REPUBLIC OF RWANDA

RWANDA AGRICULTURE AND ANIMAL RESOURCES DEVELOPMENTBOARD

Girinka Program as part of poverty reduction strategy in Rwanda: Ten Years Socioeconomic Impacts

Prepared by:
Mugabo R. Josaphat, Nsabimana Jean de Dieu, Tuyisenge Jacqueline, Dusengemungu Leonidas, Badege Peter, Nyirigira Antoine, Nyirahorana Concilie and Ngabo G. Methode

About RAB

The Rwanda Agriculture and Animal Resources Development Board (RAB) is an autonomous body established by LAW N°14/2017 OF 14/04/2017. The law specifies that: RAB has the general mission of championing the agriculture sector development into a knowledge based; technology driven and market oriented industry, using modern methods in crop, animal, fisheries, forestry and soil and water management in food, fibre and fuel wood production and processing.

RAB's vision: Improved food security and livelihoods of all Rwandans by transforming agriculture from subsistence into modern farming through generating research and extension innovations that generate sustainable crop, animal husbandry and natural resource management.

RAB's mission: RAB has the general mission of developing agriculture and animal resources through research, agricultural and animal resources extension in order to increase agricultural and animal productivity as well as their derived.

Key RAB's responsibilities are:
1. To implement the national policy of agriculture and animal husbandry;
2. To contribute in determining policy in agriculture, animal husbandry, agricultural and animal husbandry research and technology;
3. To provide farmers and consumers of agricultural products with information, techniques and services meant for improving their profession and supplying the internal market with increased and quality production thereby raising their agricultural and animal husbandry incomes;
4. To prevent and fight animal diseases and implement appropriate strategies meant for ensuring control, prevention, diagnosis and treatment of animal diseases
5. To prevent and control plant diseases, insects and pests and implement appropriate strategies meant for ensuring control and prevention of plant diseases;
6. To identify and provide farmers with new technologies for proper management of land, water and use of agricultural and animal husbandry mechanization;
7. To coordinate activities aiming at promoting agricultural and animal husbandry infrastructure;
8. To provide agricultural extension services in accordance with agricultural and animal husbandry needs;
9. To coordinate activities of agricultural extension and research plans and disseminate such agricultural and animal husbandry needs as determined by zonal branches of RAB;
10. To ensure partnership and coordinate activities of the non-governmental organizations, private operators and organs involved in implementation of agricultural and animal husbandry programs.

Republic of Rwanda

Ministry of Agriculture and Animal Resources

Girinka Program as part of poverty reduction strategy in Rwanda: Ten Years Socioeconomic Impacts

Rwanda Agriculture and Animal Resources Development Board (RAB)
2019

Citation:

FOREWORD

The last two and half decades Rwandans have benefited from rapid economic growth and reduced poverty as a result of an effective implementation of three medium-term strategies towards attainment of the long-term Rwanda Vision 2020 objectives. Girinka program, one of home-grown solutions in Rwanda which was initiated by His Excellency Paul KAGAME, President of the Republic of Rwanda late 2006 has been a key component of poverty reduction strategy for poor rural households throughout the three medium term strategies. In fact, the first medium- term strategy main pillars were: securing the national security, rebuilding the economy and growing enough food among others; the second medium-term strategy (EDPRS 1) aimed at consolidating and extending the strong achievements in human development and at prioritising public spending and improving coordination across sectors for stronger growth, faster poverty reduction and better governance. The third medium-term (EDPRS 2) focused on government efforts to transform the economy, the private sector and alleviate constraints to growth of investment, scale-up of home grown solutions forming an integral part of it. It is worth to mention that Girinka program objectives were to reduce poverty through dairy cattle farming; improving livelihoods through increased milk consumption and income generation; improving agricultural productivity through the use of manure to improve soil quality and efficiency of other fertilizers and reducing erosion through the planting of grasses and trees.

As a matter of fact, the implementation of the Girinka program from 2006 to 2017 has contributed to the reduction of poverty, but its achievements are barely documented. The socio-economics and biometrics program team of Rwanda Agricultural and Animal Resources Development Board (RAB) using a countrywide representative sample of Girinka beneficiaries and non-beneficiaries on waiting lists and appropriate analytical tools has come up with interesting results which are presented in this book. The reader will realise that in addition to findings on household welfare indicators included in the study (crop yields, household food security, household income and nutritional status of under under-five children) for obvious reasons, socio-economics characteristics of households, household productive assets, crop and cattle production, food security and food shortage coping mechanisms, Girinka program benefits and households' expenditures are extensively documented.

Findings reported in this book reveal that Girinka program has contributed significantly to poverty reduction by achieving its expected outcomes. In fact, it contributed to an increased household maize yield by about 26% (improved crop productivity and soil quality); an improved household daily calorie intake per adult-equivalent by about 14% (food security); an improved household nutrition in terms of reduction of underweight and stunting status of under-five children by 58% and 23% respectively and to an increased household annual income by about 129%.

The book, "*Girinka Program as part of poverty reduction strategy in Rwanda: Ten Years Socioeconomic Impacts"* constitutes an achievement of combined efforts from various institutions and individuals. Rwanda Agriculture and Animal Resources Development Board (RAB) therefore wishes to acknowledge the contributions of all its partners who were directly or indirectly involved in the activities that led to this publication. RAB particularly wishes to acknowledge the contribution of the Government of Rwanda through the Ministry of Agriculture and animal resources (MINAGRI) and the Ministry of finance and economic planning (MINECOFIN) for having made the Girinka program Impact Assessment study possible and the publication of this book a reality by availing required funds. RAB wishes also to acknowledge the dedication of RAB socioeconomics and biometrics scientists who not only designed and conducted the Girinka programme Impact assessment study but also produced its draft report that was eventually validated by Girinka programme stakeholders before submitting the final version of the report for publication. RAB cannot forget to mention the contributions of various other people who made the field work possible, in particular, districts and sectors veterinaries, RAB zonal directors of livestock extension and RAB zonal Girinka program focal persons.

It is expected that this publication which shows how a home-grown solution for the alleviation of poverty for rural households has been a success story in Rwanda, will be a benefit to you.

Wish you a happy reading.

Patrick KARANGWA (PhD)
Director General

TABLE OF ABBREVIATIONS

AI	Artificial insemination
ANOVA	Analysis of Variance
ATT	Average treatment effect for treated
CFSVA	Comprehensive Food Security and Vulnerability Analysis
EICV	Enquete Integrale des Conditions de Vie des Menages
ENA	Emergency Nutrition Assessment
FAO	Food and Agriculture Organization
FGD	Focus group discussion
GoR	Government of Rwanda
HH	Households
IFAD	International Fund for Agricultural Development
MINAGRI	Ministry of Agriculture and Animal Resource
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic Planning
NGO	Non government organisation
NISR	National Institute of Statistacs of Rwanda
NNM	Nearest-Neighbour Matching
PSM	Propensity score matching
RAB	Rwanda Agriculture and Animal Resources Development Board
RGB	Rwanda Governance Board
SPSS	Statistical Package for Social Sciences
UR	University of Rwanda

EXECUTIVE SUMMARY

This report presents results of an impact assessment study on Girinka Program, initiated by His Excellency President Paul Kagame in 2006 as part of poverty reduction strategy. The main objective of the study was to assess the socioeconomic impact of Girinka Program on poor households' welfare in Rwanda. It is for this end that the study looked at some Girinka Program intermediate outcomes such as crop yield, milk production and sales, and at expected Girinka Program outcomes, specifically household income, household food security and nutritional status of under-five children.

One thousand, one hundred and six (1106) households made of 343 Girinka Program beneficiaries and 763 non-beneficiaries were randomly selected from 90 cells, 51 sectors and 10 districts. Needed information was collected using semi-structured questionnaires for household survey; focus group discussions and key informants' checklists for general information and data sheets for anthropometric measurements (height and weight of children aged 6 to 59 months). The collected data were analysed using descriptive analysis, ANOVA, regression analysis and propensity score matching approach. The two first methods were used to characterize beneficiaries and non-beneficiaries in terms of mean and proportion values of the socioeconomic and demographic variables and compare these for some key features of the two groups while the two last were used to evaluate the difference between Girinka Program beneficiaries and non-beneficiaries in terms of maize and beans yield, cow milk production and sale, household annual income and weekly expenditures, household food security expressed in daily calorie consumption per adult-equivalent and nutritional status of under-five children expressed in levels of stunting, wasting and underweight.

In the 10 sampled districts[1], 23.1% of households that received a cow were headed by women with the highest proportion in Nyamasheke (39.1%) and the lowest in Huye (9.5%). The average household size in the 10 districts was 5.6 members with a highest average of 6.1 members in Nyaruguru and a lowest average of 4.8 members in Huye. The average age of household members that were given cows was 52 years with

---

[1] Bugesera, Gatsibo, Kirehe, Huye, Nyamagabe, Nyamasheke, Nyaruguru, Ngororero, Gicumbi and Gakenke

a minimum of 27 years and a maximum of 86 years. More than 82% of beneficiaries in 6 out of the 10 districts surveyed were 60 years or older, while only Gicumbi District had a relatively low proportion of beneficiaries (64.5%) that were 60 plus years.

Most beneficiaries had completed part of their primary education (40.1%) or had completed primary education (28%). About 21.1% had received no formal education. Those who had some form of secondary or had completed secondary education were 2.5% and 1.9% respectively.

Household land holdings are very small, the average land size being 0.39 ha. Bugesera and Kirehe have the highest household landholdings with an average of 0.48 ha while Nyaruguru has the lowest household landholdings with an average of 0.23 ha. Comparison between beneficiaries and non-beneficiaries in terms of landholdings revealed that beneficiaries had more land averaging 0.58 ha while non-beneficiaries had 0.31 ha. The difference can be partially explained by the acquisition of new land bought with Girinka Program income.

Girinka Program beneficiaries mentioned three types of cattle breeds (local, cross and exotic) received from different sources. In general, the cross breed was the most common accounting for 52.8% of the total cow distributed to households in the 10 surveyed districts, followed by local breed (33.2%) and exotic breeds represent only 13.3% of distributed cows. Nyamasheke and Ngororero districts had distributed more exotic breeds than other districts with respectively 34.8% and 23.1%. On the other hand, Huye and Nyamagabe districts distributed more cross breeds with 76.9% and 72.7% respectively while local breeds were received by more Girinka beneficiaries in Gatsibo (69.7%) and Bugesera (44.7%).

The other types of livestock owned by surveyed households are goats, sheep, pigs, poultry and rabbits, the two first types representing 62.4% of all small stock owned. It is worthwhile to consider that the mentioned small stocks are owned by only 53.0% of the sampled households, the remaining households (47%) having none. Furthermore, out of 322 households of surveyed beneficiaries, only 21.1% have goats, 12.4% have sheep, 2.1% have pigs, 8.7% have poultry and 1.6% has rabbits while from the 746 households of Girinka non-beneficiaries, 24.9% have goats, 9.4% have sheep, 9.1% have pigs, 3.6% have poultry and 0.9% has rabbit.

Food crops grown by sampled households included: beans (93.1%), maize (68.4%), sweet potatoes (19.8%), potatoes (11.8%), cassava

(7.4%), soybean (6.2%) and sorghum (6%). Cooking banana was less important with only 4.2% cultivating the crop except in Gatsibo District where it was grown by 14.1% of respondents. The average yield in surveyed districts shows that highest yielding crops were respectively rice (6,608.3 kg/ha) and sweet potatoes (3,653.4 kg/ha) while the lowest yielding crop was peanut (416.8 kg/ha)

The majority of cows distributed by Girinka Program have given birth to between 1 to 4 calves. Girinka Program beneficiaries have in general one or two cows. Very few cows (less than 0.1 per beneficiary household) are from non-Girinka Program. About 89 percent (89%) of Girinka Program beneficiaries have a cowshed; only about 65% of owned cowsheds are roofed and 6.7% are both roofed and paved with cement. The best cowsheds roofed and paved with cement are found in Kirehe with 24% of respondents followed by Bugesera (18.2%) and Ngororero (18.2%). More efforts should be made in Huye where only 30% of cowsheds are roofed. Only 32.1% of Girinka beneficiaries practiced artificial insemination (AI).

On average, the program's beneficiaries received 4.5 litres of milk per day in 2015, 4.9 litres in 2016, and 4.2 litres in 2017 from their cow with an average lactation period of 184 days per year. This provides average gross revenue from milk of Rwf 21, 529 per year. Ninety-one percent (91%) of the 315 respondents had a milking cow from 2015 to 2017; 87.9% of respondents reported consuming milk in the household but only 82% of milk consuming households consumed own produced milk while the remaining household consumed milk from neighbours (8%) or from local markets (9.1%). Only 133 households out of the 315 that reported having milking cow sold milk. Major milk market outlets were respectively neighbours (45.1%), milk collection centres (35.3%) and local markets (17.3%).

Food security in terms of food access to meet household needs is a real issue for the surveyed household. In fact, only 18.5% of the households with data on food security (1,074) have enough food throughout the year. From the remaining 81.5%, they are food insecure for seven months per year. The most commonly used coping strategies for food insecure households was to reduce the number of meals per day (16.1%), undertake food for work programs (13.9%), borrowed money to buy food or got food on credit (12.6%), generally mother eat less (12.4%) and substitute common purchased foods with cheaper kinds (11.3%).

The top five benefits of Girinka Program encountered in the program's beneficiaries were: (i) health insurance (29.7%), (ii) house rehabilitation (27.7%), (iii) school fees (21.3%), (iv) land acquisition (15%) and (v) dowry (2.6%). Other quantifiable benefits were the acquisition of sewing machines, bicycles, agricultural inputs, other types of livestock, etc. (2.9%) The first four benefits were encountered in more than 90% of respondents suggesting that these items are really very important for rural poor households.

The Girinka Program's beneficiaries have spent more money than non-beneficiaries both on food and non-food items suggesting that they have more money to use. In fact, there was a statistically significant difference (Rwf 1,278.36) between the two groups in terms of total expenditures. Expenditure on non-food goods contributed largely in this difference, while contributions were minimal to household food expenditure. This suggest that both Girinka beneficiaries and non-beneficiaries relies more on own production for household food consumption.

Results of this study revealed that receiving a Girinka Program cow was associated with higher crop yields, greater calorie intake, improved nutritional status of under-five children, and increased household income. In fact, five out of the eight indicators considered in this study showed that there was a statistically significant positive benefit for beneficiaries as compared to non-beneficiaries. This shows that Girinka Program has had a definite constructive impact on beneficiaries.

