THE CONTRIBUTION OF DAIRY PROJECTS TO SOCIO-ECONOMIC DEVELOPMENT OF RURAL PEOPLE IN BURERA DISTRICT

A CASE OF RWANDA DAIRY DEVELOPMENT PROJECT (2018-2023)

By

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DECLARATION

This dissertation tilted ***"The Contribution of Dairy Projects to Socio-Economic Development of Rural People in Burera District, A Case of Rwanda Dairy Development Project (2018-2023)"*** is my original work, it has never been submitted before for any other degree award to any other University.

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Signature

Date: / 09 /2023

APPROVAL

This research has been done under my supervision and submitted for examination with my approval

Name: **Dr. RWABUTOGO Z. Marcel**

Signature

Date: / 09 / 2023

DEDICATION

To

My family,

My classmates and friends.

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First of all, I would like to thank the Almighty God for His Grace that has been with me during my time of studies.

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May god bless all!!!

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ABBREVIATIONS AND ACRONYMS

AFDB : African Development Bank

AI : Artificial Insemination

CCA : Climate Change Adaptation

CD : Community Development

DRC : Democratic Republic of Congo

DV : Dependent Variables

FAO : Food for Agriculture Organization

GALS : Gender Action Learning System

GDP : Gross Domestic Product

GoR : Government of Rwanda

HH : Household

IFAD : International Fund for Agricultural Development

IV : Independent Variables

L-FFS : Livestock Farmers' Field School

MCC : Milk Collection Center

MCP : Milk Collection Point

MINAGRI : Ministry of Agriculture and Animal Resources

MT : Milk Tone

NDS : National Dairy Strategy

NGO : Non-Governmental Organization

NISR : National Institute of Statistics of Rwanda

NST : National Strategy for Transformation

RAB : Rwanda Agriculture and Animal Resources Development Board

RDCP : Rwanda Dairy Competitiveness Program

RDDP : Rwanda Dairy Development Project

RwF : Rwandan Francs

SDGs : Sustainable Development Goals

SPIU : Single Project Implementation Unit

ToC : Theory of Change

ULK : Université Libre de Kigali

USD : United States Dollar

ABSTRACT

The dairy sector has major strategic importance in socioeconomic development of rural people. For this reason, the government of Rwanda has made significant investments in the sector. It seeks to move beyond subsistence farming towards a business-oriented, modern dairy sector. The researcher intentions are to assess the contribution of dairy projects to socio economic development of rural people in Burera District. The study objectives were to assess the activities of Rwanda Dairy Development Project in Burera District, to assess the socio economic impact of dairy farming in Burera District and to find out the challenges that project face that hinder to achieve its objectives. In conducting this study, a mixture of qualitative and quantitative research design was used. The findings showed that RDDP is assisting dairy farmers in capacity building, providing to them forage seeds for, distributing dairy cows that are more productive, promoting animal health, supporting in milk collection infrastructures. Challenges like limited access to resources, climate change vulnerability, limited technical skills and knowledge, informal market of milk poor animal nutrition and shortage of food, price of dairy products too high for a large part of they are still hindering the project to achieve its objectives fully. Then the study recommends enhancing access to resources, promoting climate resilient practices, strengthening technical skills and knowledge to farmers and promoting many livestock farmer field school.

Key Words: Dairy Projects, Socio-Economic Development and Rural People

CHAPTER 1

GENERAL INTRODUCTION

Introduction

This section provides the background of the study, problem statement, and objectives of the study. It shows also the research question, scope of the study, significance of the study, and structure of the thesis.

1.1. Background of the study

Dairy Development projects provide a great opportunity for ensuring inclusive and sustainable development that reduce poverty, food insecurity and malnutrition. Approximately 150 million households around the globe are engaged in milk production. In most developing countries, milk is produced by smallholders, and milk production contributes to household livelihoods, food security and nutrition. Milk provides relatively quick returns for small-scale producers and is an important source of cash income. In recent decades, developing countries have increased their share in global dairy production. This growth is mostly the result of an increase in numbers of producing animals rather than a rise in productivity per head. In many developing countries, dairy productivity is constrained by poor-quality feed resources, diseases, limited access to markets and services (e.g., health, credit and training) and dairy animals' low genetic potential for milk production. Unlike developed countries, many developing countries have hot and/or humid climates that are unfavorable for dairying (Jacues, 2013).

Some countries in the developing world have a long tradition of milk production, and milk or its products have an important role in the diet. Other countries have established significant dairy production only recently.

Most of the former countries are located in the Mediterranean and Near East, the Indian subcontinent, the savannah regions of West Africa, the highlands of East Africa and parts of South and Central America. Countries without a long tradition of dairy production are in Southeast Asia (including China) and tropical regions with high ambient temperatures and/or humidity (Budhathoki, 2007).

The dairy sector in Rwanda plays a key role in improving nutrition and generating income mostly for rural households. Despite the Rwandan 1994 genocide that left around 80% of dairy cows decimated, the dairy sector has experienced significant growth in the past two decades through government, development organizations, and donor programs, and through the public–private partnership. The national herd has been rebuilding and is steadily growing.

The Government of Rwanda considers the dairy sector as a valuable pathway to economic growth. It not only contributes significantly to the country's total GDP but also offers a means of addressing malnutrition, famine, and poverty to the majority of cattle keepers and service providers along the dairy value chain Currently, Rwanda is producing approximately 816,000 MT of milk. The national cattle herd now counts 1.3 million cows of which more than half are genetically improved dairy breeds (about 54%). Hybrid cows have become the main breed as a result of artificial insemination services. In 2017, the average annual milk production per cow was approximately 909 liters. Average daily production varies from 2 liters/day up to a maximum of 15 liters/day. There is a large difference between yields of exotic cows (951 liter/year), hybrid cows (505 liter/year) and local breeds (217 liter/year). It must be stressed that all yields are below the genetic potential of the cows (NISR, 2019).

In Burera District, the dairy sector is contributing enormously to socioeconomic development of rural people. There are 3,600 dairy cows that produce 23,000 liters per day. The District has 6 milk collection centers namely Bungwe, Gatebe, Kivuye, Nemba, Kirambo and Cyanika which collect milk from different areas. The district has also one Burera dairy processing plant with the capacity of 2500 liters per day. other milk about 20500 is sold to external market such as Inyanye milk industries. The price is 300 RWF per liter when it is sold to Milk Collection Center (MCC). The Rwanda dairy development project has contributed to the increase of milk production through distribution of dairy cows under Girinka program, animal feeding practices, extension services, creation of farmer's organizations for access to inputs and services, construction and or rehabilitation of milk collection infrastructures for supply of good quality milk to domestic and regional market, support in matching grants (Dhakal, 2007).

In this research, the evolution of the dairy policies, programs, and regulations in Rwanda and how they have contributed to the development of the dairy sector have been documented. The policy change has impacted the provision and use of inputs and services that have shaped the sector's milk production and productivity, milk quality, and demand. The results suggest that various policy and program level interventions have positively contributed to the growth of the dairy sector and improved the livelihoods of low-income households. This has been achieved through increased access to inputs and services, enhanced capacities of the public and private sector to deliver services, strengthened dairy cooperatives' governance, and increased value proposition to members of farmer groups and promotion of milk consumption (Shrestha, 1992).

I find that some of the implemented policies and programs, such as the “Girinka” (one cow per poor family) program, Rwanda Dairy Competitiveness Program, and RDDP have resulted in improved farmer access to improved cow breeds and improved milk quality and cow productivity through enhanced health inputs and other services (Heritier, 2019).

While the dairy policies, programs, and regulations in Rwanda have paved the way for the development of the dairy sector and contributed to the provision and use of inputs and services, there are still challenges that need to be addressed. Accessibility and use of veterinary and artificial insemination services are limited by the quality of veterinary products, while the inadequate quality of feeds leads to low productivity of improved cow breeds. Consequently, farmers' uptake and use of inputs and services can be enhanced through a strengthened capacity of milk collection centers and health and animal feed policies that guide and control the quality of veterinary products and feeds sold in the markets The dairy sector has major strategic importance when it comes to Rwanda’s realization of sustainable development goals. Sustainable growth of the sector can contribute to poverty reduction and strengthen local food and nutrition security. For this reason, the government of Rwanda has made significant investments in the sector. It seeks to move beyond subsistence farming towards a business-oriented, modern dairy sector. In the future, the dairy sector must become capable of meeting local demand for dairy products and producing surpluses for the regional market (Etikan, 2016).

1.2 Statement of the problem

Despite the remarkable progress in development of the dairy sector in Burera District, significant issues still remain. Key among them is 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; limited support services (AI, vet, extension, inputs)

and an inadequate knowledge to manage dairy cattle; limited organization of farmers for effective collective action in marketing of milk and access to inputs/services; inadequate development and management of milk collection, processing and marketing infrastructure for supply of good quality milk to the domestic and regional markets; limited access to finance for dairy value chain actors, especially women and youth; low and inconsistent supply of good quality milk partly due to seasonality of milk production, poor organization of farmers for supply to MCC and competition from the informal market who pay better prices (Augustin, 2019).

1.3 General objective of the study

The general objective of this research study is to assess the Contribution of the Rwanda Dairy Development Project (RDDP) to the Socio-Economic Development of Rural People in Burera District.

1.4 Specific objectives

The specific Objectives of this study are:

(i) To assess the activities of Rwanda Dairy Development Project in Burera District

(ii) To assess the socio-economic impact of dairy farming in Burera District.

(iii) To identify the challenges of dairy farming in Burera District

(iv) Mechanisms to overcome challenges of dairy farming in Burera District

1.5 Research questions

The following are the research questions:

(i) What are the activities of Rwanda Dairy Development Project in Burera District?

(ii) To what extent does Rwanda Dairy Development Project contribute to the socio-economic development of rural people?

(iii) What are the challenges that hinder the dairy projects to achieve their objectives?

(iv) What are the mechanisms to overcome the challenges of dairy farming in Burera District?

1.6 Scope of the study

The scope of this study is sub-divided into time, geographical and content scope and are explained in detailed manner in the following sub-sections.

1.6.1 Time scope

This study covered the periods between 2018 and 2023. The year 2018 is the beginning of the project implementation while 2023 is the year of data collection.

1.6.2 Geographical scope

This study has been conducted in Burera District. Due to the facts Burera District is one of fourteen Districts where Rwanda Dairy Development Project is being implemented make it a suitable location whereby as the data researcher needs can be found in that areas. Another reason why Burera District was chosen from other fourteen the project is being implemented is because of retrospectively it had been affected by dairy production problems while it has more opportunities in dairy sector development. so it is the suitable place to evaluate the efficient of the project being implemented.

1.6.3 Content scope

This study is related to the rural and urban development implementing Rwanda Dairy Development Project improve livestock and allied activities, enhance standard of living, and advance the socio-economic conditions of the rural people.

1.7. Significance of the study

This study is important because it assess the contribution of dairy projects on socio economic development of local community where they are taking place in social as well as economic development. It also shows the challenges that hinder those projects to achieve its objectives.

Beneficiaries of findings from this study are Burera District local community, Rwanda Agriculture and animal resources development board, public policy makers, Agriculture and livestock practitioners and future researchers and scientific community in general. For local community, the findings could make them aware the effort that the government is achieving in order to increase livestock production and helping them to sustain their livelihood. Policy makers will need this to be able to make decisions based on the real facts as well as RAB could refer to this study to evaluate the impacts that project is having on the socio-economic characters of the Burera community.

For the scientific communities, the study will be used as an added value in literature that could serve them when they will be conducting the study relating to agriculture and livestock production and its linkage to the socio-economic development.

1.8 Structure of the Thesis

The thesis is organized into five chapters. Chapter one is about the general introduction of the study. Chapter two review the literature which consists of concepts review and theoretical framework and as well as empirical literature. Chapter three deal with the research methodology, which consists of research design, sampling techniques, data collection techniques, data analysis methods as well as data processing techniques. Chapter four is about the presentation and discussion of the findings from the data collected from the fields and the last chapter which is five summarizes, conclude and recommend solutions to challenges that the work identified.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter highlights the existing literature relating to dairy projects and the socio-economic development of rural people. The researcher focuses on conceptual review, theoretical review, review of related literature as well as conceptual framework.

2.1. Conceptual review

In this section, key concepts are reviewed such as contribution, dairy subsector, Development, economic development, social development and rural area.

2.1.1 Dairy farming

Dairy farming also called dairying is a branch of agriculture that encompasses the breeding, raising, and utilization of dairy animals, primarily cows, for the production of milk and the various dairy products processed from it. Dairy farming is a class of agriculture for long-term production of milk, which is processed for eventual sale of a dairy product. Agriculture and animal husbandry have a symbiotic relationship, in which the agricultural sector provides feed and fodder for the livestock and animals provide milk, manure and draught power for various agricultural operations. Dairy sector is instrumental in bringing socio-economic transformation. It has created a lot of employment opportunities and also provides improved nutritional benefits.

2.1.2 Global context on milk production

Globally 150 million households are engaged in milk production. In most developing countries, milk is produced by smallholders, and milk production contributes to household livelihoods, food security and nutrition.

Milk provides relatively quick returns for small-scale producers and is an important source of cash income. In recent decades, developing countries have increased their share in global dairy production. This growth is mostly the result of an increase in numbers of producing animals rather than a rise in productivity per head.

In many developing countries, dairy productivity is constrained by poor-quality feed resources, diseases, limited access to markets and services (e.g., health, credit and training) and dairy animals' low genetic potential. Unlike developed countries, many developing countries have hot and/or humid climates that are unfavorable for dairying (Muriuki, 2016).

Some countries in the developing world have a long tradition of milk production, and milk or its products have an important role in the diet. Other countries have established significant dairy production only recently. Most of the former countries are located in the Mediterranean and Near East, the Indian subcontinent, the savannah regions of West Africa, the highlands of East Africa and parts of South and Central America. Countries without a long tradition of dairy production are in Southeast Asia (including China) and tropical regions with high ambient temperatures and/or humidity (Omore, 2004).

