairy development project to dairy value chain system in Nyanza district are provision of training, provision of extension services, provision of improved technique on quality milking, provision of cows, provision of managerial support to MCCs, provision of veterinary services, provision of insemination technicians, and introduction of modern equipment.. dairy farmers through the help of extension workers by RDDP are now getting information on improved way of increasing the productivity of the farmers, the milk collection center are also being trained to give quality information to dairy farmers in Nyanza district. Upcoming processors that can afford buying equipment needed for preserving fresh milk and for processing are asked to write a business plan which if approved will be entitled to a loan for their dairy processing business. For now there are no effect on marketers and consumers of dairy product. Rwanda dairy development project is still very young but a lot has been done in Nyanza district which if it continues at the pace it is going will achieve its aim and objective before the end of the project.

The research discovered that the mean age of all the value chain actors are 45 years for producers, 37 years for processors, 42 years for marketers and 34 years for the consumers so its recommended that more youth should be encourage to go into dairy value chain business, the research also discovered that majority of the value chain actors are either not educated or are primary school leaver so I recommend that more youth should have a formal education on agriculture especially on dairy value chain, construction of good roads leading to the MCC and the processing factories so that the farmers can easily take their milk to the milk collection center and the milk from the milk collection centres can be carried to the processing unit easily without the milk losing its value, Rwanda population should be encourage to buy processed milk and this can be done by reducing the price of dairy processed product as majority of the respondent still take fresh milk because they can’t afford to buy dairy processed products, raw milk should be processed to powered milk as this increase the shelve life of the milk and allows export of milk all over the world. This will help the country to generate more income and increase her GDP.

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CHAPTER ONE
INTRODUCTION

1.1 PROBLEM STATEMENT

The Rwandan economy has remained resilient and continues to grow at a sustained pace while recording moderate inflation. Between 2001 and 2015, real GDP growth rate averaged about 8% and despite a slowdown to 5.1% in 2012/13 following aid shortfall in 2012, the economy registered 7.2% growth in 2014, 6.9% in 2015 and is projected to grow at 7.6% in 2016 (World Bank, 2015). Buoyed by this remarkable economic performance, the country has recorded rapid poverty reduction from 59% in 2001 to 39% in 2014 with a corresponding increase in annual per capita income from USD 191 in 2001 to USD 720 in 2015 (World bank 2015). This successful performance is driven by a stable macro-economic and market-oriented policies, improved regulatory frameworks and transparent interactions between the private sectors and the government. A strong anti-corruption policy increased business confidence with the country now ranked by the World Bank at 45th position worldwide, and 3rd in Africa in ease of doing business. Although Rwanda has had a good record in translating its sustained growth into poverty reduction across the country, poverty is still a key challenge. It's been recorded recently

by the national poverty survey that 39.1% of the population is poor and 16.3% are extremely poor. Poverty in the country is mostly a rural phenomenon than urban: the incidence of poverty in rural areas is estimated at 43% compared to 22% in urban areas, and it is highest among households with little or no land who obtain more than half of their income working on other people's farms. Many of the farmers in Rwanda still operate in subsistence farming. it will be necessary to continue investing in pro-poor all-inclusive programmes if Rwanda is to achieve its targets of reducing the number of people living below the national poverty line and to eliminate extreme poverty by 2020. Dairy value chain is a process or a set of activity that a firm operating in a specific industry performs in order to deliver a valuable product or services for the market (Simon and Schuster 2013). The dairy value chain actors are the producers, processors, marketer and the final consumers.

The process of milk collection for processing and exporting in Rwanda is weak which is defined lack of information by dairy farmers, bad roads leading to milk collection centers especially during raining season, skills and business know-how of dairy production at all levels to compete effectively in the local and international market. Additionally, the costs of collecting, preserving before processing and marketing are still high due to high cost of transport and electricity costs and low access to inputs and equipment needed to increase efficiency by majority of the processors as most are private own processing plant and because of this, dairy product are expensive to buy by most people so they prefer to buy local fresh milk. Also dairy farmers prefer to use some of their dairy farm produce at home before selling the remaining to the milk collection centers because the processed dairy product are expensive and cannot be afforded by local dairy farmers. Transport capacity is limited and in some cases lack of infrastructure for milk channeling also compromises milk quality. Seasonality of supply compounds these issues. Although regulated by the government MCCs, as they are designed with the current capacity utilized, are not generally profitable because of both cost of operating versus prices received.

Rwanda dairy sector has helped out to solve some challenges in the country although remarkable progress in development of the dairy sector in the country, significant challenge still remain a weak dairy vale chain system which is as a result of the following (i) low milk productivity attributed to the still low number of improved dairy cattle and compounded by inadequate forage

base, animal feeding practices and seasonal fluctuations in water availability; (ii) limited support services (vet, extension, inputs) and an inadequate knowledge to manage dairy cattle; (iii) limited organization of farmers for effective collective action in marketing of milk and access to inputs/services; (iv) inadequate development and management of milk collection, processing and marketing infrastructure for supply of good quality milk to the domestic and regional markets; (v) limited access to finance for dairy value chain actors, especially women and youth; and (vi) a nascent policy and institutional framework, with the need for specific laws, regulations and capacity development of key institutions to encourage the growth of the industry (RDDP detailed report 2016).

Agriculture plays a major role in Rwanda economy and dairy sub sector is an important sector in achieving development in Rwanda. After the end of Girinka project which is one cow per family in encouraging the poor to own a cow, the Rwanda dairy development project was introduced in 2016 to encourage more ownership of cow per households and the use of dairy product by the population. This research therefore will assess the effect of Rwanda Dairy Development Project on the diary value chain improvement.

1.2 OBJECTIVES OF THE STUDY

The main objectives of the study is to assess the effect of Rwanda dairy development project on dairy value chain improvement in Nyanza district, Rwanda with the view of achieving the following objectives:

(i) To determine the dairy value chain actors in Nyanza District from production to consumption.

(ii) To examine the structure of the management of the Rwandan diary value chain system

(iii) To Identify constraints and challenges faced by value chain actors

(iv) Examine the effect of RDDP on the activities and performances of dairy value chain actors

1.3 JUSTIFICATION FOR THE STUDY

The agriculture sector accounts for over 33 and 23% of the gross domestic product (GDP) in Rwanda, and it is a major source of employment (Makoni et al., 2014). Livestock provides farmers with a way to increase assets, income and nutrition. The dairy cow is one of the most important livestock investment for farmers to improve their livelihood. It is important to study how dairy milk from cow is produce by the farmers to the final consumers. This help understand the processes dairy milk went through before it gets to the final consumer, the people involves in it and the opportunities in the value chain system.Value chain analysis is important in understanding markets, relationship between dairy farmers and markets of dairy products, the Participation of different actors, and the challenges that limit the growth of livestock production.

Literatures from previous research done in Rwanda, reveals that after the 1994 genocide, research has identify the problems faced by the dairy sectors like the inability of the dairy sectors to meet the population requirement of animal protein, genetic improvement of stocks instead of increasing their numbers, Girinka move of one cow for every poor family, creation of awareness among farmers with regards to milk handling, reinforcing the marketing of milk and milk product. Earlier studies have not done a research assessing the effect of Rwanda Dairy Development Project on dairy value chain improvement in Rwanda, and has not been able to look in-depth into the dairy value chain system to identify the weakest part of the chain which can greatly affect others dairy chain actors. This study will assess the effect of Rwanda dairy Development Project on the dairy value chain system in the study area in their first year of commencement of the project. In assessing the effect of Rwanda Dairy Development Project will identify the dairy value chain actors in the study area and look in -depth to what other studies have not done in the dairy value chain system in the study area like examining the management structure, between the actors along the chain and the recent constraint faced by the dairy value chain actors in the study area.

1.4 SCOPE OF THE STUDY

The scope of the study is among the dairy value chain actors in Nyanza district, Rwanda. The dairy value chain actors includes the producers, processors, marketers and consumers of dairy

produce and product. The research focuses on the effect of Rwanda dairy development project on the dairy value chain improvement in Nyanza district, Rwanda.

CHAPTER TWO

2.1 SITUATIONAL ANALYSIS OF RDDP AND RWANDA DAIRY SECTOR

Rwanda Dairy Development Project (RDDP) is a six years project by the government of Rwanda that officially started in May 2017 with the overall goal of contributing to pro-poor national economic growth and improving the livelihood of resource-poor rural households focusing on food security, nutrition and empowerment of women and youth in a sustainable and climate-resilient dairy value chain development. Specifically, RDDP seeks to enhance the sustainability and effectiveness of the dairy sector in supplying quality milk to domestic and regional consumers through small-scale producers. Within the frame of these six years, Rwanda dairy development project (RDDP) will address these challenges and capitalize on the gains and opportunities created by past investments in the sector. At the current level of productivity, milk supply projections show that the country will not be able to meet the rapidly growing domestic demand for milk and sustain the upward trend in cross-border exports to the DRC and Burundi markets. RDDP is expected to contribute towards closing this gap. The design of the project builds on the strengths and lessons learned in the dairy sector by focusing on developing the dairy value chain through improving cattle productivity, milk quality and processing capacity of the dairy industry, and strengthening the policy and institutional framework for the sector. The focus will be on improving food security and nutrition, empowering women and youth, increasing smallholder dairy farmer incomes and sustaining climate-resilient dairy value chain development.

The project area comprises 12 districts in four Provinces of Rwanda: East (Nyagatare, Rwamagana, and Kayonza), North (Gicumbi, Burera, and Musanze), West (Nyabihu, Rubavu and Rutsiro) and South (Nyanza, Huye, and Ruhango). Selection of the targeted districts was based on: (i) current level of cattle population and milk production; (ii) current and projected market development potential, including investments in milk collection centres, dairy processing plants, animal feed factories, and evolving domestic and export market linkages; and (iii) level of poverty, food insecurity and malnutrition. The project area has an estimated population of 4.6 million people and hosts 45% of the national cattle herd (601,479) of which 33% are crossbreeds, 22% purebreds and the remaining 45% are local breeds, mainly *Ankole*. Total milk production in the covered area in 2015 stood at 326,000 MT, accounting for 45% of national

production. The area has 65 of the 100 milk collection centres (MCCs) in the country. Poverty levels in the project area are higher than the national average estimated at 43% in 2014 with targeted districts in the North and West having the highest poverty incidence levels of 52% and 47%, respectively.

The primary target group of the project comprises slightly over 100,00 resource-poor rural households, of whom 80,000 will be involved in dairy farming (mostly zero-grazing) and 20,000 in off-farm activities along the dairy value chain. Taking into account revisions made in the national wealth ranking system (*Ubudehe*), the target groups of the project will comprise the following:

- **51,800 smallholder dairy farmers** in the **zero-grazing system** who typically own up to three cows. This is the predominant livestock system in Rwanda, accounting for 92% of all livestock keepers, producing mainly for home consumption and sell a small surplus locally.

- **22,200 smallholder dairy farmers** in the **semi-extensive grazing systems** with up to 10 cows. They are principally located in the Northern and Eastern provinces and typically have 5-10 ha which form a good base for sufficient supply of forage for their cattle, but face challenges associated with shortages of water and pastures during dry months.

- **6,000 *Girinka* beneficiaries**, who will receive a cow in-calf, and pass on the first heifer to a qualifying neighbour. These households will be drawn from *Ubudehe* Category I who meet the criteria set by the government programme, with some land for forage production and ability to construct a cow shed.

- **15,400 young farm assistants** aged 15 to 24 working as wage labourers (mainly male) in many dairy farms, especially in female-headed households with no male adults. They are typically from very poor families (*Ubudehe* Categories I and II), with little or no education and a very limited skills base.

- **5,400 rural women**, aged 15-35 (child-bearing age), will benefit from new economic opportunities and creation of small off-farm business opportunities.

- **Other beneficiaries** will include: 640 Livestock Farmer Field School (L-FFS) facilitators; 450 producers of forage seeds and vegetative planting materials; 175 vets, 72 community animal health workers and AI technicians; members of dairy cooperatives; milk collectors and traders; and dairy processors.

Objectives Of The Project

The overall goal of RDDP is to contribute to pro-poor national economic growth and improve the livelihood of resource-poor rural households. The specific objectives of RDDP is to

- Sustainably intensify dairy production and productivity among participating smallholder farmers. This shall be achieved through the promotion of improved climate-smart dairy farming practices and access to quality dairy inputs, extension services including veterinary and Artificial Insemination (AI) services; appropriate green technologies, as well as business and financial services, following a hub model approach.

- Increase incomes by at least 80% among participating smallholder farmers from dairy farming through a combined effect of the increased milk production and improved market access. This shall be achieved through the development of 30 dairy hubs; establishment and strengthening of dairy farmer organizations; and facilitation of linkages to markets and dairy value chain actors, such as milk collectors, processors, transporters, traders, and investors in milk quality through public-private-producer partnerships (4Ps).

Baseline Information Of RDDP

The project started May 2017 and much has not really been done. The baseline survey have not yet been done but will start later 2018. Currently RDDP has contributed 3000 cows to the GIRINKA project and planned to contribute 10,000 cows to the poor to support GIRINKA project.