More specifically, the distribution of Girinka Program from 2006 to 2017 contributed to an increased household maize yield by about 26% (from 1,040kg/ha to 1,309.9kg/ha); to an improved household daily calorie intake per adult-equivalent (food security) by about 14% (from 1,876 Calories/ad-eq/day to 2,142 Calories/ad-eq./day); to an improved household nutritional status of under-five children by about 58% (from -1.14014 to -0.476857 z-score) and 23% (from -3.226508 to -2.475365 z-score) respectively for underweight and stunting; and to an increased household annual income by about 129% (from 45,495 FRw to 104,299 FRw). Based on the above findings, the study recommends that this study may be used as evidence to stimulate public and private organizations to invest more in Girinka program or similar other programs to help fight against poverty and malnutrition.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1.   BACKGROUND

The Girinka (One Cow per Poor Family) program was initiated by HE President Paul Kagame in 2006 as part of the fight against rural poverty). The aim was to use livestock asset transfers to increase productivity in the livestock and agriculture sectors, and hence drive improvements in household incomes and reduce poverty among the rural poor (Ingabire, 2013; Argent et al. 2014).

The major objectives of Girinka Program include: reducing poverty through dairy cattle farming; improving livelihoods through increased milk consumption and income generation; improving agricultural productivity through the use of manure as fertilizer; and improving soil quality and reducing erosion through the planting of grasses and trees. The program also was intended to promote unity and reconciliation among Rwandans based on the cultural principle that if a cow is given from one person to another, it establishes trust and respect between the giver and the beneficiary (RAB, 2013; Hahirwa & Kalinganire, 2017; KIM et al. 2011).

The Girinka beneficiaries are selected under Ubudehe Program whereby village members under the facilitation of the village leader meet and discuss the poverty related challenges they face. It is in this meeting where Girinka beneficiaries are selected through making a list of poor households that should benefit from Girinka cow and that list is given to the cell and sector leaders. Depending on availability of Girinka cows, the distribution of cows follows the order of the presented list, the person number one on the list is the first to receive a cow (RGB, 2014; FAO, 2017). The criteria considered in the selection of beneficiaries were:

- The beneficiary must not already own a cow

- The beneficiary must be a person of integrity (Inyangamugayo) in the community and be able to practice the basic animal management

- The beneficiary must be considered by his/her community as poor and have less or no other source of income

- The beneficiary must have at least 0.25-0.75 hectares, and those who have less than 0.25 hectares must join to form a common cowshed (Igikumba) for their cows

- The selected beneficiary must construct a cowshed before he/ she receives the cow
- Must be ready for training in basic animal husbandry practices (nutrition, breeding, housing, and disease control and management practices) (RAB, 2013; Rwandapedia, 2013)

All distributed cows were meant to be in-calf, so that the benefiting household would have a new calf and milk production within a short space of time. In order for the program to be self-perpetuating, beneficiaries are obliged to pass on the gift by giving the first born calf to a new beneficiary household in the area (the so called pass on or *kwitura* in Kinyarwanda). Where the first born calf is a bull, it is expected to be sold to purchase a heifer to pass on. As the price for heifers is typically higher, the purchased heifer would usually be younger than the sold bull and not yet old enough to breed (Argent et al. 2014; UNICEF, 2011)

The Rwanda Agricultural and Livestock Development Board (RAB), under the guidance of the Ministry of Agriculture (MINAGRI) and the Ministry of Local Government (MINALOC), oversees the implementation of the Girinka Program. RAB is responsible for the selection, certification and distribution of cows, the management of the centralized budget and donations of both money and cows, the training of beneficiaries in animal husbandry as well as program monitoring and evaluation (Rwandapedia, 2013).

Each of Rwanda's districts has an allocated RAB focal person who liaises with the sector and district vet officers, selection officers, local administration and the Girinka Program coordinator (RAB, 2017). They are also involved in local level implementation, including distribution of cows, beneficiary training and informing farmers of the benefits of working with milk collection centres and milk processing factories. Monitoring and evaluation is done in partnership with local government institutions such as the Umurenge (sector), Akagali (cell) and Umudugudu (village) (RGB, 2018).

Before and after each beneficiary receives a cow (either directly or via the 'pass on' system), RAB coordinates the support of primary animal care through training, veterinary services, artificial insemination, fodder seeds and plant materials for animal feeds as well as vaccination against diseases. The aim of this support of the program is to help equip families with the animal husbandry skills to care for the cow themselves with the support of district and sector veterinary officers (RAB 2013).

Girinka funding is provided by the Government of Rwanda (GoR), non-governmental organizations (NGOs) and private citizens. From its introduction until June 2018, Girinka has distributed around 321,000 cows to beneficiaries throughout the country (RAB 2018). Despite the significant amount of public resources allocated through the program, the evidence of its socioeconomic impact at national level has not been documented. The key research question is then whether Girinka Program has contributed to the improvement of poor rural poor households' welfare in Rwanda after 12 years of its implementation. It's for this end that this study has focused on three household welfare outcomes, namely household income, household food security and nutritional status of under five years old children. In fact, improved food security and nutrition and, increased income of Girinka program beneficiaries constitute original objectives of Girinka program when it was initiated.

1.2. RESEARCH OBJECTIVES

The main objective of this study was to assess the socioeconomic impact of Girinka Program on poor households' welfare in Rwanda. More specifically the study seeks:

- To assess the effect of Girinka Program on crop yield, milk production and sale for beneficiary households.

- To assess the impact of Girinka Program on household income, food security and nutritional status.

2. METHODOLOGY

The approach that was used for this research consisted in desk review of the available literature, collection of primary quantitative and qualitative data trough semi-structured questionnaires, anthropometric measurements of children between 6 and 59 months, focus group discussions and information from key informants.

This section extensively elaborates on sampling procedure, development and pretesting of data collection tools as well as data analysis methods.\

2.1 SAMPLING AND DATA COLLECTION PROCEDURES

2.1.1. Sampling procedure

The populations of Girinka Program beneficiaries were obtained from the Districts Veterinary Officers. From that population, 10 districts, 51 sectors and 90 cells based on the representativeness of the number of cows given from 2006 through 2015 in Eastern, Northern, Southern and Western Provinces of Rwanda. The reason for considering these years is the assumption that, to give socioeconomic impact, cattle have to be reared for at least three years. Moreover, data collection involved treated (Girinka beneficiaries) and control (Girinka non-beneficiaries) groups so as to allow comparison of both groups. The number of beneficiaries and non-beneficiaries was set to represent the actual population status with respect to Girinka Program (Israel, 1992; Landsverk et al., 2012).

Whenever a person from a sampled household (HH) could not be found for interview, s/he was replaced by a member of another HH belonging in the same village, the same Girinka cluster (either beneficiary or non-beneficiary) and the same Ubudehe category to keep as much similarity as possible (NISR, 2015; Guest et al., 2006).

A four-stage clustered, purposive procedure was used to select a representative sample of farmers (Palinkas et al., 2011; Morse and Niehaus, 2009; Green and Aarons, 2011; Denzen, 1978). This representative sample is selected in a number of cells throughout the country as follows:

- **First stage**: from each Province a number of administrative Districts were purposively selected depending on the highest number of Girinka cows distributed per district except Kigali-City

- **Second stage**: from each district a number of administrative sectors were purposively selected depending on the highest number of cows distributed

- **Third stage**: from a sampled sector a number of cells were purposively selected depending on the highest number of cows distributed

- **Fourth stage**: from 90 sampled cells 1106 households were randomly selected, 343 beneficiaries against 763 non-beneficiaries from the waiting lists. At cell level, the sample size was determined by the proportions of beneficiaries and non-beneficiaries of Girinka Program

The sample size was determined using Yamane (1967:886) formula as follows:

$$n = \frac{N}{1+Ne^2}$$

Where n is the corrected sample size, N the population size, and e the margin error. At 95% confidence level, e = 0.05.

Given that one of the eligibility requirements to benefit from Girinka Program is being poor households (belonging to category one and two of the Ubudehe categorization), a random sample from the treated group was drawn from all "Ubudehe" categories since there was an assumption that some households that benefited from Girinka Program may have graduated from a lower to a higher Ubudehe category, while for Girinka non-beneficiary group, a random sample was drawn from all cells' households that are eligible for Girinka Program (i.e. from category one or two of Ubudehe categorization).

2.1.2. Data collection procedures

Data was collected by means of: (1) household survey; (2) focus group discussion (FGD), (3) interview of key informants and (4) height and weight measures of children aged from 6 to 59 months. Data collection tools were made of (1) semi-structured questionnaires for household survey; (2) FGD guide questions; (3) key informants' guides and (4) data sheet for anthropometric measurements (Patton, 2002).

FGDs were done in some sectors and involved at most 10 persons namely sector's Social Affairs Officer, sector's Veterinary Officer, a member of Girinka committee, person in charge of security, Head of Village as well as two representatives of Girinka beneficiaries and two representatives of

non-Girinka beneficiaries from the village in which the sector is located. Participating into FGDs and answering to semi-structured questionnaire were mutually exclusive meaning that nobody was allowed to participate in both. The FGDs were moderated by the researcher while a rapporteur was recording notes to make sure that all participants' views were captured as suggest by Morgan (1997). The time of discussions was quite sufficient for having required data and varied between 30 and 1 hour.

The key knowledgeable informants from NGOs, RAB and MINAGRI were selected for their ability to share opinions and capability to volunteer for freely discussing on Girinka impact and challenges.

After the semi-structured questionnaire has been designed and translated to Kinyarwanda, it has been tested among both Girinka beneficiaries and non-beneficiaries to assess its appropriateness to the study objectives. The investigators ensured that people answering during the pretesting of the questionnaire was not involved in the data collection process.

Focus Group Discussion

Anthropometric measurement

Household interview

2.2. Data analysis

The data collected from different sources with different approaches will be analysed using descriptive analysis, ANOVA, regression analysis and propensity score matching approach. The two first methods will be used to characterize beneficiaries and non-beneficiaries in terms of mean and proportion values of the socioeconomic and demographic variables and compare these for some key features of the two groups. Regression analysis (probit model) and propensity score matching approach (PSM) will be used in the process of generating the average treatment effect on the treated (ATT) (Shahidur et al., 2010), the treatment here being the implementation of Girinka Program and the treated being Girinka Program beneficiaries. Required calculations will be performed either by IBM SPSS statistics 22 or StataSE 11 (64-bit) or ENA (Emergency Nutrition Assessment) software.

2..2.1. Nutritional status data analysis

The impact of Girinka Program on nutritional status of sampled households is derived in this study from the nutritional status of under-five children. It is assessed using anthropometric data collected from children to calculate the weight/age, height/age, and weight/height ratios which are then compared to the World Health Organisation's reference population that represents the expected distribution of the growth of under-five children. Calculations are performed by ENA software that generates the so called z-scores. These z-scores are indicators for wasting (weight for height z-score), underweight (weight for age z-score) and stunting (height for age z-score) and are defined as follows:

$$(1)\ Weight-for-height\ z-score = \frac{\frac{Weight}{height}(obs.) - \frac{Weight}{height}(Ref.\ population)}{Standard\ deviation\ of\ \frac{Weight}{height}(Ref.\ population)}$$

$$(2)\ Weight-for-aget\ z-score = \frac{\frac{Weight}{age}(obs.) - \frac{Weight}{age}(Ref.\ population)}{Standard\ deviation\ of\ \frac{Weight}{age}(Ref.\ population)}$$

$$(3)\ Height-for-aget\ z-score = \frac{\frac{Height}{age}(obs.) - \frac{Height}{age}(Ref.\ population)}{Standard\ deviation\ of\ \frac{Height}{age}(Ref.\ population)}$$

2.2.2. Propensity score matching approach (PSM)

In the study, households were not randomly distributed into Girinka Program beneficiary (treatment) group and a non-beneficiary (control) group. Even though in literature randomized evaluation is highly recommended (Duflo et al., 2006), quasi-experimental methods such as PSM have been useful in evaluating the impact of development interventions (Khandker et al., 2010). The propensity score matching (PSM) approach will be used in this study. The propensity score is here defined as the conditional probability that a household participate in Girinka Program (treatment), given pre-treatment characteristics (Rosenbaum and Rubin, 1983). To create the condition of a randomized experiment, the PSM employs the assumption known as conditional independence assumption, which implies that once a covariate x (pre-treatment characteristics) is controlled for, participation is random and uncorrelated with the outcome variables mentioned in a previous section. The propensity score can be expressed as:

$$\pi(x) \equiv P(d = 1|x) = E(d|x)$$

where $\pi(x)$ stands for propensity score; d stands for treatment which is here "participation in Girinka Program"; x stands for pre-Girinka Program household characteristics (covariate).

The propensity scores $\pi(x)$ will be estimated by a probit regression model. In this regression analysis, the dependent variable (d) will be a dummy given a value of one to represent households who received the Girinka Program cow, and zero to represent households who did not receive Girinka Program cow but are on the waiting lists. The explanatory variables (x) that will be used in the models are: household size; number of household members under 18 years old; number of household members aged 18 to 59; number of household members aged above 59; sex of the head of household; and household location which is the district in this study.

The software StataSE 11 with its 'pscore ado' command calculates the propensity score, identifies the households with similar propensity scores and balances the block pairs. Once the propensity score has been calculated, households with similar scores and socioeconomic characteristics identified and the process of matching will be performed. A number of techniques have been developed to match beneficiaries with non-beneficiaries. In this study the Nearest Neighbour Matching

(NNM) method will be employed. With this process every household in the treatment group is matched with the household in the new control group with the nearest propensity score.

Myoung-Jae Lee (2005) states two way of evaluating matching success. First, checking how close each comparison group is to its matched treated unit at the individual level in terms of matching variable x and second, see how balanced x is across the two groups at the aggregate level. For the first test, the number of blocks that ensures that the mean propensity score is not different for treated and controls in each block is determined. The second test consists of checking if the balancing property/hypothesis is satisfied for each matching variable x in each of the determined number of blocks. The blocks that do not satisfy the balancing criterion, that is, those whose variables used for calculating the score differed significantly are automatically excluded from the sample. Only the matched blocks of beneficiary and non-beneficiary households with similar propensity scores remain in the impact measurement analysis. The average treatment effect for the treated (ATT) is then estimated by the average differences of matched pairs with similar score values as follows:

$$\tau|_{d=1} = E(\tau|d = 1) = E(Z_1|d = 1) - E(Z_0|d = 1)$$

where τ denotes the average treatment effect for the treated (ATT), d is a dummy for participation in Girinka Program, Z_1 is the value of the outcome (e.g. nutritional status outcomes, food security outcome, household income) when a household is a beneficiary of Girinka Program and Z_0 is the value of the outcome when a household is non-beneficiary of Girinka Program. This average difference between beneficiaries and non-beneficiaries is calculated by StataSE 11 using the 'attnd ado' command.

