EFFECT OF RWANDA DAIRY DEVELOPMENT PROJECT ON FOOD SECURITY AND NUTRITION OF SMALL HOLDER DAIRY FARMERS IN RWANDA

(CASE STUDY OF GICUMBI DISTRICT)

IFAD PROJECT RESEARCH REPORT

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ACKNOWLEDGEMENT

ABBREVIATIONS AND ACRONYMS

BMI – Body Mass Index

CFSVA/NS Comprehensive Food Security and Vulnerability Analysis and Nutrition Survey

FANTA –Food and Nutrition Technical Assistance

FAO- Food and Agriculture Organization

FAOSTAT- Food and Agriculture Organization Statistical Database

FRAC - Food Research & Action Center

HFIAS –Household Food Insecurity Access Scale

IDF- International Dairy Federation

IFAD - International Fund for Agricultural Development

MCC- Milk Collection Centre

NFNP – National Food and Nutrition Policy

NFNSP - National Food and Nutrition Strategic Plan

NIS - National Institute of Statistics

NISR - National Institute of Statistics of Rwanda

RB COSOP-Result Based Country Strategic Opportunities Programme

RDDP - Rwanda Dairy Development Project

SDGs – Sustainable Development Goals

SUN- Scaling Up Nutrition

UNAID – United Nations Agency for International Development

WFP- World Food Programme

ABSTRACT

The prevalence of food insecurity and undernutrition remains issues of concern globally. About 18.7% are food insecure (WFP 2018) with 38% of children underfive years of age suffering from stunting (NISR 2015). Following reported number of designed interventions and strategies by the Rwanda government to address issues of poverty, food insecurity and malnutrition. In spite of this, food insecurity and undernutrition remains a challenge in Rwanda. Still in the quest for addressing these issues, was the Rwanda Dairy Development Project implemented. This study therefore aims to assess effect of RDDP on Food Security and Nutrition of Smallholder Dairy Farmers in Rwanda (case study of Gicumbi district).

A descriptive cross sectional design was adopted for the study. A total of 445 respondents were studied. The HFIAS survey tool was used to measure severity of food insecurity at household level; nutritional status of adult women (aged 18-45years) was determined through their BMI and dietary diversity score. Also, qualitative data were collected using Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) with members of L-FFS cooperatives. Data analytical methods utilized include descriptive statistics such as charts, frequency tables and chi square test.

Findings of food insecurity among dairy farmers in the study area shows that 39% of them are moderately food insecure; 38% are food secure, 15% are mildly food insecure while 8% are severely food insecure. Larger percent of the farmers in the study area are beneficiaries of the RDDP (76%) and they also partake in the L-FSS. There was a significant between RDDP beneficiary status and food security (p < 0.001); 46% of RDDP beneficiaries are food secure, while only 10% of RDDP non-beneficiaries are food secure. The result obtained from the dietary diversity showed that almost all of the participants (98%) consumed grain, white roots tubers and plantain within the previous 24-hours however, the test of association between the farmers' 24-hours dietary diversity and the RDDP indices showed no association between dietary diversity group and RDDP beneficiary status.

CHAPTER ONE

Introduction

1.1 Background of the Study

Food is fundamental to human existence; it is one basic component man needs for nourishment, healthy growth and development of the body hence, effective management of food and nutrition are key to good health. Nutrients are embedded in food and enrishes the body cells in order to enable them to carry out their physiological functions of growth, reproduction and repair (Claude, 2017). However, in spite of effort and vast resources devoted to providing food for its people by governments around the world, the problem of food insecurity and undernutrition appears to be seemingly intractable. Especially in developing countries - poverty, increasing population, war, climate change and political instability are causes of food insecurity (Ubosi, 2015). Crises of chronic food insecurity occur as a result of perpetual inadequate diet resulting from the lack of resources to produce or acquire food. (Eme and Uche 2014).

Annual dairy contribution of milk production to global economy across the world in 2017 amounts to 824,801tonnes and 842,989 tonnes in 2018 with a notable incremental difference of 2.2% (FAO 2019). Milk is a vital source of food for people (Muehlhoff et al., 2013); it is a major source of income depended upon by smallholder farmers for livelihood. Generally, dairy farming encourages milk consumption (among dairy farmers and non dairy farmers); it has the capacity to generate income, improve crop yield through use of cow dung as manure and can provide chain of opportunities for people if promoted. It is therefore a spotlight that shouldn't be overlooked for its capacity to improve farmers' food security and nutrition. Good nutrition is one major strength for achieving sustainable development, it has the stimulating ability to enforce the changes needed for a more sustainable and prosperous future (FAO, 2018). The goal 2 of the Sustainable Development Goals (SDGs) by the United Nations was to "end Hunger, achieve food security, improve nutrition and promote sustainable agriculture by 2030. Its target aims to ensure access to qualitative food by all people, in particular the poor and vulnerable, including infants, all year round. The heart of agenda 2030 for sustainable development is man; having its developmental focus on people, planet, prosperity, peace and partnership, the sustainable development can only be achieved with healthy people to live it.

1.2 Problem Statement

In the face of the remarkable progress in development of the dairy sector in the country, significant challenges still remain. Poverty is mostly a rural phenomenon in the country; the incidence of poverty in rural areas is estimated at 43% compared to 22% in urban areas. About 62% of the Rwandan population lives less than US$1.25 per day (USAID 2017) which amounts to 1,150 RWF. This renders them vulnerable to common poverty related crises such as lack of access to food, education and health services.

Household food insecurity and under-nutrition also remains a challenge. Over a third of the Rwandan population experiences food insecurity, with malnutrition of about 38% (WFP 2018), 38% of children under 5 years are stunted and 2% suffer from acute malnutrition. Children at or below 23 months stands the risk of stunting, 40% percent of rural children are stunted, as compared with 24 percent of urban children.

In the light of the incidences of increased poverty in rural regions of Rwanda as well as several literatures reporting the multiplicity of government's intervention in the productivity of milk, the growth pace of the sector is yet slow. It is against this backdrop that this study seeks to examine the effect of Rwanda Dairy Development Project on food security and nutrition of smallholder dairy farmers in Gicumbi district.

1.3 Justification of the Study

Poverty is a common phenomenon among poor rural households with small portion of land; this group is also the most food insecure; at the same time, most of the Rwandan population is engaged in subsistence farming (IFAD 2016). Poor farming households are likely to depend on income from dairy for food and other basic needs; consequently, their access to food and adequate nutrition is hinged on the returns of the occupation. They are predisposed to hunger and malnutrition if productivity level remains low or falls. Hence, it is imperative to examine the RDDP program in Rwanda and its role in reduction of food insecurity and undernutrition among dairy farmers.

1.4 Research questions

The study will provide answers to the following research questions

1. What is the level of household food security among the dairy farmers in Gicumbi district?

2. What is the level of dairy farmers' participation in RDDP program in Gicumbi district?

3. What is the effect of RDDP on food security of dairy Farmers in Gicumbi district?

4. What is the effect of RDDP on nutrition of dairy farmers in Gicumbi district?

1.5 Broad Objective

i. This project aims to assess the effect of RDDP intervention on food security and nutrition of smallholder dairy farmers in Gicumbi district, Rwanda.

1.6 Specific Objectives

ii. To determine household food security among Dairy Farmers in Gicumbi district, Rwanda.

iii. To determine the level of participation in RDDP program among dairy farmers in Gicumbi district, Rwanda.

iv. To determine the effect of RDDP on household food security of dairy Farmers in Gicumbi district, Rwanda.

v. To determine the effect of RDDP on the nutritional status of dairy Farmers in Gicumbi district, Rwanda.

CHAPTER TWO

Literature Review

2.1 The Concepts: Food security and Nutrition

Food security and nutrition are related concepts; despite the nexus between them, the enhancement of one does not verify same of the other. The journal for Rwanda National Food and Nutrition Policy 2014, revealed that poor nutrition can occur regardless of household food security in certain circumstances such as household ability to acquire enough food, household resource for enough food can be used to meet other needs and allocation of the food within the household does not take into account the needs of each member. According to (FAO 2000), Food Security is achieved when it is ensured that "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life". This definition has widely established the four pillars of food security: availability, accessibility, utilization and stability.