2.2 AGRICULTURE AND DAIRY SECTOR PRODUCTIVITY IN RWANDA

The agriculture sector accounts for over 33 and 23% of the gross domestic product (GDP) in Rwanda, respectively, and it is a major source of employment (Makoni et al., 2014). Governments in Rwanda supported by programs from international development agencies, have prioritized the dairy sector to deliver economic growth, generate employment, and achieve food security objectives. Over the last 15 years, the livestock rehabilitation programs, such as Girinka in Rwanda, built households' livelihood assets and helped create a dairy sector in which very large numbers of farm families participate Girinka was initiated to pursue a threefold goal: (i) to contribute towards poverty reduction; (ii) to reduce child malnutrition; and (iii) to promote climate resilience among poor rural families. Under the program, every family whose local community confirms that it meets the national criteria of being poor receives one dairy cow. Furthermore, public investment in infrastructure created a strong foundation to improve milk collection and trade, connecting dairy farms and processing plants. Combined with these public investment programs, private investment in dairy processing plants has remarkably enhanced physical assets and infrastructure in dairy value chains.

Rwanda is estimated to rear cattle which is commonly considered to be of a high economic, social and cultural value. Zero-grazing is the most common system of dairy keeping with a household having an average of 2 to 5 cattle. GIRINKA one cow for every poor family is a program that started 2006 and is expected to reach 350,000 Rwandese families by 2017 although its still ongoing, has yielded great impact among poor farmers and has help to improve their livelihood. This strategy, through which the Government intends to fight poverty and food insecurity, targets more than 600,000 households. The significance of this strategy is aim at reducing child malnutrition rates and increasing household incomes of poor farmers. These goals are directly achieved through increased access to consumption of milk, by providing poor households with heifer. The program is crucial in addressing the main needs of those that are critically food insecure in the country. The Programme covers all the districts in Rwanda with

the main activity of selecting cow, selection of beneficiary, preparation and training of beneficiaries, distributions of cows, regular and close follow up of the distributed cows.

Thus far GIRINKA program with great impact has transform and is still transforming rural livelihoods and addressing poverty alleviation in Rwanda. One cow given to a household brings nutrition, sustenance and employment, providing a stable income for families. They gets milk from the cow and take it to the milk collection center to sell to those who will process, packaged and sell to the final consumer. They make money from this single cow who also gives birth to other young cow as time goes on. Those who have not benefited yet from the Programme and are poor are given the first calve from the cow to raise and benefit from and the circles continues. The dungs from the cow also serves as manure and is a source of soil nutrient to assist small scale cropping activities. To date, more than 203,000 families have now benefited from the Programme. However many more families. Some of the poorest in Rwanda still eagerly await to receive the many benefits the Programme can bring.

2.3 NATURE AND TRENDS OF DAIRY SECTOR IN RWANDA

The dairy subsector is the largest segment of the livestock sector in Rwanda which accounts for 10.5% of agricultural GDP and is the fastest growing sub-sector within agriculture (RDDP detailed report 2016). In the past year Rwanda Government has made significant investments in the dairy sector which aimed at transforming the sector from subsistence to commercial, modern sector capable of meeting the country's dairy product demand and producing surpluses for export market. These investments have increase the growth and transformation of the national cattle herd from a small size of 600,000 cattle dominated by local breeds with little milk production potential in the 1990s to the 1.35 million national herd today where more than half (54%) are improved dairy breeds (RDDP detailed report 2016). In tandem with this growth and transformation of the sector, annual milk production has increased from a mere 50,000 MT in year 2000 to about 731,000 MT in 2015, and per capita milk consumption has also steadily increased from below 20 litres/year in the 1990s to 64 litres/year in 2015 (RDDP detailed report 2016). Although the growth of the dairy sector in Rwanda has been encouraging and has raised the country to a level where it can now be considered an important player in the regional dairy

industry, there are still challenges to be addressed in this sector because the performance of the sector is still much lower than those of competing countries. The Government has come up with strategies to formalize the dairy sector especially the dairy value chain system, considering health benefits, increase national consumption of processed milk instead of the raw milk.

2.4 RWANDA DAIRY VALUE CHAIN ANALYSIS

Rwanda dairy value chain starts with the dairy farmers who mostly are subsistence farmers. These farmers brings their dairy produce from the farm to the milk collection centre early in the morning and in the evening. Majority of the farmer's farm are very far to the milk collection centre so uses bicycle as their major transporting system to the milk collection centre. When the fresh milk gets to the milk collection centre, which is a cooperative that is regulated by Rwanda government, the milk produce is sold to the processors who processed the milk produce into different type of dairy product adding flavour and other preservative and well packaged for sale to the marketers and or directly to the final consumers.

2.5 LOGICAL FRAMEWORK

Logical framework is an approach methodology mainly used for designing, monitoring and evaluating international development project. The diagram below is the logical framework of Rwanda dairy development project.

Logical framework

	Indicators			Means of Verification			Assumptions
	Name	**Baseline**	**End target**	**Source**	**Frequency**	**Responsibility**	
Goal: Contribute to pro-poor national economic growth and improve the livelihoods of poor rural households	□ Number of female- and male-headed households that experience an increase in household assets	-	80% of project beneficiaries	National statistics, household surveys incl. poverty & gender studies	Baseline and completion	SPIU	Income from milk sales will be used on household improvements
	□ Number of children 0-5 years suffering from chronic malnutrition in project area (stunting)	TBD	5% reduction compared to baseline data				Income from increased sales accompanied by nutrition education and behaviour change will lead to greater availability of and access to a diversified diet and nutrient-rich crops/ food items.
Development Objective: To increase competitiveness and profitability of the dairy sector for the provision of quality products from	□ Volume and value of milk sold from targeted small-holder dairy farmers annually*[i]	Volume: 43 560 MT; Value: USD 9.3m	Volume: 95 040 MT; Value: USD 22.8 m	National Statistics	Baseline, midterm, completion	SPIU	Increased production will lead to sales and domestic consumption
	□ Volume of milk exported and penetration in the East Africa Community dairy	15,038,406 litres/year (2014-2015)	30-35 million litres by 2022 (4-5% penetration in the East Africa Community dairy	National Statistics (NISR,	Baseline, midterm, completion	SPIU	Export data for dairy products are more reliable (considering that most of the milk currently exported to

smallscale producers to domestic and regional consumers, thus improving their livelihoods, food security and nutrition whilst building overall resilience	market		market for Rwanda from the current 1%)	Statistical Year Book)			Congo DRC and Burundi is not recorded)
	Increased income among participating smallholder farmers from dairy farming	-	80% of project beneficiaries	National statistics, household surveys incl. poverty & gender studies	Baseline and completion	SPIU	Incomes increase through a combined effect of increased milk production and improved market access
Outcomes: Smallholder dairy farming productivity and supply of quality milk enhanced and milk consumption at household level increased	Average kg of milk produced per cow per day during one lactation period	Crossbreeds: 5.5 kg/day Local breed: 2.1 kg/day	Cross-breeds: 9 kg/day; Local breed: 2.4 kg/day; Pure breeds: 15 kg/day	MCC records	Continuous	SPIU / RAB / MINAGRI	Improved dairy practices will improve milk productivity regardless of breed purity
	Average consumption of milk at household level increased	64 litres/person / Year	100 litres/person/ year	National Statistics	Baseline, midterm, completion	SPIU / RAB / MINAGRI	Increased and safer dairy production, consumption and education campaigns will lead to domestic consumption

Enhanced organizational capacity and enterprise skills of dairy cooperatives	□ Number (and %) of MCCs serving targeted farmers in milk collection and marketing, dairy input supply, animal health and extension services and financial services	38% (25 out of 65 category 1 MCCs)	90%	MCC records Thematic study	Continuous Quarterly and completion	Service provider SPIU / Rwanda cooperatives agency	Well-functioning MCCs intend to provide multiple services to farmers beyond mere milk collection and marketing

	Indicators			**Means of Verification**			**Assumptions**
	Name	**Baseline**	**End target**	**Source**	**Frequency**	**Responsibility**	
Expansion and improved utilization of milk collection and processing infrastructure	□ Number of dairy farmers using a formal milk collection system (by gender)	30%	80%	Thematic study	Mid-term and completion	Service provider SPIU / Rwanda cooperatives agency	Farmers have adequate incentive to supply to formal sector
	□ % of installed capacity of milk collection and processing facilities	45%	80%	MCC reports	Quarterly	Service provider	Sufficient access to services is available, e.g. to technicians, facilities, etc.

	functional and utilized						
Enhanced policy and institutional environment for development of the smallholder dairy industry	□ Stakeholder satisfaction with policy and regulatory framework	n/a	90%	Thematic study	Baseline, midterm and completion	SPIU	All relevant stakeholders are consulted and heard
Enhanced climate-smart dairy value chain and strengthened community resilience	□ GHG emissions (CO2e/kg milk) avoided or sequestered by the climate smart dairy production intensification approach (RIMS)	TBD	TBD	Thematic study using ExAct methodology at baseline and completion	Baseline and completion	SPIU / RAB / RVC / MINAGRI	Climate-smart technologies will offset the carbon footprint of the dairy sector despite eventual increase in livestock population
Outputs: Developing farmer capacity in good dairy production practices	□ Number of households adopting technologies that reduce or sequester greenhouse gas emissions (RIMS)	n/a	60 000	Service provider report	Quarterly	Service providers	L-FFS will lead to improved animal husbandry practices, leading to improved animal health, improved feeding and improved hygiene generally as well as natural resource base

Strengthening animal health services	□ Number of households receiving facilitated animal health services, incl. AI and % of success (RIMS)		80% of project beneficiaries, incl. 60% AI conception rate	Service provider report	Quarterly	Service provider	Strengthening animal health services will result in more people accessing services. Private vet and insemination services will improve animal genetic resources and sustainability of services
Supporting informal sector to comply with milk quality standards	□ Number of milk zones, kiosks and bars that have been established or upgraded and certified for milk handling	n/a	2 000	Authority in charge of animal product inspection	Quarterly	Implementing partner	The ministerial order on milk standards will be effectively implemented and informal sector allowed to upgrade to the level of required standards
Strengthening of value chain	□ Number of processors supported by project in improved processing, product diversification, packaging, certification and marketing	-	30	Service provider report	Quarterly	Service provider	Dairy cooperatives and unions with category 1 MCCs will want to invest in processing. Existing processors are willing to engage with project.
Supporting organizational	□ Number of cooperatives with new	-	60	Service provider	Quarterly	Service provider	Cooperatives are interested in operational and business

development of cooperatives	bankable enterprise development plans			report			development
Improving access to financial services	□ % financing gap of enterprise development plan	-	10%	Service provider report	Quarterly	Service provider	Financial institutions are ready to invest in dairy cooperatives
Strengthening policy development	□ Number of national policies (laws and regulations) developed to strengthen dairy industry.	n/a	5 enabling laws and regulation developed 1 national policy developed	Rwanda Standards Board records (tbd)	Bi-annually	SPIU	Budget for policy implementation is availed by government and capacity for operationalization exists at local level

Source: RDDP detailed report 2016

2.6 BACKGROUND INFORMATION ON THE SPECIFIC COMPONENT OF RWANDA DAIRY DEVELOPMENT PROJECT VALUE CHAIN

The background information of the specific component of Rwanda Dairy Development Project value chain below was extracted for RDDP detailed report 2016:
The specific component of Rwanda Dairy Development Project are production, aggregation and transport, bulking and chilling, processing, retailing, dairy value chain finances, livestock insurance and equipping and packaging.

Production

The production is still constrained by low number of dairy breeds (due to inconsistent access to and use of Quality AI services consequent to low availability of sex semen, low conception rate, timeliness of AI provision and not enough AI providers, Poor/inappropriate feeding practices (due to knowledge of farmers, low availability of raw feeding material such as cotton, sunflower, market for feeds not well developed, and low means to afford appropriate feeds 30 kg per day costing RwF 250 / kg, making the milk production at farm gate to be high compared market price of RwF 120 – 200 per litre, earning very low returns to farmers and adversary affecting farmers incentives to invest in productivity and quality enhancing technologies.

Aggregation And Transport

Inadequate rural infrastructure, particularly road networks, longer distance to MCCs increase the probability of milk spoilage and ultimately in milk rejection which denies incomes to farmers. The situation is compounded by limited rural electricity, fuel availability, and efficiency of communication networks that influence all the components of the dairy value chain, resulting in inefficiencies, higher costs and ultimately reduced competitiveness. Moreover, low professionalism of cooperatives towards collective marketing result in low levels of milk supplied to MCCs. Handling milk at farm level with limited equipment and skills result in milk adulteration.

Bulking And Chilling

100 MCCs have been established in all milk sheds, the underutilization of bulking/chilling capacity has implications on business profitability and inflates consumer prices. Inefficiencies include: poor milk collection that leads to milk spillage, spoilage and side marketing. Many MCCs are operating below capacity or are not operational due to lack of breakeven milk quantities caused by a double sided factor from supply side (low and inconsistent milk from farmers) and demand side (not enough pulling incentives from the upstream actor – processor – due to inconsistency in collection of milk as well as in delayed payment of raw milk). Underutilization is an indicator of underdeveloped supply chains, inefficient collection including milk spillage and spoilage, side marketing or existence of a large informal sector, and probably lack of shared value along the value chain.

Processing

A big installed processing capacity of 350,000 litres per day in the country's five milk sheds, dairy processing offer a steady market for dairy farmers and their MCCs while adding value and availing quality dairy product with much longer shelf life to consumers primarily in-country and in towns such as Bukavu, Goma and Bujumbura. Still, the processing industry in Rwanda is challenged by the low demand of milk products due to the high prices that do not tally with the purchasing power of today's consumers. The supply gap caused by the large installed capacity of processors and low demand (and low supplies from farmer) provides an investment opportunity to diversify the dairy product range to increase shelf life and convenience of milk such as powdered milk.