3. RESULTS AND DISCUSSION

3.1. SOCIOECONOMIC CHARACTERISTICS of HOUSEHOLDS

3.1.1. Girinka Program beneficiaries

The socioeconomic characteristics of households that received a cow from Girinka Program were mainly gender, household size and categories of Ubudehe. Across all covered districts, 23.1% of households that received a cow were headed by women with

the highest proportion in Nyamasheke, Ngororero and Huye with 39.1%, 30.8% and 30.8% respectively while the lowest proportion of women heading households were found in Huye with only 9.5%.

The average household size in the 10 districts surveyed was 5.6 members by household with a highest average of 6.1 members in Nyaruguru and a lowest average of 4.8 members in Huye. The size of population is 4.3 and 4.02 in urban and rural area respectively (NISR,2012).

The current situation of Ubudehe categories indicated that 36.3% of all households benefitting from Girinka Program have graduated from category 1 or 2 to category 3, so it means that they would no longer among the targeted households. Among the surveyed districts, more than half of households in Ngororero (53.8%) and Nyamagabe (52.2%) have graduated from category 1 or 2 to category 3 while in Nyaruguru District only 21.1% graduated.

Households heads selecting cows during the Girinka week distribution

Table 1: Socioeconomic characteristics of Girinka Program household (HH) beneficiaries

District (n)	HH gender (%)		Categories of Ubudehe (%)			Average HH size
	Male	Female	Category 1	Category 2	Category 3	
Bugesera (38)	78.9	21.1	21.1	31.6	47.4	5.4
Gatsibo (76)	75.0	25.0	5.3	61.8	32.9	5.6
Kirehe (28)	78.6	21.4	28.6	46.4	25.0	5.8
Huye (13)	69.2	30.8	23.1	30.8	46.2	4.8
Nyamagabe (23)	73.9	26.1	17.4	30.4	52.2	5.5
Nyaruguru (19)	78.9	21.1	31.6	47.4	21.1	6.1
Ngororero (13)	69.2	30.8	23.1	23.1	53.8	5.9
Nyamasheke (23)	60.9	39.1	43.5	30.4	26.1	5.8
Gicumbi (71)	81.7	18.3	26.8	39.4	33.8	5.6
Gakenke (21)	90.5	9.5	23.8	33.3	42.9	5.1
All (325)	**76.9**	**23.1**	**21.5**	**42.2**	**36.3**	**5.6**

Within the households benefiting from Girinka Program, the socioeconomic characteristics indicated that 30.5% of members that were given the cow were women with the highest proportion of women in Nyamasheke and Ngororero District with 52.2% and 46.2% respectively and the lowest proportion of women household members who were given a cow was observed in Huye District with only 9.5%.

The average age of household member that was given the cow was 52 year with a minimum of 27 years and a maximum of 86 years. The average age tends to indicate that most of the beneficiaries were old and this was also confirmed by the age categories where 78.3% of beneficiaries were over 60 years while only 2.9% were 35 years and less. More than 82% of beneficiaries in 6 out of 10 districts surveyed had 60 years and over while only Gicumbi District had a relatively low proportion of beneficiaries (64.5%) that were 60 years and over.

Given the average age of Girinka program beneficiaries within the household, it is obvious that almost all beneficiaries were married,

separated or widowed. The proportions on marital status confirmed this situation with 73.5% being married and 21.0% being widowers. Only 1.2% of respondents were single except in Huye where the number was higher (15.4%). The highest proportion of married beneficiaries was observed in Gakenke with 81% while the highest proportion of widowers was observed in Nyamasheke with 30.4%.

Table 2: Socioeconomic characteristics of Girinka Program beneficiaries (%)

District (n)	Gender of Girinka beneficiary		Age group			Marital status of Girinka beneficiary			
	Male	Female	≤35	[36, 59]	≥60	Single	Married	widowed	Separated
Bugesera (38)	73.7	26.3	2.8	13.3	83.9	0.0	78.9	21.1	0.0
Gatsibo (76)	65.8	34.2	2.1	29.1	68.8	0.0	76.3	21.1	2.6
Kirehe (28)	71.4	28.6	2.2	8.9	88.9	0.0	78.6	21.4	0.0
Huye (13)	69.2	30.8	1.8	14.5	83.6	15.4	69.2	15.4	0.0
Nyamagabe (23)	73.9	26.1	8.1	16.1	75.8	0.0	68.2	27.3	4.5
Nyaruguru (19)	73.7	26.3	0.0	17.1	82.9	0.0	78.9	10.5	10.5
Ngororero (13)	53.8	46.2	1.1	10.8	88.2	0.0	69.2	23.1	7.7
Nyamasheke (23)	47.8	52.2	2.1	12.5	85.4	0.0	60.9	30.4	8.7
Gicumbi (71)	71.8	28.2	7.1	28.4	64.5	2.8	69.0	21.1	7.0
Gakenke (21)	90.5	9.5	1.6	26.6	71.9	0.0	81.0	14.3	4.8
All (325)	**69.5**	**30.5**	**2.9**	**18.7**	**78.3**	**1.2**	**73.5**	**21.0**	**4.3**

Few beneficiaries (72 out of 325 i.e. 23.4%) expressed any change in their status as compared to why they were selected. In fact, 50 out 72 beneficiaries i.e. 69.4% where vulnerable, 25% were disabled while only 5.5% were orphans.

Most of the beneficiaries have either some primary education (40.1%) or completed the primary education (28%). The proportion of beneficiaries who had no formal education was 21.1% while those who had some secondary or completed secondary education were 2.5% and 1.9% respectively. The remaining members benefiting from Girinka Program had adult education (3.1%) or vocational trainings (3.4%).

Nyaruguru District had the highest proportion of beneficiaries with no formal education (42.1%) while Nyamagabe had the lowest proportion of 14.3%. Gatsibo had the highest proportion of beneficiaries with

some primary education (53.9%) and Nyamagabe had the highest proportion of beneficiaries who completed primary education. In general, 92.2% of beneficiaries across all districts did not go beyond primary education with the highest proportion of beneficiaries who went beyond primary education observed in Ngororero District with 30.8%.

Table 3: Education level of Girinka Program beneficiaries

District (n)	Education level of Girinka Beneficiary (%)							
	no formal education	Adult education	some primary education	completed primary education	some vocational training	completed vocational training	some secondary education	completed secondary education
Bugesera (38)	15.8	2.6	23.7	39.5	13.2	2.6	0.0	2.6
Gatsibo (76)	23.7	3.9	53.9	14.5	0.0	1.3	2.6	0.0
Kirehe (28)	21.4	0.0	35.7	35.7	3.6	0.0	0.0	3.6
Huye (13)	15.4	7.7	38.5	38.5	0.0	0.0	0.0	0.0
Nyamagabe(21)	14.3	4.8	28.6	47.6	0.0	0.0	4.8	0.0
Nyaruguru (19)	42.1	5.3	31.6	15.8	0.0	0.0	5.3	0.0
Ngororero (13)	15.4	0.0	30.8	23.1	7.7	7.7	7.7	7.7
Nyamasheke (23)	26.1	4.3	43.5	17.4	0.0	0.0	0.0	8.7
Gicumbi (71)	16.9	1.4	45.1	29.6	0.0	1.4	4.2	1.4
Gakenke (20)	25.0	5.0	30.0	40.0	0.0	0.0	0.0	0.0
All (322)	**21.1**	**3.1**	**40.1**	**28.0**	**2.2**	**1.2**	**2.5**	**1.9**

A study commissioned by USAID (2014) finds similar demographic indicators with slight differences. However, these indicators are still lagging behind the national average but can be explained by the fact that those beneficiaries used to be the poorest among the poor. In fact, the household size is 5.6 against 4.4 at the national level and 5.2 for the poor; the proportion of Girinka beneficiaries who have never attended school is 21.1% against 12.8% at national level and 16.4% for the poor (NISR, 2018).

3.1.2. Girinka program non-beneficiaries

The total number of non-beneficiary's households surveyed in the 10 selected districts was 749 and among them 35.5% were headed by women. The highest proportion of women heading the households was observed in Huye District (45.2%) while the lowest proportion was observed in Kirehe District with 21.5%.

The average household size was 4.7 members by household with the highest average of 5.5 members by household in Nyamagabe District and the lowest average of 3.9 members by household in Gakenke District.

Fifty-nine percent of the Girinka non-beneficiaries were classified in the second category of Ubudehe with the highest proportion observed in Gakenke and Kirehe districts with 85.7% and 74.8% respectively. The lowest proportion was in Huye and Nyamasheke districts with 38.1% and 41.1% respectively.

Table 4: Socioeconomic characteristics of Girinka Program non-beneficiaries

District (n)	Gender of household head (%)		Ubudehe categories (%)		Average HH size
	Male	Female	Category 1	Category 2	
Bugesera (105)	66.7	33.3	41.9	58.1	4.81
Gatsibo (113)	63.7	36.3	38.9	61.1	4.70
Kirehe (107)	78.5	21.5	25.2	74.8	5.10
Huye (42)	54.8	45.2	61.9	38.1	4.40
Nyamagabe (39)	59.0	41.0	33.3	66.7	5.46
Nyaruguru (63)	57.1	42.9	49.2	50.8	4.22
Ngororero (80)	56.3	43.8	43.8	56.3	4.15
Nyamasheke (73)	61.6	38.4	58.9	41.1	5.23
Gicumbi (84)	69.0	31.0	44.0	56.0	4.45
Gakenke (43)	62.8	37.2	14.3	85.7	3.91
Total (749)	**64.5**	**35.5**	**40.9**	**59.1**	**4.68**

3.1.3. Anthropometric measurements

Anthropometry involves measurement of variation of physical dimension and gross composition of human body at different age level and degree of

nutrition (USAID, 2016; OMS and UNICEF, 2019). In this study we took anthropometric measures of children aged between 6 and 59 months in all surveyed households. The information collected for this purpose was child age in months, sex, weight and height.

Across the all households surveyed and after data cleaning and plausibility check, the anthropometric measurements were considered for 203 children aged between 6 and 59 months. About 52 percent (52.2%) of them were boys against 47.8% girls and 31.0% were from beneficiaries of Girinka Program against 69.0% from the non-beneficiaries' households.

Table 5: Characteristics of children aged between 6 and 59 months in the surveyed households

District (n)	Sex of the child (%)		Girinka beneficiaries (%)		Age categories in Months (%)			Average weight (Kg)		Average height (Cm)	
	Boys	Girls	No	Yes	<24	[24;48]	>48	Boys	Girls	Boys	Girls
Bugesera (34)	50.0	50.0	79.4	20.6	29.4	55.9	14.7	12.2	12.5	82.9	85.4
Gatsibo (42)	57.1	42.9	59.5	40.5	38.1	33.3	28.6	12.4	12.5	82.3	83.5
Kirehe (30)	40.0	60.0	76.7	23.3	26.7	50.0	23.3	12.1	13.5	79.1	84.9
Huye (25)	60.0	40.0	88.0	12.0	36.0	36.0	28.0	11.7	11.8	80.7	85.3
Nyamagabe (18)	50.0	50.0	50.0	50.0	50.0	33.3	16.7	12.6	10.1	83.4	72.6
Nyaruguru (1)	0.0	100.0	100.0	0.0	0.0	0.0	100.0	_	18.5	_	102.0
Ngororero (1)	0.0	100.0	100.0	0.0	0.0	100.0	0.0	_	16.5	_	87.0
Nyamasheke (9)	55.6	44.4	88.9	11.1	44.4	33.3	22.2	13.6	11.9	85.6	83.3
Gicumbi (28)	57.1	42.9	50.0	50.0	28.6	42.9	28.6	13.3	12.2	85.8	85.5
Gakenke (15)	53.3	46.7	66.7	33.3	33.3	40.0	26.7	12.6	10.3	88.9	79.0
Total (203)	**52.2**	**47.8**	**69.0**	**31.0**	**34.0**	**41.9**	**24.1**	**12.5**	**12.3**	**83.1**	**83.4**

Across the districts, the highest proportion of boys was observed in Huye with 60.0% while the lowest proportion was in Kirehe with 40%. On the other side, girls in Kirehe were 60% as the highest proportion and those in Huye were 40% as the lowest proportion. Nyaruguru and Ngororero districts were rejected because each of these districts had one child in the surveyed children.

The proportion of children from households that have benefited from Girinka Program was high in Nyamagabe and Gicumbi with 50% each district and the proportion was very low in Nyamasheke and Kirehe with 11.1% and 12.0% respectively.

The average age was 32.0 months for boys and 35.5 months for girls. By categorizing age into three categories, the results showed that many children were between 2 and 4 years old (41.9%) and no significant difference was observed among districts except Bugesera and Kirehe where the proportion was 56% and 50% respectively.

No significant difference was in the average weight and height among boys and girls. In fact, the average weight was 12.5 kg for boys against 12.3 kg for girls and the average height was 83.1 cm for boys against 83.4 cm. Across the districts, the highest average weight for boys was observed in Nyamasheke with 13.6 kg and the lowest average was 11.7 kg in Huye District while for girls the highest average weight was 13.5 kg observed in Kirehe and the lowest weight was 10.1 kg observed in Nyamagabe. The average height for boys was high in Gakenke (88.9 cm) and low in Kirehe (79.1 cm) while the average height for girls was high in Bugesera (85.4 cm) and low in Nyamagabe (72.6 cm). Nyaruguru and Ngororero districts were omitted due to the few observations.

3.2. HOUSEHOLDS PRODUCTIVE ASSETS

3.2.1. Land ownership

The Table 6 shows that the average land owned by surveyed household is 0.39 ha. Bugesera and Kirehe are first with the average of 0.48 ha while Huye and Nyaruguru are last with 0.25 ha and 0.23 ha respectively. During the period that survey was done (2018 Season A), in Bugesera the land under crop is bigger than own land due to system of renting in and

borrowing of land by households. Nyamagabe is the first to rent out land with 0.04 ha. Gakenke is ranked first to have land with woodlot followed by Gicumbi, Nyamagabe, Nyaruguru, Huye and Ngororero. This is explained by the acidity of the land which can't be used for crop production but can be good for wood production. Huye is ranked first in follow with 0.04 ha followed by Kirehe with 0.03 ha. Concerning the pasture and fodder plot, Gatsibo, Bugesera and Ngororero seem to have a plot of 0.04 ha of pasture/fodder production. This figures are confirmed by the EICV5 report on National average of household's land size. It says that 55.6% of households have less than 0.3ha. (NISR,2018). In other hand the agriculture is the first source of income (MINECOFIN,2019). To make more profitable this small land, the use of agriculture inputs is crucial.