Components of food security includes; food availability, access, and utilization, Herwig H., (2000). Availability refers to the physical existence of food, be it from own production, purchase from markets or from transfer. Riely, F. and Mock N., (1995) elaborates that food access is ensured when all households and all individuals within those households have sufficient resources to obtain appropriate foods for a nutritious diet. Access to food is a function of the physical, social and economic environment which determines how effectively households are able to utilize their resources to meet their food security objectives. If changes such as harsh climatic condition, political instability or even war occur, this may seriously disrupt production potential or inflow of income; and on the long run, limit availability and food access to affected households. These shocks not only affect households' access to food temporally but often lead to the loss of productive assets such as livestock. They also have severe implications for the future productive potential of households and, in turn, their long-term food security.

Undernutrition is the outcome of insufficient dietary intake and insufficient dietary intake is caused by household food insecurity, lack of clean water, lack of knowledge on good sanitation, and lack of alternative sources of income (Ubosi 2015) this could lead to hunger as individual households may not be able to meet their dietary consumption needs thus rendering them food insecure on the long run.

2.2 Global Incidence of Food Security and Nutrition

Food Insecurity and Malnutrition hasn't ceased from becoming one of the most subject of discuss globally. Till today, Africa is still caught in the struggle of severe food insecurity and undernutrition with estimate of undernourished to be one-third of the population of Eastern Africa (FAO and OECD 2018). Every age group is threatened with malnutrition and caught up with it if appropriate measures are not taken. However, most vulnerable groups are women and children in some forms of malnutrition.

In the Global Nutrition Report 2018, it was reported that through Africa and North America; 20 million babies are born of low birth weight each year, 150.8 million children under five years of age are stunted, 50.5 million are wasted, and 38.3 million are overweight with about 88% women to be overweight in 124 countries. FAO 2010 states that out of 240million people in sub-Saharan Africa one in four people lack adequate food for healthy and active life, similarly Tewodros and Fikadu (2014) found that 62 % of households in Ethiopia were food insecure as incidents of poverty and malnutrition remain alarming in Rwanda with 16% of the population living in extreme poverty and 38% of children under age 5 suffering from stunting (NISR 2015)

2.2Food Security and Nutrition Strategy in Rwanda

The Rwanda Government in the quest for suppressing food insecurity and under nutrition has set up several policies directed towards Economic Development and Poverty Reduction Strategy Agricultural Transformation, Environment and Natural Resources, the Forestry, Elimination of Malnutrition among others. The key nutrition policies and programs related to food security and nutrition are the Rwanda National Food and Nutrition Policy (NFNP) and the National Food and Nutrition Strategic Plan (NFNSP). The seven main strategic directions of National Food and Nutrition Strategic Plan of Rwanda (2013-2018) are;

1. Sustaining and prioritizing the position of food and nutrition.
2. Prevention of Stunting in children under two years of age.
3. Promoting household food security.
4. Preventing and managing all forms of malnutrition.
5. Enhancing food and nutrition education in schools.
6. Strengthening preparedness and response for food security disasters of individuals and households.

7. Improving governance system on food security and nutrition activities and services.

2.3 Contribution of Dairy Sector to Food Security and Nutrition

Compared to commercial dairy farming, smallholder dairy farming contributes largely to economic productivity (Hill 2017). Although small, the sector plays a vital role in providing milk and milk products such as cheese, ice cream, yogurt and butter hence, providing food, income and employment opportunity for people (FAO 2013). Therefore, investing in small scale dairy farming is giving people access to food and livelihood opportunities.

The dairy sector has the potential to reduce micronutrient deficiency, malnutrition through promotion of milk consumption. The national dairy strategy for Rwanda is saddled with the vision to developing a competitive dairy sector that provides quality dairy products which are affordable, available, and accessible to all Rwandans and other consumers in the region. In tandem with this resolution was the implementation of the Rwanda Dairy Development Project (RDDP) aimed at developing the dairy value chain; by improving cattle productivity, milk quality and processing capacity of the dairy industry, increasing smallholder dairy farmer incomes, food security and nutrition (IFAD, 2016).

CHAPTER THREE

Research Methodology

3.1 Study Design

This study adopted the descriptive survey research design of the cross-sectional type as it aimed at assessing the effect of RDDP on food security and nutrition of small holder dairy farmers in Rwanda (case study of Gicumbi district). The choice of descriptive design was to afford the researcher, opportunity to critically and objectively describe the state of the concerned variables in the study as obtainable in Rwanda.

3.2 Participants

The participants of this study were households of dairy farmers in Rutare, Bukure and Mutete sectors in Gicumbi district, who are either beneficiaries or non beneficiaries of the RDDP.

3.3 Locations and Period

The study was carried out in Gicumbi district in Northern Province, Rwanda. Reported from the design report of RDDP (2016); the Northern and Southern Provinces are found to be regions that are food insecure with an estimate of 46.2% and 45.3% respectively. More so, the Northern Province has the highest poverty rate, with Gicumbi district taking the highest percentage of 55% among the selected IFAD project area. Hence, the location was selected as it will allow the study to assess the effect of the program on the food security status and nutrition of dairy farmers. The study period was from August 2019 to October 2019.

Figure 1. Map of Gicumbi District Showing the three Study Area

Source: memoireonline.com

3.4 Sample Size Determination
For populations that are large, Fishers (1935) developed the equation to yield a representative sample for proportions

$$n = \frac{Z^2 pq}{d^2}$$

$W = constant = 1.96$

$n = minimum\ sample\ size$

$d = error\ tolerance\ 5\% = 0.05$

$p = prevalence$ (approximately 50% prevalence of food insecurity and malnutrition was used)

$q = 1 - p$

$$n = \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.05)^2}$$

Minimum sample size derived = 384

3.5 Sample and Sampling Technique

From the 12 projects area wherein the Rwanda Dairy Development Project was executed, purposive sampling was used to select Gicumbi district. The justification for selecting this district was on the fact that, among the 3 sectors of the project's target area in the North which are; Gicumbi, Burera and Musanze; Gicumbi happens to be the district with highest number of population and households. Furthermore, to ensure fairness in all sectors having equal chances of being selected, probability random sampling was used to select three sectors (Rutare, Bukure and Mutete) out of the 21 in the district which was done through balloting. Thereafter, simple random sampling was used to select households in the three sectors. At the end of the selection, 149, households in Rutare, 147 in Bukure and 149 in Mutete were used for the study.

3.6 Data Collection

The mixed method approach of the triangulation type was employed in gathering data for this study. This made it possible to make use of both the qualitative and quantitative instruments to elicit necessary information from respondents. A questionnaire was administered at household level; Focus Group Discussion (FGD) was scheduled with members of L-FFS cooperative while Key Informant Interview Schedule (KIIS) was used to collect information from notable informants. Administered questionnaire contained;

- Socio demographic characteristics of respondents
- Participation of farmers in RDDP
- Household food insecurity access scale
- Anthropometry Measurements
- 24 hr dietary recall

The tools used to collect anthropometric measurements of respondents were;

- A bathroom scale for measuring weight
- A locally designed stadiometer for measuring height (meter rule)

3.7 Inclusion and exclusion Criteria

Generally, dairy farmers' households of beneficiaries and non beneficiaries were included in this study representatives in charge of food preparation in the household were also included. However nutritional assessment will exclude adult male household heads while it focuses primarily on women within childbearing age in the households

3.8 Quality assessment

The study engaged experienced people who are familiar with the terrain. A team of 6 enumerators with two from each sector, who understood English were trained to help administer questionnaire at household level and assist in translation in case of language barrier; they were also required to give progress report at each day after the data collection for monitoring and guidance if need be.

3.9 Ethical Issues

Permission was obtained from Ministry of Agriculture and Natural Resources, Gicumbi district and local authorities at sectoral level before administering questionnaires to the respondents at household level. Introductory letter was also drafted and submitted at appropriate quarters. In order to ensure the cooperation of respondents to a larger extent, the cooperative leader or L-FFS facilitator assisted in addressing members of cooperative in a meeting before group interview.