Retailing

The milk distribution channel, at least in Kigali, has expanded in the recent two years with the change of Inyange's business model of distributing processed milk, especially pasteurized, through a network of joint ventures dubbed milk zones which has later been replicated by Crystal milk's Milk Point concept. Milk bars are still predominant selling points but face challenges related to quality/hygienic due to (i) inability to trace critical points of hazards from the variety of milk supplied by farmers; (ii) inappropriate cold chain / transport system leading to poor

quality raw/fresh milk; and (iii) lack of micro processing machineries such as micro pasteurizers and sterilizers.

Dairy value chain finance

Key to the expansion of the sector, financial services along the value chain are still not easily accessed due to both demand and supply related constraints. Demanders (farmers, Cooperatives/MCCs, processors, input dealers, transporters) lack appropriate finance management skills, mastering of the dairy market dynamics, and acceptable collaterals by financial.

Livestock insurance

Dairy farmers have not been targeted by the insurance industry as a viable market segment for their products. In Rwanda UAP and SONARWA have developed pilot insurance products on cattle mortality mainly covering diseases and accidental health risks and have found the product commercially viable because farmers are organized into cooperatives, and milk has found its way to MCCs through registered aggregators.

Equipment And Packaging

Dairy related equipment is provided in-country by private enterprises that sometimes combine with the sales of other agro vet inputs and/or agro processing machineries. Large processing machines are imported from India and Germany while packaging materials are imported from Tetra pack in Kenya rendering the cost of packaging, especially in small sizes, very high. Plastic containers are easily sourced locally.

CHAPTER THREE

3.1 LITERATURE REVIEW

A value chain refers to the full life cycle of a product or process, including material sourcing, production, consumption and disposal/recycling processes (WBCSD 2011). It describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. Value chain according to GHG Protocol (2011) is all of the upstream and downstream activities associated with the operations of the reporting company, including the use of sold products by consumers and the end of-life treatment of sold products after consumer use. Value chain is essential to an understanding of markets, their relationships, the Participation of different actors, and the critical constraints that limit the growth of livestock production and consequently the competitiveness of smallholder farmers (Sivapula & Rajadran 2012). A value chain is made up of a series of actors or stakeholders ranging from input, supplier, producers and processors to exporters and buyers engaged in activities required to bring agricultural product from its conception to its end use (Kaplinsky and Morris, 2001). According to Bammann (2007), there are three important levels of value chains (1) Value chain actors: The chain of actors who directly deal with the products, i.e. producer, processer, trader (2) Value chain supporters: The services provided by various actors who never directly deal with the product, but whose services add value to the product. (3)Value chain influencers: The regulatory framework, policies and infrastructures. Value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (it included three or more of the following: producers, processors, distributors, brokers, wholesalers, retailers and consumers (Kaplinsky and Morris, 2001).

Value chain analysis is a method for accounting and presenting the value that is created in a product as it is transformed from raw inputs to a final product consumed by end users. Value chain analysis is synonymously referred to as production chain, ‘’market chain’’, ‘’processing chain’’ or ‘’supply chain’’. Value Chain analysis aims to assess both goods and services along the chain and the relative strengths and weaknesses in the links among various actors involved in the chain. So, the efficiency of a market chain is a result of how well the actors in the chain are

organized and also how well the chain is supported by a range of business development services (SNV, 2008)

Actors In Dairy Value Chain

The various dairy value chain actors includes farm input suppliers, producers of different scales, cooperatives and unions, extension service providers, traders, processors, distributors, industry facilitators, development partners and consumers as end users (Yilma *et al*., 2011).

The formal milk chain involves seven distinct value adding activities from production of the milk through reaching to the final consumer in the market, these activities include input supply, milk production, raw milk transportation, bulking and cooling, processing and packing, transporting processed milk and milk products and retailing gathering (bulking) (Land O'Lakes, 2010).

3.2 REVIEW OF CONCEPTUAL ISSUES

The empirical issues to be discuss are value chain and dairy value chain. The term "value chains" was conceived in business management studies. Porter (1985) tailored the concept as a basic framework for developing a corporate strategy to promote firm competitiveness by directing attention to the entire system of activities involved in producing and consuming a product (GVC on economic development 2017). Value chain proofed itself as an effective way to analyze the activities of firm and government (Nguyen & Trans 2015)

Value chain analysis is essential to an understanding of markets, their relationships, the Participation of different actors, and the critical constraints that limit the growth of livestock production and consequently the competitiveness of smallholder farmers (Sivapalan & Rajandran2012). Kilinochchi District, Sri Lanka evaluated the effectiveness of value chain in dairy production in Kilinochchi District, Sri Lanka and found out that the dairy value chain system is weak because the karachchi division do not have enough technological facilities to preserve the pure milk. And also they don't have the value added strategies like milk toffee, ice cream, yoghurt in the large scale.

The dairy value chain encompasses milk production, milk collection and trade, dairy processing, distribution and marketing (Douphrate et al., 2013). These principle value adding activities in the chain are supplemented by a range of supporting industries which are the milk production, milk

collection and trade, dairy processing distribution and marketing (Nguyen&trans 2015). A unique feature of the dairy industry is the socioeconomic position of dairy farmers that have weak and vulnerable position in the dairy market and are only able to adjust to market trends in a limited, slow and gradual way (Douphrate et al., 2013). To improve their value chain position, these actors, therefore, generally form cooperatives that often have different and varied functions. Africa is a rather small global player in milk production. The content, together with the other developing regions, has pursued an extensive growth strategy, which is increasingly facing natural resource constraints and competitive disadvantage compared to the leading dairy exporter regions (OECD/FAO, 2015). Global milk production at farm level was estimated approximately 800 million tons in 2013 (FAO, 2015). More than 50% of the global volume is produced in Southeast Asia, the EU, and the U.S. At an individual country level, India with approximately 18% of world's share in 2013 is the leading producer, followed by the U.S. (12%), China (5%), Pakistan (5%), Brazil (4%), and Germany (4%) (FAOSTAT, 2015). Whereas milk production has increased approximately 3% per year globally over 2004-14, the underlying factors driving growth starkly differed between the developed and developing countries (OECD/FAO, 2015). The growth in developing countries, where dairy farming is pervasively small-scale, has been fueled by an expanding cattle stock, delivering over two-thirds of the additional supply. This extensive strategy, though increasingly abated by the constraints in water and pasture availability, is projected to continue spurring growth in developing countries, expected to account for approximately 75% of the additional milk supply over the next decade (OECD/FAO, 2015). In contrast, milk productivity has driven growth in developed countries, particularly, in major dairy exporters (OECD/FAO, 2015).

Milk processing is important for conservation and conversion of milk into high-value exportable dairy products. Dairy processing involves heat treatment of 'raw' milk to produce pasteurized drinking milk products, primarily for domestic markets; and further processing of milk to manufacture a range of exportable products (i.e., high-value, low-weight products with long shelf-lives), such as cheese, whey, whey protein concentrate, and lactose powder (IBISWorld, 2016). Unlike the other agro-food industries, the global dairy industry is very fragmented. Regardless of the ownership structure, dairy processors directly undertake or coordinate pivotal value chain activities, including: milk collection and bulking, processing, product development

and brand manufacturing, and increasingly post-processing distribution and delivery services in a business-to-business relation with customers, mainly in food retail, food manufacturing, restaurants and food service industries (Douphrate et al., 2013; IBISWorld, 2016; USDA, 2005). The global dairy retail market was valued approximately US$446 billion in 2015, equivalent to 234 million tons of dairy products (Euromonitor, 2015). Trade in dairy products is predominantly localized, serving domestic markets. International trade is below 10% of global milk production in milk equivalent terms, despite its recent rapid growth, increasing twice as fast as milk production during 2010-13 (FAOSTAT, 2015).

3.3 REVIEW OF EMPIRICAL ISSUES

Rwandan modern dairy industry was founded in 1994 after the end of the genocide and ever since then, the Government of Rwanda international development agencies, and the private sector has improved on the production of milk, collection, as well as processing. The Girinka initiatives also known as one cow per poor family has helped create a dairy sector in which very large numbers of farm families now participate (Klapwijk et al., 2014). The Dairy Cattle Development Support Project also supports construction of MCCs across the country together with Girinka which provided rapid drive needed to move the industry forward. In the dairy processing segment, private investment, led by Inyange Industries, has tripled processing capacity in the country since the early 2000s, reaching 160,000 liter per day in 2014 (Bingi & Tondel, 2015; Makoni et al., 2014). Dairy farming in Rwanda have access to higher value markets to remain profitable (Makoni et al., 2014). Low per capita consumption, estimated 40 liters per capita (FAOSTAT, 2015), limits domestic market opportunities although the national program, One Cup of Milk per Child program, launched in 2010, and innovative distribution models recently set up by the private sector in 2014, stride to stimulate domestic demand. A price-sensitive consumer base has also favored the lower-cost informal dairy channels, often leaving MCCs and processing plants to operate well below installed capacity.

Rwanda's milk production has increased more than tenfold, rising from just 58,000 tons in 2000 to approximately 700,000 tons in 2014 (Country STAT, 2015). This astonishing growth was

achieved primarily by expanding the cattle population through major national restocking program, popularly, known as, “One Cow per Poor Family.” Since its launch in 2006, the program has distributed more than 200,000 dairy cattle, nearly a fifth of the country’s total cattle stock, estimated 1.14 million heads in 2014 (MINAGRI, 2016). The program aims to reach a target of 350,000 cows distributed by the end of 2017. Limited landholdings, on average of 0.7 hectares per household at the national level, however, restrain significant expansion of per-household cattle stock in the country; farms own on average two cows (Makoni et al., 2014). Although the restocking program imported cattle breeds of improved genetics to country, the indigenous breed still is dominant, accounting for 70 % of total cattle stock in the country (Makoni et al., 2014). The pure- and cross-breeds have milk productivity, respectively, 6.7 and 4.6 liters per day compared to the local breed with a potential milk productivity of 1.2 liters per day (USAID, 2015, 2016). Despite the dominance of small-scale production, a handful of large dairy farms, mainly keeping exotic breeds, have been established in Kigali peri-urban areas (Makoni et al., 2014). There are at least three distinctly different feeding systems across the country: First, open grazing is common in the remote Northern and Northwestern regions because of land availability. Milk production in this system, and elsewhere in the country, is largely influenced by rainfall conditions, leading to seasonal variations in milk supply and prices. Milk production has shrunk by nearly 11% in 2002/03 and 13% in 2007/08, both major drought years in Rwanda; the negative impact on milk yield was even higher: 18.3 percent and 20.8 percent drops in milk yield in these same years, respectively (World Bank, 2015). However, reliable market access is a major issue for dairy farmers in these regions although IAAKIB cooperative and Blessed Dairy Ltd has connected milk supply from this region with the demand in Kigali and also the neighboring country Democratic Republic of Congo (Makoni at al., 2014; USAID2013).

Second, the mixed livestock-crop grazing system, country is the dominant feeding system in the country, particularly in the Eastern region where landholdings are large and allow fodder production (Makoni et al., 2014). Dairy farming in this system is also challenged by the poor access to clean water, land degradation, and protracted drought. Third, aligned with the government policy, zero-grazing, or intensive farming, is common in Kigali peri-urban areas as well as in the Southern and Western regions of the country. In the absence of readily accessible

pastureland in peri-urban areas where land shortage and population pressure are paramount, this system is inevitable. Although farmers in this system bear the highest production costs, and they are affected the most by seasonal milk prices because they incur the same cost year-round, access to high value dairy markets in Kigali supports relatively higher production costs in this region (USAID, 2015; World Bank 2015).

Although milk collection infrastructure has remarkably been upgraded in Rwanda over the last decade, efficient use of the physical infrastructure is undermined by a dominant 'informal' market (Ajmal & Gary 2016). A large number of independent transporters and local traders collect milk from dairy farms, and they primarily tend to trade with downstream actors from the dominant informal market, accounting for nearly 85-90% of milk marketed (Makoni et al., 2014). Poorly coordinated milk supply chain results in major challenges, including milk quality issues and low capacity utilization in processing plants. There is dairy cooperatives in Rwanda which was established to progressively assume management responsibility of MCCs as business units that were supposed to deliver services in milk bulking and marketing as well as farmer training, credit, and veterinary services and inputs to cooperative members. In a pyramid-like structure, dairy cooperatives are then further grouped at the district and federal levels, respectively, into district unions and the National Dairy Farmers' Federation of Rwanda (Makoni et al., 2014). The improved organizational capability, supported by the infrastructure investment in MCCs, was expected to help realize scale economies and improve quality control in milk supply chain.

The major reason for the establishment of cooperative was to monitor the buying power and behavior of processor firms (Makoni et al., 2014). Milk handled by local transporters is often adulterated and transported under unhygienic conditions, leading to a major barrier to improve quality milk supply to the processing market (USAID, 2015). It is partly because the processing industry has not yet been able to introduce quality-based pricing although it does already require more stringent quality standards than the competitors in the alternative markets. Milk transfer from the farms to MCC, satellite milk aggregation points, or other buyers is undertaken by milk transporters who collect and mix milk from several farmers (Makoni et al., 2014). Despite training of milk farmers and transporters on hygiene and best practices in milk handling by

several development programs, such as the East Africa Dairy Development Program (EADDP), Rwanda Dairy Competitiveness Program II (RDCP II), and Netherlands Development Organization (SNV), and the related policy action by the government of Rwanda, banning milk transportation in plastic jerry cans, quality control is still a challenge for dairy processors and total bacteria count levels affect milk suitability for production of shelf-stable products, such as UHT and milk powder (Makoni et al., 2014).This strongly influences the quality of processed products and the ability of dairy industry to produce exportable products, meeting harmonized regional standards (Bingi & Tondel, 2015).