Table 6: Means of land owned and its management per household across surveyed districts (hectares)

District (n)	Owned land	Borrowed	Rented in	Rented out	Lent out	Under crop cultivation	under woodlot	under fallow	under pasture
Bugesera (141)	0.48	0.05	0.09	0.01	0.00	0.50	0.01	0.02	0.04
Gatsibo (189)	0.43	0.01	0.04	0.01	0.00	0.39	0.01	0.01	0.04
Kirehe (135)	0.48	0.01	0.03	0.01	0.01	0.38	0.02	0.03	0.01
Huye (54)	0.25	0.04	0.05	0.00	0.00	0.20	0.03	0.04	0.02
Nyamagabe (60)	0.38	0.01	0.05	0.04	0.00	0.30	0.04	0.02	0.02
Nyaruguru (82)	0.23	0.01	0.05	0.01	0.00	0.22	0.03	0.01	0.02
Ngororero (92)	0.27	0.03	0.02	0.00	0.00	0.18	0.03	0.01	0.04
Nyamasheke (96)	0.38	0.01	0.05	0.01	0.01	0.26	0.02	0.01	0.03
Gicumbi (154)	0.42	0.02	0.03	0.01	0.01	0.32	0.05	0.02	0.03
Gakenke (64)	0.43	0.01	0.04	0.01	0.00	0.27	0.11	0.02	0.02
All (1064)	**0.39**	**0.02**	**0.05**	**0.01**	**0.00**	**0.33**	**0.03**	**0.02**	**0.03**

When comparing the own land of beneficiaries and non-beneficiaries' results shows that beneficiaries have in general 0.58 ha whereas non-beneficiaries have 0.31 ha on average. The difference of land size can be explained by the benefits gained from Girinka Program which permit them to buy other land. Similar resultd were reported by USAID (2014) with about three quarters of surveyed households owning between 0 and 0.5ha.

3.2.2. Livestock ownership

In general, the cross breed ranks first with 52.8% of the total cow distributed to household in the ten surveyed districts. Huye and Nyamagabe are first to give cross breed with 76.9% and 72.7% respectively. Exotic breed represents 13.3% of the total, Nyamasheke and Ngororero are first to distribute them with 34.5% and 23.1% of total breed distributed. The local breeds represent 33.9% of distributed cows in surveyed households across 10 districts. In Gatsibo, 69.7% of surveyed households have received local breeds. The National average of local breed is 43% of the total bread (MINAGRI, 2018). The proportion of local breeds is 10% less compared to one in the Rwanda livestock master plan and the one of exotic breeds is more than double (ILRI, 2017). This means that Girinka beneficiaries are benefiting from improved breeds.

Table 7: Type of Girinka breed (in %)

District (n)	Local breed	Cross breed	Exotic breed
Bugesera (38)	44.7	34.2	21.1
Gatsibo (76)	69.7	27.6	2.6
Kirehe (28)	28.6	53.6	17.9
Huye (13)	15.4	76.9	7.7
Nyamagabe (22)	22.7	72.7	4.5
Nyaruguru (19)	52.6	36.8	10.5
Ngororero (13)	23.1	53.8	23.1
Nyamasheke (23)	13.0	52.2	34.8
Gicumbi (71)	31.0	67.6	1.4
Gakenke (21)	38.1	52.4	9.5
All (324)	**33.9**	**52.8**	**13.3**

The major source of Girinka cows is district/government with
39% followed by Ubudehe with 26.2%. The two sources can be
combined in one which is government. Other stakeholders have
distributed 18.1% of the total and pass on (inyiturano) represents
10.3% of the total Girinka cows. 44.4% of distributed cows in
Kirehe come from stakeholders.

In Gicumbi, 69% of surveyed households have cows from Ubudehe. In
Nyamasheke 73.9% comes from district while none comes from local
NGO, Ubudehe, and inyiturano. In Gatsibo 25% are from inyiturano.

Table 8: Sources of Girinka cows distributed per districts (%)

District	District/ Government	Stakeho- lders	FARG	Local NGO	Pass on	Ubu- dehe
Bugesera (38)	23.7	13.2	0.0	2.6	5.3	55.3
Gatsibo (76)	19.7	7.9	0.0	0.0	25.0	47.4
Kirehe (27)	18.5	44.4	0.0	11.1	3.7	22.2
Huye (12)	66.7	16.7	8.3	0.0	8.3	0.0
Nyamagabe (22)	40.9	22.7	9.1	0.0	22.7	4.5
Nyaruguru (19)	52.6	0.0	10.5	0.0	21.1	15.8
Ngororero (12)	50.0	33.3	0.0	8.3	8.3	0.0
Nyamasheke (23)	73.9	21.7	4.3	0.0	0.0	0.0
Gicumbi (71)	15.5	11.3	0.0	0.0	4.2	69.0
Gakenke (21)	28.6	9.5	0.0	9.5	4.8	47.6
All (321)	**39.0**	**18.1**	**3.2**	**3.2**	**10.3**	**26.2**

The other types of livestock represent small stock. Goats stand for 40.5% of small stock in all surveyed districts. Goats are more find in Kirehe, Gatsibo and Bugesera. Sheep comes first in Huye followed by Nyamagabe with 36.4% and 30.0% respectively. Pig comes first in Nyamagabe where they represent 55.0% of all small stock. Some households have more than one small stock. On the other side there are 47.0% of the households that have no small stock.

Table 9: Other types of livestock distribution by district in %

District (n)	Goat	Sheep	Pig	Poultry	Rabbit
Bugesera (89)	64.0	20.2	6.7	7.9	1.1
Gatsibo (97)	68.0	13.4	10.3	6.2	2.1
Kirehe (64)	70.3	10.9	14.1	4.7	0.0
Huye (33)	15.2	36.4	30.3	15.2	3.0
Nyamagabe (40)	5.0	30.0	55.0	10.0	0.0
Nyaruguru (36)	38.9	25.0	27.8	8.3	0.0
Ngororero (34)	35.3	29.4	14.7	14.7	5.9
Nyamasheke (42)	42.9	14.3	23.8	16.7	2.4
Gicumbi (86)	27.9	18.6	19.8	14.0	19.8
Gakenke (29)	37.9	20.7	20.7	17.2	3.4
All (550)	**40.5**	**21.9**	**22.3**	**11.5**	**3.8**

Within the 322 households of Girinka surveyed beneficiaries, only 21.1% have goats, 12.4% have sheep, 2.1% have pigs, 8.7% have poultry and 1.6% has rabbits. Considering 746 households of Girinka non-beneficiaries, 24.9% have goats, 9.4% have sheep, 9.1% have pigs, 3.6% have poultry and 0.9% has rabbit. Non-beneficiaries (24.9%) own more goats than beneficiaries (21.1%), but for the other types of small stocks, beneficiaries own more than non-beneficiaries.

Table 10: Small stocks ownership by Girinka Program beneficiaries and non-beneficiaries in %

Types of small stock	Beneficiaries (322)		Non-Beneficiaries (746)	
	Yes	**No**	**Yes**	**No**
Goats	21.1	78.9	24.9	75.1
Sheep	12.4	87.6	9.4	90.6
Pigs	12.1	87.9	9.1	90.9
Poultry	8.7	91.3	3.6	96.4
Rabbits	1.6	98.4	0.9	99.1

The sources of small stock are diversified (table 11). The first source of small stock is in all districts the own source and represented by 44% in average. The second source is relatives and friends with 22.2% in average. The last is Girinka and indagizo which represent 6.5% and 6.2% respectively. Gakenke District comes first to have source from Girinka with 13.3% and receive from friends and relatives with 33.3% respectively. Nyamasheke is the first in GoR source with 31.8%. Huye is first in income source from NGOs with 19.4%. Nyamagabe is the first in other sources with 62.5%. Kirehe comes first in indagizo source with 15.6%.

Table 11: Source of small stock across surveyed districts

District (n)	Income from Girinka Program cow	Income from other GoR program	Income from NGOs	Income from other sources	Received from a relative/ friend	Inda-gizo
Bugesera (91)	6.6	14.3	15.4	46.2	13.2	4.4
Gatsibo (98)	11.2	21.4	7.1	29.6	26.5	4.1
Kirehe (64)	1.6	21.9	0.0	43.8	17.2	15.6
Huye (31)	3.2	6.5	19.4	51.6	12.9	6.5
Nyamagabe (40)	5.0	5.0	0.0	62.5	25.0	2.5
Nyaruguru (37)	5.4	8.1	8.1	45.9	32.4	0.0
Ngororero (35)	5.7	14.3	5.7	40.0	28.6	5.7
Nyamasheke (43)	2.3	31.8	9.1	34.1	18.2	2.3
Gicumbi (68)	10.3	5.9	10.3	44.1	14.7	14.7
Gakenke (30)	13.3	0.0	3.3	43.3	33.3	6.7
Total (532)	**6.5**	**12.9**	**7.8**	**44.1**	**22.2**	**6.2**

3.3. CROP AND CATTLE PRODUCTION

3.3.1. Compost/manure production

Results in table 12 reveal that only 56.5% of respondents have compost pit. Among each of the two groups considered in this study Girinka Program beneficiaries group has the higher proportion of users of compost/manure pit (83.5%) while less than 50% of non-beneficiaries do not have compost pit. The quantity of compost/manure produced is very low. On average 35kg of manure are produced each 3 moths.

Manure for crop production

Districts of Eastern province respectively Bugesera, Gatsibo and Kirehe have longer period of time in months to produce manure and bigger quantities produced, unlike Southern province districts (Nyamagabe, Nyaruguru and Huye) which take shorter time to produce manure. The seasonal survey report from National Institute of statistics (2018) shows that 48% of small holders use organic fertilizer in theirs farms.

Table 12: Compost/manure production

District	If HH has compost pit (%)		HH having compost pits (%)		Manure production	
	No	Yes	Girinka non - benefi- ciaries	Girinka benefi- ciaries	Period of time for manure production (months)	Quantity of manure produced (kg)
Bugesera (121)	57.9	42.1	19.3	92.1	4.1	63.9
Gatsibo (189)	49.2	50.8	23.0	92.1	3.5	33.9
Kirehe (135)	51.9	48.1	35.5	96.4	3.5	74.4
Huye (55)	47.3	52.7	47.6	69.2	2.1	21.3
Nyamagabe (62)	37.1	62.9	59.0	69.6	1.7	49.6
Nyaruguru (82)	47.6	52.4	47.6	68.4	1.7	44.6
Ngororero (93)	40.9	59.1	53.8	92.3	2.2	13.9
Nyamasheke (96)	38.5	61.5	52.1	91.3	2.8	25.0
Gicumbi (155)	26.5	73.5	58.3	91.5	2.3	17.4
Gakenke (64)	32.8	67.2	55.8	90.5	2.0	19.0
All (1052)	**43.5**	**56.5**	**42.2**	**83.5**	**2.7**	**35.2**

3.3.2. Crop production

For Girinka beneficiaries and non- beneficiaries combined in all districts surveyed, major food crops cultivated (table 13) include respectively beans (93.1%), maize (68.4%), sweet potatoes (19.8%), potatoes (11.8%), cassava (7.4%), soybean (6.2%) and sorghum with 6% of respondents. Cooking banana is less important with only 4.2%, except in Gatsibo District where it got 14.1% of respondents. The peanuts are ranked least in major crops with 2% of respondents found mainly in Bugesera, Nyamagabe and Gatsibo (Table 12). Among surveyed districts, Gicumbi (24.7%) and Nyamagabe (23%) are the most productive for Irish potatoes production while major sweet potatoes producers are found in Nyamagabe with 50.8% of respondents followed by Nyaruguru (43.6%), Huye (42%) and Ngororero (36.5%). Production of sweetpotaoes is linked with use of manure as affirmed the International Alert and Pro-Femmes/ Twese Hamwe (2018) analysis.

Table 13: Food crops produced per poor households in selected districts %

District (n)	Maize	Beans	Potato	Cassava	Sorghum	Cooking banana	Sweet potato	Soybeans	Peanuts	Other
Bugesera(138)	87.0	94.9	5.8	7.2	8.7	2.9	8.0	11.6	8.0	2.9
Gatsibo (177)	79.7	83.6	9.0	6.8	2.8	14.1	3.4	4.0	2.8	2.8
Kirehe (128)	94.5	89.1	2.3	5.5	7.0	7.0	6.3	4.7	0.0	2.3
Huye (50)	32.0	98.0	10.0	16.0	26.0	0.0	42.0	8.0	0.0	6.0
Nyamagabe(61)	50.8	93.4	23.0	3.3	6.6	0.0	50.8	1.6	6.6	6.6
Nyaruguru (78)	56.4	100.0	15.4	15.4	6.4	0.0	43.6	7.7	0.0	2.6
Ngororero (85)	55.3	95.3	3.5	5.9	2.4	1.2	36.5	11.8	0.0	18.8
Nyamasheke(79)	43.0	94.9	16.5	21.5	0.0	0.0	6.3	15.2	0.0	0.0
Gicumbi (146)	55.5	97.3	24.7	0.0	6.8	0.0	28.1	0.0	0.0	0.7
Gakenke (67)	84.2	96.5	14.0	1.8	0.0	5.3	17.5	0.0	0.0	0.0
All (999)	**68.4**	**93.1**	**11.8**	**7.4**	**6.0**	**4.2**	**19.8**	**6.2**	**2.0**	**3.8**

*Other food crops mentioned were wheat, rice, tomatoes, eggplants, taro, and sunflower, cabbages, green pepper, vegetables and peas.

Results in table 14 reveal that cooking banana takes more area (0.30 ha in average) compared to other major food crops (0.17 ha in average). Looking at the prices, they vary from crop to another and from 2017 2017 Season B to 2018 Season A. However, the average price results show that the most profitable crops are respectively peanuts with 896 Rwf/kg, soybean (around 466 Rwf), wheat (435 Rwf/kg), cooking banana (361 Rwf/kg), sweet potatoes (347 Rwf/kg) beans (338 Rwf/kg) and cassava (around 206 Rwf/kg). The least profitable are tomatoes (164 Rwf/kg), Irish potato (172 Rwf/kg), sorghum (184 Rwf/kg), rice (190 Rwf/kg), and maize (196 Rwf/kg).