2.1.3 Milk production in Rwanda

In Rwanda, milk production has increased from 50,000 MT in 2000 to about 731,000 MT in 2015; and increased milk availability and per capita milk consumption from below 20 litres/year in the 1990s to 64 litres/year in 2015. This impressive performance has been achieved through strong commitment of the government in implementing a dynamic livestock intensification program as outlined in the National Dairy Strategy 2013-2022. Large investments have been made in improving milk production and milk productivity including through the importation of improved dairy cattle and distribution to resource-poor families under the Girinka and Igikumba

cy'umudugudu programme; in improved accessibility of artificial insemination (AI), animal health and animal husbandry services to farmers; and establishment of milk collection centers (MCCs) and dairy cooperatives to improve market access and enhance food safety in the milk supply chain. Investments have also been made in improving rural access roads, rural electrification and improved water supply, as well as promoting public and private sector investments in animal feed production and processing of milk and other dairy products, and expansion of the domestic market through campaigns aimed at increasing milk consumption per capita from 40 liters in 2010 to 80 liters by 2022 (Singh, 2003).

2.1.4 Context of the Rwanda Dairy Development Project

The Rwanda Dairy Development Project is a six-year project implemented by the Ministry of Agriculture and Animal Resources. The project is co-financed by the International Fund for Agricultural Development and the Government of Rwanda.

The project was undertaken to support the dairy value chain and address the existing following challenges of 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; limited support services (AI, vet, extension, inputs) and an inadequate knowledge to manage dairy cattle; limited organization of farmers for effective collective action in marketing of milk and access to inputs/services; inadequate development and management of milk collection, processing and marketing infrastructure for supply of good quality milk to the domestic and regional markets; limited access to finance for dairy value chain actors, and 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.

The Project coordination is under the responsibility of the Single Project Implementation Unit (SPIU) for IFAD-Funded Projects under MINAGRI (IFAD, 2016).

2.1.4.1. RDDP goal and development objective

The overall goal of RDDP is to contribute to pro-poor national economic growth and improve 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, the project seeks to increase competitiveness and profitability of the dairy sector for the provision of quality products from small-scale producers to domestic and regional consumers, thus improving their livelihoods, food security and nutrition whilst building overall resilience (RAB, 2016).

2.1.4.2 Specific objectives

-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 (Shapiro, 2017).

2.1.4.3. Development outcomes

(i) Smallholder dairy farming productivity and supply of quality milk to domestic and regional markets enhanced and milk consumption at household level increased;

(ii) Organizational capacity, and enterprise skills of smallholder dairy farmers and their cooperatives enhanced;

(iii) Infrastructure for collection, handling, processing and marketing of milk and other dairy products expanded and its utilization improved and tailored to adverse climate risks; and

(iv) A conducive policy and institutional environment for the development of smallholder dairy industry fostered and strengthened.

2.1.4.4 Project component description and intervention logic

RDDP comprises the following four components:

(i) Climate-smart dairy production intensification;

(ii) Producer organization and value chain development;

(iii) Institutional and policy development and

(iv) Project management and coordination.

Component 1: Climate-smart dairy production intensification aimed at increasing smallholder dairy farmers and farm assistants capacity to sustainably produce and supply higher volumes of quality milk to the dairy market with a focus on three broad areas such as enhance the capacity of male and female smallholder dairy farmers and farm assistants to improve their knowledge, attitude, and behavior for increased milk productivity and quality; enhance sustainable access of smallholder dairy farmers to public and private livestock services and inputs; support to resource-poor households who have no cattle to acquire dairy assets so that

they can enter into dairy farming under the Girinka program and increase their capacity to implement climate-smart and strategic investments aiming at sustainable increase in milk productivity and improved milk quality, as well as increased milk consumption at HH level.

Component 2: Producer organization and value chain development designed to enable farmers to capitalize on productivity gains expected to be realized through investments made under component 1 to increase earnings through support in organization and capacity building of dairy farmer cooperatives for improved service delivery to farmers in milk collection and marketing, input supply, proximate animal health services, and financial services under the "hub" model; investment in climate resilient milk collection, processing and marketing infrastructure aimed at reducing post-production losses and enhancing the supply of quality milk in the domestic and regional markets; and leveraging financing for climate resilient dairy enterprise development aimed at catalyzing growth in all segments of the dairy value chain.

Component 3: Institutional and policy development aimed at facilitating the consolidation of an evidence-based, inclusive policy framework and institutional structure for the Rwandan dairy sector by supporting the formulation of a national dairy policy and necessary legislation for improving the regulatory environment of the sector; policy implementation and strengthening of key institutions; and policy related analysis and technical assistance.

Component 4: Project management and coordination aimed to ensure that the Project is efficiently and effectively managed to achieve the expected results. MINAGRI's SPIU will have overall responsibility for coordinating and managing the Project and its funds. Gender, youth, environmental, knowledge management and communication considerations will be integrated in all aspects of project management, as well as the activities of the SPIU and the implementing partners.

The performance indicators of this component will include quality and timely execution of annual work plan and budgets, timely submission of progress reports and annual audit reports, participatory M&E able to document key indicators and actual levels of disbursements in line with planning (MINAGRI, 2018).

In Burera District, the Rwanda dairy Development project is contributing to socio economic development in so many ways. Smallholder farmers joined Livestock-Farmer Field School groups to develop skills in dairy husbandry, milk quality and hygiene, household nutrition, basic numeracy and literacy, and record keeping. They joined dairy cooperatives to gain skills in group management. Those Livestock-Farmer Field School also supported farmers to prepare enterprise development plans for financing. The Girinka households, young farm workers and women-headed households (from Category I) received 750- dairy cows (Girinka beneficiaries) and join L-FFS activities. Young rural women developed individual or group business plans for income generating activities and enterprises directly linked to increased milk production or from increased income in the local economy (NISR, 2015).

Dairy sector is providing an opportunity for dairy farmers to earn income from the sale of dairy products, have decent jobs, and improve their nutrition and the household's general wellbeing. Actually, one liter of raw milk is sold at 300 RWF. The average milk revenue of a dairy farmers is 54,000 RWF. By mobilisation, The dairy project has increased the number of people who drink milk at 85% of the total population of Burera District (MINAGRI, 2021).

2.1.5 Dairy sector and rural livelihoods

The dairy subsector is crucial for rural development, poverty reduction and food and nutrition security for the country.

It offers a pathway out of poverty for the large number of households keeping livestock, and for those who provide services and value addition throughout the supply chain. The current "farm gate" value of annual milk production is approximately RwF 117.0 billion (USD 162.4 million). 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.

The dairy sector accounts for 6 per cent of the National GDP and the annual milk production was estimated at 1 million metric tons in 2021 (860 million litres marketable) and smallholder dairy farmers (owning 1 to 5 cows) supply more than 80 per cent of the milk consumed in the country. The consumption of milk per capita is estimated at 75.3 litres per year and it is projected to increase by 3.8 per cent in the next ten years. The government not only aims at covering the national demand but also at increasing the exports of milk and dairy products. By 2026, it foresees to produce 1.45 billion of litres and the consumption per capita is expected to increase to 115 litres by 2032. Through the “one cup of milk programme”, around 85,000 school children receive about 1 litre of milk per week. The demand for processed dairy products (yoghurt, butter, milk powder and cheese) is growing (currently 6% of the produced milk) (MINAGRI, 2022).

In recognition of the strategic importance of the sector, the Government has over the past decade made significant investments in the industry aimed at transforming it from subsistence orientation to a business-oriented, modern sector capable of meeting the country’s demand for dairy products and producing surpluses for the regional market. The results of these investments are clearly visible today and include the rebuilding of the national cattle herd from an insignificant level after the 1994 genocide during which over 80% of cattle were decimated to a herd of 1.35 million in 2015, where more than half (54%) are improved dairy breeds.

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 (Regnar, 2002).

While the growth of the dairy sector in Rwanda has been impressive and has elevated the country to a level where it can now be considered a significant player in the regional dairy industry, sector performance is still much lower than those of competing countries in the region and there are still many challenges to be addressed. The government's National Dairy Strategy seeks to build on the gains so far made to address the remaining factors constraining the sector from achieving its potential. A key thrust of the strategy is to formalize the dairy value chain and, considering health benefits, increase national consumption of processed milk instead of the raw milk currently being consumed. It also seeks to improve value addition, based on the use of the anticipated increases in milk production. The NDS aims at both increasing the number of improved breed cows and further improving their productivity. The latter is important in ensuring consistent milk supply, particularly during the dry season when milk supply has consistently been below demand. The Government further seeks to expand milk collection infrastructure including establishment of more milk collection centres (MCCs) and commercialization of their operations.

The improved productivity and efficiency along the dairy value chain is expected to reduce costs, and hence make Rwandan dairy products cheaper and more competitive in regional markets. The National Dairy Strategy emphasizes the importance of public-private-producer partnerships in the achievement of its objectives.

The Government has spearheaded the development of the dairy industry through a number of projects such as the AfDB-funded Development of Dairy Cattle and Livestock Infrastructure Projects and the USAID-funded Rwanda Dairy Competitiveness Program.

In addition, SNV Rwanda, Heifer International, 'Send a Cow' and the recently-completed Bill and Melinda Gates Foundation-funded East African Dairy Development Project, have supported dairy development in Rwanda. The projects are being implemented in prescribed districts with RDCP II working in 17 districts across the five milk sheds in Rwanda. Since the NDS was developed after wide consultation of stakeholders, most of the projects supported by development partners fit under the NDS framework (ICF International, 2015).

About 50% 15 of livestock-keeping households in Rwanda are estimated to rear cattle which is commonly considered to be of a high economic, social and cultural value. The most common system of dairy keeping is zero-grazing, with an average holding per household of 2 to 5 cattle (1 to 3 cows). Smallholder dairy production provides a pathway out of poverty: with Girinka households having the possibility to progress from one cow and calf and home consumption of milk and informal sales, to gradually increasing herd size and more formal engagement in the milk marketing chain (Mwijarubi, 2007).

Women contribute to the production but have no control over large livestock such as cattle. Traditionally, women were not allowed to milk even though they were engaged in many other activities regarding the care of dairy cows at the household level. This poses specific challenges in female-headed households who are frequently short of male labour. They pay a higher price for wage labour for feeding and taking care of the cow and end up incurring higher production costs compared to dairy keeping male-headed households. Women account for 34% of members of dairy cooperatives. In line with initiatives for fostering modernization and transformation of

agriculture, MINAGRI is actively involved in addressing gender disparities through annual assessments and annual action plans within the framework of its Agriculture Gender Strategy. The dairy sector creates a large number of on-farm wage jobs for family labour and for farm assistants, who are mainly young men. Rural off-farm jobs are generated by the collecting, marketing and processing of milk mainly in the small-scale informal sector. While involvement of young men is visible, young women are more likely to work in family farms than young men (74% compared to 55%, respectively) and pro-active measures for increasing their remunerative participation are required (MINAGRI, 2020).

2.1.6 Milk marketing

Estimates on the dairy sector in Rwanda suggest that about 45% of the milk produced in the country is consumed by milk producing households and the balance (55%) is marketed in the rural and urban markets, with a small part exported to neighboring countries, mainly Burundi and DRC as fermented milk. Out of the total marketed milk, a small proportion (about 10– 15%) is sold directly by dairy farmers to end consumer's other households in the neighborhood who do not have cattle or are facing milk deficits, local markets, kiosks and rural restaurants. The rest of the milk (85–90%) is sold through either informal milk trader (alternative market system) or through dairy farmer cooperatives who have since 2006 been supported by the government and various development partners to establish a cold chain of MCCs with linkages to processors and large milk traders. The cooperatives channel is however currently handling 15-20% of total marketed milk. Milk marketing is therefore currently dominated by informal milk traders who handle upwards of 70-75% of all milk sold by farmers.

On the whole, it is estimated that the rural market currently consumes around 70% of marketed milk while the rest is sold in Kigali and other urban markets, with some going to urban markets in neighboring Burundi and Eastern DRC, annually estimated at up to 12m MT (Josiane, 2018).

2.1.7 School milk programs

School milk programs are a great opportunity to expand and increase local consumption, improve nutritional status of children, as well as to improve domestic marketing of milk. In 2010, the Agricultural Board initiated the 'One Cup of Milk per Child Program'. By 2020, the program had reached approximately 85,000 school children from 112 schools in 15 districts. School children receive one liter of milk per week through the government program. This includes two portions of ½ a liter twice a week and costs are covered by the government. The allocated budget for the program per child in 2019 was 28,800 RWF (about USD 29). School milk programmes are common in many countries around the world, for good reasons. The benefits of providing school children with milk are plentiful. They include both nutritional for the child and for the economic for the dairy sector most importantly as a market (MINAGRI, 2021).

2.1.8 Milk supply projections for the Rwanda market

Currently, there are about 1,371,828 dairy cattle in Rwanda. It was projected that by 2022 the number would increase by 46%, while milk production would grow from 747 million liters of milk produced in 2017 to 1.2 billion liters by 2022, an 18.2% boost. Rwanda targets a per capita milk consumption of 80 liters per person per year by 2020, from approximately 40 liters in 2012, according to the National Dairy Strategy. The projected cow milk production is at least 1.2 billion liters per year by 2022, according to Rwanda Livestock Sector Master Plan. Milk production will have to increase 13 percent per year to meet this target.

Observing the same growth rate of 13% per year, the annual milk production in Rwanda will increase from about 934 million liters in 2020 to 2.6 billion liters per year by 2030 (FAO, 2017).