3.10 Data Analysis

The Household food security was analysed using the HFIAS developed by FANTA. The scale contains nine questions categorized as occurrence questions with four responses (never, rarely, sometimes and often) to measure the frequency of occurrence coded from 0 to 3. Level of participation in RDDP was analysed using descriptive statistics such as frequencies tables and percentages. Nutritional status was determined using MDD-W and anthropometric. BMI of respondents were determined. The Body Mass Index is one of the anthropometric measures; it is a simple index of weight and height used to classify underweight, overweight and obesity given as weight in kilograms divided by the square of the height in meters as represented as

$$BMI = \frac{Weight\ (Kg)}{Height^2\ (m^2)}$$

The W.H.O classification of BMI was adopted for this study is given as; underweight<18.5 normal range 18.5- 24.9, overweight 25.0- 29.9, obesity≥ 30.0.

The MDD-W was developed as a proxy indicator to reflect the micronutrient adequacy of women's diets with divers food items classified into ten groups. Food consumed were extracted from 24 hr dietary recall questions and classified into 10 food groups, which is recommended by FAO for the calculation of MDD-W. One is recorded to each food group that is consumed and the scores are thereafter totaled to get the dietary diversity score of the woman.

Table 1. Analysis of Objectives

S/N	Research Objectives	Data Required	Method of Analytical
1.	To determine Household Food Security among Dairy Farmers in Gicumbi District, Rwanda.	Occurrence questions and frequency of occurrence.	Descriptive statistics (frequency and percentages) on the Household food insecurity Access Scale (HFIAS).
2.	To determine the level of participation in RDDP program among Dairy Farmers in Gicumbi District, Rwanda.	Participation of small holder farmers in the RDDP.	Descriptive statistics such as frequencies tables and percentages.
3.	To determine the effect of RDDP on Household Food Security of Dairy Farmers in Gicumbi District, Rwanda.	Socio-Demographic Characteristics of respondents such as age, gender, marital status, food security of the household.	Chi-square test
4.	To determine the effect of RDDP on nutrition of Dairy Farmers in Gicumbi District, Rwanda.	Dietary intake: Quantity of food consumed Anthropometric measures: Weight and Height.	Chi-square test

CHAPTER FOUR

Analysis and Discussion

4.1 Socio-demographics of Respondents

The socio-demographic distribution of the dairy farmers enumerated in the Gicumbi district of Rwanda is presented on Table 2. It was found that more of the farmers were male than females, two-thirds (66%) and about one-third (34%) respectively. The mean age farmers was about 47 years; classification of the age record showed that only around 5% were below age of 30 years, almost 23% were aged 30 – 39 years, almost one-third (34%) were aged 40 – 49 years, about a quarter (25%) were aged 50 – 59 years, while only 13% were aged 60 years or more.

Information on their level of education revealed that three-quarter (75%) had just the primary level of education, about 12% were non-formal, 10% had secondary education, while a similar proportion (1%) had the tertiary education and vocational training

The distribution of their household size revealed that about 17% had a household of 1 – 3 persons, about 63% had household of 4 – 6 persons, while 20% had 7 or more persons in their household.

Most of the farmers had their household headed by a male person 71%, about 15% reported having a female household head, while a few (14%) did not specify who was head of their household.

Results on Marital Status of Respondents revealed many of the farmers (81%) were married, as at time of the study, 13% were widowed, 2% reported been departed from their partners, while 4% were single.

Table 2. Socio-demographics of respondents

	Frequency (n = 445)	Percentage
Gender		
Male	295	66.3
Female	150	33.7
Age group [46.8 ± 11.5]		
Below 30 years	22	4.9
30 – 39 years	101	22.7
40 – 49 years	151	33.9
50 – 59 years	112	25.2
60 or more years	59	13.3
Household Size		
1 – 3 persons	75	16.9
4 – 6 persons	281	63.1
7 or more	89	20.0
Household head		
Male	318	71.5
Female	66	14.8
Non-response	61	13.7
Level of Education		
Non-formal	55	12.4
Primary	332	74.6
Secondary	46	10.3
Tertiary	6	1.3
Vocational training	6	1.3
Marital status		
Single	19	4.3
Married	361	81.1
Widow	57	12.8
Separated	8	1.8

Source: Field Survey, 2019

4.2 Food Security Level of Respondents

Generally 38% are food secure, 15% are mildly food insecure, 39% are moderately food insecure while 8% are severely food insecure as displayed on Figure 2. Using the nine indices for measuring food insecurity scale, result shows that over the past four weeks, about two-thirds of the participants (66%) did not experience worry about not having enough food in the past four weeks preceding the study, slightly more than a half of the participants (55%) confirmed they had the experience of not eating the preferred kind of food, as caused by lack of resources and exactly half of the participants (50%) reported they had not at any time in the past four weeks ate a limited variety of food due to lack of resources. Result is given in table 3 and table 4 below

Figure 2. Outcome of Household Food Insecurity Access Scale
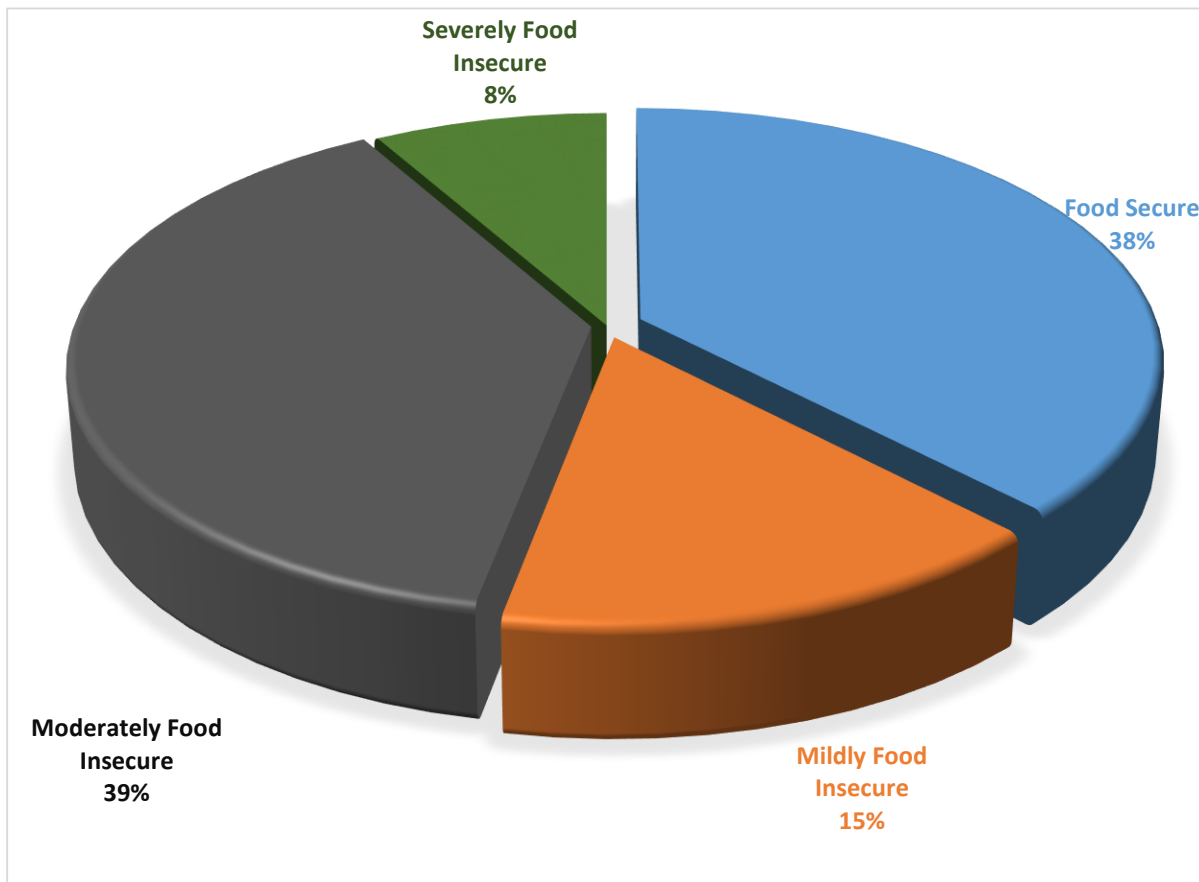
Source: Field Survey, 2019