Table 14: Crop production and prices in 2017 2017 Season B and 2018 2018 Season A

Major crops	Cropped area in 2017 Season B	Quantity produced in 2017 Season B	Price in 2017 Season B	Cropped area in 2018 Season A	Quantity produced in 2018 Season A	Price in 2018 Season A	Average price per kg in Rwf
Maize	0.19	138.8	195.3	0.21	159.3	196.9	196.1
Beans	0.18	75.5	339.4	0.18	75.9	337.1	338.2
Potato	0.13	178.2	175.1	0.12	147.5	168.3	171.7
Cassava	0.14	460.6	223.5	0.17	484.6	189.7	206.6
Sorghum	0.18	98.0	234.5	0.07	34.8	134.0	184.3
Rice	0.09	266.7	250.0	0.04	266.3	130.0	190.0
Cooking banana	0.30	446.1	359.1	0.22	270.2	363.8	361.4
Sweet potato	0.13	138.3	365.0	0.13	153.8	330.4	347.7
Soybeans	0.07	23.5	505.7	0.09	28.8	427.0	466.3
Wheat	0.09	137.3	375.0	0.08	42.0	496.0	435.5
Tomatoes	0.22	152.4	228.0	0.14	270.0	100.0	164.0
Peanuts	0.20	42.3	888.2	0.28	43.8	903.9	896.0

The average yield in surveyed districts (table 15) shows that high yielding crops are respectively rice (6,608.3 kg/ha), sweet potatoes (3,653.4 kg/ha), Irish potatoes (3,184.3 kg/ha) and cooking banana (2,233.6 kg/ha). The

less yielding crops are peanuts (416.8 kg/ha), beans (832.1 kg/ha), soybean (821.9 kg/ha) and maize (1,116.2

kg/ha). Results show that sorghum yield (1,472.4 kg/ha) is higher than wheat yield (1,185.3 kg/ha). However, peanuts are the most profitable as mentioned above. These results should help RAB breeders to think about high yielding varieties of peanuts and start its mass production.

Table 15: Crop yield in 2017B and 2018A

Major crops	2017 Season B yield of major crops (kg/ha)	2018 Season A yield of major crops (kg/ha)	Average yield for major crops (kg/ha)
Maize	1129.6	1102.9	1116.2
Beans	797.5	866.7	832.1
Potato	3247.5	3121.2	3184.3
Cassava	1725.5	1918.3	1821.9
Sorghum	1598.1	1346.7	1472.4
Rice	5104.2	8112.5	6608.3
Cooking banana	2516.2	1951.1	2233.6
Sweet potato	3843.2	3463.7	3653.4
Soybeans	681.5	962.3	821.9
Wheat	1620.6	750.0	1185.3
Tomatoes	820.5	2160.0	1490.2
Peanuts	562.9	270.8	416.8

3.3.3. Cattle production

3.3.3.1. Proportion of cows distributed by Girinka Program from 2006 to 2015

Two 5-year periods have considered in table 16, that is, cow distribution from 2006 to 2010 and 2011 to 2015. In the first period, fewer cows were distributed (45.5%) across districts. In the second period (2011-2015) more cows (55.5%) were distributed because several partners joined the GoR for the implementation of Girinka Program.

Cows distribution to poor households' heads

During the second period, districts which had received fewer cows in 2006-2010, received more. These are respectively Nyamagabe (86.4%), Nyamasheke (73.9%) and Huye (69.2%).

Table 16: Proportion of Girinka beneficiaries per five years period (in %)

Name of the district	Period when the Girinka cow was received	
	2006-2010	2011-2015
Bugesera (38)	39.5	60.5
Gatsibo (76)	59.2	40.8
Kirehe (28)	42.9	57.1
Huye (13)	30.8	69.2
Nyamagabe (22)	13.6	86.4
Nyaruguru (19)	52.6	47.4
Ngororero (13)	76.9	23.1
Nyamasheke (23)	26.1	73.9
Gicumbi (68)	38.2	61.8
Gakenke (21)	57.1	42.9
All (321)	**44.5**	**55.5**

3.3.3.2. Herd possessed

The herd is constituted by the number of owned cows from Girinka Program and other cows possessed by households. Majority of Girinka Program cows have given birth from 1 to 4 calves. Owned cows from the mentioned program vary from 1 to 2 cows in general. Very few cows (0.1) are from non-Girinka program while it was noted that there is none in Gicumbi, Ngororero and Kirehe (Table 17). This demonstrates the role of Girinka Program in the livelihoods of citizen because owning a cow outside the GoR program is by friends/relatives gift or other personal incomes and this could not happen by hazard. The program targets really the poor households.

Table 17: Number of cows owned by Girinka Program beneficiaries

Name of the district	Number of calves given birth by Girinka cow	Number of cows owned	Number of owned cows from Girinka Program cow	Number of non-Girinka program owned cows
Bugesera (36)	2.9	2.1	1.9	0.1
Gatsibo (75)	3.2	1.5	1.3	0.1
Kirehe (28)	2.6	1.8	1.8	0.0
Huye (11)	2.8	1.8	1.7	0.6
Nyamagabe (20)	2.3	1.4	1.2	0.1
Nyaruguru (19)	2.5	1.3	1.3	0.1
Ngororero (13)	4.2	1.2	1.2	0.0
Nyamasheke (23)	2.3	1.5	1.5	0.1
Gicumbi (71)	1.9	1.3	1.3	0.0
Gakenke (21)	2.2	1.2	1.1	0.2
Total (317)	**2.6**	**1.5**	**1.4**	**0.1**

3.3.3.3. Cowshed and its status

Results in table 18 show that majority of Girinka beneficiaries (89.2%) own a cowshed. In average, 10% of respondents do not have a cowshed and the situation is worse in Gakenke (20%), Huye (15.4%) and Nyamagabe (13.6%) districts. The best cowsheds roofed and paved

with cement are found in Kirehe with 24% of respondents followed by Bugesera (18.2%) and Ngororero (18.2%). Other districts have roofed cowsheds with 64.7% in average, but poverty is still observable in some households through not roofed cowsheds (28.6%) in spite strict instructions of Girinka Program officials. Nyamasheke District is number one in having cowsheds (95.7%) with roofed status (86.4%). More efforts should be done in Huye where only 30% of cowsheds are roofed and 70% not roofed.

Table 18: Cowshed ownership and its current status

District	If household has a cowshed		Status of cowsheds		
	No	Yes	Roofed	Not roofed	Roofed and paved with cement
Bugesera (33)	10.5	89.5	75.8	6.1	18.2
Gatsibo (68)	10.5	89.5	75.0	20.6	4.4
Kirehe (25)	10.7	89.3	72.0	4.0	24.0
Huye (10)	15.4	84.6	30.0	70.0	.0
Nyamagabe (19)	13.6	86.4	68.4	26.3	5.3
Nyaruguru (17)	10.5	89.5	47.1	52.9	.0
Ngororero (11)	7.7	92.3	63.6	18.2	18.2
Nyamasheke (22)	4.3	95.7	86.4	13.6	.0
Gicumbi (63)	9.9	90.1	50.8	49.2	.0
Gakenke (15)	20.0	80.0	46.7	46.7	6.7
All (283)	**10.8**	**89.2**	**64.7**	**28.6**	

3.3.3.4. Animal feeding by Girinka beneficiaries

Napier grass is combined with other feeds as shown in table 19. However, 39.3% declared that they use all feeds except concentrates. These include a mix-up of Napier grass, crop residues, miscellaneous grasses, and mineral blocks.

Napier grass grown under Girinka Program Scheme for animal feeding

It is however observed that very few Girinka beneficiaries (0.3%) found only in Gatsibo District feed their cows with mineral blocks known as being rich in nutrients. The use of this nutrient is exemplified by GoR colourful distribution event of Girinka cows to poor households with full package for animal production improvement (licking salt/mineral block, medicines, and fodder seeds) during the dedicated week campaign every year. Hence, more sensitization of farmers to use mineral blocks in animal feeding is extremely recommended for all districts.

Table 19: Animal feeding and feeds

District (n)	Animal feeds (1. Napier grass; 2. Crop residues; 3. Miscellaneous grasses; 4. Concentrates; 5. Mineral blocks)									
	1	2	3	1+2+3+5	1+2+3+4+5	1+2+3	1+3	1+2	1+4	1+5
Bugesera (37)	16.2	0.0	2.7	43.2	0.0	13.5	21.6	2.7	0.0	0.0
Gatsibo (76)	31.6	2.6	6.6	36.8	0.0	2.6	11.8	5.3	1.3	1.3
Kirehe (27)	14.8	0.0	11.1	70.4	0.0	3.7	0.0	0.0	0.0	0.0
Huye (13)	46.2	15.4	0.0	0.0	7.7	30.8	0.0	0.0	0.0	0.0
Nyamagabe (22)	9.1	0.0	0.0	36.4	4.5	45.5	4.5	0.0	0.0	0.0
Nyaruguru (19)	26.3	0.0	0.0	31.6	0.0	26.3	10.5	5.3	0.0	0.0
Ngororero (13)	7.7	0.0	0.0	69.2	0.0	7.7	7.7	7.7	0.0	0.0
Nyamasheke (23)	17.4	0.0	13.0	13.0	4.3	43.5	8.7	0.0	0.0	0.0
Gicumbi (68)	11.8	11.8	0.0	48.5	1.5	11.8	11.8	1.5	1.5	0.0
Gakenke (20)	50.0	20.0	0.0	15.0	0.0	10.0	0.0	5.0	0.0	0.0
Total (318)	**22.0**	**5.0**	**3.8**	**39.3**	**1.3**	**15.1**	**9.7**	**2.8**	**0.6**	**0.3**

3.3.3.5. Artificial insemination, book keeping, vaccination and disease control.

Girinka beneficiaries practice artificial insemination (AI) at 32.1% (Table 20). This shows how adoption of new technologies goes slowly by slowly. This result is almost similar with adoption rate (30%) of new crop seeds in Rwanda (reference). Livestock keepers stick on traditionalism and bring their cows to the bulls which reduce all expectations on the quality of breeds and quantity of milk.

Whereas the keeping of cow book is compulsory, it was observed that only 15.8% have such kind of book where they put records on AI, calving, vaccination dates, etc.). For animal health improvement, Girinka cows are treated for disease (at 93.0%) and vaccinated (at 94.9%).

Table 20: AI, book keeping and disease control

District	If AI		If livestock book		If vaccination used		If Girinka cow treated for disease	
	No	Yes	No	Yes	No	Yes	No	Yes
Bugesera (38)	72.2	27.8	75.0	25	5.2	94.7	0	100
Gatsibo (76)	78.9	21.1	96.1	3.9	5.2	94.7	7.9	92.1
Kirehe (28)	26.9	73.1	52.0	48	0.0	100	3.6	96.4
Huye (11)	71.4	28.6	83.3	16.7	9.1	90.9	9.1	90.9
Nyamagabe (20)	50	50	66.7	33.3	5.0	95	16.7	83.3
Nyaruguru (17)	75	25	100.0	0	18.7	81.2	29.4	70.6
Ngororero (13)	38.5	61.5	53.8	46.2	0.0	100	0	100
Nyamasheke (23)	57.9	42.1	76.5	23.5	4.3	95.7	8.7	91.3
Gicumbi (70)	78.1	21.9	95.1	4.8	5.7	94.3	5.7	94.3
Gakenke (20)	69.2	30.8	83.3	16.7	0.0	100	0	100
All (316)	**67.9**	**32.1**	**84.2**	**15.8**	**5.1**	**94.9**	**7.0**	**93.0**

3.3.3.6. Milk production, consumption and sold

Majority of Girinka cows (91.1%) have given birth from 1 to 3 calves and milk is consumed by producer households at 87.9% (Table 21).

Girinka milk consumed by children for better nutrition

Girinka cow constitutes the main source of milk with 82.1% followed local market with (9.9%) while the neighbours were the source of milk for 8% with the highest proportion of 26.7% observed in Nyaruguru. The neighbours should be encouraged to provide milk to fellow farmers especially in Bugesera, Nyamagabe and Nyamasheke where none of the respondents got milk from them.

Table 21: Source of milk consumed at household level

District	If Girinka cow gave birth		If milk is consumed in the household		Source of home consumed milk		
	No	Yes	No	Yes	Girinka cow	Neighbours	Local market
Bugesera (38)	7.9	92.1	10.5	89.5	84.8	0.0	15.2
Gatsibo (76)	9.2	90.8	13.1	86.8	86.2	3.1	10.8
Kirehe (28)	0.0	100.0	10.7	89.3	79.2	16.7	4.2
Huye (12)	8.3	91.7	8.3	91.7	72.7	9.1	18.2
Nyamagabe (18)	11.1	88.9	18.8	81.2	92.3	0.0	7.7
Nyaruguru (19)	15.8	84.2	15.8	84.2	73.3	26.7	0.0
Ngororero (13)	7.7	92.3	15.4	84.6	81.8	18.2	0.0
Nyamasheke (23)	0.0	100.0	4.8	95.2	85.0	0.0	15.0
Gicumbi (69)	15.9	84.1	12.7	87.3	81.0	11.1	7.9
Gakenke (19)	0.0	100.0	5.0	95.0	73.7	10.5	15.8
All (315)	**8.8**	**91.1**	**12.1**	**87.9**	**82.1**	**8.0**	**9.9**

From 2015 to 2017, each household owned a cow with 184 days of lactation in average. Respondents have got respectively 4.5 litres of milk per day in 2015, 4.9 litres in 2016, and 4.2 litres in 2017. This was caused by harsh climate conditions (drought) occurred from the end of 2016 towards the half of the year 2017. Milk production is higher in Kirehe District with 7.8 litres per day and lower in Gakenke (2.8 l/day) in 2017. There is no significant difference between milk production by males (4.6 litre/day) compared to females (4.2 litre/day). Male and female can all milk a cow; it is a matter of changing from Rwandan culture.

The highest lactation mean in days is found in Bugesera (206 days), Kirehe (201 days) and Gicumbi (196 days) districts while the lowest lactation days are found in Gakenke (153 days) and Nyaruguru (165 days). The reason for these longer lactation periods was the farmers' better knowledge about cattle feeding and watering.