2.1.9 Milk collection infrastructures

To ensure that food safety standards are maintained in traded milk, Rwanda has recently (December 2015) passed a Ministerial Order (MO) regulating the collection, transportation and selling of milk. Under this new regulation, all milk sold in the country must first be collected at a place where its quality testing is possible before being marketed. This law recognizes two types of milk collection points: simple sheltered milk collection sites and modern milk collection centers (Hahirwa, 2017)

2.1.9.1 Simple milk collection points/sites

This is the simplest milk collection infrastructure and involves a structure that provides shade, is close to a road, sheltered from dust, and is equipped with clean containers (aluminium milk cans) and milk testing equipment (at least an alcohol-gun; lactodensimeter and thermometer). Available information shows that no milk collection site in the country currently meets the expected specifications under the new regulations. Milk is either collected directly from farmer's homesteads or at designated roadside points mostly without any shade. Rough estimates suggest that the country requires at least 2,000 milk collection sites to handle the current level of milk production sold by farmers (Budhathoki, 2007).

2.1.9.2 Milk collection centres

A modern milk collection centre is defined as one that meets a number of specifications related to construction, and utilities (availability of water and electricity) as well as milk testing facilities. A recent assessment of the operational status of the current MCCs conducted by MINAGRI on the basis of service delivery to farmers, connection to essential utilities (electricity

and water) and operating capacity, puts the 100 MCCs into three categories: in category 1 where most of the services are offered and milk collection, cooling and selling is done well; 58 in category 2 where not all services are offered due to various capacity limitations; and 14 which are not operational either because they are newly constructed or have closed down for various reasons. Overall, however all the 100 MCCs have buildings which meet the statutory requirements for a modern MCC, all have at least a 3-phase generator and 86 of them have electricity connection (34 on 3-phase and 52 on single phase). The biggest shortfall is in functional capacity of cooling facilities and reliable water connection (Urassa, 2019).

While all the MCCs have cooling facilities (most with at least 2 tanks of up to 7 MT combined capacity), for many of the MCCs, part of this installed capacity is not functional largely due to disrepair or because of electricity connection (single phase, when the coolers require 3-phase electricity). Most of the MCCs complain about access to clean and reliable water supply. All these factors combine to lower the functional capacity of most MCCs to 50 – 60% of installed capacity and stands out as an issue that needs to be addressed (Godefroid, 2021)

Beyond functional capacity of established structures and facilities, a major challenge facing MCCs is the overall level of utilization of the facilities by farmers. Available information shows that more than 60% of the MCCs have daily milk collections below the 2,000 liters minimum threshold used in the business model for establishment of MCCs. Overall, estimates by MINAGRI suggest that only about 25–30% of the total installed capacity of existing MCCs is being utilized. While there are many interrelated factors behind this low utilization, the main ones relate to farmer organization and ownership of MCCs; management capacity; and market linkages. Underutilization is also 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 (MINAGRI, 2020) to support the establishment of a milk collection infrastructure that meets Rwanda's need for adherence to milk quality standards of traded milk, it is important that measures are taken to increase the functional capacity of existing facilities and its utilization. Beyond this however, analysis of the distribution of the existing MCCs vis a vis current levels of milk production shows that there is still a need for expansion of the second tier milk collection aggregation centers. Estimates show that at least 177 MCCs are required in the country to handle current levels of milk sold by farmers at 85–100% capacity utilization levels (Heritier, 2019).

2.1.10 Relationship of milk production and nutrition

The National Development Plan Vision 2050 refers to the objective of reducing malnutrition in all forms for children by 2035 as part of Pillar I "Human Development". Eradicating malnutrition is also embedded in the second priority area of the 2018-2024 National Strategy for Transformation (NST1) social pillar. The National Early Childhood Development Programme, the National Health Promotion Strategy, the Nutrition Policy has been at the basis of the design of the National Social and Behaviour Change Communication Strategy for Integrated Early Childhood Development Nutrition and WASH 2018-2024. In addition, the National Comprehensive School Feeding Policy from 2019, promoted by the Ministry of Education, emphasizes on the multi-sectoral collaboration with agriculture, health and nutrition to provide healthy and nutritious meals as well as adequate sensitization (Joshi, 2019).

Significant effort was also devoted to address the issue of high prices of nutritious foods through the promotion of government-led nutrition programs in line with the "no one left behind" approach. These programs include home-grown school feeding, ECD Centres at the local level, the "One Cow per poor family" and "One Cup of milk per Child" policies.

However, the dairy consumption levels remain considerably low as many families often do not see the importance of consuming safe and good quality milk and dairy products and income generated from livestock and dairy does not necessarily translate into improved nutrition (Budhathoki, 2007).

2.1.11 Environment and vulnerability to climate change

Rwanda is highly vulnerable to climate change as it is reliant on rained agriculture both in crop and livestock production. Climate change impacts vary depending on agro-ecological zones. The Northern and Western provinces are more affected by floods, while the Eastern and Southern provinces are more vulnerable to drought events. The impact of floods and droughts in recent years are thought to have been exacerbated by climate change and the environmental degradation observed throughout the country. The mean annual temperature is expected to increase up to 3.25°C for the region by the end of the century resulting in proliferation of diseases, crop decline and reduced land availability that affects food security and livestock production. Rainfall variability is more uncertain, though models predict more extreme events with higher rainfall intensities leading to landslides, crop losses, health risks and damages to infrastructure. The degradation of Rwanda's resource base is closely tied to relentless pressure exerted by a large and rapidly growing population on a limited arable land area for farming, raising livestock, and other agricultural production.

The dairy sector is susceptible to climate change both on the production and marketing sides, as water and land become more limited for fodder production and as temperatures increase requiring changes to forage feeding systems. This makes the transport and safe

storage of milk in the supply chain to consumers more complex with and requirements for more energy use. Without major unit cost-reducing developments in feed/forage production, milk supply and marketing chain, many of the short term gains and improvements made in the livelihoods of smallholder farmers from investments in the dairy sector will be reduced due to increasing climatic risks and higher energy costs. On the other hand, dairy farming is also a contributor to climate change as increases in dairy production may contribute to anthropogenic greenhouse gas emissions, biophysical degradation and potential loss of biodiversity if extensification occurs and green strategies are not promoted along with good dairy management practices. For these reasons, increases in dairy production need to be realized through a well-managed intensification, rather than extensification approach, and must incorporate climate-smart measures and technologies to mitigate against adverse environmental impact (RAB, 2022).

2.1.12 Development

Development has been defined by many scholars in different ways. Some argue that development involves growth of per capita income while others focus improving living conditions of the beneficiaries by reducing inequality of income distribution (*Schumpeter & Joseph, 2003*). In defining the concept development, Rochere (1992) states that development is comprehensive and dynamic by which Society creates opportunities for its members, material resources, intellectual and spiritual news. This author is not limited to the quantitative aspects of development that make only a growth of assets and income.

It shows instead of that opportunities and resources must be created in all sectors of life, they are finalized by happiness of men and they have no meaning if they are not advanced in their life style. He says the social culture or spiritual is not there by the products of economic progress on the contrary (Dhakal, 1999).

2.1.13 Economic development

Economic development generally refers to the sustained, concerted actions of policymakers and communities that promote the standard of living and economic health of specific area. Economic development is a term that economist, politicians, and others have used frequently in the 20th Century. The concept, however, has been in existence in the West for centuries. Modernization, Westernization, and especially industrialization are other terms people have used when discussing economic development. Although no one is sure when the concept originated, most people agree that the development is closely bound up with the evolution of capitalism and the demise of feudalism. The economic development is the transformation of the institutional structure which allows the appearances of the growth and its prolongation during the historical time, it is translated into indicator which justifies concretely the economic modifications in which lives certain population. We can also say that the economic development is measured by a quantifiable change of a population in time present compared to the past (Urassa, 2019).

2.1.14. Social development

The social development is defined like management of the employee “actor collectives” privileging the participative aspects, the mobilization of the qualifying Organizations of work, the improvement of the working conditions, the formulations conceived like as many collective investments (Utiger, 2000).

In its work, privileged this preceding definition by saying that the Social development is what relates to the human Society in its evolution, thus, a human Society studies its structure, its organization and its program, in short, social effects.

It is also what relates to the improvement of the standard of living and which aims at creating solidarity between the members of community within the same company. Social development is process which results in the transformation of social structure in a manner which improves the capacity of society to fulfill aspiration. Social development consists of two interrelated aspects learning and application. Society discovers better ways to fulfill its operations and develop organizational mechanisms to express that knowledge to achieve its social and economic goal

2.1.15 Rural area

Rural areas are poorer than urban areas. The relationship between a region's "rural-ness" and its poverty level is practically obvious (clear) and is constantly confirmed by studies and statistics.

The Organization for Economic Cooperation and Development (OECD) has established the following widely accepted definitions: A community is defined as rural if its population density is less than 150 people per square kilometer. A region is defined as rural and remote if more than 50% of its population lives in rural communities. The second definition, coupled with the fact that rural regions are poor, suggests a strong relationship between locality and poverty. In developing and developed countries alike, the further an area is from the nearest populous area, the poorer its inhabitants are. This correlation applies not just to financial poverty, but to general human welfare. The barrier of sheer distance is an enormous one, and one that limits education, health, and happiness. One way that lending organizations attack the social problems facing the world's poor is to erode the distance barrier. Technological innovation has been shrinking the world for ages from the wheel to seafaring to the railroad to the telegraph to the telephone to

supersonic jets but never so much as it has during the Information Age. Computing and the internet are moving information and bringing people closer together at exponentially increasing rates, and lending organizations are attempting to leverage this power in every possible way to combat poverty (Shapiro, 2017).

2.1.16 Relationship between Community Development and Rural Development

Community development and rural development are correlated to each other more than 90 percentage of community development projects were demonstrated in rural areas. According to some social scientists, community development is attributed to the practice of agricultural extension instituted in 1870 in some Midwestern states of the United States of America. The aim of the agricultural extension is said primarily to have been to transfer knowledge regarding agricultural practices and techniques and, later, also promote self-help projects in rural areas. Most of the community development programmes are later transformed into rural development programmes. In India the community development programme (CDP), initiated in the 1950, intended to involve popular participation in rural development. It laid emphasis on the building of infrastructure in rural areas with the participation of rural communities. Planned development of the villages was taken up by the central government in October 1952 when the first five-year plan was started. In the beginning it was called community development but latter on its name was changed to rural development. The CD programme has generated forces which have led to increased agricultural production and has improved to some extent, the living conditions in the rural areas. Prof. Toynbee, viewed that, “The community development programme is one of the most benefit revolutions in the peasantry’s life that have been known, so far to the history (Prahad, 2016).

2.2. Theoretical review

This study refers especially to two theories: Theory of change and Theory of the dairy industry modernization as detailed below.

2.2.1. Theory of change

One of the greatest challenges for practitioners is that there is no single definition for Theory of Change (ToC); it can mean different things to different people. Consequently, expectations about how it should be used also differ. So, let us start with where there is agreement. There is broad consensus in ToC literature that it is a planning process which articulates how change can be achieved. It begins by defining the long-term goal or vision statement ('the change we want to happen') and works backwards to systematically laying out each step along a 'causal pathway' – a series of steps which lead towards the long-term goal. For many people, 'Theory of Change' is not a very helpful term; it sounds academic (theoretical) and vague. Because of this ToC is often rephrased. It is sometimes described as a roadmap as it helps in defining a 'destination', how you expect to get there, the challenges that may be faced and assumptions made about the nature of the journey. Critically, it also acknowledges that, like any journey, you may face unexpected challenges and need to reroute. This is consistent with adaptation planning which is often described as an iterative process where continual adjustment is required (Budhathoki, 2007).

People talk about ToC in different ways, which often leads to confusion. van Es et al. (2015) identify three different ways of viewing ToC as a way of thinking or an overall approach; a process (or enquiry) and a product (usually a diagram). Often donors and practitioners focus solely on the need for a diagram; however the end-product will only be useful if you have an effective process in place.

Further problems arise when ToC diagrams are developed for a proposal then abandoned; ToC only becomes useful if it is revisited and used to consider and evaluate progress. Think of it this way, would you plan your route up a mountain and then leave your map at home?

Rwanda Dairy Development Project is addressing the barriers to green and efficient production and marketing in the dairy value chain. For production, support will include access to feed, water, health and breeding services, training and the introduction of climate-smart practices and nature-based solutions. To convert higher production into higher incomes, the Project will support improved milk collection and storage facilities, collective marketing through productive alliances, and promote increased demand through awareness raising. Cutting across the production and marketing activities, the Project will promote the use of digital technologies, access to finance, and a conducive policy and institutional environment (Singh, 2003).

By promoting sustainable improvements in milk production and enhanced marketing of milk, the Project is expected to sustainably increase incomes, which can then be reinvested into sustainable production as part of a virtuous cycle, while improving the sector's resilience and households' livelihoods. Sustainability is enhanced particularly by the productive alliances with private sector actors and sustainably governed cooperatives. Higher incomes and increased milk consumption are also expected to improve food security and nutrition. The Project will enhance the participation of women and youth in all supported activities, and promote women's empowerment (Aboud, 1995).

Key assumptions for these impact pathways are sufficient availability of quality milk to respond to market demands; effective implementation arrangements and manageable workload of the SPIU; management capacities and good governance of dairy cooperatives and adequate labour and working conditions for women (Jacues, 2013).

Why is ToC useful for dairy development?