Table 3. Information on Household Food Insecurity Access

	Frequency (n = 445)	Percentage
Worry about not having enough food		
Not at all	294	66.1
Rarely	137	30.8
Sometimes	14	3.1
Inability to eat the preferred kind of food due to lack of resources		
Not at all	244	54.8
Rarely	139	31.2
Sometimes	59	13.3
Often	3	0.7
Ate limited variety of food due to lack of resources		
Not at all	224	50.3
Rarely	185	41.6
Sometimes	29	6.5
Often	7	1.6
Ate foods that you did not want to due to lack of resources		
Not at all	250	56.2
Rarely	126	28.3
Sometimes	64	14.4
Often	5	1.1
Ate smaller meal than you felt you needed due to insufficiency		
Not at all	283	63.6
Rarely	112	25.2
Sometimes	44	9.9
Often	6	1.3
Ate fewer meals/skipped meals in a day due to insufficiency		
Not at all	403	90.6
Rarely	38	8.5
Sometimes	4	0.9
Unavailability of food in household due to lack of resources		
Not at all	422	94.8
Rarely	22	4.9
Sometimes	1	0.3

Source: Field Survey, 2019

Table 4. Information on Household Food Insecurity Access (2)

	Frequency (n = 445)	Percentage
Slept hungry due to lack of enough food		
Not at all	427	96.0
Rarely	18	4.0
Went the whole day and night without eating due to lack of food		
Not at all	437	98.2
Rarely	7	1.6
Sometimes	1	0.2

Source: Field Survey, 2019

4.3 Participation of Respondents in RDDP

RDDP Beneficiary Status

Almost three-quarter (76%) of the enumerated farmers had benefitted from the Rwanda Dairy Development Project (RDDP), while the remaining quarter (24%) are not yet beneficiaries of RDDP. The study also revealed that, averagely, an RDDP farmer had been a member for about 18 months prior the study; about 3% were in their first three months of been an RDDP member, 13% had spent between half a year and one year, about 16% had spent over a year but not more than one and half year, 25% had spent up to two years as RDDP members, while others were unable to recall how long they had been in RDDP.

About three-quarter (75%) of the dairy farmers generally were members of an association of cooperative. A little more than a quarter (27%) confirmed having had access to credit or loan. The result also showed that, among the 339 RDDP beneficiaries, not more than 15% had received an RDDP grants. From the 289 RDDP beneficiaries who had not received a grant; it was found out that many of them were at the stage where their business plan or grant is undergoing an approval, 3% were at the stage of having a signed contract with RDDP, while 7% did not explicitly indicate what stage of the grant processing they were. Exclusive to the 339 RDDP farmers, a little above the three-quarter of the RDDP beneficiaries (68%) affirmed RDDP had enabled them access to health service such as payment of health insurance.

Table 5. Information on participation in RDDP

	Frequency (n = 445)	Percentage
Major Source of Income		
Dairy	267	60.0
Staple crops (E.g. Maize)	172	38.7
Cash crops (coffee & tea)	6	1.3
RDDP Beneficiary Status		
RDDP Beneficiary	339	76.2
RDDP Non-beneficiary	106	23.8
Duration of RDDP Membership (n = 339)		
$[\mathbf{18.3 \pm 5.8}]$		
1 – 6 months	10	2.9
7 – 12 months	44	13.0
13 – 18 months	56	16.5
19 –24 months	85	25.0
Can't recall	144	42.5
Member of Association/Cooperative		
Member	336	75.5
Non-member	109	24.5
Access to Credit/Loan		
Yes	122	27.4
No	323	72.6
Awareness of RDDP Grants		
Yes	339	76.2
No	106	23.8
RDDP Grant Beneficiary (n = 339)		
Yes	50	14.7
No	289	85.3
Stage of Grant Processing (n = 289)		
Approved business plan/grant	258	89.6
Signed contract	9	3.1
Non-response	22	7.3
RDDP enabled health services/health insurance (n = 339)		
Yes	229	67.6

Source: Field Survey, 2019

4.4.1 Members of Livestock Farmers Feed School (LFFS)

The L-FFS training is given to the dairy farmers through a cooperative. The farmers are trained on forage seeds, gender roles at household and group levels, artificial insemination, nutrition, animal husbandry and vaccination. The study revealed that almost three-quarter were members of the Livestock Farmer Field School (LFFS); a similar proportion of the dairy farmers indicated they were aware of the RDDP grants, irrespective of being an RDDP beneficiary or non-beneficiary. As indicated in figure 4, majority of the farmers had received training on how to get the forage seeds (82%) exactly half of the farmers reported having trained on use of vaccines for their cows, other training were also received. However, some farmers were privileged to benefit from training on different practices. This finding corresponds with information gotten from cooperatives in the three sectors (Rutare, Bukure and Mutete) as majority of the farmers indicated that they were beneficiaries of training on forage and forage seeds production which serve as feeds for their cows.

Figure 3. Members of LFFS
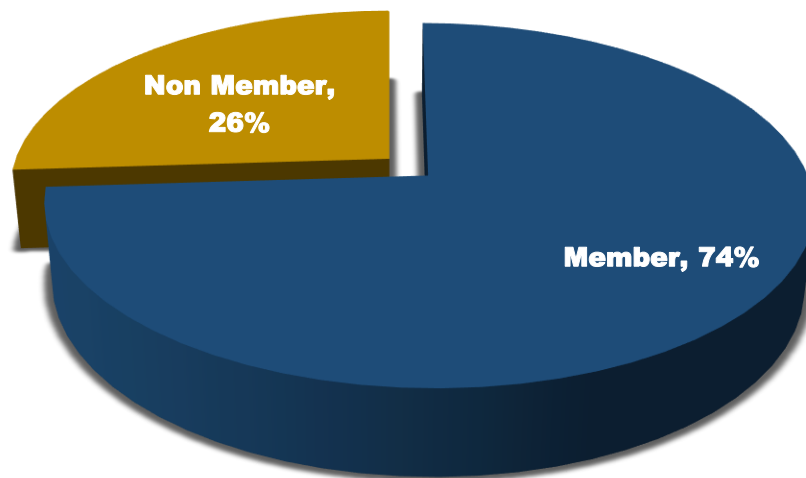
Source: Field Survey, 2019

Figure 4. Training Benefitted from L-FFS

Percentage of Training Beneffited from L-FFS

Cow/Heifer Husbandry 10%, Human Nutrition Training 12%, Semen/Artificial... 15%, Gender Training 18%, Vaccines 50%, Forage Seeds 82%
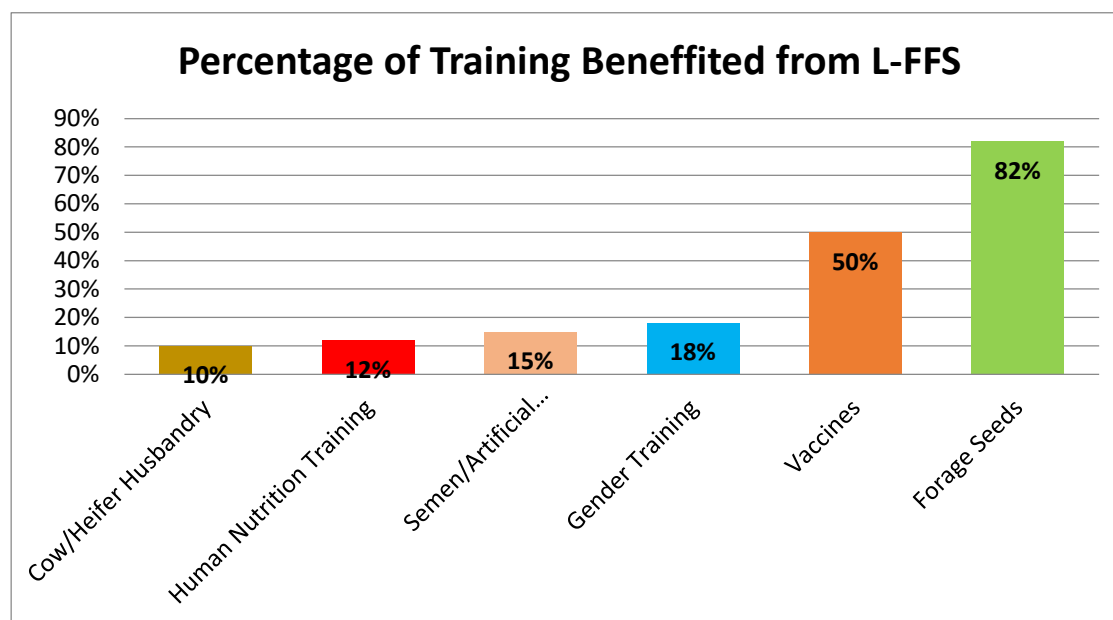
Source: Field Survey, 2019