The 'informal' distribution channels of milk in Rwanda controls over 80% of milk market while the processing industry struggles with low capacity utilization, high cost of packaging materials, and limited scope and reach of the retail distribution networks. (Ajmal & Gary 2016). Total dairy processing capacity in Rwanda has tripled over the last 15 years, reaching 160,000 liters per day in 2014 (Bingi & Tondel, 2015). The processing industry still accounts for a very small share of dairy market in the country. Less than 10-15% of the total milk marketed is processed in Rwanda although an estimated 30% was of total market milk was reportedly channeled through MCCs (Land O'Lakes Inc, 2012; Makoni et al., 2014). Rwanda currently lacks the capability to convert surplus milk into powder, a shelf stable product for export markets (Ajmal &Gary 2016).

The dairy processors still face the challenge of supply of quality milk leading to very low capacity utilization, estimated at 20% at the industry level (Makoni et al., 2014). Low capacity utilization obviously increases the per-liter fix cost of processed milk products and it has been a challenge for both processors and MCC units in Rwanda. The cost of Rwandan milk doubles if processed through the 'formal' channels (USAID, 2016). Besides inefficiencies in milk collection and processing, competitiveness of processed or pasteurized packaged milk in Rwanda is negatively affected by the high cost of packaging (Makoni et al., 2014). Dairy products reach consumers through several distribution outlets, such as supermarkets, hotels, restaurants, and recently also RwandAir (Ajmal &Gary 2016). To expand the sale of processed milk, a recent innovative distribution strategy, launched by Inyange Industries in 2014, has been the introduction of "milk zones," or franchised outlets. In contrast to pasteurized packaged milk distributed through supermarkets, the "milk zones" retail'unpackaged' pasteurized milk at about

half the price while consumers bring in their own containers. Within 18 months of its launch, Inyange Industries had established 70 milk zones, with daily sales of pasteurized milk reaching 28,000 liters—an increase of 17,000 liters per day (Makoni et al., 2014). The strategy has strongly enhanced price-competitiveness of processed milk and made the product more accessible through a scattered distribution network, resembling competitors in the 'informal' market. The latter consists of approximately 1,500 kiosks, scattered around Kigali, that mostly retail 'raw' or 'boiled' milk directly to consumers (Makoni et al., 2014).

3.4 REVIEW OF METHODOLOGICAL ISSUES

Duke CGGC Dairy report 2016 focused its research efforts on literature reviews and in-depth interviews with industry stakeholders, supplementing when possible with data from the public and proprietary databases. Field research was also conducted together with phone or Skype interviews with officials who have direct ties to the dairy value chain in the research region, including government officials and private sector actors in various segments of the chain. The report relies on the global value chain (GVC) analytical framework, which is a systems based and actor-centric approach. It combines broad analyses of global industry structures and trends with detailed mapping of national industries and local economic clusters based on existing economic statistics. As the primary actors within value chains, firms are of central importance in the GVC methodology—GVC analysis seeks to determine what makes firms productive in the context of dispersed supply chains, how private-sector governance and public policies influence performance in the value chain, and what factors and strategies allow actors to move into higher value segments of the chain. Specifically, it involves mapping the input-output structure, geographic scope, and the governance role played by lead firms, and market trends in a particular value chain.

Haregweyni 2015, on Value Chain Analysis of Dairy in Laelay Maychew and Adwa Districts in Central Zone of Tigray, Ethiopia used a two-stage sampling technique to draw sample units through random sampling methods from 160 respondent. Representative samples were taken

from the dairy value chain actors that can contribute value addition to the commodity under study and services providers that contribute services provided to producers. The sample size dairy value chain actors involved in the study were input suppliers 24 including: private feed supplier (7), drug suppliers (4) and 13 retailers (Restaurants, snack, café and hotels,9 service providers including: OoARD(2), Dedebit credit and saving institution (2), AI service provider (2), Vet service provider (2) and 1 from Relief Society of Tigray . Primary data was collected using semi structured questionnaire. Descriptive statistics such as mean, frequency, percentages and standard deviations were used in the process of comparing socioeconomic, demographic and institutional characteristics of households. Results of market participation decision indicated that the probability to milk market participation is significantly affected by educational level, cross breed type, access to credit and access to extension service in the study area. European Training Foundation, 2013 conducted a research on value chain analysis in the montenegri dairy sector and reviewed relevant literature (e.g. reports and studies) and an analysis of qualitative and quantitative data. The field research was conducted in 25 interviews with key actors at different levels of the dairy value chain. These included primary producers (farmers), dairy processors, traders, retailers and hotel and restaurant owners. The field research was conducted in 25 interviews with key actors at different levels of the dairy value chain. These included primary producers (farmers), dairy processors, traders, retailers and hotel and restaurant owners. Secondary data was used to get a qualitative data and an interview for the qualitative data. The research found out that the study area needs both education and training.

Past studies has used both quantitative in terms of questionnaire and qualitative for in-depth interview. The advantage of in-depth interview over questionnaire is that it involve direct and one-on-one engagement with individual participants and delivers reliable information for a particular research although the limitation is that it will not cover a large view of the subject matter. It will only cover few people which will be used as a representative for others. In-depth interview also takes time and is very expensive to conduct especially when there is a language barrier. Although questionnaire covers more respondent, the information given may not be as reliable as the in-depth interviews. This research uses questionnaire to collect data for the research. The main reason for this is because the research is for a short period and language barrier. This constraint will not allow covering of a large range of people in the speculated time.

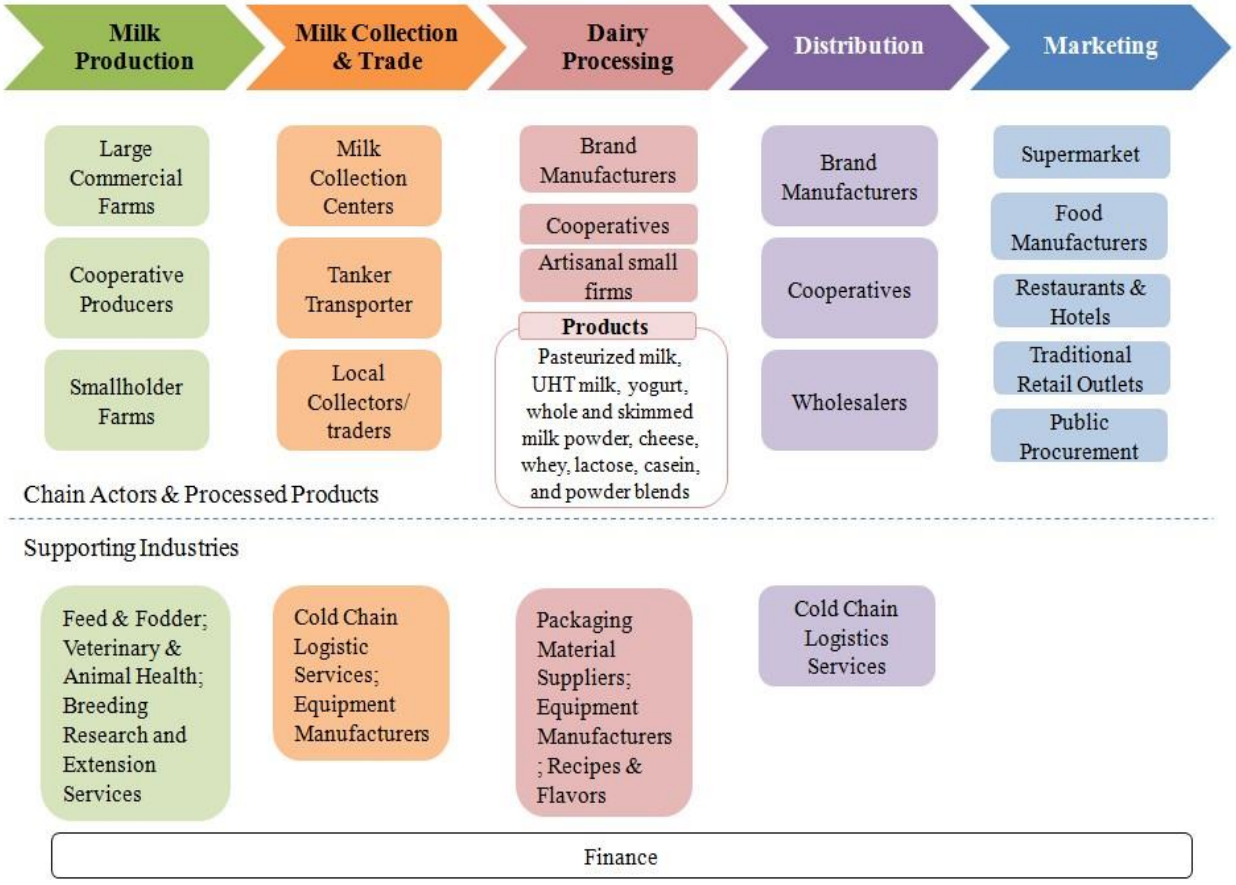
CHAPTER FOUR

METHODOLOGY

4.1 CONCEPTUAL/ANALYTICAL FRAMEWORK

The diagram below shows the dairy value chain actors and how they linked together.

Figure 1



Source: Duke Centre on Globalisation Governance and Competitiveness 2016

The diagram above reveals the value chain actors and how they operate until dairy product gets to the final consumers. The chain starts with milk production from cattle gotten by the cattle

farmers from lactating cow. The farmer very early in the morning and in the evening time milk cow/cows and then transfer it to the milk collection center or sell fresh milk directly to local people in need of milk. Milk farming can be done in largescale in commercial farm or in small scale. In Nyanza district most of the farmers operate on a small scale. In production of milk from the farm, the farmers gives fodders to cattle which is needed for the cow to strive well and be in good condition to produce expected milk, ensure sick animals are treated and ensures good health condition of the cattle by the veterinary. veterinary services is also needed to ensure health of the cow, animal health and breeding services when needed especially when there is a need for a crossbreed, research and extension service to know what else can be done to increase productivity and how information can be disseminated to the dairy farmers for improvement in the dairy sector. After milking is done by the farmers, the milk is sold to the milk collection center or sold locally to local collectors and tankers. After collection, the milk collection center sells to dairy processors who processed the fresh milk into different dairy product like canned milk, powdered milk, yoghurt, milk candy, whole and skimmed milk, pasteurized milk and other dairy product.

In processing, flavors, preservatives, recipes are added and packaging of dairy product is done. This allows the extension of the shelve life of the dairy product and make it attractive, add more taste and flavor to dairy product. Export of dairy product is also made easy when it is processed and well package. After processing and packaging, milk is distributed to the final consumers. And this can be done in retail or wholesales. The milk product is sold by the processors to those that will sell to retailers that finally gets to the final consumers like restaurants, hotels, airlines, supermarkets etc for consumption. Milk product in the dairy value chain system ends with the final consumers.

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4.2 SAMPLING DESIGN

A simple Random Sampling method was used. Only sectors were Rwanda dairy development project is done is selected in the study area these sectors are Kibilizi, Kibirizi, Muyira, Nyagisazi, Nyagisozi. Nyanzo. Questionnaire was randomly distributed to the farmers at the milk collection center. Because of language barrier enumerators were hired to help interpret the

questions to the farmers who come to the milk collection centers to sell their milk. Sample size calculator was used to calculate the sample size in the study area. The research administered a total of 356 questionnaires in the study area.

4.3 DATA REQUIREMENT AND SOURCES

Study Population

Nyanza district have a population of more than 320,000 people (according to the 2012 national census.). Nyanza is predominantly rural than urban with 7.9% urban and 92.1% rural. The district is divided into 10 ssectors: Busasamana, Busoro, Cyabakamyi. Kibirizi, Kigoma, Mukingo, Muyira, Ntyazo, Nyagiozi and Rwabicuma. The bulk of Nyanza's economy is agriculture based with mostly young population. The labor force rate is higher among the male than the female in both urban (74.1% vs 66.2%) and rural areas (74% vs 71.2%) . the field site was selected based on the following criteria: (1) the important of dairy in the Nyanza; (2) The existence of dairy value chain (i.e. milk production, processing, marketing and dairy consumers) in the study area; (3) representativeness of the study area with respect to dairy value chain development as one of the district benefiting from the impact of Rwanda dairy development project.

4.4 SAMPLE SIZE AND DATA COLLECTION METHOD

The population size for the research was calculated using an online sample size calculator (Survey Systems, 2018) using a confidence level of 95%. The sample size was given as 356 people who were selected randomly across 10 sectors in Nyanza.the sectors are Busasamana, Busoro, Cyabakamyi. Kibirizi, Kigoma, Mukingo, Muyira, Ntyazo, Nyagiozi and Rwabicuma. Questionnaires were randomly administered to 200 dairy farmers, 6 dairy processors, 50 dairy marketers and 100 dairy consumers in Nyanza district which covers all the value chain actors in the study area. Secondary data was used in getting information about Rwanda Dairy Development Project.

4.5 VALIDITY AND RELIABILITYOF RESEARCH INSTRUMENT

A pretest was done in Nyanza district before the commencement of data collection to test for the validity and reliability of the research instrument.

4.6 METHOD OF DATA ANALYSIS

(i) The data collected from the identified dairy value chain actors were encoded into SPSS IBM 21. Descriptive statistics such as mean, frequency, percentages and standard deviations were used in objective one for identifying the dairy value chain actors.