ToC is well suited to complex, multifaceted and long-term issues as it helps the user to focus on the question "how do I make change happen?" rather than "what should my project do?" It can help us avoid falling into the trap of designing activities we are familiar with rather than those most relevant to the change we want to achieve. For example, we often consider workshops as a means of stakeholder engagement. Yet if a desired outcome is to "sustain ongoing awareness of climate related disaster risks in coastal communities" then a range of alternative activities might be considered such as training local wardens, teachers or members of the local church. (Prahad, 2016) Highlight a number of other reasons that ToC is a useful tool for climate adaptation planning:

(i) ToC encourages contextual analysis - how can change happen in a given location, sector or social group, what are the barriers and assumptions in this context – which is consistent with adaptation planning. Climate change is a global issue but adaptation is context specific, ToC can connect diverse projects and programmes and enhance linkages across Climate Change Adaptation (CCA) sectors and scales

(ii) ToC is designed to be iterative and flexible and allows projects to respond to changes in the social, political, or natural environment. This is vital for adaptation programmes, which need to accommodate dynamic and emerging conditions. This makes ToC a valuable tool for monitoring and evaluation (M&E) as well as adaptation planning,

(iii) There is a strong focus on the assumptions that underlie a programme and thresholds that identify what is needed to advance towards the desired change. This provides valuable markers against which the process can be assessed (and where necessary, adjustments to strategic direction made),

(iv) If used as part of project or programme planning with stakeholders it can encourage a more open dialogue regarding perspectives and values, leading to a shared vision and stronger relationships with partners and stakeholders

(v) By discussing the underlying logic and the change stakeholders wish to see, different views and perspectives are revealed at an early stage. This helps to establish shared expectations which can avoid misunderstandings,

(vi) ToC can be a valuable M&E tool. Due to the long-term nature of climate change, it can be difficult to determine whether outcomes are achieved. ToC provides a means of identifying 'lessons learned', which is a crucial way to build the evidence base on climate change adaptation,

(vii) The flexible nature of ToC can better account for uncertainties that are inherent in adaptation processes. By monitoring assumptions ToC is agile and provides evidence of where changes may be needed at key points in the project process

2.2.2 Theory of the Dairy Industry Modernization

Modernisation is a derivative of the French word moderne, which means "new", "upto-date". Modernisation means the improving of a human, society, state, economy, branch of business in general as well as its individual components (Shapiro, 2017).

Implementation of modernisation processes in the agro-industry, including those for the milk production, is preceded by the designing of innovative plane in which the following is pointed out: idea of modernisation; goal of modernisation; object of modernisation; means and mechanisms of modernisation; sources of funding of modernisation processes; dates of implementation of modernisation processes; evaluation of the anticipated results of modernisation; making decisions of modernisation processes implementation in the field;

implementation of modernisation plan in the field; analysis of the acquired results of modernisation plan implementation in the field and correction of modernisation plan in the field; While creating such innovative plan it is necessary to remember the concept of technological, economic and social modernisation in the field (Hahirwa, 2017).

The reality is that nowadays technological modernisation of dairy industry is dealing mostly with the problems of rehabilitation of traditional livestock houses and new construction. But the construction of the large livestock object which has both economic advantages and social disadvantages is more preferable. The problems of modernisation of breeder and milking stock on the basis of mostly imported and own reproduction of young breeder of cattle is questionable. What about the problems of milk processing, implementation and price formation, they are almost not subjected to modernisation, which nullify the effectiveness of technological modernisation of the field (Regnar, 2002).

Weak motivation in the dairy industry is the result of inability of economic factors, their helplessness in the conditions of little credit availability, insufficient governmental help, low production effectiveness, which, undoubtedly, promises no good prospects for the development of this branch. According to the State programme of agriculture development and market regulation of agricultural products, raw materials and food for 2013-202, where modernisation is paid a lot of attention, the measures of technical re-equipping are pointed out into special sub-programme “Technical and technological modernisation, innovative development” for these goals 23.7 billion roubles are granted for the period of the Programme 2 . Nowadays 30.9 million tons of milk per year is produced in the RF. These figures which can be compared to the volume of annual production of milk in such states as China (37.8 million tons), Germany (30.5 million tons) and Brazil (32.3 million tons), speak for the fact that Russia has all the opportunities for

becoming one of the world leading producers of dairy products. D. A. Medvedev claimed the serious potential of dairy industry in Russia during the meeting “About the development of dairy cattle husbandry” in Voronezh region in October, 20134. However now the situation in dairy industry is crucial - dairy cattle livestock is being decreased in agricultural organisations, total milk yield is also decreased and the shortage of this product is being increased. According to the Federal State Statistics Service the consumption of milk and milk products in 2012 was 265 kg per 1 person, in 1990 this index was 380 kg per 1 person. There appears the necessity of provision of growing demand for milk and milk products by means of development of dairy industry. Increasing of the demand and level of consumption is not the only factors which speak for the importance of effective modernisation of milk production (Etikan 2016).

2.3. Empirical review

As expressed by the concept, an empirical review analyses previous empirical studies in order to provide an answer to a specific research topic that relies on observations rather than theories. It is in this context the following studies are reviewed (Shapiro, 2017).

2.3.1. Impact of dairy production on socio-economic development

Livestock farming specially dairying is backbone of income for the villagers. Animal and animal by-products keep economic value such as animal sale, milk cash, fertilizer, and biogas and broadly speaking, it has socio-economic importance. They will contribute for education and health leading to better life. Some of the components in the conceptual framework can be described as milk cash as it is considered as a cash product for farmer as it is being sold morning and evening daily. Farmers deliver their milk at Milk Producers Cooperatives (MPC) and get the milk cash as per quality parameter of fat and SNF and volume basis at each fortnight.

Another component is animal sale in which farmers of dairy cooperative have local and cross breed of dairy animals. With regards to cattle, heifers are sold to the customers at market price and less productive and or old animals are culled at low price. However, few calves are sold as per demand of the customer for the purpose of natural service. There is also fertilizer which is an organic manure which is prepared by the slurry from shed and dung of animals. This fertilizer makes the field more fertile rather than chemical fertilizers. Lastly there is employment which creates labour for completion of daily work. Farmers have not any alternate options except dairy farming. Therefore, this farming has created the employment in each household.

All the above economic impacts are inter-linked in terms of social aspect such as income from animal sale, milk cash, fertilizer, and biogas finally help to afford in education and health. Education makes individual educated and its influences in society make them civilized and healthy. Likewise, agro by-products, dung, urine and litters, which converts into farmyard manure maintains sustainable positive natural cycle that improves environment by producing and maintaining more greens and control pollution. Dairy farming creates employment to work at shed, feeding, housing etc. It also creates employment at dairy cooperative for technical work, accounting, managing etc. An employer is also a good communicator through which people are in contact to get services. At last, all these directly and indirectly make an effect to the society (Dhakal, 2007).

2.3.2 Importance of milk consumption and dairy products in Rwanda

The dairy value chain has its main purpose to feed the population and improve its economic status. The consumption of milk and dairy products is very crucial for the children’s growth and the well-being of the entire family.

Considering the nutrition composition of milk, the latter remains the only source of almost all kinds of nutrients the human body needs; proteins, fats, minerals and vitamins, and water.

Milk is the source of proteins that is affordable compared to other sources of proteins. The inclusion of milk and milk products in daily meals would ensure one has a balanced diet (Joshi, 2019).

The Government of Rwanda has noticed the importance of milk in the life of its citizens and introduced the One Cow per poor family and the One Cup of Milk per child programs the milk production and consumption. The One Cup of Milk Program was done by serving milk to the school-going children. The beneficiaries have positively welcomed the program and its outcomes were observed across the community. Apart from the nutrition status of beneficiaries that got improved, the school enrolment has improved and the school dropout reduced in the beneficiary schools. However, the program does not reach the whole community which needs information on the importance of consuming milk. Only the parents of the targeted pupils do. It is of great importance to organize other forums where the whole community can be met and get taught to use dairy products and their importance.

As we all know, among the causes of malnutrition, ignorance comes first. The lack of the right information on nutrition and the nutritional importance of some basic food items remains an issue. One may feel selling sell milk and buying any other products for his children, another one may prefer to buy alcohol at three or four times the price of milk. This is because she/he doesn’t know the right products to buy for his/her family. This harms the welfare of the family members and is a source of malnutrition that suffers many families. The RDDP project design had proposed ways to handle the above-mentioned issues.

2.3.3 Assessing Linkages between Livestock and Poverty Reduction

In 2015 the 193 Member States of the United Nations adopted a set of 17 Sustainable Development Goals (SDGs) to guide development actions of governments, international agencies, civil society and other institutions over the next 15 years (2016-2030). The SDGs aim to end poverty (SDG1) and hunger (SDG2) while restoring and sustainably managing natural resources. Worldwide, some 900 million poor people live on less than US$1.9/day (Budhathoki, 2007).

About half of them depend directly on livestock for their livelihoods. To poor people, farm animals are a major asset, representing both capital and, in many cases, a source of income, while at the same time being a source of high quality nutrients. Livestock, which can be sold in times of crisis, act as household insurance. On the farm, they provide draught power and fertilization, and reward their owners with a wide diversity of products ranging from milk, meat and eggs to hides, skins, leather and wool. Livestock therefore contribute to three major pathways out of poverty by increasing resilience; improving smallholder and pastoral productivity and increasing market participation (ILRI, 2008).

However, in order to reinforce livestock's role in poverty eradication, it is important to obtain more accurate information on the number and characteristics of poor livestock keepers and of workers along livestock supply chains. Another priority is to gain a better understanding of how livestock can best be used to reduce poverty. Within livestock, the dairy sector is regarded as carrying particular promise to contribute to SDG1. It has been estimated that almost 150 million farm households, i.e. more than 750 million people, are engaged in milk production, the majority of them in developing countries (FAO, 2017).

Annual milk consumption growth rates in these countries is at least double the growth rates of major staple foods and due to the perishability of dairy products the bulk of dairy production is consumed domestically without entering international trade. Given the importance of livestock in poor people's livelihoods, livestock sector development is regarded as a promising avenue for supporting the achievement of SDG1 and a large body of literature exists on livestock sector development and poverty reduction (FAO, 2017).

2.3.4 Dairy impacts on producer households

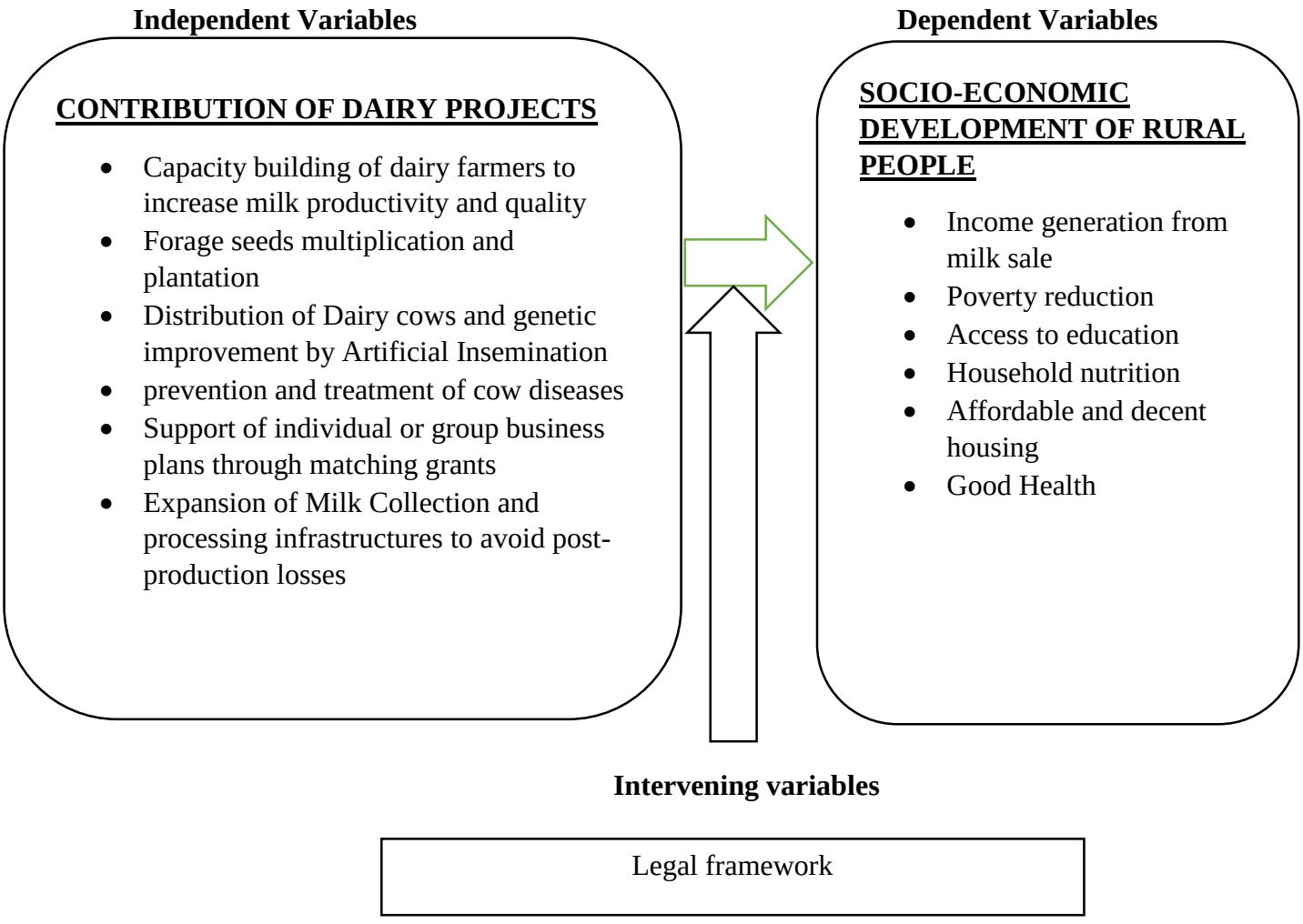
The bulk of the eligible studies cover the direct impact of engagement in milk production on household welfare. Two study designs are used to assess the impact of dairying on household welfare. The first draws on cross-sectional data and compares households with dairy cows (cross-bred or exotic) to households without dairy cows, in their majority controlling for numerous other variables potentially influencing household welfare. The second study design uses longitudinal data collected from households that have received a dairy cow (or two) through a donation programme and mostly compares household status before enrollment to status at various points in time after enrollment (Bhattarai, 2014).