Table 6 below represents common reasons for not having joined the L-FFS by the dairy farmers; given reasons were lack of awareness or information about LFFS, waiting for outcome after application; L-FFS not implemented around some location, not being an RDDP beneficiary and lack of interest in LFFS while 1% of respondents has a disability and others didn't specify any reason for not joining the L-FFS.

Table 6. Reasons for not joining the Livestock Farmer Field School

Reasons for not joining LFFS	Frequency (n = 115)	Percentage
No reason	13	11.3
Has a disability	1	0.9
Not interested	2	1.7
Not an RDDP beneficiary	2	1.7
Not implemented around location	19	16.5
Applied, but waiting for outcome	30	26.1
Not aware/Lack of information about LFFS	48	41.7

Source: Field Survey, 2019

4.4.2 Cow Ownership, Production, and Sales Income Level of Participants

Before the start of the Rwanda Dairy Development Project (RDDP) an average dairy farmer had not more than 2 cows – cumulatively as local and improved breeds; the highest number of cows by any of the farmers recorded were 8 cows. Since the inception of RDDP, each of the RDDP beneficiaries owned about 2 cows averagely, with the greatest number of cows as 8 cows; for non-RDDP beneficiaries, the highest number of cows owned had dropped to 6 cows.

Before RDDP averagely, each of the current RDDP beneficiaries averaged 8 liters of milk production per day, while since joining RDDP, the average production had rose to 10 liters per farmer; the test of significant difference between their production levels revealed that a difference exists in production before and since joining RDDP ($p < 0.001$). Meanwhile production level of dairy farmers who did not join the RDDP since its inception averaged about 9 liters per farmer.

A statistically significant difference was found between sales of milk before and during RDDP for the farmers in the two categories – those currently benefitting from RDDP and those who had never benefitted ($p < 0.001$). Each of the current beneficiaries averaged 6 liters and 8 liters of dairy sales before and during RDDP; while non beneficiaries of the project had an average of 5 liter and 7 liters of dairy sales before and during RDDP respectively.

Analysis of the income level from dairy production before and during RDDP revealed that, prior RDDP each of the farmer averaged about 25,000 RWF per month. However, since the inception of RDDP, there was an incremental shift from previous income level of beneficiaries compared to income level of non beneficiaries ($p < 0.001$). These improvements attained by beneficiaries can be attributed to trainings and support services offered by the project which is confirmed from interview with the coordinator of MCC at Bukure; Mr Mutsindashyaka John stated that the MCC collect milk from the farmers and pay them twice a month for the milk collected. Further confirmation was from L-FFS facilitator at Mutete sector who reported that milk produced by members of the cooperative is taken to MCC with a bicycle.

Table 7. Cows Owned Before and During RDDP

	Min.	Max.	Average	25th Percentile	75th Percentile
RDDP Beneficiary					
Cows owned before RDDP	1	8	2	1	3
Cows owned during RDDP	1	8	2	1	3
RDDP Non-Beneficiary					
Cows owned before RDDP	1	8	2	2	3
Cows owned during RDDP	1	6	2.5	2	4

Source: Field Survey, 2019

Table 8. Daily Dairy Production Before and During RDDP

	Min.	Max.	Average	25th Percentile	75th Percentile	p-value
RDDP Beneficiary						
Production before RDDP (*liters*)	1	35	8	5	10	< 0.001
Production during RDDP (*liters*)	1	40	10	7	14	
RDDP Non-Beneficiary						
Production before RDDP (*liters*)	1	40	8	6	10	< 0.001
Production during RDDP (*liters*)	3	25	9	7	13	

Source: Field Survey, 2019

Table 9. Daily Dairy Sales Before and During RDDP

	Min.	Max.	Average	25th Percentile	75th Percentile	p-value
RDDP Beneficiary						
Daily sales before RDDP (*liters*)	2	30	6	4	8	
Daily sales during RDDP (*liters*)	1.5	30	8	5	12	< 0.001
RDDP Non-Beneficiary						
Daily sales before RDDP (*liters*)	2	30	5	4	7	
Daily sales during RDDP (*liters*)	3	20	7	5	10	< 0.001

Source: Field Survey, 2019

Table 10. Monthly Income Before and During RDDP

	Min.	Max.	Average	25th Percentile	75th Percentile	p-value
RDDP Beneficiary						
Monthly production before RDDP (*RWF*)	1,800	112,500	25,200	18,000	36,000	
Monthly production during RDDP (*RWF*)	4,800	178,500	38,000	25,500	57,600	< 0.001
RDDP Non-Beneficiary						
Monthly production before RDDP (*RWF*)	9,000	126,000	25,500	18,000	36,000	
Monthly production during RDDP (*RWF*)	14,400	108,000	37,800	27,000	52,650	< 0.001

Source: Field Survey, 2019

Table 11. Difference in monthly income during RDDP

		Average Income (*RWF*)	p-value
Main Source of Income	Dairy	44,100	< 0.001
	Staple crops	30,600	
	Cash crops	72,000	
Duration with RDDP	1 – 6 months	28,400	< 0.001
	7 – 12 months	39,600	
	13 – 18 months	25,500	
	19 – 24 months	53,500	
Household Food Insecurity Access	Food secure	40,800	0.001
	Mild Food Insecurity	29,300	
	Moderate Food Insecurity	30,600	
	Severe Food Insecurity	32,100	

Source: Field Survey, 2019

4.5 Effect of RDDP on Food Security of Respondents

Test of association between some RDDP indices and food security was carried out. A significant association was observed between RDDP beneficiary status and food security ($p < 0.001$); notable was that, close to half of the RDDP beneficiaries (46%) were food secured, while only 10% of those who were RDDP non-beneficiaries belonged to the same category; majority of the RDDP non-beneficiaries had experienced moderate food insecurity (51%). RDDP grant status was also associated with food security levels of the farmers ($p = 0.038$) as given in the table below.

Table 12. Relationship between RDDP indices and food security

	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity	Chi-Square (p-values)
RDDP Beneficiary Status					
RDDP Beneficiary	157 (46.3%)	38 (11.2%)	118 (34.8%)	26 (7.7%)	< 0.001
RDDP Non-beneficiary	11 (10.4%)	30 (28.3%)	54 (50.9%)	11 (10.4%)	
RDDP Grant Beneficiary					
Yes	17 (34%)	8 (16%)	17 (34%)	8 (16%)	0.038
No	134 (48.6%)	29 (10.5%)	96 (34.8%)	17 (6.2%)	

Source: Field Survey, 2019

4.6 Effect of RDDP on Nutritional Status of Respondents

4.6.1 BMI Women in Dairy Farmers' Household

Figure 5 shows the BMI of women of child bearing age in farmers' households. Test of association between the RDDP indices and the BMI categories revealed RDDP beneficiary status not to be statistically related with BMI category (p = 0.056); RDDP grant beneficiary status was also not statistically associated with BMI category (p = 0.411); It was discovered that most women in dairy farmers' household had a normal BMI level, irrespective of farmer's RDDP beneficiary status and RDDP grant status. This finding could be attributed to environment, household income level and amount, and type of food they consume that could possibly influence body weight (APPG 2018).