(ii) Descriptive statistics such as mean, frequency and percentages was used for the structure of the management of the Rwandan diary value chain system

(iii) Descriptive statistics such as mean, frequency, percentages was used to examine the constraint and challenges faced by the value chain actors

(iv) Descriptive statistics such as mean, frequency, percentages was used to examine the effect of RDDP on the activities and performances of dairy value chain

CHAPTER FIVE

RESULTS AND INTERPRETATION

5.1 DEMOGRAPHIC CHARACTERISTICS

This section reveals the socio-economic and demographic information of the respondents who participated in the assessment study of the value chain actors in the dairy production, processing, marketing and consumption in Rwanda. The results, as seen on Table 1, showed that the mean age of the dairy producers was 44.69 years, for processors is 36.7 years, marketers is 42.1 years and for consumers is 34.1 years. The study made enquiry on the household sizes of the respondents. It was revealed that mean of the overall household size for the producers is 4.48, 3.3 for processor, 3.9 for marketers and 3.5 for the final consumers. The result reveals that there are older people among the producers than other dairy chain actors with the processors having the least age of people. The household size of the producer is more than the processors having the least household size in the value chain.

Table 1: ***Age and overall household size of the dairy value chain actors***

	Producer	**Processor**	**Marketer**	**Consume**r
Age (Years)	**44.69**	**36.7**	**42.1**	**34.1**
Overall Household Size	**4.48**	**3.3**	**3.9**	**3.5**

The distribution of the respondents according to their gender was revealed on Table 2. It was observed that there were more male dairy producers than female dairy producers; amounting to 74.5% and 25.5% respectively. It was observed that there were more female dairy processors than male dairy processors;

amounting to about 67% and 33% respectively. Among the marketers, it was obtained that 42% were males, while 58% were females. Among the consumers, 47% were males and 53% were female. There are more male among the producer than the other dairy value chain actors and more female marketers among the dairy value chain actors.

Table 2: ***Gender of the value chain actors***

	Producer	**Processor**	**Marketer**	**Consumer**
Male (%)	**74.5**	**67**	**42**	**47**
Female (%)	**25.5**	**33**	**58**	**53**

The distribution of the respondents according to their marital status, as seen on Table 3, showed that the most of the producers were married, amounting to 75%; about 14% of the producers were reported to be widowed; up to 8% of them were reported to be single; while 3% were found to be divorced. Among the processors, 33% each belonged to the groups of single, married and widowed. Among the marketers, 62% were found to be married, 24% were reported to be widowed, and 14% were reported to be single. Among the interviewed consumers, 62% were found to be married, 32% were single, 5% were widowed, while 1% were divorced. The processors have the highest single, producers have the highest married, processors have the highest divorcee and the marketer have the highest respondent that are widow.

Table 3: ***Marital Status Of The Dairy Value Chain Actors***

	Producer	Processor	Marketer	Consumer
Single (%)	**8**	**33.3**	**14**	**32**
Married (%)	**75**	**33.3**	**62**	**62**
Divorced (%)	**3**	**33.3**	**0**	**1**
Widowed (%)	**14**	**0**	**24**	**5**

The distribution of the respondents by their level of education as seen on Table 4, revealed that the most of the dairy producers (71.5%) had only primary education; 15.5% had secondary education, while 11.5% were had no formal education. Among the dairy processors, 33% each had primary education, secondary education and post-secondary education. The marketers' responses showed that 54% had primary education, while about 46% had secondary education. The information gathered from the respondents showed that about 41% of them had secondary education, 29% had primary education, 27% had post-secondary education, while not more than 3% had no formal education. Marketers have the highest respondent with no formal education, producers have the highest respondents with primary education, marketers have the highest respondents with secondary education, producers have the highest respondents with post-secondary education.

Table 4: ***Level Of Education Of Value Chain Actors***

	Producer	Processor	Marketer	Consumer
No formal (%)	**11.5**	**0**	**54.0**	**3**
Primary Education (%)	**71.5**	**33.3**	**0**	**29**
Secondary Education (%)	**15.5**	**33.3**	**46.0**	**41.0**
Post-secondary (%)	**31.5**	**33.3**	**0**	**27.0**

The distribution of the respondents by their primary occupation as seen in Table 5, revealed that among the interviewed dairy producers, the majority of them were into crop production, as indicated by about 47.5%; 36.5% of them were into Dairy Cattle Keeping; about 12% had wage employment as their primary occupation; only about 3% were into business. Among the dairy processors, about 67% of them indicated to be into businesses, as their primary occupation; the remaining 33% stated they had wage employment. Among the marketers, it was observed that the most of them, up to 50%, were into Dairy Cattle Keeping; 26% were into business activities; about 18% were into crop production as their primary occupation; and lastly, not more than 6% indicated to be involved in wage employment. Among the consumers, the most of them indicated to be primarily occupied with Dairy Cattle Keeping, amounting to about 56% of the consumers; 29% indicated to have had a wage employment; 8% indicated they were primarily occupied by Crop Production; only about 5% indicated they were into business.

Table 5: Primary Occupation of the dairy value chain actors

	Producer	Processor	Marketer	Consumer
Wage Employed (%)	**12.0**	**33.3**	**6.0**	**29.0**
Dairy Cattle (%)	**36.5**	**0**	**50.0**	**58**
Business (%)	**3.0**	**66.7**	**26.0**	**5.0**
Crop Production (%)	**47.5**	**0**	**18.0**	**8**
Others (%)	**1.0**	**0**	**0**	**0**

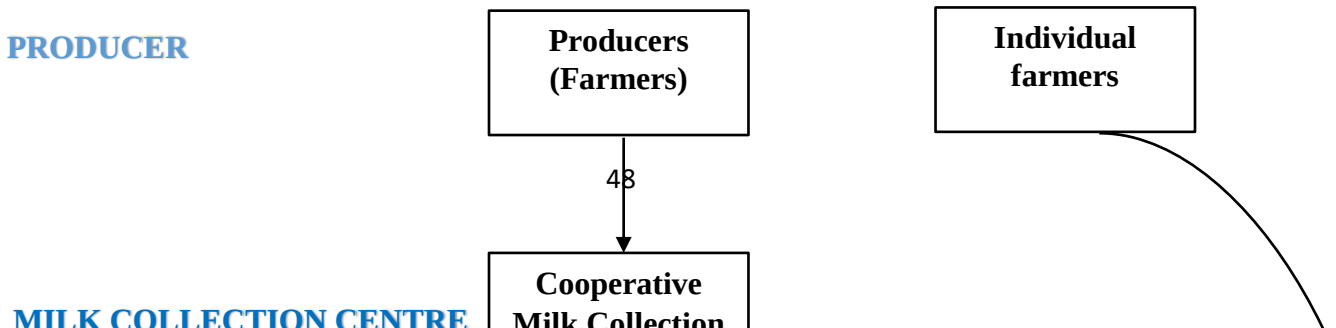
5.2 DAIRY VALUE CHAIN ACTORS IN NYANZA DISTRICT

This section reveals the value chain actors in the study area. Information obtained from the respondents who were stakeholders of the dairy value chain, from production to consumption reveals that there are five dairy value chain actors which are the producers, milk collection center, processors, marketers and the final consumers. The diagram below reveals all the value chain actors in Nyanza district, Rwanda. There are five value chain actors in Nyanza district, Rwanda. They are the producers (Farmers), the milk collection centers, processors, marketers and the final consumers. Producers (Farmers) are majorly subsistence in the study area with at least one cow. The farmers milk their cow early in the morning or late in the evening. They carry the milk milked from their cow/cows in an aluminum or plastic can and take the milk to the milk collection center. Some farmers sell fresh milk directly to local fresh milk consumers at a cheap price.

The milk collection center are cooperatives regulated by the government to collect and help the farmers to sell their milk produce to the processors at a regulated price by the government through the Rwanda ministry of agriculture and animal resources. The farmers brings their milk produce to the milk collection center in exchange for money. The milk collection center send the

milk produce to the processors. Milk processors process the process the milk produce into different dairy product like packed liquid milk, yoghurt, gee and sell it to the marketers or directly to restaurants, supermarkets, local food joint, hotels, airlines and individual consumers. Marketers sell the milk product from the processors to restaurants supermarkets, local food joint, hotels, wholesales to retailers and also retailers buy directly from marketers who finally sell to the final consumers.

FIGURE 2



MARKETERS

CONSUMERS

SOURCE: FIELD SURVEY 2018

DIAGRAM SHOWING THE DAIRY VALUE CHAIN ACTORS IN NYANZA DISTRICT, RWANDA

Results on Table 6 revealed from the study gathered that, among the dairy producers, the most of them (about 71.5%) have been in the production line for more than 5 years before the study; about 19% had been in the production line for about 3 – 4 years; while about 9.5% indicated they

had been in dairy production for not more than 2 years before the study. The study also revealed from Table 7 that the period since start of dairy processing and dairy marketing among the processors and marketers respectively. It was observed that the processors have been engaged in their phases for as low as 8 years and high as 81 years, with an average of 28 years in engagement in the dairy processing. It was also observed that the marketers have been in their engagement for not more than 8 years, while some were found to have spent less than a year in the business. Information from the consumers, as seen on Table 8, showed that up to 87% of them did not purchase dairy product, while the remaining 13% indicated they purchased the milk they consumed

Table 6: ***Period Of Start Of Dairy Farming By The Farmers***

	Frequency	**Percentage**
1 – 2 years	**19**	**9.5**
3 – 4 years	**38**	**19.0**
More than 5 years ago	**143**	**71.5**
Total	**200**	**100.0**

Table 7: ***Period to Start of Milk Processing and Milk Marketing Business***

	Min.	**Max.**	**Mean**
Processing Period (years)	**8**	**81**	**28.0**
Marketing Period (years)	**0**	**8**	**3.2**

Table 8: ***Purchase Of Dairy Product By Consumers***

	Frequency	**Percentage**

Purchased dairy product	**13**	**13.0**
Did not purchase dairy product	**87**	**87.0**

As seen on Table 9, the study enquired from the producers about their milking processes, quantity of milk consumed by producers, quantity sold to various sources in wet and dry seasons and total quantity of milk sold in the previous year. It was obtained that the dairy producers could milk as low as 1 cow per day, while they could also milk as much as 5 cows per day, altogether averaging not more than 1 cow on daily basis among the producers. It was also revealed that the consumption of produced milk among producers could be as low as 1 liter per day at both wet and dry seasons, while the consumption in wet season is as high as 20 liters per day, with a higher consumption in dry season reaching up to 27 liters per day. The amount of raw milk sold, among the producers, in the wet season of previous year was observed to be as low as 90 liters and ranging up to 10,000 liters at its peak; thus, an average sale of about 1,300 liters was obtained among the producers. The amount of raw milk sold among the producers, in the dry season of the previous year was observed to be as low 30 liters and rising up to 7,800 liters at its peak; thus, an average of about 710 liters

of raw milk production was observed among the producers.

Table 9: ***Milk Production in Wet and Dry Seasons***

	Min.	**Max.**	**Mean**	**Std. Dev.**
No. of Cows milked per day	**1**	**5**	**1.4**	**0.8**
Quantity of Milk Consumed at Home (Wet Season: Liters)	**1**	**20**	**2.4**	**2.6**
Quantity of Milk Consumed at Home (Dry Season: Liters)	**1**	**27**	**2.0**	**2.4**

Total Quantity Sold Last Year (Wet Season: Liters)	**90**	**10,000**	**1287.7**	**1162.1**
Total Quantity Sold Last Year (Dry Season: Liters)	**30**	**7,800**	**707.8**	**937.0**

The study also revealed information on the cost incurred by the producers in the production process, as seen on Table 10. It was obtained that the average distance from point of production to the nearest milk collection centers to the various producers was about 2.2 km; while generally, some farmers produced at distance not more than 1 km to the milk collection centers, while some had their production at distance up to 10 km from the milk collection centers. Further enquiry on the selling cost of raw milk in both wet and dry season among producers revealed that they sold as low as 160 RWF and as high as 200 RWF; with an average selling cost of about 179 RWF and 181 RWF in wet and dry season respectively.

More enquiry on the cost incurred on various phases of production such as salary, cattle feed, drugs, veterinary services and transportation revealed that on monthly an average of 6,550 RWF is spent on salary; approximately 17,800 RWF is spent on cattle feed; about 6,700 RWF is spent cattle drugs; about 11,350 is spent on veterinary services of the cattle; and lastly, about 3,200 RWF is spent on transportation of the milk producers. The results reveals that farmers spend more on feed in milk production.

Table 10: Cost Incurred in Milk Production

	Min.	Max.	Mean	Std. Dev.
Distance between Home and MCCs (km)	1	10	2.2	1.9
Milk Price per liter (Wet Season)	160	200	179.4	12.5
Milk Price per liter (Dry Season)	160	200	181.1	11.6
Amount spent on Salary (Monthly)	1,000	20,000	6,550	3,516.2
Amount spent on Feed (Monthly)	1,000	60,000	17,756.7	14,167.8

Amount spent on Drugs (Monthly)	670	40,000	6,712.9	7,182.8
Amount spent on Veterinary Services (Monthly)	1,000	80,000	11,350.9	11,321.3
Amount spent on Transportation (Monthly)	300	30,000	3,175.8	5,142.6

The study also revealed the marketers' contribution on the value chain through quantity and price of milk sold during the wet and dry season. It was obtained that during the wet season, on daily basis, the marketers sold milk as low as 20 liters and as high as 210 liters, averaging an overall sale of about 65 liters per marketer per day; in contrast, during the dry season, the quantity of milk sold daily was as low as 10 liters, and as highest at 145 liters daily, with an average sale of about 40 liters per day (in the dry season). Further enquiry made on the marketers' buying price of milk revealed that they buy milk at an average price of 200 RWF per liter, with lowest buying value of 200 liters and highest of 210 liters; the enquiry also revealed the average selling price of milk, among the marketers, was about 245 RWF, with lowest selling value of 220 RWF and highest of 300 RWF.