In a few studies, welfare of households in a donation programme was compared to that of eligible households, which had so far not received an essential component of the programme. These two study designs were also used to assess the impacts of improved dairy cow management and / or participation in a dairy cooperative or 'dairy hub'. A considerable number of measures are used to quantify various potential impacts of dairy cow ownership and improved dairy cow management on household welfare. The multitude of measures used reflects the variety of pathways through which dairy (Singh, 2003).

2.4. Conceptual framework

This Conceptual framework is considered as road of the study whereby the researcher is intending to demonstrate how cause is producing an effect. So, Contribution of dairy projects is the cause that can allow people affected by socio economic development to raise income and nutrition. Therefore, conducting those activities is influencing socio-economic living conditions of Burera District people.

Conceptual framework of the contribution of dairy projects to socioeconomic development relation of rural people



The above presents the Independent Variable (IV) which is Contribution of dairy projects which consists Capacity building of dairy farmers to increase milk productivity and quality; Forage seeds multiplication and plantation; Distribution of Dairy cows and genetic improvement by Artificial Insemination (AI); Cows diseases control (prevention and treatment); Support of individual or group business plans through matching grants, Expansion of Milk Collection and processing infrastructures to avoid post-production losses (Researcher's design, June 2023).

For Dependent Variable (DV) which is socio-economic development of rural people, consists of Income generation from milk sale; Poverty reduction; Access to education; Household nutrition; Affordable and decent housing; Good Health. There are also the intervening variables which is legal framework.

Regarding on how it is interlinked, contribution of dairy projects through their activities can led to the socio-economic development of rural people, however there is still the external influential factors (intervening variables) which influence the outcomes either negatively or positively, under this study those external influential factors are the legal framework.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the techniques, methods, target population and related approaches that were applied during data collection and analysis. It comprises Research design, The population of the study, Sampling, Data collection techniques and tools, Validity and reliability tests, Data processing, Methods of data analysis, Limitations and ethical considerations.

3.2. Design of research

A research design is the 'procedures for collecting, analyzing, interpreting and reporting data in research studies'. In other words, the research design sets the procedure on the required data, the methods to be applied to collect and analyze these data, and how all of this is going to answer the research question. Due to the nature of the study, qualitative and quantitative design was both be applied to effectively manage to find the reliable answer the research questions so that the researchers can attain the research objectives (Grawitz, 2002).

3.2.1 Qualitative approach

The approach allows for a closer interaction between the researcher and the subjects under study and helps ensure the credibility of the data obtained as well as gaining the deeper understanding about the participant's personnel experiences and impressions. Through the survey method, it was possible to capture and document the subject opinions and perceptions on how the specific independent variables strategic direction (SD) strategic staffing (SS) and stakeholder's accountability influence Rwanda Dairy Development Project.

Qualitative data collection plays an important role in monitoring and evaluation as it helps you delve deeper into a particular problem and gain a human perspective on it. It provides in depth information on some of the more intangible factors like experiences, opinions, motivations, behaviors or descriptions of a process, event or a particular context relevant to your project. So, in other words, a qualitative approach uses people's stories, experiences and feelings to measure change. Compared to a quantitative approach, a qualitative approach is more open, informal and unstructured or semi-structured, and it provides more flexibility in how data is collected. Qualitative research is investigative in nature and the data collected through this process answers the question 'why' or 'how' how do people feel about a situation, or why are health care facilities underutilized? This approach relies more heavily on interactive interviews, discussions and deeper conversations. While using this approach, many researchers also use triangulation or mixed methods to increase the credibility and authenticity of their findings. Data is often recorded in the form of field notes, sketches, audiotapes, photographs and other suitable means.

Usually the findings drawn from qualitative research are not generalizable to any specific population, rather each case study produces a unique piece of evidence that can help identify patterns among different studies of the same issue. The results produced from this approach can be subjective and as such can be subject to bias in their interpretation. Analyzing such data can also be quite complex and time-consuming which can make it an expensive process.

On conclusion of each day of qualitative fieldwork, I did self-progress evaluation to see whether the sampling of respondents was done correctly, the quality of the notes taken, what are the key themes emerging from the qualitative research, and if this is adequately reflected in the field notes? what probing questions require additional focus for future interviews; and who else in the community needs to be interviewed, based on emerging findings (Robert, 2010).

3.2.2 Quantitative approach

According to Robert (2010) quantitative research approach was confirmatory and deductive in nature and deals with numbers. This approach is widely applied in scientific research due to its ability to provide objective and statistically valid information based on quantified measures and also enable researcher to investigate a large number of cases. in regard to quantitative approach the study adopted two methods, the descriptive statistics and correlational tests. Through the descriptive statistics the study was able to generate numerical values for information obtained from the respondent's trough qualitative approach. Specifically, the study was able to segregate and segment the respondents in terms of percentage levels (%), means (measure of central tendency), and levels of deviations from computed means. The correlational tests on the other hand were used to identify relationships among the variables of the study (Nachmias,2017).

The essence of correlational test was to establish if a relationship of sufficient magnitude exists between the independent variables strategic direction (SD) strategic staffing (SS) and stakeholder's accountability and performance of Rwanda Dairy Development Project. The quantitative approach was used to address a number of the survey objectives using household survey. The survey was designed to collect required data for research questions. The quantitative approach uses numbers and statistics to quantify change and is often expressed in the form of digits, units, ratios, percentages, proportions, etc.

Compared to the qualitative approach, the quantitative approach is more structured, straightforward and formal. Quantitative approach is utilized to derive answers to the questions 'how much' or 'how many**.** Quantitative research is useful for multi-site and cluster evaluations that involve a large group of respondents or sample population.

This approach relies heavily on random sampling and structured data collection instruments that fit diverse experiences into predetermined response categories. Typical quantitative data gathering strategies include, experiments or clinical trials, gathering relevant data from management information systems, administering surveys with closed-ended questions or observing and recording well-defined events (Mugenda, 2018).

3.3. Target population

A population refers to the total number of elements covered by the research question (Maxwell Gratien, 2015) defines a population of the study as any group of people or Organizations, subjects or events about which the researcher wants to draw conclusion, whilst any member of such population is called as a case.

The total target population is composed by 900 livestock farmers that are members of 20 dairy cooperatives involved in project implementation among others those who were trained in milk productivity and quality, given dairy cows, given forage seed for plantation, got matching grants for livestock projects.

3.4. Sampling

The sampling as the process of selecting people cases or items to take part in the research study (Grawitz, 2002).

3.4.1. Sample size

The adjusted minimum sample size is calculated by determining function of variability, statistically method, power and difference sought. Before identifying the sample of respondents in this research, it is necessary to indicate how the sample size is determined.

In order to determine the sample size, the following formula designed by Yamane in 1967 is used, as shown below.

$$\mathbf{n}=\frac{N}{1+N(e)2}$$

Where, **n** is the sample size;

N is size of the population

e is a marginal error

So, the sample size is n$=\frac{900}{1+900(0.1)2}$

$$\mathbf{n}=\frac{900}{10}=90$$

n= 90

Therefore, the sample size of 90 was selected from the whole targeted population and the following section showed the sampling techniques that were used in determining the respondents.

3.4.2 Sampling selection technique

In determining the sample to represent the study's population, the following sampling technique was applied.

3.4.3.1 Purposive sampling technique

According to Maxwell (2015) purposive sampling is a judgmental sampling in which the research purposively selects a certain group or individuals for their relevance to the research. Mugenda (2018) said that, purposive sampling is an on-probability sampling procedure in which the researcher uses his/her research skills and make judgment to select those respondents that

best meet the needs of his/her research study. Purposive sampling techniques were used in making sampling as the researchers selected based on the data needed and the information targeted population holds. In selecting the sample size among the whole target population, as aforementioned, purposive sampling technique was used in selecting the respondents who have more information on the implementation project as they take part in its implementation as well as being affected by it directly.

Regarding the implementers of Rwanda Dairy Development Project, the researcher makes sure every department is being represented, selection of the heads of each department that means, head of livestock farmer field school groups, farmers organizations, access to finance, market support and animal genetic improvement. Regarding the respondents from the local communities, the researcher considers the individuals that had been affected by the project activities (livestock farmer field school groups, the beneficiaries of Girinka Program, the beneficiaries of matching grants, milk collection centers,)

3.5 Data Collection Techniques

The following data collection techniques were used to get data.

3.5.1 Interview technique

According to (Nachmias Jonathan, 2017) a research interview is a data collection technique whose main purpose is to obtain information, research interview, therefore, is used in situation where the respondents claimed to have no time to fill the questionnaire. Interview used mainly to the Rwanda Dairy Development Project officials and local government officials whose responsibilities relating to the project implementation.

3.5.2 Questionnaire Technique

According to Nachmias (2017) defines questionnaire as survey instrument intended for us in mailed or in-person surveys. It is a technique in which the researcher set a series of questions which he asks questions to collect the necessary data and this help to avoid any ambiguity. Surveys will be conducted in-person to the residents of Burera District who are taking part in the daily implementation of the Rwanda Dairy Development Project as well as those who had been directly affected by its implementation.

3.5.3 Documentation technique

According to Maxwell (2015) the documentation techniques is the use of the literature which purpose is the scientific literature on the study and exploration of literature related to a problem this technique involves the use document realized in area of study. Documentation technique helps mostly in obtaining the existing literatures through reports, previous research, and books all related to the study. It helped the researcher in consulting the reports about how far the outcomes of the projects is are.

3.6. Validity and reliability

The collected data from the fields must be valid and reliable, and the followings presents techniques that were used by the researcher in order to minimize the risk of collecting the data that are biased or untrue.

3.6.1 Validity

Validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study (Robert, 2010).

For the validity of data collected, the researcher administrated himself the interview and did not exert an influence on employee to make them biased. With the help of the colleague and the supervisor, the researcher sits together to analyze whether the data collection techniques to be used measure what intended to be measured.

3.6.2. Reliability

Reliability refers to the extent to which data collection techniques or analysis procedures yielded consistent findings. The data to be collected was deemed to reliable as the researcher conducted a pre-test and retest interview, pre-test of questionnaire and retest of questionnaire. The use of interview also increases the reliability of the data as it helped the participant not to be influenced by the time or the situations they were in. Regarding the questionnaire, the usage of ArcGISsurvey123 instead of manual questionnaire answering minimize the chance of data being collected being biased (Grawitz, 2002).

3.7. Data processing methods

Data processing was used to transform the respondent's views into meaningful test. On this note, editing, coding and tabulating of data were applied in order to be able to handle it easily.

3.7.1 Editing

Editing as the process whereby errors in completed interview, schedule and the mail questions are identified whenever possible. For some unclear responses, the researcher went back to the respondents so as to make them clarify their responses.

3.7.2. Coding

According to Nachmias (2017) coding refers to the assigning of symbol or a number to a response for identification purpose. This was used in order to summarize data by classifying different responses, which were made into categories for easy interpretation and analysis.

3.7.3. Tabulation

Frequency distribution tables were used after editing and coding of data. Tables were constructed according to the main themes in the questionnaire to summarize all the findings of the study.

3.8. Methods of data analysis

According to Mugenda (2018) method is a collection of steps which put together in a logical manner a purpose of achieving a given objective. Therefore, as it is contextualized in the following point, historical, analytical and synthetic methods were used.

3.8.1. Historical

Method According to Robert (2010) the historical method or simply the diachronic approach is based on analysis of fact or data in a specific period of time or well-defined time in the past. “obviously the emphasis is on studying evolution from the background to the situation of the day of search” such a study cannot be achieved without resorting to find out the causes of the problems studied and note the achievement made in time to make judgements that are required. now.

3.8.2. Analytical method

It makes it possible systematically to analyze all information as well as the collected data. It insists much on each case, on each element of a whole study. This method helped the researcher

to make a deep analysis on the collected primary data from the respondents on the impact of the dairy projects to socio economic development of rural people in Burera District.

3.8.3. Synthetic method

The synthetic method it is possible to synthesize or of globalize the elements in a coherent unit. The synthetic spirit considers the various elements in their totality This method helped the researcher to gather the relevant data and information and then reject the wrong data for just adopt the presentation of the findings. In brief, the technique that was in analyzing the data is the descriptive analysis highly considering the frequency and percentage. Both analytical and synthetic methods were used by the researcher in this research study (Maxwell, 2015).

3.9. Ethical consideration

During conducting this research, the researchers considered the ethics in order to establish rapport with the respondents and there is information of consent in doing research, the researcher will get permission from the respondents to participate in the research. The researcher requested the staff management of Rwanda Dairy Development Project and local government officials in Burera District in order to allow their employees to participate in the interview and questionnaire answering which required authority letter. Researcher allowed the respondents to be free when collecting the data, mentioning names might look like coercing so the respondent's names are avoided. Researcher made sure that respondents are to express themselves during the interview for a better data collection

3.10. Limitations of the study

During the process of undertaking the study, the following limitations were faced by the researcher: Obtaining the RAB/RDDP's permission of conducting the research to Rwanda Dairy Development Project due to administrative process, delayed data collection phase and

consequently work completion. But even if it has been costly in terms of transport, the researcher came up to get needed data. Then some respondents pertain to sample did not feel easily free to responding to researcher's questionnaire but by ensuring them the privacy and anonymity.

Regarding how I addressed those limitations, I added ten additional days to my calendar of data collection and negotiated some of respondents to visit them during weekend days and they agreed. Also, making respondents aware of the research's importance helped me to the flexibility of weekend days' visits in addressing time limitations.

CHAPTER 4

PRESENTATION OF THE FINDINGS

Introduction

This chapter presents the data that were collected from the field, and it come up with the analysis interpretation and discussion from the researcher supported by data existing literature.

4.1 General Information

The general information that are presented are the age, sex, marital status and educational level of the respondents.