Figure 5. BMI Categories by Farmers' RDDP Status
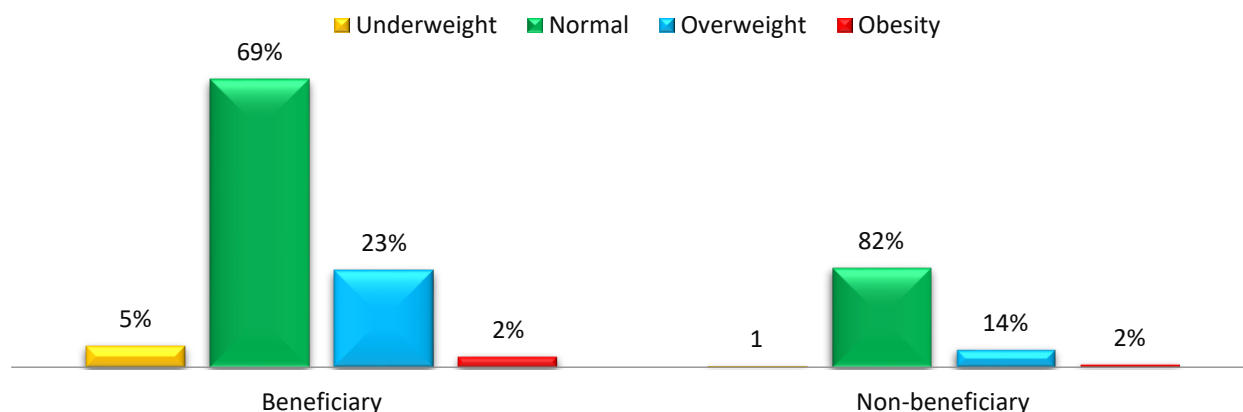
Source: Field Survey, 2019

Table 13. Relationship between RDDP indices and BMI of Adult Women in Dairy Farmer's Household

	Underweight	Normal	Overweight	Obesity	Chi-Square (p-values)
RDDP Beneficiary Status					
RDDP Beneficiary	17 (5.1%)	232 (69.3%)	78 (23.3%)	8 (2.4%)	0.056
RDDP Non-beneficiary	1 (1.0%)	80 (82.5%)	14 (14.4%)	2 (2.1%)	
RDDP Grant Beneficiary					
Yes	2 (4.1%)	30 (61.2%)	16 (32.7%)	1 (2.0%)	0.411
No	15 (5.5%)	192 (70.3%)	59 (21.6%)	8 (2.5%)	
No	9 (4.4%)	142 (69.3%)	49 (23.9%)	5 (2.4%)	

Source: Field Survey, 2019

4.6.2 Dietary Diversity Score of Adult Women in Dairy Farmers' Household

The result obtained from the dietary diversity showed that almost all of the participants (98%) consumed grain, white roots tubers and plantain within the previous 24-hours; about 88% consumed foods in the pulse category; 52% consumed dairy. About a quarter consumed foods in groups of other vegetables and dark green leafy vegetables 28% and 17% respectively; not more than 18% reported consumption of any of meat, poultry, and fish; 13% consumed other kinds of fruits, such as Mango, Orange, Pears and Watermelon; consumption of nuts and seeds was obtained from 13% of the participants; about 9% reported consumption of Vitamin A rich fruits and vegetables, like Carrot and Pepper; consumption of egg was not more than 1%.Taking counts of the number of the food groups each of the participant had consumed in the previous 24-hours; it was found that about 2% consumed food in just one of the aforementioned categories, 16% consumed foods in two different categories, one-third (33%) consumed foods in three different categories, 29% consumed foods in four diverse categories, 14% had consumed foods from five different categories, only about 4% consumed up to six or more groups of food.

Figure 6. Dietary Diversity Score of Respondents
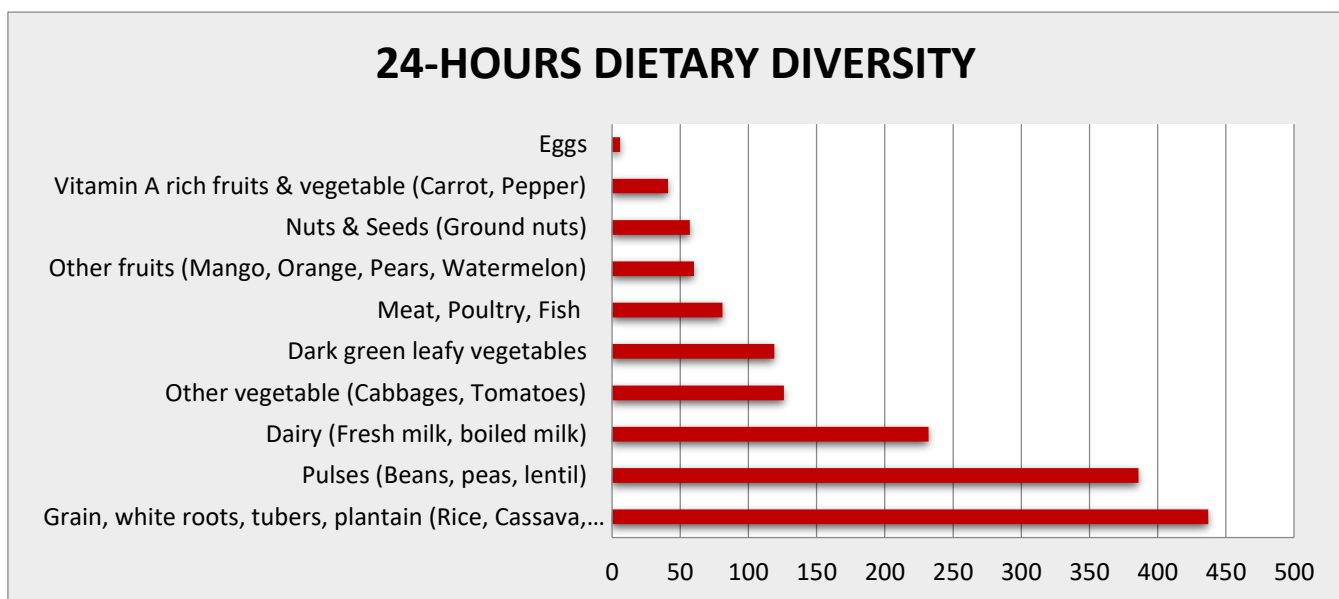
Field Survey, 2019

The test of association between the farmers' 24-hours dietary diversity and the RDDP indices showed no association exists between dietary diversity group and each of; RDDP beneficiary status (p = 0.621), RDDP grant status (p = 0.467). Regardless of the farmers RDDP status in

terms of being a member or having received RDDP grant, they generally had below recommended level of daily dietary consumption (1 – 4 groups of food consumed in the past 24-hours).

It was revealed from the study that larger proportion of women in dairy farmers' households fall below the average minimum adequate diet diversity score of 5 food groups given by FAO and FHI 360 (2016) irrespective of their participation in RDDP. Majority of them fall within the scores 3 to 4; this could be explained using the Rwandan food item (MINAGRI 2018), the report revealed Cassava to be the largest consumed food item by Rwandese, which was rated at 26.7%, following was beans (19.1%) while consumption of other food items fell below 10%.

Table 14. Relationship between RDDP indices and dietary diversity

	1 – 4 Groups	5 – 7 Groups	Chi-Square (p-values)
RDDP Beneficiary Status			
RDDP Beneficiary	276 (82.1%)	60 (17.9%)	
			0.621
RDDP Non-beneficiary	84 (80%)	21 (20%)	
RDDP Grant Beneficiary			
Yes	42 (85.7%)	7 (14.3%)	
			0.467
No	223 (81.4%)	51 (18.6%)	

Source: Field Survey, 2019

CHAPTER FIVE

Summary, Conclusion and Recommendation

5.1 Summary

The research assessed the level of participation, food security, and effect of RDDP on food security and nutritional status of small holder dairy farmers in Gicumbi district, Rwanda. A descriptive cross sectional design was adopted for the study. The HFIAS survey tool was used to measure severity of food insecurity at household level and nutritional status of respondents was determined through their BMI and dietary diversity score. Also, questionnaire was administered at household level; Focus Group Discussion (FGD) was scheduled with members of L-FFS cooperative and Key Informant Interview was also scheduled (KIIS) with notable individuals such as facilitators of L-FFS and coordinators of MCC. 445 dairy farmers' households who are either beneficiaries or non-beneficiaries of the RDDP were samples of the study.