Results in table 22 show that the highest annual income from milk is in Bugesera (Rwf 34,247) followed by Kirehe (Rwf 31,448) and Gatsibo (Rwf 31, 448). It is further revealed that better prices of milk per litre are found in districts of Eastern Province (around Rwf 200 litre) whereas low prices (litre of milk) and low annual income from milk are found in Ngororero (Rwf 9, 688) and Nyaruguru (Rwf 10, 415) districts. The later districts are located in very remote areas of Rwanda. Eastern province districts have more access to Kigali-City, best milk consumer. The average income from milk is only Rwf 21,529 per year whereas income from cow sold is Rwf 44, 035. The quantity of milk reduced year by year from 2015 to 2017 for many of surveyed districts but it is observable that the price of one litre of milk slightly increased from Rwf 179.9 to Rwf 189.8 by adding almost Rwf 10 during that three years period.

Table 22: Mean of quantity of milk produced by Girinka cow and total income from 2015 to 2017.

District	№ of cows (mean)	№ of days of lactation	Quantity (litres) of milk 2015 (mean)	Average price for 2015 (Rwf/l)	Quantity (litres) of milk 2016 (mean)	Average price for 2016 (Rwf/l)	Quantity (litres) of milk 2017 (mean)	Average price for 2017 (Rwf/l)	Annual income from milk (Rwf)	Income per cow sold (Rwf)
Bugesera (33)	1.9	206.6	4.6	196.5	4.4	195.5	4.2	206.8	34,248	42,594
Gatsibo (59)	1.3	174.3	3.6	198.3	4.3	189.2	4.3	208.4	28,017	72,228
Kirehe (24)	1.8	201.3	7.3	168.2	7.1	175.7	7.8	192.9	31,448	23,186
Huye (9)	1.7	190	3.8	175	6.7	173.3	4.3	195	12,620	26,981
Nyamagabe (12)	1.2	185.5	5.2	180	3.8	200	4.5	168.6	14,323	21,433
Nyaruguru (13)	1.3	165	3.8	165	3.5	174	4	178.3	10,415	30,037
Ngororero (10)	1.2	173.3	4.9	183.3	5.4	178.3	4.1	186	9,688	41,304
Nyamasheke (18)	1.5	159.2	3.9	181.4	3.9	257.1	3.5	207.1	12,023	19,942
Gicumbi (53)	1.3	196.2	3.4	147.5	5.6	152.1	4.6	155.5	21,403	55,665
Gakenke (18)	1.1	153.3	2.3	159	3.5	144.4	2.8	167.1	11,506	69,375
Total (249)	**1.4**	**183.8**	**4.2**	**179.9**	**4.9**	**181.7**	**4.5**	**189.8**	**21,529**	**44,036**

Girinka beneficiaries sell their milk mostly to direct neighbours (45.1%). These could be traders, employees like teachers and/or medical agents, etc. The milk collection centres (35.3%) are not yet taking the highest rank as the better selling points for milk as expected by the government.

Milk Collection Centre and milk selling record card

Local markets (17.3%) get less milk and they are supposed to sell milk bought from collection centres. This instruction should be reinforced (Table 23).

Table 23: Milk marketing by Girinka beneficiaries

District	Local market	Neighbours	Milk collection centre	Other
Bugesera (12)	0.0	83.3	16.7	0.0
Gatsibo (20)	10.0	65.0	25.0	0.0
Kirehe (18)	11.1	55.6	33.3	0.0
Huye (1)	0.0	100.0	0.0	0.0
Nyamagabe (5)	0.0	60.0	20.0	20.0
Nyaruguru (6)	50.0	50.0	0.0	0.0
Ngororero (8)	50.0	25.0	25.0	0.0
Nyamasheke (9)	33.3	55.6	0.0	11.1
Gicumbi (48)	16.7	25.0	56.2	2.1
Gakenke (6)	16.7	16.7	66.7	0.0
All (133)	**17.3**	**45.1**	**35.3**	**2.3**

In total, 85.1% of Girinka beneficiaries have given a cow from Girinka Program to another person (pass on obligation) and 74.9% were able to sell at least one cow from those received from Girinka Program. In the bid of pass on cow (Kwitura) principles, Gakenke ranks fist with 100 % performance followed by Ngororero with 92.3% (Table 24). If Girinka Program is to achieve its set objectives, more emphasis should be put in Huye and Nyaruguru where they have 72.7% and 77.8% of pass on cows respectively.

Table 24: Pass on and selling of Girinka cows

District	Pass on (%)		Selling a cow from Girinka Program (%)	
	No	Yes	No	Yes
Bugesera (35)	22.9	77.1	31.4	68.6
Gatsibo (74)	10.8	89.2	14.9	85.1
Kirehe (28)	14.3	85.7	39.3	60.7
Huye (11)	27.3	72.7	30.0	70.0
Nyamagabe (16)	12.5	87.5	57.1	42.9
Nyaruguru (18)	22.2	77.8	15.8	84.2
Ngororero (13)	7.7	92.3	15.4	84.6
Nyamasheke (23)	17.4	82.6	41.2	58.8
Gicumbi (67)	16.4	83.6	26.1	73.9
Gakenke (18)	0.0	100.0	5.0	95.0
All (303)	**14.9**	**85.1**	**25.1**	**74.9**

3.4. FOOD SECURITY AND FOOD SHORtAGE COPING MECHANISMS

3.4.1. Food access and availability

In this section, surveyed households were asked whether there were months in which they did not have enough food to meet their family's needs in the past 12 months and results in table 25 indicated that only 18.5% had no food access issues. The proportion is much higher in Girinka beneficiaries with 30.5% against 13.4% among the non-beneficiaries. The surveyed households from three districts of Eastern Province have showed the highest proportions of households with no food issues. In fact, 65.8% of Girinka Program beneficiaries from Bugesera District had no food access issues followed by Girinka beneficiaries from Gatsibo and Kirehe districts with 44.7% and 35.7% respectively. Among the non-beneficiaries, these districts had also the highest proportion of households with no food issues. On the other side, surveyed households from southern province in both Girinka Program beneficiaries and non-beneficiaries had the lowest proportion of households with no food access issues: only 4.3% of Girinka beneficiaries had no food access issues while none of the non-beneficiaries from Nyaruguru had no food access issues. An assessment of Girinka program 2016-2016 (RGB, 2018) showed the positive impact of Girinka on food security and health. This report also revealed that the malnutrion was reduced due to the increase in milk production. Girinka has played an important role in food security as revealed by Kayigema (2013), Mutarutwa (2014) and Ndahindwa (2014).

The low proportion of households with no food access was also shown by the short period of household food stock and the comprehensive food security and vulnerability analysis (CFSVA) has provided more insights on food access (NISR, 2016). In fact, surveyed households were asked how long the 2017 Seasons A and B harvest last and how long they think the current harvest (2018 Season A) will last for both the most important cereal and legume crops. Results indicated that the most important cereal crop was maize with 93.6% and sorghum (5.5%) and the most important legume crop was beans with 98.6%. The average period the harvest of 2017 Season A and B last for the important cereal crop was 2.56 months and the 2018 Season A harvest was expected to last 2.66 month while for the legume crop, the average period was 3.04 months and 3.26 months for the 2017 Season A and B and 2018 Season A harvest respectively.

Table 25: Proportion of households with no food issues and period of stock for most important cereal and legume crops.

District (n)	Households with no food access issues			Cereal crop stock		Legume crop stock	
	Benefi-ciaries	Non-benefi-ciaries	Total	2017A & B	2018 A	2017A & B	2018 A
Bugesera (143)	65.8	17.1	30.1	3.15	3.11	3.68	3.31
Gatsibo (189)	44.7	23.0	31.7	3.06	3.05	2.90	2.90
Kirehe (135)	35.7	26.2	28.1	2.96	3.02	3.37	4.31
Huye (55)	7.7	4.8	5.5	2.48	2.14	3.38	3.67
Nyamagabe (62)	4.3	7.7	6.5	1.76	1.75	2.74	3.18
Nyaruguru (82)	5.3	0.0	1.2	1.94	2.44	2.51	2.51
Ngororero (93)	7.7	3.8	4.3	1.95	1.73	2.38	2.64
Nyamasheke (96)	21.7	9.6	12.5	2.16	2.35	2.88	3.03
Gicumbi (155)	22.5	10.7	16.1	1.70	2.19	3.09	3.61
Gakenke (64)	23.8	9.3	14.1	3.19	3.15	3.38	3.27
Total (1074)	**30.5**	**13.4**	**18.5**	**2.57**	**2.67**	**3.04**	**3.26**

In general, for 81.5% of surveyed households that have food access issues, the proportion of households that have enough food to meet their family needs was 47.0% with January and February being the critical months where the proportion was less than 30% and October and November being the months where many households had enough food to meet their family needs with 65.8% each month (Figure 1).
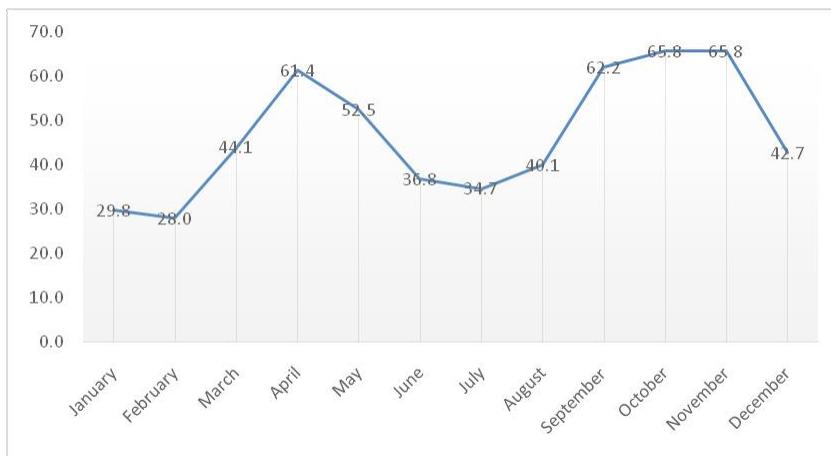
Figure 1: Food access in the last 12 months (From March 2017 to February 2018)

3.4.2. Coping mechanisms

Following the food shortage observed in the survey households, a list of 12 coping mechanisms was proposed and the surveyed households have indicated which ones they use and how often they use them. Results showed that all the 12 proposed coping mechanisms were used across all the surveyed district and their utilization was almost equally distributed except the ones of mortgaged/sold assets to get money to buy food and getting help from government programs used respectively by 1.9% and 3.1% of the total households surveyed on this issue. The most coping mechanisms used were the reduction of number of meals and the food for work programs with 16.1% and 13.9% of surveyed households respectively and similar results were found by FAO (2010).

Across the surveyed district, the difference was not significant, the highest proportion observed was 19% of households from Gakenke District have reduced the number of meals as the main coping mechanism while the lowest proportion was observed in Bugesera where only 0.4% have mortgaged/sold assets to buy food.

Table 26: Food shortage coping mechanisms by district

Coping mechanisms	Bugesera	Gatsibo	Kirehe	Huye	Nyamagabe	Nyaruguru	Ngororero	Nyamasheke	Gicumbi	Gakenke
Borrowed money to buy food or got food on credit	14.0	12.8	11.0	8.3	11.6	9.3	14.2	13.4	12.5	15.7
Reduced the number of meals	18.0	14.9	14.0	18.9	18.1	18.1	15.0	16.9	14.7	19.0
Mother ate less	10.9	11.9	13.2	12.4	13.3	13.9	12.2	13.0	12.1	9.9
Father ate less	8.9	9.2	11.6	8.8	10.6	10.8	8.6	7.6	10.7	6.2

Coping mechanisms	Bugesera	Gatsibo	Kirehe	Huye	Nyamagabe	Nyaruguru	Ngororero	Nyamasheke	Gicumbi	Gakenke
Children ate less	7.6	11.8	14.0	7.4	7.8	7.6	11.4	12.2	11.5	9.5
Substituted commonly bought foods with cheaper kind	11.6	13.9	11.4	10.6	11.3	12.1	8.2	8.6	12.5	11.2
Mortgaged/sold assets	0.4	1.0	2.4	2.3	2.7	2.0	2.8	1.7	2.1	3.3
Borrowed from neighbours	8.4	8.5	10.1	9.2	6.5	7.3	9.6	8.1	8.5	7.9
Went for food for work programs	17.8	14.2	11.1	15.7	15.0	14.1	13.6	13.2	13.5	13.6
Government programs	2.4	1.9	1.2	6.5	3.1	4.8	4.2	5.4	2.1	3.7

Coping mechanisms for Girinka beneficiaries and non-Girinka beneficiaries seem to be similar. Slight differences are observed in reducing the number of meals (17.5% against 15.2%) and working for food (14.2% against 12.1%) which are higher for non-beneficiaries and substitutes with cheaper food (10.8% against 12.7%) which is higher for Girinka beneficiaries.

Table 27: Food shortage coping mechanisms by Girinka beneficiaries and non-beneficiaries

Coping strategies	Non-beneficiary	Bene-ficiary	All
Borrowed money to buy food or got food on credit	12.4	12.9	12.6
Reduced the number of meals	17.5	15.2	16.2
Mother ate less	12.4	12.3	12.4
Father ate less	9.3	10.4	9.6
Children ate less	10.6	10.8	10.6
Substituted commonly bought foods with cheaper kind	10.8	12.7	11.3
Mortgaged/sold assets	1.7	2.8	2.0
Borrowed from neighbours	8.5	8.3	8.5
Went for food for work programs	14.4	12.1	13.8
Government programs	3.3	2.5	3.1

To reduce the number of meals constitutes the coping mechanism number one for all districts surveyed. Thus, it is analysed alone to compare how households cope with number of meals across district. Results show that Gakenke, Huye, Nyamagabe, Bugesera and Nyaruguru are the most using this strategy. This is linked with low soil fertility found in those districts except Bugesera which faces periodic ally improvised drought.

Within these coping mechanisms, the mortgaging/ selling assets was mainly used very few times with 43.3% and the help from government programs recorded the highest proportion of households using it all the time with 38.7%

Table 28: Frequency of using food shortage coping mechanisms

Coping mechanisms	Very few times (seldom)	Occasio-nally	Regu-larly	All the time
Borrowed money to buy food or got food on credit	13.0	50.2	31.4	5.4
Reduced the number of meals	8.6	40.4	38.7	12.3
Mother ate less	9.7	44.6	36.7	9.0
Father ate less	9.1	52.2	31.3	7.5

Coping mechanisms	Very few times (seldom)	Occasio-nally	Regu-larly	All the time
Children ate less	10.4	47.0	35.8	6.9
Substituted commonly bought foods with cheaper kind	6.9	32.3	45.7	15.1
Mortgaged/sold assets	43.3	30.0	20.0	6.7
Borrowed from neighbours	18.0	53.6	23.4	5.1
Went for food for work programs	5.2	28.3	39.2	27.3
Government programs	11.3	28.9	21.1	38.7

3.5. GIRINKA PROGRAM BENEFITS

3.5.1. Major benefits

The top five benefits of Girinka Program as revealed by a sample of the program beneficiaries are respectively, (i) health insurance (29.7%), (ii) house rehabilitation (27.7%), (iii) school fees (21.3%), (iv) land acquisition (15%) and (v) dowry (2.6%). Other quantifiable benefits are acquiring sewing machines, bicycles, agricultural inputs, other types of livestock, etc. (2.9%) Biogas energy is also mentioned but by very few respondents (0.9). The first four benefits are recognized by more than 90% of respondents suggesting that these items are really very important for rural poor households. The same benefits were also highlighted in several studies conducted in Rwanda (Niwemugeni, 2013; Rugema, 2014; RGB, 2014; Militery et al. 2013; Argent et al. 2013; Hahirwa & Kalinganire, 2017; MINAGRI, 2017; MINAGRI, 2018).