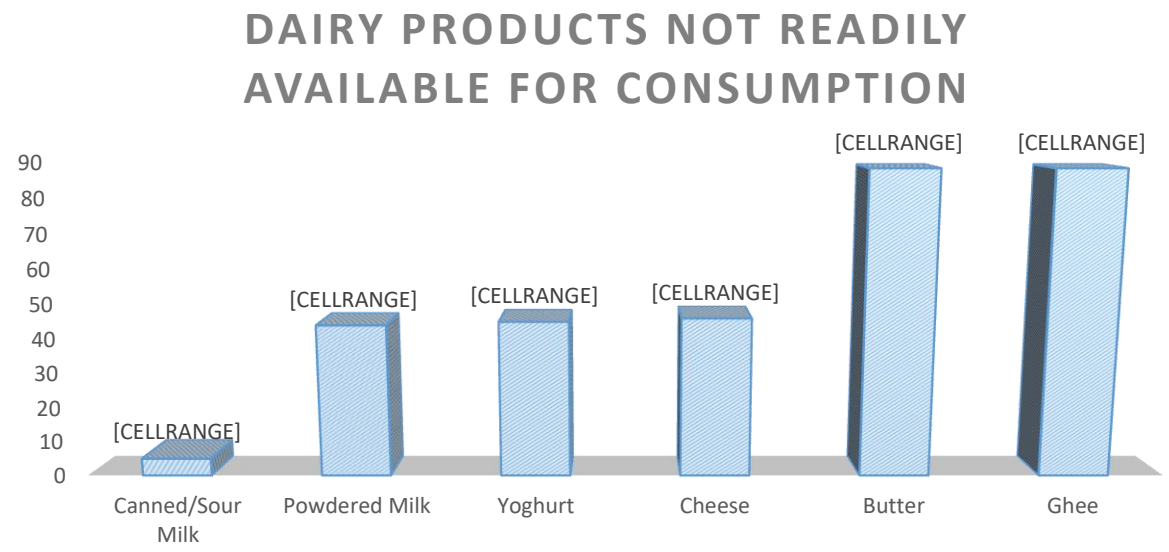
Table 11: ***Quantity and Price of Fresh Raw Milk Among Marketers***

	Min.	Max.	Mean	Std. Dev.
Quantity of Raw Milk Sold daily (Wet Season: Liters)	20	210	64.6	45.9
Quantity of Raw Milk Sold daily (Dry Season: Liters)	10	145	40.2	30.2
Buying Price of Raw Milk (Per Liter)	200	210	200.2	1.4
Selling Price of Milk (Per Liter)	220	300	245.2	28.1

The dairy processors were enquired on, as regards the kind of scale they run their processing productions. It was revealed that, up to 80% of them had a small scale production, while only

20% reported to process dairy on large scale. Responses obtained among the consumers showed that only about 34% stated to have been able to buy the desired quantity of milk at any point in time, while up to 66% indicated they usually cannot buy the desired quantity. Consumers most preferred choice of milk is “Raw Milk”, as indicated by about 97% of them, while only 3% indicated they also consumed “Processed Milk”. It was obtained that the most reported unavailable product was “Ghee” and “Butter”, as each was indicated by 88% of the consumers. About 46% indicated they could not have “Cheese” readily available; about 45% indicated “Yoghurt” was not readily available; about 44% indicated “Powdered Milk” was not readily available; not more than 5% indicated Canned/Sour Milk was not readily available.

FIGURE 3



5.3 STRUCTURE OF THE MANAGEMENT OF THE RWANDA DIARY VALUE CHAIN SYSTEM

The responses in this section were enquiries made from all actors of the value chain with respect to their structure in Nyanza district. All the value chain actors belong to one organization or the other and this help to organize and coordinate actions taken in the value chain system. Table 15 and 16 reveals the responses of producers and processors, regarding their membership to various organizations. It was revealed that about 68% of the producers belonged to an organization; while only about 40% of the processors indicated to belong to an organization. The entirety of the processors who belonged to an organization were members of the Rwanda National Dairy Platform, with all having had 3 years of membership.

*Table 12: **Membership On Producer's Organization***

	Frequency	Percentage
Members of organization	136	68.3
Non-members of organization	63	31.7
Total	**199**	**100.0**

*Table 13: **Processor's Organization***

	Frequency	**Percentage**
Members of organization	2	40.0
Rwanda National Dairy Platform	2	100.0
3 years	2	100.0

The value chain actors that belong to an organization identifies the benefits of being a member of an organization. The benefits of membership stated by producers included; enhancement of

sales/marketing of produced milk, as stated by 63%; training on necessary production techniques was also stated among benefits derived from membership, by almost 44% of the producers; not more than 2% indicated they had benefitted through health insurance. Benefits to membership as stated by the processors was strictly establishment of unity among processors. Services obtained by producers from their organization membership included; sales/marketing of milk- as stated by 65%; 37% stated training has been part of the services they got through membership; while only 1.5% stated they enjoyed some veterinary services. Services enjoyed from membership among processors were "advocacy" and "meetings and trainings". Cattle feeding system is also organized and coordinated as it was revealed among the interviewed that 82.5% of producers engage their farmers in "zero grazing", while about 15.5% indicated they operate their cattle rearing on semi-grazing; not more than 2% indicated their cattle rearing is strictly grazing.

To find out the coordination of the dairy producers with respect to their animal treatment, it was obtained from the study that about 84% indicated they practice home visitation of veterinary doctors to treat their cattle, while the remaining indicated they practice self-medication on drugs for their reared cattle. The organization of the dairy producers showed that about 70% of them have had their milk carried to the milk collection centers by milk collectors; while 27% of them stated convey their produce to the milk collection centers by themselves. 58.5% uses aluminum for their milk preservation while 41% of the respondents uses plastic for their milk preservation. Sources of information on market price is determined by the milk collection center, buyers and the ministry of agriculture.

FIGURE 4

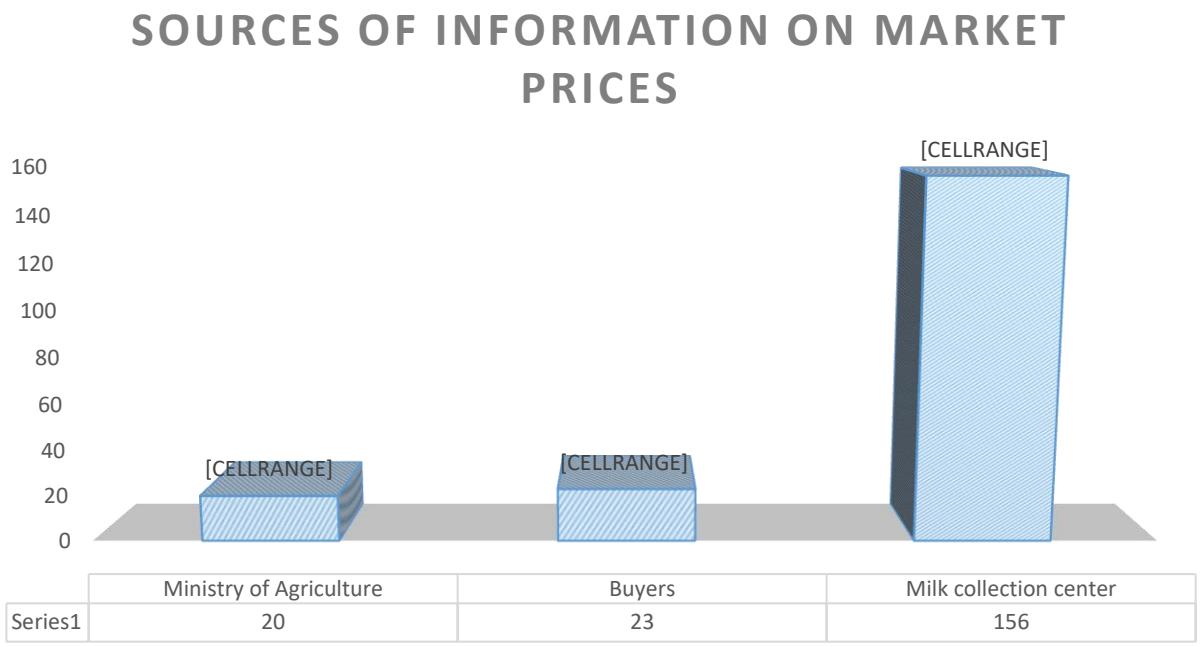


Table (14) reveals that processing unit have some measures to ensure purchase of quality of raw milk. 60 % uses alcohol test, 40 % uses lactodensimeter while the remaining 20 % uses SOPs. It was found out from the research that the dairy value chain actors in the study area have a strong management structure which is controlled and monitored by the government.

Table 14. ***Measures to ensure quality purchased of raw milk***

	Frequency	**Percentage**
Alcohol test	3	60.0
Lactodensimeter test	2	40.0
SOPs	1	20.0

5.4 CONSTRAINTS AND CHALLENGES FACED BY VALUE CHAIN ACTORS

The research reveals that the processors as a value chain actor also face some challenges in the value chain system. 60% of the respondent complain of lack of sufficient start-up capital, 60 % indicated its seasonal fluctuation in supply of milk while 60% of the respondent says its lack of processing skills and machineries. Figure 3 gives details on the constraint faced by dairy farmers in the dairy farm business. 7.50 % reveals high cost of drug as their constraint, 9.50 % says its bad roads. 9.50 % for cow poor housing, 18% listed rejection of milk by the milk collection center, 30.50% for lack of forage/fodder and water, 30.50% for fall in price of milk, 62% says it's because of animal diseases. Marketer faced some challenges in not getting enough skills, lack of communication and market for dairy products.

FIGURE 5

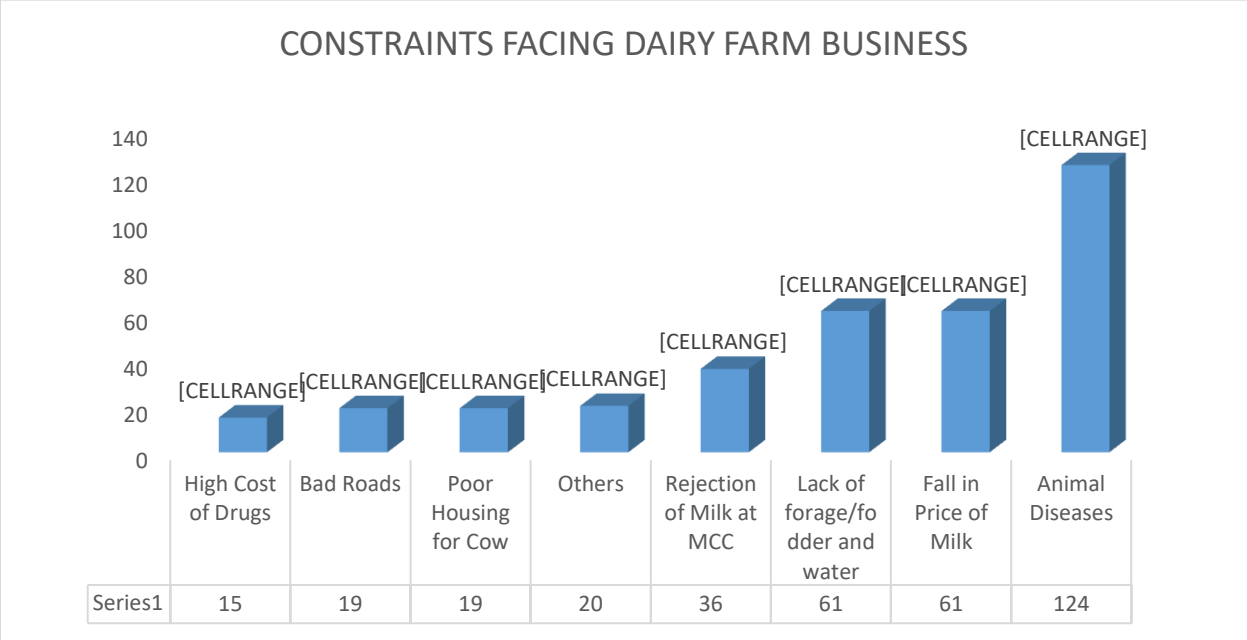
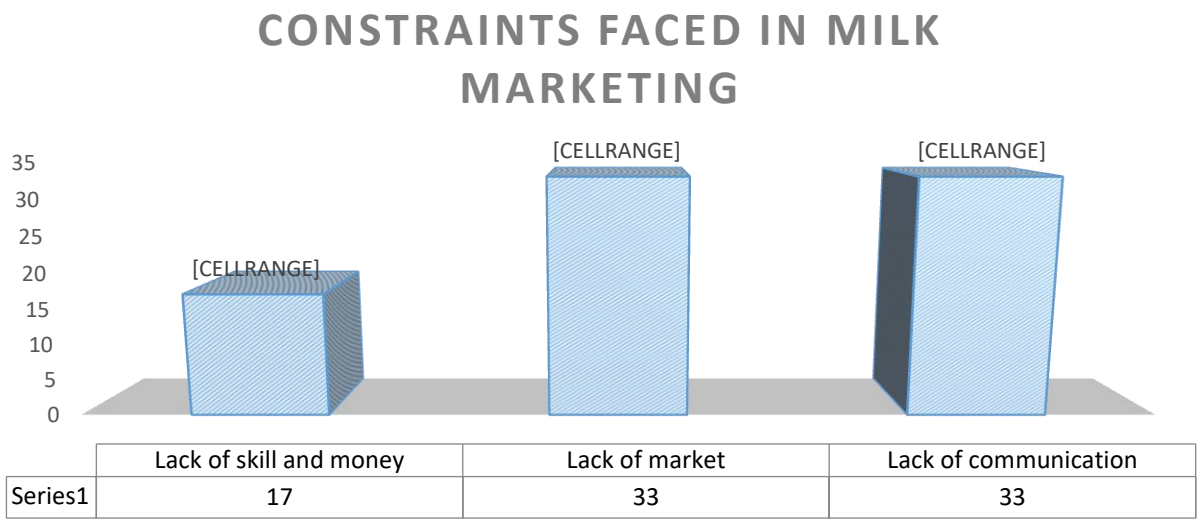


FIGURE 6



Various suggestions stated by the actors of the value to mitigating the constraints and challenges faced in the study area from Table 4.0 showed that the milk processors had suggestions regarding "provision of loans"- as stated by 60% of the processors; "reduction of taxes and favourable policies"- as stated by 40% of the processors; lastly, "improvement and implementation of feed conservation strategies"- as stated by 20% of the processors.