Results for food insecurity access scale showed that 38% are food secure, 15% are mildly food insecure, 39% are moderately food insecure, while 8% are severely food insecure. About 76% of the respondents are beneficiaries of RDDP with other 24% revealed not have benefited from the project. Average duration of beneficiaries participating in RDDP was 18 months and they also partake in the L-FSS (74%). Trainings received from L-FFS were on cow husbandry (10%), human nutrition (12%), artificial insemination (15%), gender roles at household and group levels (18%), vaccination (50%) and forage seeds, and forage seeds (82%).

Significant association was observed between RDDP beneficiary status and food security ($p < 0.001$); a good number of RDDP beneficiaries (46%) are food secured, while only 10% of RDDP non-beneficiaries are food secure. Test of association between the RDDP indices and BMI of women of child bearing age revealed RDDP beneficiary status not to be statistically related with BMI category ($p = 0.056$); RDDP grant beneficiary status was also not statistically associated with BMI category ($p = 0.411$). Test of association between the farmers' 24-hours dietary diversity and the RDDP indices showed no association exists between dietary diversity group and RDDP beneficiary status ($p = 0.621$), RDDP grant status ($p = 0.467$).

5.2 Conclusion

Food is of primary importance to man; unavailability, lack of access and stability of food has the potential of inciting other health and life issues. A healthy and active life is characterized by its state of health. Smallholder dairy farming system would be less productive if it remains underdeveloped and as such, leaving the farmers incapacitated in assessing food due to poor productivity and low income. The aim of Rwanda Dairy Development Project (RDDP) has promising benefits to pro-poor smallholder dairy farmers, with its aim to improving the dairy sector for rural development, reducing poverty and enhancing food and nutrition security. Following the finding of the study on the effect of the project on food security and nutrition of dairy farmers in Gicumbi district; production, sales and income level of the beneficiaries has been enhanced through the project. This has led to their food insecurity meanwhile, nutritional status of the dairy farmers still calls for consideration as the BMI and Dietary diversity of respondents showed no association with the project.

5.3 Recommendation

In spite of the improvements of beneficiaries' food security status through their participation in the RDDP as revealed by the findings of the study, there is a need for further actions to be taken at the district level spreading across the country to address food and nutritional challenges for the sustainability of the project, some of which are;

- Intensification and strengthening of the L-FFS; The L-FFS has proven to be a medium for transmitting knowledge and skills to the farmers however, the initiative should be intensified. Inclusive training on human nutrition is recommended whereby the farmers are educated on dietary requirement, consumption and its implication on health and human development. Dairy farmers should also be encouraged to own a family poultry, grow and consume vegetables and fruits at household level with organized support and monitoring services.

- Further technological adoption such as vaccines, improved breeds should be supported and disseminated effectively among poor rural smallholder dairy farmers; Subsidy can as well be provided to encourage farmers in the adoption of improved technology. This would further increase the productivity and quality of milk produced and consumed.

- Platforms for intra and inter interaction between dairy farmers should be created and monitored, to strengthen relationship between beneficiaries and non beneficiaries to enhance rapid replication of technological improvement by non beneficiaries.

REFERENCES

APPG (2018). The current landscape of obesity services. www.obesityAPPG.com

Classification of Overweight and Obesity by BMI, Waist Circumference, and Associated Disease Risks (2012)

Coates et.al.(2007). Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide; Volume 3.

EME et. al. (2014). Challenges of Food Security in Nigeria: options before government. Arabian Journal of Business and Management Review (OMAN Chapter) Vol. 4, No.1; August. 2014

Fakayode S. B., Raji M.A.Y, Oni O. A., and Adeyemi M. O. (2009). An assessment of Food Security Situation of Farm HouseHolds in Nigeria. A USDA approach; The Social Sciences, 4(1):24-29

FAO and OECD (2018). Nutrition: Challenges for Agriculture and the Hidden Potential of Soil. CA0917EN/1/09.18

FAO (2017). Regional Overview of Food Security and Nutrition in Africa 2017. The food security and nutrition–conflict nexus: building resilience for food security, nutrition and peace. Accra

FAO and FHI 360. (2016). Minimum Dietary Diversity for Women: Guide for Measurement. Rome: FAO.

FAO, IFAD, UNICEF, WFP and WHO (2018).The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO

FAO Outlook (2016). FAO Bi-Annual Dairy Report, June 2016. Available from fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Dairy/Documents/ F_ Dairy_June_2016.pdf FAOSTAT (2016). faostat3.fao.org

FAO (2018), Dietary Assessment: A resource guide to method selection and application in low resource settings, Rome

FAO, IFAD, UNICEF, WFP and WHO. 2018. *The State of Food Security and Nutrition in the World 2018.Building climate resilience for food security and nutrition*. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO.

Foster J. Greer J. and Thorbecke E. (1984). A class of decomposable poverty measures; notes and comments. Econometrica, 53 (3): 761-765

Food and Nutrition Technical Assistance (FANTA) Project (2004) "Measuring Household Food Insecurity Workshop, April 15-16, 2004 Workshop Report." Washington, D.C: Food and Nutrition Technical Assistance Project, FHI 360, 2004

Global Nutrition Report (2018). Shining a light to spur action on nutrition

IDF (2015). The World Dairy Situation 2015. Bulletin of the International Dairy Federation 481/2015. ISSN 0250-5118

IFCN Dairy Report 2015. For a better understanding of the dairy world. www.ifcndairy.org/en/news/ DairyReport2015.php

IFAD 2016. Rwanda Dairy Development Project (RDDP), Detailed Design Report

J. P. Hill (2017). Assessing the overall impact of the dairy sector. http://dx.doi.org/10.19103/AS.2016.0005.43

Riely, F. and Mock N., (1995). Inventory of Food Security Impact Indicators. In: Food Security Indicators and Framework: A Handbook for Monitoring and Evaluation of Food Aid Programs.USAID, Food Security and Nutrition Monitoring Project (IMPACT) Publication. Virginia: Arlington

Sin-Ho- Jung (2014), Stratified Fisher's Exact Test and its Sample Size Calculation, Biom Journal;Volume 56(1):10.1002/bimj.201300048

Steinfeld, H., Monney, H. A., Schneider, F. and Neveille, L. E eds. 2010. Livestock in a changing landscape: Vol 1: Drivers, consequences and resources; Vol2: Experiences and regional perspectives

Mary Claud (2017). Malnutrition, definition, causes, indicators for assessment. A public nutrition perspective. Available on www.masterhdfs.org

MINAGRI (2018), Strategic Plan for Agriculture Transformation 2018-24, 77

National Institute of Statistics of Rwanda. (2016). Rwanda poverty profile report: integrated household living conditions survey 2013/2014. Kigali, Rwanda: NISR. (Available from: http://www.statistics.gov.rw/file/4135/download?token=cylGgLRl)

Per Pinstrup-Andersen (2009). Food security: definition and measurement.Springer Science Business Media B.V. & International Society for Plant Pathology.

Rwanda National Food and Nutrition Policy (2014). Ministry of Local Government January 2014 http://www.minaloc.gov.rw/ Ministry of Health http://www.moh.gov.rw/ Ministry of Agriculture and Animal Resources http://www.minagri.gov.rw/ Kigali: Republic of Rwanda

Stanley J. Ulijaszek and Deborah A. Kerr (1999), Anthropometric measurement error and the assessment of nutritional status. British Journal of Nutrition, vol. 82, Issue 3. Published online 09 March 2007

TewodrosTefera, and FikaduTefera (2014). "Determinants of Households Food Security and Coping Strategies for Food Shortfall in Mareko District, Guraghe Zone Southern Ethiopia." Journal of Food Security, vol. 2, no. 3 (2014): 92-99. doi: 10.12691/jfs-2-3-4.