Figure 2: Major benefits of Girinka Program
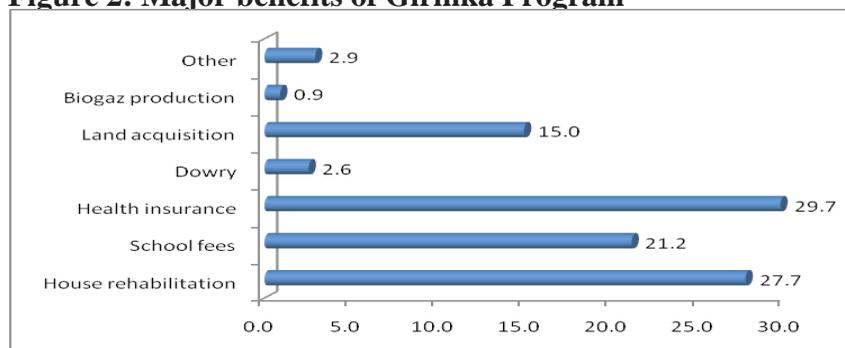
3.5.2. Other benefits

Other benefits are made of self-esteem (28.9%), contribution to social ceremonies (16.8%), membership in associations (16%), purchase of improved inputs (14%), improved skills and experience (12.9%), graduation in Ubudehe category (6.9%) and sales of manure (4.4%) (Figure 2). IFAD (2012) has confirmed that Girinka Programme is generating more organic manure for the crops. With a score of 14, "purchase of improved inputs" as a benefit from Girinka Program is a revelation that very few Girinka beneficiaries use improve agricultural inputs. The same benefits were also reported by RGB (2018).

Figure 3: Other benefits from Girinka Program
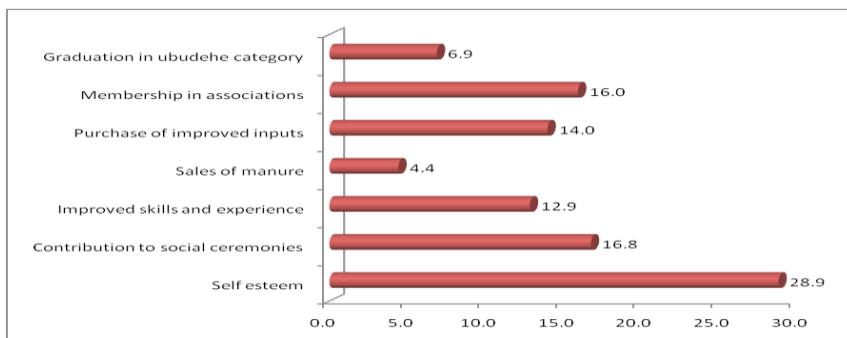
3.6. HOUSEHOLD EXPENDITURES

In the previous section highlighting the benefits of Girinka Program, some of these such as health insurance, house rehabilitation, school fees, land acquisition and purchase of improved inputs require some money to spend. Results in Table 29 show that Girinka Program beneficiaries have spent on average, more money than non-beneficiaries both on food and non-food items suggesting that they have more money to use. In fact, there was a statistically significant difference (Rwf 4,215) between the two groups in terms of total expenditures. Expenditures on food goods contributed largely in this difference, contribution of household non-food expenditures being just minimal. This suggest that both Girinka beneficiaries and non-beneficiaries relies more on own production for household food consumption.

Table 29 Comparison of Girinka beneficiaries and non-beneficiaries' weekly expenditures (FRw)

District	Food expenditure			Non-food expenditure			Total expenditure		
	Beneficiaries	Non-beneficiaries	Difference	Beneficiaries	Non-beneficiaries	Difference	Beneficiaries	Non-beneficiaries	Difference
Bugesera	12,401	8,112	4,290***	3,717	1,676	2,042**	16,119	9,787	6,331***
Gatsibo	11,374	8,713	2,661***	2,546	1,713	833*	13,920	10,426	3,493***
Kirehe	10,860	7,966	2,893**	1,878	2,435	(557)	12,738	10,401	2,336
Huye	7,546	7,398	148	2,363	1,798	565	9,909	9,196	712
Nyamagabe	7,839	7,455	384	2,396	1,667	729	10,235	9,122	1,113
Nyaruguru	8,168	5,260	2,908***	2,534	1,670	864	10,702	6,930	3,771***
Ngororero	9,430	5,987	3,444**	3,950	1,037	2,913***	13,380	7,023	6,357***
Nyamasheke	12,384	7,363	5,021***	1,874	1,453	421	14,258	8,816	5,441***
Gicumbi	11,436	8,457	2,979***	2,363	1,321	1,041*	13,799	9,778	4,021***
Gakenke	13,561	7,715	5,846***	2,438	1,653	785	15,999	9,368	6,631***
All	10,913	7,586	3,326***	2,561	1,672	889***	13,474	9,259	4,215***

Mean differences marked with asterisks are significantly different from zero at 90% level of probability (*), 95% level (**) and 99% level (***)

Girinka beneficiaries from all the districts covered by the study seem to have more money to spend than those who are still on waiting lists (non-beneficiaries). However, for two districts, namely Nyamagabe and Ngororero, there was no statistically significant difference between Girinka beneficiaries and non-beneficiaries in terms of expenditures on food and non-ffod stuffs. This means that among poor rural farmers who received cows

(beneficiaries) or are still on waiting lists (non-beneficiaries), there was a statistically significant difference between the two groups in all other 8 districts.

3.7. GIRINKA PROGRAM IMPact

Three household welfare outcomes were considered in this study and these are: household income, household food security and household nutritional status. Household income was made of farm income (crop and livestock) and off-farm income. Household expenditures were also estimated for more insight on household income. Food security was measured by daily calorie intake per adult-equivalent. The impact of the program on crop yield (maize and beans) was also assessed for more clarifications on household food security. Nutritional status of under-five children was measured by their height for age, weight for age and weight for height *z-scores*.

It is worthwhile to notice that from the original sample of 1092 households, sub samples were used varying with the outcome assessed and the level of analysis. Some of the households were in fact dropped due to identified outliers, inconsistencies detected by analytical computer programs used or because of unmatched non-beneficiary households in the process of PSM.

The anthropometric dataset used included children from 221 households out of 1070 households of the sample in ten districts in all the four provinces. The ENA software listed 26 children (from 17 households) with either extreme values or with more than 3 z-scores from the mean of the population from the analysis and these children were excluded in in the analysis.

The discussion of the results in this section is divided into two sub sections: (1) Empirical results of probit regression and PSM; and (2) the impact of Girinka Program on crop yield, household food security, income and nutritional status

3.7.1. Empirical results of probit regression and PSM

Table 32 presents the mean, standard deviation, minimum and maximum values for each control variable included in the probit regressions used to generate propensity scores.

Table 30 Summary statistics of variables

Variable	n	Mean	Standard deviation	Min	Max
Outcome variables					
Crop yield					
Beans yield	832	867.804	831.628	88.888	3000
Maize yield	597	1136.468	1128.85	83.333	4666.6
Household food security					
Calorie per adult-equivalent per day	962	2026.326	853.882	578.654	3500
Household income					
Annual gross income	951	56420.75	57096.73	0	282422.2
Weekly expenditures	962	10479.82	7063.04	1560	34010
Nutritional status					
Weight for height z-score (W4H)	203	1.067419	1.193972	-1.551	4.089
Weight for age z-score (W4A)	203	-0.76003	0.93622	-3.055	1.884
Height for age z-score (H4A)	203	-2.69353	1.34223	-6.259	-0.294
Treatment variable					
Girinka program beneficiary	962	0.309771	0.46263	0	1
Household characteristics					

Household size	962	4.96569	2.14991	1	12
Under 18 years old	962	2.34095	1.66689	0	9
18 to 59 years old	962	2.18815	1.26382	0	8
Above 59 years old	962	0.40748	0.63889	0	3
Female household head	962	0.31288	0.46391	0	1
Bugesera District	962	0.13825	0.34534	0	1
Kirehe District	962	0.12889	0.33526	0	1
Huye District	962	0.05093	0.21998	0	1
Nyamagabe District	962	0.05717	0.23229	0	1
Nyaruguru District	962	0.07692	0.26660	0	1
Ngororero District	962	0.08627	0.28092	0	1
Nyamasheke District	962	0.06964	0.25468	0	1
Gicumbi District	962	0.14657	0.35386	0	1
Gakenke District	962	0.06029	0.23815	0	1

Note: Reference for district dummy variables is the Gatsibo District, for the gender dummy variables is the male household head and for the treatment dummy variable is non-beneficiary.

The results of the probit regressions (Table 33) show that each of the dependent variables (matching variables) included in the six models except two (Female headed household, age of the child and sex of the child) has a coefficient that is statistically significant at 5% level in at least one of the models suggesting that it contribute in the participation of poor rural household in Girinka Program. On the other hand, the gender of head of household and of an under-five child and the age of an under-5 children are not determinant factors in Girinka Program participation. Girinka Program beneficiaries are most likely to have above 59 years old, be members of households with big size, less under 18 and 18 to 59 members. These results suggest then that Girinka Program intervention focused on aged people who are part of more vulnerable categories in the country.

Table 31 Parameter estimates of Probit Regressions of Girinka Program participate (Matched observations)

	Crop yield		Food security	Household income		Nutrition
	Beans	Maize	Calories per adult-eq. per day	Annual income	Weekly expenditures	W4H; W4A; H4A
Constant	-1.00040***	-0.83500***	-0.74412***	0.86452***	-0.79879***	-0.93966**
	(0.17574)	(0.20357)	(0.19421)	(0.15401)	(0.16129)	(0.43337)
Household size	0.19655	0.23034***	-0.01226	0.18049**	0.19108***	0.12784
	(0.06824)	(0.04866)	(0.02031)	(0.07154)	(0.07145)	(0.09091)
Under 18 years	-0.01907	-0.16051**	0.040657	-0.09046	-0.12309*	-0.07353
	(0.07419)	(0.06226)	(0.02880)	(0.06945)	(0.06839)	(0.11501)
18 to 59 years	0.07010		-0.01226***	-0.03222	-0.04266	-0.22806
	(0.07821)		(0.02031)	(0.07358)	(0.07265)	(0.26883)
Above 59		-0.06535	0.18929**			
		(0.09414)	(0.07449)			
Female headed household	-0.20381*	-0.19695	-0.16837*	-0.19443*	-0.19025*	-0.11946
	(0.09815)	(0.13650)	(0.10205)	(0.10419)	(0.10301)	(0.28599)
Bugesera District	-0.19857	-0.34461**	-0.46479***	-0.46169***	-0.46040***	0.65531**
	(0.16754)	(0.16798)	(0.15534)	(0.15391)	(0.15757)	(0.32306)
Kirehe District	0.01860	-0.77567***	-0.56775***	-0.73482***	-0.59776***	-0.54779
	(0.17642)	(0.18475)	(0.16119)	(0.16989)	(0.16246)	(0.33511)
Huye District	0.04326	-0.48794	-0.45403**	-0.36176	-0.39861*	-0.89194**
	(0.22778)	(0.38123)	(0.22510)	(0.22359)	(0.22111)	(0.39216)
Nyamagabe District	0.17277	-0.85084***	-0.16320	-0.07242	-0.15125	
	(0.20628)	(0.30435)	(0.19931)	(0.19109)	(0.19546)	

Nyaruguru District	0.05981	-0.94195***	-0.44102**	-0.42032**	-0.45910**	
	(0.19347)	(0.29565)	(0.18929)	(0.18430)	(0.18660)	
Ngororero District	0.20006	-0.40258	-0.44102***	-0.80654***	-0.75762***	
	(0.19950)	(0.25078)	(0.18929)	(0.20091)	(0.19805)	
Nyamasheke	0.03127	-0.17792	-0.16409	-0.48625***	-0.52404***	-0.95505
	(0.20227)	(0.27710)	(0.18782)	(0.17798)	(0.19126)	(0.60521)
Gicumbi District	-0.02447	0.34881*	0.17367	0.12018	0.17594	0.17208
	(0.16324)	(0.18828)	(0.14484)	(0.13770)	(0.14554)	(0.31753)
Gakenke District	-0.32271	-0.13606	-0.16581		-0.27870	-0.22305
	(0.23396)	(0.23170)	(0.20119)		(0.21520)	(0.39701)
Female child						0.12262
						(0.19795)
Child age						0.00573
						(0.00686)

Notes:
- Reference for district dummy variables is the Gatsibo District, for the gender dummy variables is the male household head and for the treatment dummy variable is non-beneficiary
- Single, double and triple asterisks (*) denote significance at the 10%, 5% and 1% levels respectively
- The standard errors are in parentheses

Following Myoung-Jae Lee (2005) concerning ways of evaluating matching success, the first test was successfully determined for each of the 8 sub outcomes considered in this study, the number of blocks that ensures that the mean propensity score is not different for treated and controls in each block having been determined. The second test showed that the balancing property was satisfied each matching variable x having been balanced in each of the determined number of blocks. The balancing test was satisfied for 8 probit regressions specified for the 8 sub outcomes.