4.1.1. Age of the respondents

The age of the respondents is necessary to know whether the respondents are mature and are able to provide rational ideas to the researcher. The following table presents the age of the respondents

Table 1: Age of the respondents

Age range	Number of respondents	Percent
16-25	26	28.9
26-35	39	43.3
36-45	15	16.7
46-55	6	6.7
>=56	4	4.4
Total	90	100.0

Source: Field data, August 2023

Table 1 indicates that 28.9% of the respondents are between 16 and 25 years old, 43.3% of the respondents are between 26 and 35 years old, 16.7% of the respondents are between 36 and 45 years old while 12.2% of the respondents are between 46 and 55 years old are 6.7 % and the respondents that are beyond 55 years old were 4.4%. The findings revealed that the Rwanda dairy development Project activities reach to the whole community regardless their age. However, the range of 26-35 years old, and 18-25 years old occupies the large portion of the respondents; this is based on the fact that the activities of the RDDP Project reached more people in those range of age compared to the other range and this is influenced by the nature of the activities that are being implemented.

4.1.2. Sex of the respondents

The variable sex that I associated in my criteria allowed me to identify the number of female and male that answered questionnaire. It also allowed me to collect opinions of the women and men on the contribution of dairy projects to the socio economic development of rural people.

The following table presents the sex of the respondents.

Table 2: Sex of the respondents

Sex	Number of respondents	Percent
Male	46	51.1
Female	44	48.9
Total	90	100.0

Source: Field data, August 2023

Table 2 indicates that 51.1% of the respondents are Male while 48.9% of the respondents are female.

This reveal that the majority of the respondents are male. But based on the observation being made to the field the researcher can argue that both male and female are reached by the project activities in equitable way as the project implementers also claim.

4.1.3. Marital status of the respondents

The marital status of respondents was also taken into account for more analysis as it would help to get reliable information based on marital status of respondents. The following figure presents the marital status of the respondents.

Table 3: Marital status of the respondents

Marital status	Number of respondents	Percent
Married	65	72.2
Divorced	1	1.1
Single	16	17.8
Widowed	8	8.9
Total	90	100.0

Source: Field data, August 2023

Table 3 indicates that 72.2% of the respondents are married, 17.8% of the respondents are single, 8.9% of the respondents are widowed while 1.1% of the respondents is divorced. The majority of the respondents are married, single and widowed. however, the reasons why the married respondents are dominants among the respondents is due to the facts that the activities that is implemented by RDDP Project actually affects the households than others.

4.2 Activities of Rwanda dairy development project in Burera District

This presented subsection of the fourth chapter concerns with different activities of Rwanda Dairy Development project in assisting livestock dairy farmers. Those activities are like capacity building on the improvement of milk productivity and quality; provision of forage seed to livestock farmers; distribution of dairy cows under Girinka program; genetic improvement; diseases control; construction of milk collection centers; support of business plans through matching grant that are going to be discussed in detail here under.

4.2.1 Capacity building

The project has invested in building the capacity and skills of rural farmers through training programs and technical assistance. Farmers have been trained on various aspects of dairy production, including animal management (shelter, water, cleanliness), feeding practices, milk hygiene, Household nutrition, Gender Action Learning System (GALS) and business skills.

Table 4: Capacity building

Areas of capacity building	Number of respondents	Percent
Animal management	89	98.8
Animal feeding practices	84	93.3
Milk hygiene	88	97.7
Household nutrition	70	77.7
Business skills	78	86.6
Gender action learning system	83	92.2

Source: Field data, August 2023

According to the table above, 98.8% of households among beneficiaries acknowledged to have been trained by the project in animal management, animal feeding practices (93.3%), milk

hygiene (97.7%), household nutrition (77.7%), Business skills (86,6%) and Gender action learning system at (92.2%).

During interview one of the respondents whom the project trained stated: "*Before RDDP Project, I hadn't skills on how my cow can produce more milk but after being trained by the project in feeding practices and knowledge in health care, my cow is producing 12 liters' of milk per day while before produced 5.5liters per day means that the production doubled.*

Considering the level of adoption of training to livestock farmers, it is good and it is answering the National Dairy Strategies (NDS) which states: *"Rwanda targets to increase milk production 13 percent per year from 1.2 billion liters per year by 2022*". Observing the same growth rate of 13% per year, the annual milk production in Rwanda will increase from about 934 million liters in 2020 to 2.6 billion liters per year by 2030. *(RDDP impact Study, April 2023).* This capacity-building approach has empowered farmers to adopt improved practices, enhance productivity, and effectively manage their dairy enterprises. By equipping farmers with knowledge and skills, the project has contributed to poverty reduction by enhancing their ability to generate sustainable incomes.

4.2.2 Forage seeds distributed by RDDP Project

Distribution of forage seeds to farmers for planting is among the project activities which help the project to achieve to dairy value chain development. Forage crops are an essential component of agriculture, providing a reliable and cost-effective source of animal feed. They are also important for sustainable agriculture, as they can help improve soil fertility and reduce erosion.

Table 5: Forage seeds received by farmers from RDDP

Forage species	Number of respondents	Percent
Brachiaria	82	91.1
Calliandra	90	100
Chloris gayana	56	62.2
Desmodium distortum	63	70
Leucaena	90	100
Mucuna	59	65.5
Panicum Coloratum	68	75.5
Penissetum Kakamega	90	100

Source: Field data, August 2023

It appears from the data that project beneficiaries put their preference to Penissetum Kakamega, calliandra and Leucaena (100%) followed by Brachiaria (91.1%), Panicum coloratum (75.5%), Desmodium distortum (70%), Mucuna (65.5%), and Chloris gayana (62.2%). Many beneficiaries have implemented forage crops in their farms. One livestock farmer of Kinoni sector confirmed that most of farmers did not have forage varieties developed in their farms before RDDP interventions. This is the case for Girinka beneficiaries who did not have cows. The implementation of forage plots was made possible by the project with the introduction of various proven pasture grasses and fodder materials to dairy cattle breeders. It provided seed and assisted various seeds multipliers aimed at having enough seeds and fodder materials for distribution to dairy farmers. The distribution of forage varieties is in line with Rwanda agriculture and animal resources development board objective that is to support the dairy value chain and address the

existing challenges like 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.

Most farmers who have applied feeding technologies/practices find them effective mainly as regards to forage conservation and the use of concentrates to lactating cow. Less effectiveness is perceived for forage plots and the use of crop residues, hence, need further interventions to address the constraints and improve their effectiveness for higher adoption. Most reported challenges for forage plots include the small size of land which cannot allow large plots to produce large quantity of fodder for feeding needs, and seeds/planting material which was not accessed in due time leading sometimes to failure due to dry season. Project interventions should support further seed multipliers to increase access to fodder planting material and advise farmers on optimum use of their farmlands to use available niches for fodder production.

4.2.3 Distribution of Dairy cows breed by RDDP

The Rwanda dairy development project distributed dairy cows in supporting Girinka program which translates as “may you have a cow” that was started in 2006 with the goal of reducing child malnutrition rates and increasing household incomes of vulnerable poor families. Households that receive the cows then pass on the first female offspring to the next resource-poor family, and the cycle continues. To be considered for Girinka, a family has to show is able to care for the animal and construct a cowshed, and has a plot of land minimum 0.25 ha to support the cow. The table below presents data on the categories of dairy cows by household and type of breed received from the project.

Table 6: Dairy cow breed received by beneficiaries

Cow Breed	Frequency	Percent
Freisian	69	76.7
Jersey	13	14.4
Cross breed	8	8.9
Local breed	0	0
Total	90	100.0

Source: Field data, August 2023

At the time of the survey, findings on table above highlight that 100% of have dairy cows as one of RDDP objective which is to reduce the number of local breed up to its total elimination.

The concern of this study related to the development of exotic (Freisian, Jersey) and cross breed versus local breed. For exotic breed (Freisian and Jersey), 76.7 and 14.4% of respondents respectively showed that they have them. This is a good indicator, as a result of RDDP action. It has facilitated farmers to get such a kind of breed so that they succeeded to replace local breed by exotic breed. in general, RDDP has triggered the increase of Exotic breed more than other breeds. For Cross-breed, we observe a percentage of 8.9%. This increase of improved dairy cows is still attributable to RDDP interventions. It has facilitated farmers to get artificial and natural insemination so that most local breed gave birth to cross-breed calves.

The objective of RDDP was to increase the number of Exotic and Cross breed is consistent with its objective of reducing the number of local breed up to its total elimination. This is because it wants to get cows with the highest milk production possible. If we consider the total average number of cows per household, we find that it reduced from to 0%.

This is a positive indicator because it shows that the number of local breed goes reducing over time. RDDP strategies have succeeded by replacing highly productive cows to low productive cows.

4.2.4 Genetic improvement/reproduction practices

Genetic improvement is a powerful tool for improving animal agriculture sustainability because the results are permanent and cumulative. Unlike nutritional and animal health interventions, which require continuous inputs, genetic improvements made in one generation are passed onto the next. Over the last two decades, the Government of Rwanda (GoR) has initiated bovine genetic improvement by improving the productivity of local breeds by exotic breeds (both imported and locally produced) through artificial insemination (AI) technology. The status of training and adoption on breeding/reproduction technologies and practices among the project beneficiaries is presented in the table below.

Table 6: Reproduction practices

Reproduction practice	Number of respondents	Percent
Artificial insemination	72	80.0
Natural mating (using bull)	18	20.0
Total	90	100.0

Source: Field data, August 2023

Most livestock farmers adopted Artificial insemination (80%) while few of them are still using bulls (20%) as reproduction practice. The use of AI by households is an indicator of the the average penetration rate of Artificial Insemination in the RDDP intervention zone which stands at 80%.

The good adoption of using Artificial Insemination is significantly contributing to the National Dairy Strategy which aims at both increasing the number of improved breed cows and further improving their productivity.

Therefore, more training is still needed with a specific focus to dairy reproduction management to ensure all farmers can make appropriate decisions on the practice to use. The involvement of Livestock Farmer Field School Facilitators (L-FFS) and animal health workers are expected to provide the training to farmers even when the project will be ended. Therefore, the project should continue strengthening the capacity of L-FFS facilitators and animal health workers to engage effectively in farmers training, for increased adoption of dairy animal genetic improvement.

The use of natural mating using bulls as a practice of breeding is decreasing among beneficiaries. Beneficiaries' preferences are noticed for artificial insemination. Findings from respondents have highlighted challenges affecting the adoption of promoted breeding technologies/practices by RDDP. They include the following:

For farmers who use natural mating, most of them obtain bull from the neighbour or use their own bull. This means that growing their own bull for insemination is still practiced by farmers. This may hinder genetic improvement results if the bulls are not selected for that purpose which unfortunately the case. The average cost of bull service is high, about Frw 3,000 FRw, almost the same as the average cost of insemination service. However, basing on the maximum fees of AI service charged in some zones (ranging between Frw 5,000 and 10,000), the cost may have been a limiting factor to adoption of AI among local farmers.

Although a good accessibility of veterinary services to farmers was confirmed with the inseminator reaching them within a maximum of 2 hours, some cases were reported where veterinary agent could only reach farmers the following day or even later. There is need to increase the timely availability of inseminators to increase the rate of adoption of AI as recommended genetic improvement practice among farmers. Inseminator agents should conduct appropriate breeding action within approximately 6 to 12 hours after first observing standing heat to increase the chance of success of Artificial Insemination.

4.2.5 Adoption of animal health and disease management practices

An infectious animal disease can spread beyond the farm where it first occurs. It can cause damage to other farming businesses, infect other animals of other species and people, and to the economy at large and can pose a threat to public health. Farmers and the government, therefore, take every precaution to prevent these diseases, such as keeping animal housing clean and vaccinating livestock. That is why RDDP has stepped in to help against the spread of zoonotic diseases from livestock to humans and to also combat these diseases. Farmers are responsible for the health of their livestock. Sometimes, the government has to step in and help prevent or combat a disease if it is exceptionally infectious or dangerous.

The status of training on animal health and disease management practices among the project beneficiaries is presented in the table below.

Table 7: Animal health and disease management practices

Animal health and disease management practices	Number of respondents	Percent
Disease prevention (deworming)	86	95.5
Disease prevention (acaricides)	81	90
Regular vaccination against cows' diseases	87	96.6
Recognizing a sick cow	84	93.3

Source: Field data, August 2023

It appears that RDDP has intervened largely in training of farmers in animal health management and disease prevention, as acknowledged by over 90% of beneficiaries. the rate of respondents reporting to have participated in training in deworming is 95.5%, 90% know how to use acaricides, 96.6% do regular vaccination against cow's diseases while 93.3% know how to recognize a sick cow. As the adoption of livestock health and disease management practices is above 90%, it is a good indicator of achievement of project outcomes which is "*Organizational capacity, and enterprise skills of smallholder dairy farmers and their cooperatives enhanced*". During field survey one resident in a place where a project is being implemented, declared: "*I am considered a model of farmer whose livestock health and disease management practices have significantly improved because of the project interventions, in particular through the promotion of animal health".*

4.2.6 Time spent to reach Milk collection centers supported by RDDP

Milk as fresh liquid product requires proximity to output markets. Just after milking, a cow's milk is cooled and stored in a stainless steel bulk tank at a temperature between 0 and 4°C to reduce bacterial growth. Every 2 days, a milk truck arrives at the milk collection center to collect the milk. So, the project has invested in the construction of milk collection centers to the proximity of farmers to avoid long distances that can make milk deteriorated. The following table presents the time spent by dairy farmers to reach milk collection centers.