FIGURE 7

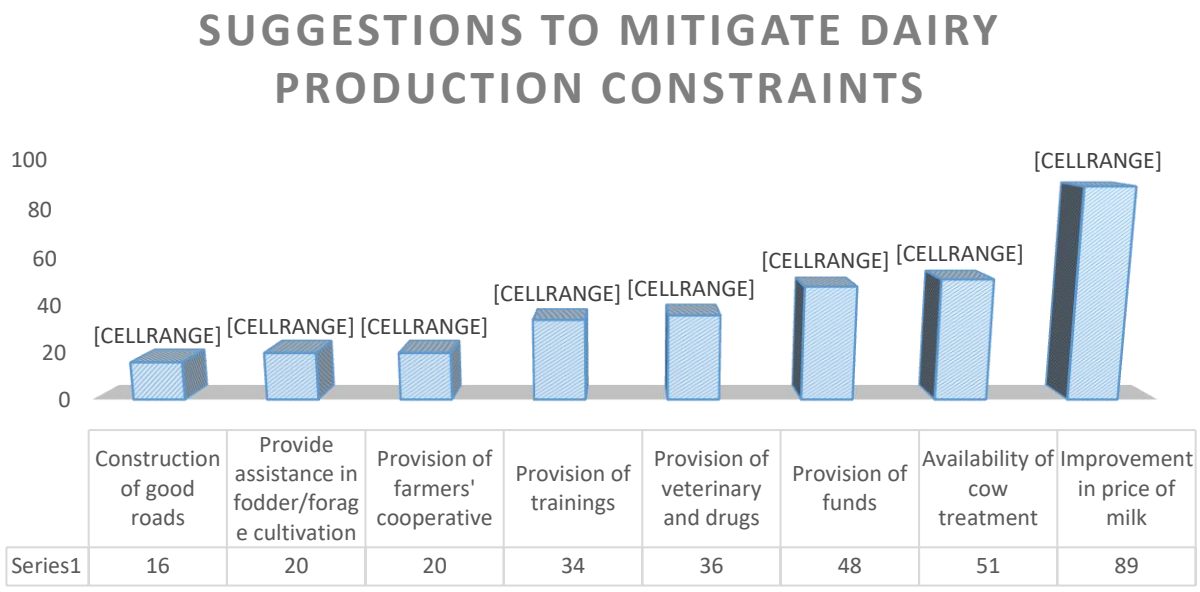
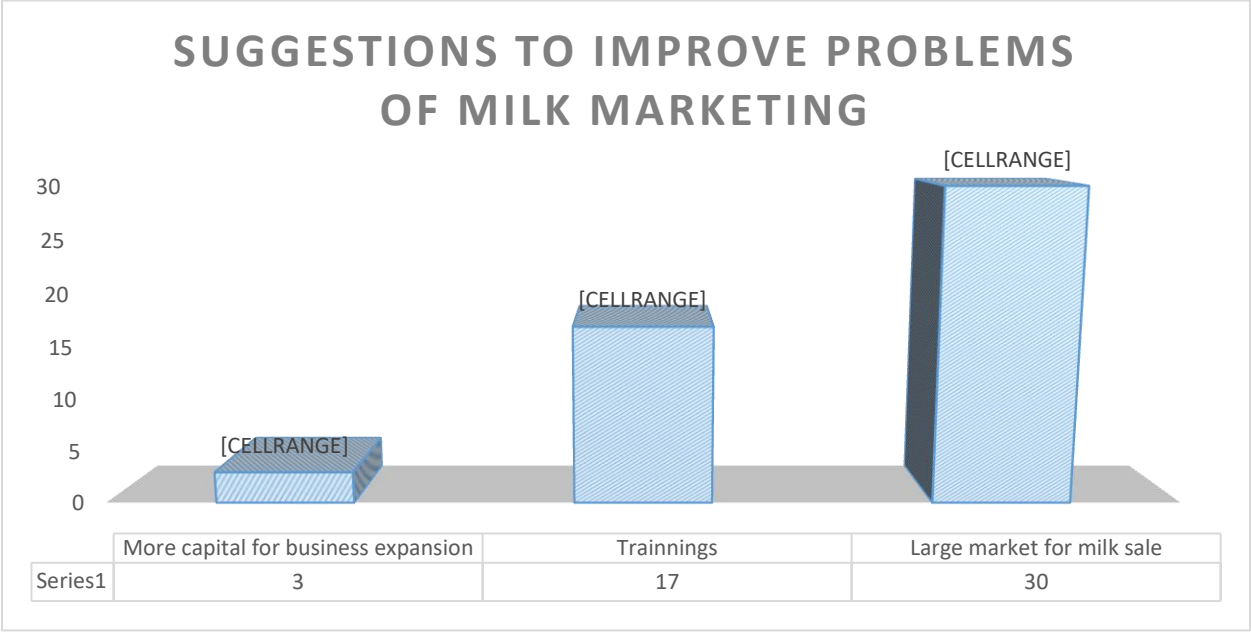


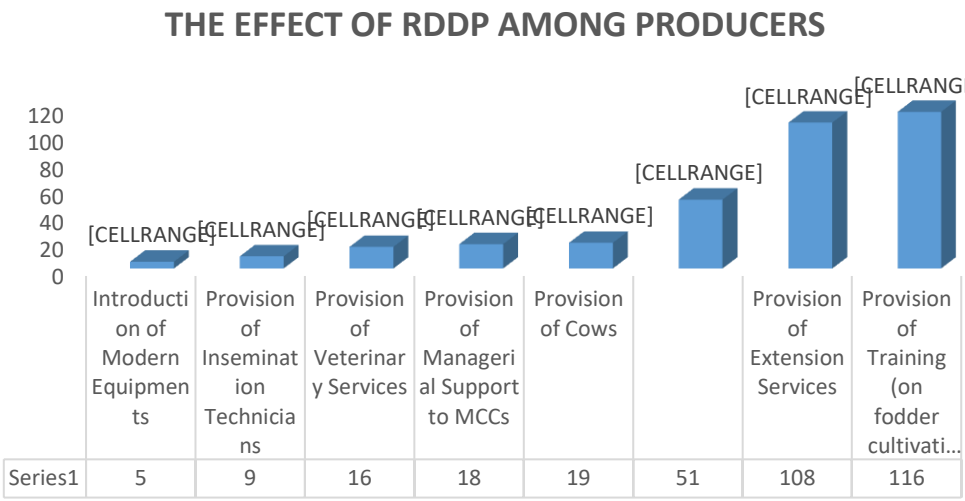
FIGURE 8



5.5 EFFECT OF RDDP ON DAIRY VALUE CHAIN ACTORS

To evaluate the effect of the RDDP on dairy producers, enquiry was made among the producers. Results from Figure 8 showed that RDDP has impacted the dairy value chain through diverse means, such as: provision of training, provision of extension services, provision of improved technique on quality milking, provision of cows, provision of managerial support to MCCs, provision of veterinary services, provision of insemination technicians, and introduction of modern equipment

FIGURE 9



Other effects of RDDP in Nyanza district are establishments of 21 farmer field school group around a hub model milk collection center with 568 members. All the FFS groups have been equipped with a package equipment that facilitate field learning such as breeding calendar, breeding records card, weighing band, measuring tape, plastic sheeting, salopettes, gum boot etc. and an establishment of a learning plot of at least 0.5 Ha each for practical of all lessons learned. Cows were vaccinated against different diseases. 8663 cows was vaccinated against black quarter disease, 6301 was vaccinated against LSD, 2124 was vaccinated against brucellosis, and 184 cows were vaccinated against ECF, Two standard communal shed was designed and provided for feed storage, 4231 (86.7%) cows have been inseminated using artificial insemination for genetic improvement through the artificial insemination campaign, provision of

seed multiplication plot with at least 5 Ha for seed multiplication. RDDP has also make sure all the milk collection center in Nyanza district is operational with the average milk collected per year increased by 10% and the organization of producers (MCC Coops, Unions) and other Value Chain (VC) players. Because RDDP is still a young project, its effect is not yet felt among the other value chain actors like the processors, marketers and the consumers. The project started with the weakest of the chain in the study area which is the dairy producers.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 SUMMARY OF THE STUDY

Agriculture plays a major role in Rwanda economy and dairy sub sector is an important sector in achieving development in Rwanda. After the end of Girinka project which is one cow per family in encouraging the poor to own a cow, the Rwanda dairy development project was introduced in 2016 to encourage more ownership of cow per households and the use of dairy product by the population. This research therefore assess the effect of Rwanda Dairy Development Project on the diary value chain improvement with the overall goal of contributing to pro-poor national economic growth and improving the livelihood of resource-poor rural households focusing on food security, nutrition and empowerment of women and youth in a sustainable and climate-resilient dairy value chain development. The main objectives of the study is to assess the effect of Rwanda dairy development project on dairy value chain improvement in Nyanza district, Rwanda with the view of achieving the following objectives: To determine the dairy value chain actors in Nyanza District from production to consumption, to examine the structure of the management of the Rwandan diary value chain system, to Identify constraints and challenges faced by value chain actors, examine the effect of RDDP on the activities and performances of dairy value chain actors. The sample size was given as 356 people who were selected randomly across 10 sectors in Nyanza.the sectors are Busasamana, Busoro, Cyabakamyi. Kibirizi, Kigoma, Mukingo, Muyira, Ntyazo, Nyagiozi and Rwabicuma. Questionnaires were randomly administered to 200 dairy farmers, 6 dairy processors, 50 dairy marketers and 100 dairy consumers in Nyanza district which covers all the value chain actors in the study area. Secondary data was used in getting information about Rwanda Dairy Development Project. Data collected from the identified dairy value chain actors were encoded into SPSS IBM 21. Descriptive statistics such as mean, frequency, percentages and standard deviations were used in each objectives.

The study shows that the mean age of dairy producers, processors, marketers and consumers are 45, 37, 42 and 34 respectively which means that the dairy value chain actors in Nyanza district are adult with little or no youth involving in dairy production. The distribution of the respondents according to their gender was observed that there were more male dairy producers than female dairy producers; amounting to 74.5% and 25.5% respectively. It was observed that there were

more female dairy processors than male dairy processors; amounting to about 67% and 33% respectively. Among the marketers, it was obtained that 42% were males, while 58% were females. Among the consumers, 47% were males and 53% were females with more females consuming more milk than the male. Most of the producers are married, amounting to 75% and educated with more of the respondent having completed primary school along the value chain actors.. The amount of raw milk sold among the producers, in the dry season of the previous year was observed to be as low 30 liters and rising up to 7,800 liters at its peak; thus, an average of about 710 liters of raw milk production was observed among the producers. Average distance from point of production to the nearest milk collection centers to the various producers is about 2.2 km; while generally, some farmers produced at distance not more than 1 km to the milk collection centers, some had their production at distance up to 10 km from the milk collection centers. Selling price can be as low as 160 RWF and as high as 200 RWF; with an average selling cost of about 179 RWF and 181 RWF in wet and dry season respectively. The various types of processed products the processors make are natural fermented milk amounting to about 83% of the producers; about 67% of them indicated they produced “Packed fermented milk”; about 17% stated they produced “Pack pasteurized milk”; while about 17% also reported to produce “Yoghurt”. The dairy processors run their processing productions with 80% operating on a small scale production, while only 20% reported to process dairy on large scale.

The value chain system is organize as 82% of the dairy farmer operate on a zero grazing system. For animal treatment, 84% practice home visitation of veterinary doctors to treat their cattle, while the remaining practice self-medication on drugs for their reared cattle. Other effect of RDDP in Nyanza district are establishments of 21 farmer field school group around a hub model milk collection center with 568 members. All the FFS groups have been equipped with a package equipment that facilitate field learning such as breeding calendar, breeding records card, weighing band, measuring tape, plastic sheeting, salopettes, gum boot etc. and an establishment of a learning plot of at least 0.5 Ha each for practical of all lessons learned. Cows were vaccinated against different diseases. 8663 cows was vaccinated against black quarter disease, 6301 was vaccinated against LSD, 2124 was vaccinated against brucellosis, 184 cows were vaccinated against ECF, two standard communal shed was designed and provided for feed storage, 4231 (86.7%) cows have been inseminated using artificial insemination for genetic

improvement through the artificial insemination campaign, provision of seed multiplication plot with at least 5 Ha for seed multiplication.