Ubosi Nwanganga Ihuoma. Synergy of Poverty, Food Insecurity And Malnutrition IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) E-ISSN: 2319-2402,P- ISSN: 2319-2399.Volume 9, Issue 5 Ver. I (May. 2015), PP 35-40 www.Iosrjournals.org

United Nations. Transforming our World: The 2030 Agenda for Sustainable Development.

(Usaid, fanta, fhi, pepfar (2016). Nacs user's guide module 2, version 2nutrition assessment and classification may 2016

USAID. 2017. "Country Profile: Rwanda." https://feedthefuture.gov/country/rwanda

U.S. Dairy (2016) Sustainability Report. Available at US Dairy.com/Report

World Food Programme (2016), Comprehensive food security and vulnerability analysis, Rwanda Country Brief.

World Food Programme (2018), Rwanda Country Brief.

World Health Organization (2006), International Journal of Chronic Obstructive Pulmonary Disease (COPD), Influence of Diet and Obesity on Development and Outcomes. Available from: http://apps.who.int/bmi/index.jsp'.IntroPage=Intro-3.httml. Accessed December 6, 2013.

APPENDIX

A RESEARCH ON
EFFECT OF RWANDA DAIRY DEVELOPMENT PROJECT (RDDP) ON FOOD SECURITY AND NUTRITION OF SMALL HOLDER DAIRY FARMERS' HOUSEHOLD IN RWANDA
(CASE STUDY OF GICUMBI DISTRICT)

Dear Respondents, I am a researcher currently working on an International Food and Agricultural (IFAD) funded project which is the Rwanda Dairy Development Project with the aim of assessing Food Security and Nutrition of Small Holder Farmers in Rwanda. Please, kindly answer the following questions accordingly as all given information shall be handled with confidentiality. Thank you for your cooperation.

Please tick (√) where necessary and provide suggestions where required. Thank you.

I.D of Respondent:……………………………………………………………...…Questionnaire No:…………
Date:………………………………Name of Enumerator:…………………………………
GPS:Longitude:………… Latitude: …………… Altitude: ………District:……………..…Sector:…………..Village:
…………………..

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

	QUESTIONS/ STATEMENTS	RESPONSE			CODING
1	Gender of Respondent	Male [ ]			1
		Female [ ]			2
2.	Age of Respondent				
3.	What is your highest Educational qualification?	None [ ]			1
		Primary [ ]			2
		Secondary [ ]			3
		College/University degree [ ]			4
		Vocational			5
		Others, specify _____			6
4.	Marital Status	Single [ ]			1
		Married [ ]			2
		Widow [ ]			3
		Divorced [ ]			4
5.	Head of Household	Male [ ]			1
		Female [ ]			2
6.	Household Size		Male	Female	
		Total			

SECTION B: PARTICIPATION OF DAIRY FARMERS IN RDDP

1.	What is your **major** source of income	Rate by importance in the order **1,2,3**	
		Dairy [ ]	1
		Staple crops such as maize [ ]	2
		Cash crops such as coffee and tea [ ]	3
		Others, Specify _____	4
2.	Have you benefited or currently benefiting from the Rwanda Dairy Development Project?	Yes [ ]	1
		No [ ]	2
3.	How long have you been beneficiary of RDDP?	_____(Month/Year)	
4.	Member of Association/Cooperative	Yes [ ]	1

		No [ ]	2
5.	Access to credit/loan	Yes [ ] No [ ]	1 2
6.	**Type of financial institution:** • Microfinance	SACCO RIM Umutanguha Agaseke Urwego Opportunity Bank Unguka Duterimbere IMF Ltd Copedu Others, Specify _____	1 2 3 4 5 6 7 8 9 10
	• Commercial Banks	Bank of Kigali Equity bank Coge bank KCB bank Bank of Africa GTB Eco bank BPR I & M Others, Specify _____	1 2 3 4 5 6 7 8 9 10
7.	Are you a member of the L-FFS (Livestock Farmer Field School)?	Yes [ ] No [ ]	1 2
8.	If Yes, which of the following training did you benefit?	Vaccines [ ] Cow/Heifer Husbandry [ ] Gender Training [ ] Semen /Artificial Insemination [ ] Human Nutrition[ ] Forage Seeds [ ] Other, specify _____	1 2 3 4 5 6 7
9.	If No, why?		
10.	Are you aware of grants from the Rwanda Dairy Development Project to interested Dairy Farmers?	Yes [ ] No [ ]	1 2
11.	Have you received the RDDP grant?	Yes [ ] No [ ]	1 2
12.	If No, what stage of the process are you?	Approved business plan/grant [ ] Signed contract [ ]	1 2

13.	**Number of Cows before RDDP**		14.	**Number of Cows during RDDP (for the past two years)**		
	Local Breed	Improved Breed		Local breed	Improved breed	

	Male	Female	Male	female			Male	Female	Male	Female	
Total						**Total**					

14.	**Litres of Milk produced per day before RDDP**				15.	**Litres of Milk produced per day during RDDP**	
	Local		Improved			Local		Improved	
	Total					**Total**			

16.	How much do you make in a month from milk production before RDDP?	RWF	
17.	How much do you make in a month from milk production during RDDP?	RWF	
18.	How many litres of milk do you sell a day before RDDP?	LTRS	
19.	How many litres of milk do you sell a day during RDDP?	LTRS	
20.	At what price do you sell your milk per litre before RDDP?	RWF	
21.	At what price do you sell your milk per litre during RDDP?	RWF	
22.	Has RDDP enabled you to access health services such as payment of health insurance?	Yes [ ] No [ ]	
23.	If No, why?		

SECTION C:HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS)

	QUESTION	RESPONSE QUESTIONS	CODE
1.	In the past four weeks, did you worry that your household would not have enough food?	No (skip to Q2) [ ] Yes [ ]	1 2
1a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weks) [ ]	1 2 3
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	No (skip to Q3) [ ] Yes [ ]	1 2
2a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3

3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	No (skip to Q4) [ ] Yes [ ]	1 2
3a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	No (skip to Q5) [ ] Yes [ ]	1 2
4a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3
5.	In the past four weeks, did you or any household member have to eat a smaller meal (smaller portion) than you felt you needed because there was not enough food?	No (skip to Q6) [ ] Yes [ ]	1 2
5a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3
6.	In the past four weeks, did you or any other household member have to eat fewer meals (skip meals) in a day because there was not enough food?	No (skip to Q7) [ ] Yes [ ]	1 2
6a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	No (skip to Q8) [ ] Yes [ ]	1 2
7a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	No (skip to Q9) [ ] Yes [ ]	1 2
8a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	No [ ] Yes [ ]	1 2
9a.	How often did this happen?	Rarely (once or twice in the past four weeks) [ ] Sometimes (three to ten times in the past four weeks) [ ] Often (more than ten times in the past four weeks) [ ]	1 2 3

SECTION D – ANTHRPOMETRIC MEASUREMENT OF WOMAN IN THE HOUSEHOLD

Age	Weight	Height:	BMI:

SECTION E–24 HR DIETARY RECALL

Date _____   **Day of the week** _____

S/N	FOOD CONSUMED	PLACE	TIME	DESCRIPTION	QUANTITY/AMOUNT

1. Was food intake usual? (Yes/NO)
If no, how was it unusual?
4. Probe for fermented beverages consumed

2. Was it a feast day? (Yes/NO)
If yes, specify

3. Probe for sickness (Yes/NO)
If yes, did the sickness affect appetite? (Yes/NO)
If yes, how? Increase or decrease

4. Probe for fermented beverages consumed

| Plate A | Plate B |

Plate A: focus group discussion with dairy farmers at Rutare sector; point of discussion was the sustainability of the Project.
Plate B: interview with facilitator of L-FFS cooperative

| Plate C | Plate D |

Plate C: During anthropometric measurement of a female respondent.

Plate D: Interview with a dairy farmer at his cow shed.