Table 8: Time spent to reach the milk collection center

Time spent to the MCC	Number of respondents	Percent
Less than ten minutes	12	13.3
Less than 30 minutes	38	42.2
Less than an hour	31	34.4
More than an hour	9	10.0
Total	90	100.0

Source: Field data, August 2023

Table 8 indicates that 13,3% of respondents use less than ten minutes to reach MCC, 42.2% use less than 30 minutes to reach the MCC, 34.4% use less than an hour to reach MCC while 10% of respondents use more than an hour to reach MCC. They added that it is RDDP project which supported the construction of those MCCs and equipped them with milk collection equipment's such as cooling tanks, milk cans, alcohol gun, lacto scan. The supported MCCs in the area are namely Bungwe, Kivuye, Gatebe, Kirambo and Cyanika Milk Collection Centers. 5.5% of

respondents said that there are no milk collection centers in the area while 0% don't know about availability of MCC in the area.

One of interviewed people testified: "*Before RDDP constructed Milk Collection Center, I used one hour from my home to the MCC and the milk sometimes was rejected by the MCC because of deterioration throughout the long distance, but today I am using 10 minutes from home to the newly constructed MCC, this prevent milk deterioration because of the proximity of milk collection infrastructure*." This intervention is in line with Rwanda Ministerial Order (MO) regulating the collection, transportation and selling of milk. Under this regulation: "*all milk sold in the country must first be collected at a place where its quality testing is possible before being marketed*".

4.3.7 RDDP matching grant

In October 2018, a MoU was signed between BDF and MINAGRI/SPIU for BDF to participate in the RDDP value chain as a service provider to facilitate the implementation of business plan development and matching grant management, assisting promoters to develop business plans for funding. The status of matching grant received by RDDP beneficiaries is as follows. Major supported facilities under RDDP business plans through BDF include among others: the construction of cowshed, provision of water tanks, construction of forage hangar (shelters), establishment of Veterinary drugs shop, buying motorcycle for milk transport facilities from household level to the MCCs, buying veterinary kits and motorcycles facilitation, farm clearing and fencing, construction of cowshed and water tank, buying equipments to be used for milk collection, handling and selling, milk processing and value addition facilities, animal feeds etc (RAB, 2018).

Table 9: Matching grant

Type of matching grant	Number of respondents	Percent
Cowshed	90	100
Water harvesting tank	90	100
Forage hangar	12	13.3
Veterinary drug shop	1	1.1
Motorcycle for milk transportation	18	20
Chopper and bailer machine	5	5.5
Milk equipment's and value addition facilities	90	100
Animal feeds	3	3.3

Source: Field data, August 2023

Data in the above table show that 100% of respondents received RDDP matching grant of cowshed, water harvesting tank and equipment's and value addition facilities. 13.3% of respondents received a grant for forage hangar, 1.1 % received a grant to run a veterinary drug shop, 20% bought motorcycle for milk transportation, 5,5% bought chopper and bailer machine while 3.3% of total respondents was supported by RDDP Project in animal feeds.

As the table above shows it, there is one veterinary drugs shop supported by the project which is not sufficient across the District which require a continuous sensitization of private vets to invest in other veterinary drugs. Also, there is a serious problem of animal feeds in the region. Most reported challenges for animal feeds goes with the small size of land which cannot allow large plots to produce large quantity of fodder for feeding domestic animals.

Project interventions should support further seed multipliers to increase access to fodder planting material and advise farmers on optimum use of their farmlands to use available niches for fodder production. This intervention is in line with the RAB objectives regarding dairy subsector of increasing 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 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).

4.3 Socio economic impact of dairy farming in Burera District

In the determination of impact of Rwanda Dairy Development Project on the households, different activities were considered, assuming that they are key impacts to the household. They include the following: the status of the price of milk sale before and after RDDP project, ability to provide to children school fees and materials, the capacity of the household in terms of meals per day, the house status, household's equipment's and health status of household members.

4.3.1 Sale of milk at household level

One assumption made to the RDDP is that increased production would lead to sales and domestic consumption. Milk cash contribute to the household revenue. The table below displays the percentage of farmers who sell milk.

Table10: Sale of milk

Milk sale	Before RDDP		After RDDP	
	Number of respondents	Percent	Number of respondents	Percent
Yes	13	14.4	72	80
No	77	85.5	18	20

Source: Field data, August 2023

The percentage of farmers who sell milk increased form 14.4% before the project to the current 80%. About 20% of households don't sell milk. Various reasons that still prevent households from selling milk as reported by the above 20% are the lack of enough milk and the price too low. A dairy farmer stated: "*Before RDDP intervention I sold 2 liters of milk per day at RWF100 / liter but currently my cow produces 10 liters and we consume 2 liters, 8 liters are sold every day at RWF 300 per liter which is helping my household to get the basic needs on its own*".

This is a sign that milk consumption is increasing because of intervention measures implemented by RDDP. As assumed by the project, improved dairy practices and milk productivity complemented by consumption and education campaigns should lead to increased domestic milk consumption.

4.3.2 Ability of the household to avail school materials and school fees

School fees and school materials have been found to be a significant barrier to educational enrolments, deterring poorer parents from sending their children to school. After the socio economic contribution of the Rwanda dairy development project, parent's capacity of paying school fees and school materials increased as it is shown in the table below.

Table 11: Ability of the household to avail school materials and school fees

Description	Before RDDP		After RDDP	
	Number of respondents	Percent	Number of respondents	Percent
Able	41	45.6	85	94.4
Not Able	49	54.4	5	5.6
Total	90	100.0	90	100.0

Source: Field data, August 2023

Taking into consideration the above table, it is clear that the population living in Burera District that are RDDP beneficiaries are able to pay school fees of their children (94.4%) after RDDP assistance which is totally different from the situation before (45.6%) and only 5.6% of respondents have said that they are not able to pay school fees and provide school materials while they were 54.4% before.

A widower woman who is the beneficiary of RDDP Project testified: *Before RDDP Project, 2 of my 3 children dropped out the school because of limited means of scholarisation but today all my 3 children attend school with necessary materials due to milk sold from a dairy cow that we received from RDDP Project*". She added: "*The elder girl is studying in twelve years' basic education school and she got good marks".*

Due to the surplus of milk production, population of Burera District supplies the production to the market and income generation. This facilitates them to pay tuition fees for their children at primary level, secondary level and university level. In addition, there is also a support of the Government of Rwanda regarding the education for all.

4.3.3 Household food security

Reference to the World Food Summit (1996) and FAO (2001), food security is defined as when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies). This study focused on the number of meals a day per households.

Table 12: Capacity of a household in terms of meals per day

Capacity of meals per day	Number of respondents	Percent
Once a day	8	8.9
Twice a day	56	62.2
Three times and more	26	28.9
Total	90	100.0

Source: Field data, August 2023

Here the responses clearly show that those with the capacity to take one meal a day are 8.8%. many households have capacity of two meals per day with 62.2%. only 28.8% of households eat three times and more per day. respondents confirmed that their eating habits has improved for the better. This indicates that the project is in its objective as it is to contribute to pro-poor national economic growth and improve 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 National Development Plan Vision 2050 refers to the objective of reducing malnutrition in all forms for children by 2035 as part of Pillar I "*Human Development*". Eradicating malnutrition

is also embedded in the second priority area of the 2018-2024 National Strategy for Transformation (NST1) social pillar. In addition, the National Comprehensive School Feeding Policy from 2019, promoted by the Ministry of Education, emphasizes on the multi-sectoral collaboration with agriculture, health and nutrition to provide healthy and nutritious meals as well as adequate sensitization. Significant effort was also devoted to address the issue of high prices of nutritious foods through the promotion of government-led nutrition programs in line with the "no one left behind" approach. These programs include home-grown school feeding, Early Child Development Centres at the local level, the "*One Cow per poor family*" and "*One Cup of milk per Child*" policies

4.4.4 Habitat status

It is assumed that working with RDDP project induced changes in households 'assets ownership due to income received from different resources: milk sales, labor when constructing physical infrastructures such as hangars, MCCs and MCPs. Table below reports such changes.

Table13: Habitat status of the main house

Description	Before RDDP		After RDDP	
	Frequency	Percent	Frequency	Percent
Roof with Iron Sheet	64	71.2	72	80
Roof with Tiles	26	28.8	18	20
Walls with Cement blocks	3	3.3	5	5.7
Wall with Baked Clay bricks	7	7.5	6	6.5
Wall with adobe bricks	56	62	60	66.8
Wall with Wood covered with mud	21	22.3	16	18.2
Pavement with cement	23	25.6	42	46.3
Pavement with Tiles	1	1.1	2	2.2
Pavement with Bricks	3	3.3	3	3.3
Pavement with Stones	3	3.3	2	2.2
Pavement with soil	58	64.9	45	50.2
Pavement with other	2	2.5	1	1.1

Source: Field data, August 2023

The table above shows that 80.0% and 20.0% of houses are roofed with iron sheets and tiles. While it has been an improvement, the majority of houses (66.8% compared to 62.0% before the project) are built using adobe bricks. This is probably due to the fact that the government has relaxed these materials to be used. Respondents indicated that houses with cement pavement are respectively 46.3% (from 40%) and are above the national average of 31.2% (*Rwanda National Census, 2022*). Pavement of houses using soil improved to 41.5% from 64.9% (before the project). These proportions are still below the national average that is 60.4% (*Rwanda National Census, 2022*). From the analysis of the data above, they are indicators of development.

Development has been defined by many scholars in different ways. Some argue that development involves growth of per capita income while others focus improving living conditions of the beneficiaries by reducing inequality of income distribution (*Schumpeter, 2003*). This suggests an improvement in living conditions that can be attributed to some extent to the activities of the project to beneficiaries.

4.4.5 Household equipment's possession

Household equipment comprises the objects that are needed in daily life and that constitute the majority of moveable belongings. this includes primarily communications equipment's, means of transport and house equipment's. We are all familiar with basic household appliances. These appliances all make our lives a little easier by providing us with convenience and by reducing the amount of time we spend doing everyday tasks around our homes.

The table below presents the possessed equipment's in the house.

Table 14: Household equipment's possession

Household equipment's	Before RDDP		After RDDP	
	Respondents	Percent	Respondents	Percent
Own a radio	51	57.0	71	79.3
Own a television	0	0	20	22.7
Own a mobile phone	53	59.4	76	85
Own a smartphone	0	0	21	23.1
Own a computer	2	2.2	5	5.5
Own a computer with internet	1	1.1	4	4.4
Using bike as transport means	18	20.2	28	32
Using a car as transport means	0	0	1	1.1
Using a motorcycle	2	2.2	6	6.4
Possess benches	61	67.8	36	40.5
possess chairs	37	41.2	56	62.3
possess beds	46	52.1	76	85.2
Possess mattress	52	58	80	89.5
Possess sofa	9	10.4	21	24.4

Source: Field data, August 2023

Findings on the table above reveal that the majority of targeted beneficiaries of the project zone adopted mobile phone and radio as principal means of communication. The mobile phone is used by 85.0% and 79.3%.

These proportions are above the national average of 74.7% *(Rwanda National Census, 2022*). The mobile phone had improved respectively to 85% from 59.4% in comparison to the period before working with RDDP. Similarly, the second channel of communication was radio adopted respectively by 79.3%. However, these findings fail below the national average that is of 81.3%

(*Rwanda National Census, 2022*). The use of smart phone adopted as a Chanel of communication is also increasing as it is around 23% of respondents from the project zone. These channels are most used to get information on weather conditions, market prices (*MINAGRI e-Soko*). They are tools that help in mobilization of farmers in extension services and campaigns (mulching, pruning operations, fertilization and pesticides application, harvesting periods, early warning information, etc.).

As means of transport the bike is most used transport mean as reported by 32.0% and this indicator is above the national average of 11% (*Rwanda National Census, 2022*). Though there is a small improvement in the number of households owing motorcycle, still households use bikes at a low proportion, suggesting that they use other traditional means of transport such putting their luggage's to their head or on the back. With such insufficient means of transport, it is a challenge to take households' produce to markets in big quantities and at long distance.

In relation to house equipment's, beneficiaries of the project are closer in the same proportions. However, compared to findings corresponding before the project, a slight improvement is noticed. Household owing sofa increased to 24.4% from 10.4%. Those owing beds increased to 85.2% from 52.1% while those owing mattress were 89.5% from 58.0%. Based on households' assets ownership, findings confirm a positive change with relatively higher magnitude in the project zone. These household's equipment proportions are all above the national average of 12.9% for sofa, 60.6% for beds and 70.2% for mattresses (*Rwanda National Census, 2022*). Economic development is measured by a quantifiable change of a population in time present compared to the past (*Sindayiheba, 2022*). This suggests that interventions of the project have at some extent contributed to these changes.

4.4 Challenges of dairy farming in Burera District

Dairy farming faces challenges in Burera District such as shortage of land, poor quality and quantity of feeds, climate change vulnerability, lack of knowledge in dairy management, informal market of milk and the price of dairy products which is high for a large number of population. The following table presents the challenges hindering the dairy sector in Burera District. The respondents were asked to list all challenges and possible solutions.

Table 15: challenges of dairy farming in Burera District

Challenges	Number of respondents	Percent
Shortage of land	13	14.4
Climate change vulnerability	14	15.6
Limited technical skills and knowledge	14	15.6
Informal market of milk	14	15.6
Poor animal nutrition and shortage of food	18	20.0
Price of dairy products too high	17	18.9

Source: Field data, August 2023

As table above indicates it, 14.4% of respondents reported shortage of land as one of challenges of dairy farming in Burera District. Resource-poor rural households face challenges in accessing necessary resources such as capital, land, and equipment. This hinders their ability to engage effectively in the dairy value chain and limit their competitiveness. Lack of access to financial services, market information, and supportive infrastructure can further exacerbate these challenges. Also, Climate change vulnerability is another challenge as reported by 15.6%. it poses significant risks to the dairy sector, including shifts in weather patterns, water scarcity, and

increased disease prevalence. Resource-poor rural households may lack the capacity to adapt to these changes, making them more vulnerable to production disruptions and income fluctuations. Climate-resilient practices and technologies need to be promoted and accessible to mitigate these challenges.