6.2 CONCLUSION

From the results, the dairy value chain in Nyanza district are the producers who are the dairy farmers, the milk collection centers, processors, marketers and the final consumers. Rwanda dairy sector is organized and coordinated by the government introducing cooperatives and milk collection centers which make easy sale of milk produce by the dairy farmers. All the dairy value chain are linked together and negative effect on one will affect the other links in the chain. It was found out that the producer and the dairy processors are still the weakest actors in the dairy chain in the study area. Rwanda dairy value chain system is well structured, managed and regulated by the government. Majority of the dairy farmers, operate on a small scale farming and thus reduced the amount of milk needed by the processing unit to process for Rwanda population and export. The major constraint in Rwanda dairy value chain is that majority of the farmers are also either not educated or primary school leaver so they don't have much information to improve the quality and quantity of milk produced by cow. The roads leading to the milk collection centers are very bad and this discourages the farmers from milking and transporting their milk to the milk collection center especially during raining season which directly affect the processor from getting enough milk for processing so, operating below their capacity. The effect of Rwanda dairy development project to dairy value chain system in Nyanza district are provision of training, provision of extension services, provision of improved technique on quality milking, provision of cows, provision of managerial support to MCCs, provision of veterinary services, provision of insemination technicians, and introduction of modern equipment.. dairy farmers through the help of extension workers by RDDP are now getting information on improved way of increasing the productivity of the farmers, the milk collection center are also being trained to give quality information to dairy farmers in Nyanza district. Upcoming processors that can afford buying equipment needed for preserving fresh milk and for processing are asked to write a business plan which if approved will be entitled to a loan for their dairy processing business. For now there are no effect on marketers and consumers of dairy product. Rwanda dairy

development project is still very young but a lot has been done in Nyanza district which if it continues at the pace it is going will achieve its aim and objective before the end of the project.

6.3 RECOMMENDATION

1. The research discovered that the mean age of all the value chain actors are 45 years for producers, 37 years for processors, 42 years for marketers and 34 years for the consumers so its recommended that more youth should be encourage to go into dairy value chain business

2. The research also discovered that majority of the value chain actors are either not educated or are primary school leaver so I recommend that more youth should have a formal education on agriculture especially on dairy value chain.

3. Construction of good roads leading to the MCC and the processing factories so that the farmers can easily take their milk to the milk collection center and the milk from the milk collection centres can be carried to the processing unit easily without the milk losing its value.

4. Rwanda population should be encourage to buy processed milk and this can be done by reducing the price of dairy processed product as majority of the respondent still take fresh milk because they can't afford to buy dairy processed products.

5. Raw milk should be processed to powered milk as this increase the shelve life of the milk and allows export of milk all over the world. This will help the country to generate more income and increase her GDP.

6.4 LIMITATION OF THE STUDY

The first and the major limitation of the study is language barrier. Majority of the respondent don't understand and can't speak english so making it difficult to communicate well. Another limitation of the study is the time to carry out the research which is very short. Also the roads leading to most milk collection centres where i collected the data were bad.

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SURVEY QUESTIONNAIRE ON THE EFFECT OF RWANDA DAIRY DEVELOPMENT PROJECT ON DAIRY VALUE CHAIN IMPROVEMENT IN NYANZA DISTRICT, RWANDA

SECTION A. SOCIO ECONOMIC CHARACTERISTICS

1. Serial number of the respondents……
2. Date of Interview……
3. Village……4. Cell…….. 5. Sector……..
District……
4. Province…..……
5. Age of Respondent……..
6. Sex of Respondent, (a) Male…….. (b) Female…….
7. Marital Status of respondent (a) Single…… (b) Married……..(c) Divorced… (d) Widowed…….. (e) Others (Specify)……
8. What level of education did you attain…….
(a) Primary…….. (b) Secondary……..(c) Post-Secondary…… (d) None……..
9. What is the size of your household in number…….?
(a) Children below 10 years……... (b) Children between 11 and 17…… (c) Adults from 18 and above…… (d) Adults from 70 years and above …….
10. What is your primary occupation?
(a) Wage employed…… (b) Dairy cattle keeping…….
(c) Business…… (d) Crop production…… (e) Others specify …….……..
11. What is your secondary occupation?
(a) Wage employed…… (b) Dairy cattle keeping…….
(c) Business…… (d) Crop production…… (e)Others (Specify)…….

SECTION B: INFORMATION ON MILK PRODUCTION

2a. DAIRY ENTERPRISE INFORMATION

12. When did you start the dairy farming?

(a) 1-2 years ago…….(b) 3-4 years ago……. (c) More than 5 years ago……16. What type of feeding system do you practice…….?

(a) Zero grazing…… (b)Semi grazing…… (c)Grazing……

13. Do you purchase feed for your cattle? YES/NO,

14. If YES indicate the Type Source ……

15. How do you treat your sick animals?

(a) A vet doctor visits my home……. (b)Take animals to vet doctor…… ©Buy drugs to treat animals on my own…… (d)Treated by a neighbor…… (e)Others (Specify)……

16. Have you had your animals vaccinated/ treated over the past year? YES/ NO

17. If YES, against what diseases were the animals vaccinated/ treated?

(a) Worms…… (b)ECF…….. (c)FMD…… (d)Others (Specify)……

2b. **MILK PRODUCTION TREND**

18. How many cows do you milk in a day…….?

19. What is the average amount of milk per cow per day in liters ……

(a) Dry season…….. (b) Wet season……

20. Please estimate the amount of milk that you allocated to the different uses on daily basis in liters.

Items	**Wet season**	**Dry season**
(a) Consumed at home		
(b) Sell to neighbors		
(c) Send to local market		
(d) Send to collection center		
(e)Sell to hotels/restaurants etc.		
(f) Remain unsold		
(g) Sell to processing plant		

22. Please indicate the quantity of milk sold last year during wet and dry season in liters

Season	**Quantity**
Wet season	
Dry season	

23. How do you carry your milk to a milk collection center? (a) Myself…….. (b) My worker……. (c) By a milk collector……. (d) Other (Specify)……

24.What means of transport do you or someone else who take your milk) use in distributing milk?

(a) Head carrying……. (b) Bicycle…….. (c) Public transport……

(d) Own vehicle…… (e) Hired vehicle……. (f) Other (Specify)……

25. What is the distance from home to the milk collection center in km …….

26. What is your unit of measure for selling milk? Litre…...others (Specify)……

27. What is the price of milk per the unit above during; (a) Wet season…….. (b) Dry season…….

28. Who sets the price of milk? (a) Producer……. (b) Buyer……. (c) Negotiated……

29. Please indicate how much you pay for the following kind of costs of producing/Handling/selling milk per day/month

(a) Salary…… (b) Feeds…… (c) Drugs……. (d) Payment to vet doctor…….. (e) Transport costs…… (f) Others (specify)……...

30. Do you process milk? YES/ NO…….. If YES, what milk products do you make?

(a) Sour milk……(b)Yoghurt…….(c)Ghee……(d)Butter……(e) Cheese……

2c. MILKING AND MILK HANDLING

31. How long does it take before you milk a treated animal……?

32. Hygiene at milking ……..

(1) Do you normally wash your hands before milking; YES/NO……..……

(2) What type of utensils do you use for milk preserving / storing/ transporting and selling?

(a) Plastic….. (b) Aluminum……. (c) Other (Specify)……..

(3) How do you get the milking utensils cleaned?

(a) By cold water and soap……. (b) By warm water……

(c) By hot water and soap…… (d) Others (Specify)…….

(4) Is milk strained? Yes / No, If Yes, what method do you use?

(a) Sieve (mesh)…… (b) Cloth (cotton cloth)……..

2d. MEMBERSHIP TO ORGANIZATION AND RELATIONSHIP WITH OTHER ACTORS IN THE MILK CHAIN

33. Are you a member of a milk producer's organization or cooperative, YES/ NO….

34. If YES what is the name of the organization……..?

35. If YES, for how long have you been a member……?

36. What services do you get from the organization…….……,

37. What benefits do you get by being a member…….,

38. If you have contractual obligations to supply given amount of milk throughout the year, what do you do to ensure constant supply of milk……...

39. Do you have access to any extension services……?

2e. MARKET INFORMATION

40. How do you get the information on the demand (Quantity of milk demand)…….……

41. How do you get the information on the prices prevailing in the market……..

42. What do you consider to be the main constraints facing your dairy farm business? **.....**

……

……

……

43. What do you suggest to be done to solve or reduce the constraints……

……

……

……

44. What is the impact of RDDP on your farm? .....

……

……

……

SECTION C: MILK PROCESSING INFORMATION

3a.MILK PROCESSING TREND

1. When did you start milk processing……

2. What is the source of milk that you process……..

3. What type of processed products do you produce…….

(a) Naturally fermented milk…… (b) Yoghurt…… (c) Packed fermented milk…… (d) Packed pasteurized milk…….. (e) Yoghurt…… (f) Cheese…… (g) Ice cream…… (h) Others (specify)……

4. Do you get adequate supply of raw milk throughout the year? YES/NO……..

5. If NO, what strategies do you employ to obtain adequate raw milk for processing.....?

6. What measures do you take to ensure quality of purchased raw milk…….

…….....

7. What measures do you take to ensure quality of processed product……

8. Do you face any problems in selling processed products……

9. How do you go about solving this problem…….

10. What is your scale of operation? Small……Medium……Large……

(a) What is the Volume of production under full capacity…….?

(b) Do you utilize fully your processing capacity, YES/ NO……..?

If NO, What period of the year do you operate below capacity.....?

Why……

11. a) Do you have competitors from Nyanza district (a) Yes (b) No

b) If yes, who are your competitors……

……

3b. MEMBERSHIP TO AN ORGANIZATION

11. Are you a member of a milk processors organization or cooperative, YES/ NO……,

12. If YES, what is the name of the organization……

13. If YES, for how long have you been a member……?

14. What services do you get from the organization…….....,

15. What benefits do you get by being a member…….……

……

16. What do you consider to be the main constraints in milk processing business?

(a)……

(b)…….

17. What do you suggest to be done improve the situation……

…….

…….

18. What is the impact of RDDP to your factory……

……

……

……

SECTION D: MILK MARKETING INFORMATION

4a. MILK MARKETING TREND

1. Business type;

(a) Wholesaler/ assembler…… (b) Retailer/kiosk/shop/milk bar…… (c)Hawker…… (d)Vendor…… (e)Others (Specify)……

2. When did you start the milk business……?

3. Do you do business as?

(a) Individual…… (b) Group…… (c) Cooperative/ association……..

4. Please provide the following information for all kinds of milk products

Product type	Source	Quantity in liters Season		Buying price in Rwf Season		Buyers/ customers Season		Quantity in liters Season		Price in Rwf	
								Seasons			
		wet	dry	wet	dry	wet	dry	wet	dry	wet	dry
Raw Fresh milk											
Fresh boiled milk											

Sour milk											
Yoghurt											
Cream											
Ghee											
Butter											
Cheese											
Packed fermented											
Packed pasteurized											

5. If you market raw fresh milk, how do you preserve it?

(a) Refrigerating…….. (b) Boiling……. (c) Preserve using traditional means (specify)……. (d) Process unsold milk…… (e) Other (Specify)…….

6. If you process, what products do you make?

(a) Sour milk…… (b) Ghee……. (c) Butter…… (d)Yoghurt…… (e) Cheese……

7. What do you do to ensure quality of purchased milk?

(a) Visual observation…… (b) Taste……. (c) Smell……. (d) Use Lactometer …… (e) Thermometer… (f) No quality check……. (g) Other (Specify……

8. How do you get milk transported from source to the selling point?

(a) Head carrying……. (b) Bicycle…….. (c) Public transport……

(d) Own vehicle…… (e)Hired vehicle……. (f)Other (Specify)……

9. What type of utensils do you use for milk handling / storing/ transporting and selling?

(a) Plastic…... (b) Aluminum……. (c)Other (Specify)……..

10. How do you get the milking utensils cleaned?

(a) By cold water and soap……. (a) By warm water……

(a) By hot water and soap…… (a) Others (Specify)…….

4b. MEMBERSHIP TO ORGANIZATION

11. Do you belong to any traders' organization? YES/ NO…….

12. If YES, for how long have you been a member……..

13. What services do you get from the organization…….....

14. What benefits do you get as a member……. ……

15. Who sets the following for your products?

(a) Buying price……. (b)Selling price……..

16. What do you consider to be the main problems in marketing milk and milk products?

(a)……...

(b)……...

17. What do you suggest to be done improve to the situation? ……..

SECTION E: MILK CONSUMPTION INFORMATION

1. Do you purchase any dairy/ milk products, YES/ NO…….?

2. Who consumes milk products in your household?

(a) All…… (b) Infant…….. (c) The sick…….

(d) Guest/ Special occasion……. (e) Others…….

3. How often do members of your household consume milk and milk products?

(a) After every meal…… (b) Once a day…… (c) Few times a week ……

(d) Few times a month…… (e) Can't recall…… (f) Never……..

4. In what form is milk consumed in the household?

Product	**Quantity per day**	**Price**	**Distance from premise**	**Means of transport**	**Cost of transport**
Raw fresh milk					
Boiled milk					
Sour milk					
Packed pasteurized					
Fermented packed					
Yoghurt					
Ghee					
Butter					
Cheese					

Powdered milk					
Canned milk					

5. Do you process the raw milk that you purchase? YES/ NO……?

6. If YES, do you use culture or do you let it ferment naturally…….?

7. Do you boil milk before drinking it? YES/ NO

8. How do you preserve raw milk……..?

(a) Refrigerating……. (b) Preserve by traditional means……

(d) Boiling……... (e) Other (Specify)……

9. Do you usually buy as much milk as you would like to? YES/ NO……

10. If NO, why not……, …….,

11. Which dairy products who you would like to consume but which the market does not offer? (List them) ….....

12. Are there any products you would like to consume more but you cannot because they are too expensive? (List them) ……..., ……,……

13. What do you prefer most between raw, processes and packed milk? …….

Why? ……..

14. What do you consider to be the main factors constraining you in consuming milk?

(a)……

(b)……

15. What suggestion do you give which will help improve the consumption level?

.....

……

……