Small-scale producers have no sufficient technical skills and knowledge required for modern dairy production and value addition as said by 15.6% of respondents. This can obstruct their ability to produce quality products, meet market demand, and compete effectively. Lack of access to training and extension services can perpetuate this challenge.

Small-scale producers often face difficulties in accessing reliable markets and securing fair prices for their products which result in informal market of milk as reported by 15.6% of respondents. Limited market infrastructure, inadequate market information, and a lack of bargaining power can result in low profitability and limited market opportunities. Integration into the broader value chain is crucial for small-scale producers to maximize their potential.

Regarding the shortage of animal feeding, there is a challenge of shortage of forage mainly in dry season. As said by 20% of respondents. Focus on crossbreeding to reduce the number of low productive, indigenous cow breeds in a country with scarce land, enhance production of fodder crops, including irrigation and forage conservation may reduce this challenge. The price of dairy products such as cheese, yoghurt, butter, is high for 18.9% of respondents. Increase awareness regarding the importance of food safety and certification, build economies of scale to optimize use of processing capacity and lower prices of processed dairy products may reduce this challenge.

4.5 Mechanisms to overcome the challenges of dairy farming in Burera District

Following the challenges faced by dairy sector in Burera District, below are the mechanisms to overcome those challenges:

(i) **Enhance access to resources:** Efforts should be made to improve access to financial services, including microfinance and credit facilities to enable small-scale producers to invest in their dairy enterprises. Enhancing financial inclusion, ongoing efforts should focus on expanding the reach of financial services, improving financial literacy, strengthening agricultural financing, and promoting women's financial empowerment. By doing so, Burera District can achieve more inclusive and sustainable rural development, contributing to overall growth and poverty reduction. Access to land and affordable leasing arrangements can also be facilitated. Additionally, providing support in acquiring necessary equipment and technologies can enhance productivity and competitiveness

(ii) **Promote climate-resilient practices:** Training programs and extension services should be focused on building climate resilience among small-scale producers. This includes promoting water conservation, climate-smart agricultural practices, and the use of renewable energy sources. Encouraging the adoption of climate-resilient crop varieties and animal breeds can also enhance adaptability to changing climate conditions.

(iii) **Strengthen technical skills and knowledge:** Investing in training and capacity building programs tailored to the needs of small-scale producers is crucial. These programs should focus on improving technical skills related to animal husbandry, feed management, milk quality, processing, and value addition. Strengthening

extension services and facilitating knowledge-sharing platforms can also provide ongoing support. However, modules of marketing are to be offered from the start of any training on business and marketing organized for beneficiaries.

(iv) **Promote many L-FFS groups at village level:** The L-FFS have proved to be channels of information sharing and strong bonds among beneficiaries. This innovation is to be extended to the remaining districts of the country and integrate also local veterinaries.

(v) **Encourage gender and youth inclusion**: Specific interventions should be implemented to empower women and youth within the dairy sector. This includes providing targeted training and capacity-building programs, ensuring equal access to resources and opportunities, and promoting leadership and entrepreneurship among women and youth. Engaging women and youth in decision-making processes and creating supportive networks can further enhance their empowerment.

(vi) **Conduct regular research:** To inform activity to be undertaken, research is to be first conducted. This may solve also the problem of factors that cause the low success of Artificial Insemination.

(vii) **Encourage report keeping:** Farmers are to be encouraged to keep records on their cattle to allow an efficient monitoring of the history of the cattle to avoid among negative effects of reproduction linkage (a bull to its juvenile).

(viii) **Advocate for promotion of feeder roads:** Farmers complained about the poor quality of roads that limit the access of milk to MCPs and MCCs, hence discouraging farmers to invest in acquiring cattle with high yield.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

This chapter presents the summary of the findings, conclusion which is a summary of all important conclusions that have been made earlier in write-up of the findings. It also presents recommendations based on the findings.

5.1 Summary of the findings

The Rwanda dairy development project contributed to the socio economic development of rural people in Burera District, the findings showed that the project provided support and capacity-building to small-scale producers, equipping them with the necessary skills as reported by more than 77.7% of respondents. the project distributed forage for fodder cultivation in order to feed cows and after distributed dairy cows. The project supported the construction of milk collection infrastructures in Burera District to avoid post production losses and supported 361 business plans related to dairy projects.

Also, there is a remarquable socio economic impact as testified by respondents during field survey. The project has implemented strategies to enhance the competitiveness of the dairy sector in order to create sustainable income-generating opportunities for small-scale producers, reducing poverty and promoting inclusive development. The project placed particular emphasis on empowering women and youth, recognizing their crucial roles in the dairy sector and their potential as agents of change. The project Enhanced the competitiveness and profitability of the dairy sector aiming to provide quality dairy products from small-scale producers to both domestic and regional consumers, thereby enhancing livelihoods, food security, and nutrition

while building overall resilience. It Strengthened the dairy value chain targeting to enhance the availability, accessibility, and utilization of quality dairy products. This, in turn, contributed to improved food security and nutrition for rural households.

The project recognized that addressing nutritional needs is vital for the overall well-being and development of individuals, especially vulnerable populations such as women and children. It Strengthened the capacity of small-scale producers to adapt to climate change, market fluctuations, and other shocks, the project ensured the long-term sustainability of the dairy value chain. This resilience-building approach contributed to the stability and success of rural households, reducing their vulnerability and enhanced their ability to withstand future challenges. The project Promoted sustainable agricultural practices, efficient resource management, and climate-smart technologies with the ultimate aim to ensure the long-term viability of the dairy sector while minimizing its environmental impact. This approach aligns with the broader goals of sustainable development and mitigating the effects of climate change. The project also promoted dairy production and consumption with the aims to contribute to improved food availability, accessibility, and utilization. This focus on nutrition aligns with efforts to combat malnutrition and improve overall well-being, particularly among vulnerable populations.

5.2. Conclusion

This study was contribution of dairy projects in socio-economic development of rural people in Burera District, A case of Rwanda Dairy Development Project (2018 - 2023). The study finds out that the project had contributed to economic growth and improved the livelihoods of resource-poor rural households. By focusing on key aspects such as food security, nutrition, and the empowerment of women and youth, the project created a sustainable and climate-resilient

dairy value chain. The project increased competitiveness and profitability within the dairy sector, ensuring the provision of high-quality dairy products from small-scale producers to both domestic and regional consumers. Through these efforts, the project enhanced the livelihoods, food security, and nutrition of rural households while building overall resilience.

By promoting the competitiveness of the dairy sector, the project empowered small-scale producers and created income-generating opportunities, leading to improved livelihoods and reduced poverty. In pursuing its objectives, the project adopted a comprehensive approach to dairy value chain development. It focused not only on increasing productivity but also on adopting sustainable and climate-resilient practices. By providing support, training, and capacity-building initiatives to small-scale producers, the project enhanced their knowledge and skills, ensuring the production of high-quality dairy products that meet market demand. The project also integrated climate-smart technologies and efficient resource management practices to mitigate environmental impact and enhance the sector's long-term sustainability.

The project commitment to food security and nutrition is evident through its interventions. By strengthening the dairy value chain, the project contributed to improved availability, accessibility, and utilization of nutritious dairy products. This has a direct positive impact on the nutritional status and overall well-being of rural households, particularly vulnerable populations such as women and children.

As the resilience building was the core focus of the project, it equipped small-scale producers with the tools to adapt to climate change, market fluctuations, and other challenges; the project enhances their ability to withstand shocks and ensures the long-term viability of the dairy sector. This resilience is crucial in promoting the stability and sustainability of rural households, reducing vulnerability, and enhancing their capacity to thrive in a dynamic environment.

With all its interventions in Burera District, the project sat a solid foundation for sustainable development and paves the way towards a prosperous and resilient dairy. The Livestock-Farmer Field School innovative model has proven efficient in networking and knowledge transfer between farmers.

5.3 Recommendations

Following are the recommendations based on challenges within the geographical of the case study:

i. Regular capacity building in programs tailored to the needs of small-scale producers is crucial. These programs should focus on improving technical skills related to animal husbandry, feed management, milk quality, processing, and value addition. Strengthening extension services and facilitating knowledge-sharing platforms can also provide ongoing support. However, modules of marketing are to be offered from the start of any training on business and marketing organized for beneficiaries.

ii. The One Cup of Milk Program in schools should be extended as it is appreciated positively in order to promote milk consumption and to reduce malnutrition.

iii. Rwanda dairy development Project had been quite successful, they should start to think to extend and mobilize funds to carry out the project activities in the other areas that are vulnerable to dairy production

iv. In order to improve the ownership of the activities being implemented, the training and knowledge transfer should be extended to the local community regularly so that the activities will be sustainable.

5.4 Areas for further studies

The following topics suggested to future researchers

(i) Analysis of factors that cause the low success of Artificial Insemination in cattle

(ii) Assessment of the impact of Gender and Youth inclusion in dairy sector.

(iii) Analysis of the sustainability of implemented activities after project closure

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APPENDICES

Appendix 1: CONSENT FORM

Dear Participant,

My name is DUFATANYE Venuste, I am a student at Kigali Independent University (ULK), in Masters of Development Studies. Prior to finalizing my studies am doing research entitled: The contribution of dairy projects in socio-economic development of rural people in Burera District, A case of RDDP (2018-2023). With reference to this research project, there are questions which have been designed for the collection of data that will lead to the successful completion of the study. If you accept to respond to these questions, your responses with other responses from your fellow will be generalized to produce a greater picture of the contribution of dairy projects to the socio-economic development of rural people in Burera. This could help the projects leaders/ or managers to improve the projects outputs. If you need some clarification about any issue, please feel free to ask questions related to this research. Your names will not be asked or mentioned anywhere for your security reasons. Would you like to take part in the successful completion of my studies by honestly responding to my questions?

Appendix 2: GENERAL INFORMATION OF RESPONDENTS

1. Age of the respondents

16-25	
26-35	
36-45	
46-55	
>=56	
Total	

2. Sex of the respondents

Male	
Female	

3. Marital status of the respondents

Married	
Divorced	
Single	
Widowed	
Total	

PART TWO: ACTIVITIES OF RWANDA DAIRY DEVELOPMENT PROJECT IN BURERA DISTRICT

Kindly rate your opinion regarding the following statements on the contribution of dairy projects in socio-economic development of rural people In Burera District. A case of Rwanda Dairy Development Project (2018-2023). Use a scale of 1-5 where 1= strongly disagree, 2-disagree, 3-neutral, 4- agree and 5= strongly agree.

4. Capacity building

	5	4	3	2	1
Animal management					
Animal feeding practices					
Milk hygiene					
Household nutrition					
Business skills					
Gender action learning system					

5. Forage seeds received

	5	4	3	2	1
Brachiaria					
Calliandra					
Chloris gayana					
Desmodium distortum					
Leucaena spp					
Mucuna					
Panicum Coloratum					

6. Dairy cow breed received

	5	4	3	2	1
Freisian					
Jersey					
Cross breed					

7. Reproduction practices

	5	4	3	2	1
Artificial insemination					
Natural mating (using bull)					

8. Animal health and disease management practices

	5	4	3	2	1
Disease prevention (deworming)					
Disease prevention (acaricides)					
Regular vaccination against cows' diseases					
Recognising a sick cow					

9. Time spent to reach milk collection centers

	5	4	3	2	1
Less than ten minutes					
Less than 30 minutes					
Less than an hour					
More than an hour					

d

10. Matching grant

	5	4	3	2	1
Cowshed					
Water harvesting tank					
Forage hangar					
Veterinary drug shop					
Motorcycle for milk transportation					
Chopper and bailer machine					
Milk processing and value addition facilities					
Animal feeds					

PART II. SOCIO ECONOMIC IMPACT OF DAIRY FARMING IN BURERA DISTRICT REASONSFORNOTSELLING

Kindly rate your opinion regarding the following statements on socio economic impact of dairy farming in Burera District reasons for not selling. Use a scale of 1-5 where 1= strongly disagree, 2-disagree, 3-neutral, 4- agree and 5= strongly agree.

11. Sale of milk by households

	5	4	3	2	1
Do not produce enough milk					
No information about milk marketing in my farming area					
Price too low					
No buyers available					
Produced for home consumption					

12. Ability of the household to avail school materials and school fees

	5	4	3	2	1
Able					
Not able					

13. Capacity of a household in terms of meals per day

	5	4	3	2	1
Once a day					
Twice a day					
Three times and more					

14. Habitat status of the main house before and after

	5	4	3	2	1
Roof with Iron Sheet					
Roof with Tiles					
Walls with Cement blocks					
Wall with Baked Clay bricks					
Wall with Unbaked clay bricks					
Wall with Wood covered with mud					
Pavement with cement					
Pavement with Tiles					
Pavement with Bricks					
Pavement with Stones					
Pavement with soil					
Pavement with other					

15. Household Equipment before and after

	5	4	3	2	1
Access to Radio					
Access to Television					
Access to Mobile phone					
Access to Smartphone					
Access to Computer					
Access to computer with internet					
Using bike as Transport means					
Using Car as Transport means					
Using Motorcycle as Transport means					
Able to Buy Benches only					
Able to Chairs at home					
Able to buy beds					
Able to buy Mattress					
Unable to access any household equipment					

16. Challenges faced by of dairy farming

	5	4	3	2	1
Limited access to resources					
Climate change vulnerability					
Limited technical skills and knowledge					
Informal market of milk					
Poor animal nutrition and shortage of food					
Price of dairy products too high for a large part of the population					

Thank you for your cooperation!!!

Appendix 3: Cans for milk transportation and milk cooling tank provided by RDDP to Giramata Gatebe dairy Cooperative

Appendix 4: Butaro communal cowshed supported by RDDP

Appendix 5: Farmer Field School facilitators trained by RDDP to train other farmers