Results of the previous tests are somehow confirmed by figure 8 that shows the distribution of the propensity scores for both treatment and control distributions with maize yield as the outcome variable and Girinka Program beneficiary as the treatment (dependent) variable after matching. The two distributions are fairly similar, and range from just about zero to about 0.8. Within the sample, all observations in the treated group have close matches, all of them being located in the region of the common support of the treatment and control groups. All other propensity score graphs are provided in annex 1

Figure 4: Girinka Program maize yield propensity scores
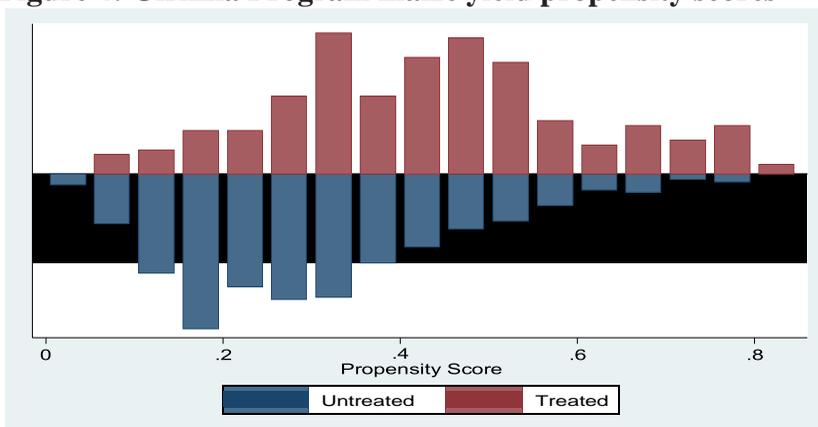
3.7.2. The impact of Girinka Program on crop yield, household food security, income and nutritional status

Table 32 shows that matching the Girinka Program beneficiaries and non-beneficiaries with the NNM method have reduced the size of the sample due to the rejection of non-beneficiaries who did not match with any beneficiary. This process produced a new control group that led to more accurate average measurement of a given outcome for both beneficiaries and non-beneficiaries for all the three outcomes considered for Girinka Program split into eight sub outcomes. The computed average treatment effect for the treated (ATT) which is the average measurement of the outcome of beneficiaries less the average measurement of the outcome of non-beneficiaries is presented with the associated standard error.

Based on the above ATTs, receiving a Girinka Program cow was associated in with higher crop yield, more calorie intake, improved nutritional status of under-five children, and increased household income and weekly expenditures. The same trend in yield and income was also found in Gatsibo district with significant difference ATT. (Mutarutwa, 2014). In fact, when the significance is set at 5% level, for six out of the eight ATTs presented there was a statistically significant difference between the two considered groups (beneficiaries and non-beneficiaries), implying that Girinka Program did have a positive impact on beneficiaries. For these six outcomes one can see that beneficiaries have increase their maize yield by about 26%; they have improved their daily calorie intake per adult-equivalent at about 14.2%; the nutritional status of their under-five children has improved by 58.2% and 23.3% respectively for underweight (Weight for age z-scores) and stunting (Height for age z-scores); they have increased their annual income by 129.3% and their weekly expenditures by about 42%. In other words, the Girinka program increased annual income of beneficiaries translated into increased weekly expenditure. This is in line with results in figures 2 and 3 which revealed that the extra money gained by Girinka Program beneficiaries is spend on food items, health insurance, house rehabilitation, school fees and land acquisition.

Table 32: Average treatment effect for treated (ATT) for Girinka Program outcomes

| Outcome | Average measurement | | ATT | % change due to Girinka program | Number of observations | |
	Beneficiaries	Non-beneficiaries			Beneficiaries	Non-beneficiaries
Beans yield (kg/ha)	830.9459	732.9397	98.006 (81.240)	13.37	268	175
Maize yield (kg/ha)	1309.987	1040.057	269.931*** (127.151)	25.95	209	200
Calorie per adult-equivalent per day	2142.602	1876.334	266.268*** (82.840)	14.19	298	221
Weight for height z-scores	1.28138	1.046508	0.235 (0.261)	22.44	63	41
Weight for age z-scores	-0.476857	-1.140143	0.663*** (0.186)	58.18	63	41
Height for age z-scores	-2.475365	-3.226508	0.751** (0.278)	23.28	63	41
Annual Income (Rwf)	104299.4	45495.1	58804.3*** (5224.6)	129.25	272	330
Weekly expenditures (Rwf)	13473.7	9531.6	3942.3*** (703.67)	41.5	279	342

Notes:
- Single, double and triple asterisks (*) denote significance at the 10%, 5% and 1% levels respectively
- The standard errors are in parentheses

4. CONCLUSIONS AND RECOMMENDATIONS

Girinka Program is a home grown initiative that has laid its foundation in Rwandan culture. It was initiated in 2006 with the main purpose of contributing to the poverty alleviation among poor Rwandans and has achieved a lot. Cows from different sources have been distributed to poor Rwandans and have contributed to the development of the beneficiaries' households as well as their neighbourhoods.

This assessment of socioeconomic impact of Girinka Program on poor households in Rwanda has been conducted throughout the country with the main purpose of documenting the program's other impact on yield of major crops, household income from crop and livestock production sales, household food security and household nutritional status.

The findings revealed that the beneficiaries of the Girinka Program have achieved significant results and their livelihoods have been significantly improved. Most beneficiaries received either cross breeds or exotic, while other have used AI to produce cross breed cattle.

Most beneficiaries of the Girinka Program practise proper health and care management of their cows with more than three quarters of all beneficiaries vaccinating their cows and treating them for diseases, feeding their cows with a combination of different fodders and have cow sheds. These types of breeds combined with the proper management of the received cows yielded an increase of milk production (4.7 l/day) which is above the national average (2.5 l/day).

This high quantity of milk has increased the rate of milk consumption. According to Ndahindwa (2014); with an increase availability of milk, other families can buy some milk and fight against malnutrition. Most of the beneficiaries consumed some of their own milk, while some other quantities were given to neighbours as their contribution to fight against malnutrition, and any surplus was sold gaining a not insignificant and a non-negligible income was gained. The milk consumption has impacted positively on the nutritional status and food security of benefiarys' households as well as the neighbours

Most of the cows distributed have given birth more than once and then most beneficiaries have already completed their pass on obligation and this practice has strengthened the social cohesion among beneficiaries and those on the waiting list.

More than half of the beneficiaries have at least sold one cow from Girinka Program and, thanks to the income gained combined with the income from selling produced crops and produced milk, beneficiaries have acquired more land, so almost doubling their areas as compared to those of non-beneficiaries. They have used the extra income to help pay for their children's school fees, pay for their households' health insurance and to rehabilitate their homes.

Using the application of PSM approach and the computation of average treatment effect for the treated (ATT) for eight outcome variables considered (bean's yields, maize yields, calorie per adult-equivalent per day, weight for age z-score, height for age z-score, weight for height z-score, annual income and weekly expenditures), this showed that beneficiaries of the Girinka Program have higher crop yields, a higher calorie intake, improved nutritional status of under-five children, and increased household income compared to their neighbours non-beneficiaries. The percentage change between the two groups was ranging from 13.8% to 129.3% for the 8 outcome variables considered and the average treatment effect on treated was highly significant (at 5% level) for maize yield, daily calorie intake per adult-equivalent, weight for age z-scores, height for age z-scores and annual income. Briefly said, Girinka Program has a positive impact on poor rural households' welfare as expected. Therefore, findings of this study may be used as evidence to stimulate public and private organizations to invest more in Girinka program or similar other programs to help fight against poverty and malnutrition.

REFERENCES

1. Argent J., Augsburg B. and Rasul I. 2014. Livestock Asset Transfers With and Without Training: Evidence from Rwanda.
2. Denzen NK. 1978. The research act: A theoretical introduction to sociological methods. 2nd McGraw Hill; New York
3. Esther Duflo, Rachel Glennerster and Michael Kreme (2007), Using randomization in development economics research: a toolkit. Centre for Economic Policy Research (CEPR) No. 6059, Available online at: www.cepr.org/pubs/dps/DP6059.asp.
4. FAO.2010. The State of Food Insecurity in the world: Addressing food insecurity in protracted crises. Rome, 2010.
5. FAO.2017. Gender assessment of dairy value chains: evidence from Rwanda, Rome, Italy
6. Green AE, Aarons GA. 2011. A comparison of policy and direct practice stakeholder perceptions of factors affecting evidence-based practice implementation using concept mapping. Implementation Science.
7. Guest G, Bunce A, Johnson L. 2006. How many interviews are enough? An experiment with data saturation and variability. Field Methods.
8. Hahirwa J.G and Kalinganire C, (2017) Exploring the success and challenges of the Girinka programme and the need for social work involvement: Southern Province, Rwanda, Rwanda Journal, Series B: Social Sciences, Volume 4 No 1
9. IFAD. 2012. Republic of Rwanda Country Programme Evaluation, Report No. 2434-RW, Kigali, Rwanda
10. Ingabire C. (2013) Strengthening ownership through capacity development, Case story: Girinka Munyarwanda
11. International Alert and Pro-Femmes/ Twese Hamwe. 2018. Towards sustainable agriculture: An analysis of farmers' participation in agriculture programmes in Rwanda. Kigali-Rwanda.
12. IRLI (International Livestock Research Institute), 2017., Rwanda Livestock Master Plan, August 2017
13. Israel, Glenn D. 1992. Sampling The Evidence of Extension Program Impact. Program Evaluation and Organizational

Development, IFAS, University of Florida. PEOD-5. October.

14. Kayigema V. (2013) An assessment of the Girinka (one cow per poor family) program and poverty alleviation in Rwanda a case study of Bugesera district; School of Agriculture, Earth and Environmental Sciences, College of Agriculture, Engineering and Science, University of KwaZulu-Natal.

15. KIM S. K., TIESSEN K., BEECHE A., MUKANKURUNZIZA J. and KAMATARI A (2011); Cattle manure management in Rwanda – A case of Girinka cow beneficiaries in the district of Ngoma, Rwanda Journal, Volume 24 Series E 2011: Agricultural Sciences

16. Landsverk J, Brown H, Chamberlain P, Palinkas LA, Horwitz SM.2012. Design and analysis in dissemination and implementation research. In: Brownson RC, Colditz GA, Proctor EK, editors. Translating science to practice. Oxford University Press; New York: 2012.

17. Militery N. O, Mbonyinkebe D. and Lebailly P., (2013) Impact of social protection programs on economic resilience of poor households in eastern province of Rwanda, IV International Symposium, Agrosym 2013, 10.7251/AGSY13031213M

18. MINAGRI. 2018. Strategic plan for agriculture transformation 2018-24, planning for health, Kigali.

19. MINAGRI.2017. Raporo ku ishyirwa mu bikorwa ry'imyanzuro y'inteko Rusange y'Umutwe w'Abadepite, Kigali, Rwanda.

20. MINAGRI.2018. Draft Annual Report 2018-2019

21. MINECOFIN. 2019. Key statistics on Rwanda, Kigali.

22. Morgan DL. 1997. Focus groups as qualitative research. Sage; Newbury Park, CA

23. Morse JM, Niehaus L. 2009. Mixed method design: Principles and procedures. Left Coast Press; Walnut Creek, CA

24. Mutarutwa N. C. 2014. The impact of the Girinka one cow per poor family program on household income in Gatsibo district, Rwanda, School of Agriculture and Enterprise Development of Kenyatta University. September 2014

25. Myoung-Jae Lee (2005), Micro-econometrics for policy, program and treatment effects, Published to Oxford Scholarship Online: February 2006.

26. National Institute of Statistics of Rwanda (NISR), Rwanda Poverty Proile Report, 2016/17, November 2018

27. National Institute of Statistics of Rwanda (NISR). 2012. Population size, structure and distribution, fourth population and housing census, Rwanda, Thematic report, January 2014

28. National Institute of Statistics of Rwanda (NISR). 2015. Social protection and VUP Report, 2013/14.

29. National Institute of Statistics of Rwanda (NISR). 2016. Rwanda.2015 Comprehensive food security and vulnerability analysis. The 2015 Rwanda CFSVA is available at http://www.wfp.org/food-security, www.statistics.gov.rw .

30. National Institute of Statistics of Rwanda (NISR). 2018. Seasonal agricultural survey, Annual report, Kigali.

31. National Institute of Statistics of Rwanda (NISR).2018, The Fifty Integrated Household Living Conditions Survey, Environment and Natural Resources, -2016/2017 -, thematic report, December 2018, Kigali.

32. Ndahindwa. 2014. Impact evaluation of the "One Cow per Poor Family program" in Rwanda. UR, Huye, Rwanda

33. Niwemugeni, A. 2013. Contribution of Girinka program in social economic development case study: Nyamirambo sector, Institut d'enseignement supérieur de Ruhengeri, faculty of fundamental applied science, department of statistics applied to economy, Musanze 2013

34. OMS and UNICEF. 2019. Recommendations for data collection, analysis and reporting on anthropometric indicators in children under 5 years old. Geneva. Licence: CC BY-NC-SA 3.0 IGO

35. Palinkas LA, Aarons GA, Horwitz S, Chamberlain P, Hurlburt M, Landsverk J. 2011. Mixed method designs in implementation research. Adm Policy Ment Health Jan 2011; 38(1):44-53

36. Patton MQ. 2002. Qualitative research and evaluation methods. 3rd Sage Publications; Thousand Oaks, CA

37. RAB. 2013. The one cow per poor family program (Girinka) in Rwanda; Kigali.

38. RAB. 2017. Girinka Annual Report, FY 2016-2017, Kigali, Rwanda

39. RAB. 2018. Animal resources department internal report, Kigali, Rwanda

40. RGB. 2014. the assessment of the impact of home grown initiatives, Kigali Rwanda, November 2014, ISSN: 2306-9236

41. RGB. 2018. Assessing Girinka progamme (2006-2016). Citizen perspectives, Kigali June 2018.

42. Rosenbaum Paul R.; Rubin Donald B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects, Biometrika, Vol. 70, No. 1. (Apr., 1983), pp. 41-55.

43. Rugema, M. 2014. The Contribution of Pro-Poor Growth Programmes to Poverty Reduction in Rwanda; A case study of the Girinka Programme in Rural Rwanda. Faculty of Humanities University of Cape Town

44. Rwandapedia, 2013. Home grown solutions. http://rwandapedia. rw/explore/ubudehe. Accessed: 02 October 2013.

45. Shahidur R. Khandker Gayatri B. Koolwal Hussain A. Samad. 2010. Handbook on Impact Evaluation Quantitative Methods and Practices. Washington DC 20433

46. Shahidur R. Khandker, Gayatri B. Koolwal, Hussain A. Samad. 2010. Handbook on Impact Evaluation Quantitative Methods and Practices. Washington DC 20433.

47. UNICEF. 2011. Case Study on Narrowing the Gaps for Equity Rwanda, One Cow per Poor Family: Reaching the most marginalized in Rwanda

48. USAID. 2014. Assessment of the Economic, Social, and Environmental Impacts of the Land Use Consolidation Component of the Crop Intensification Program in Rwanda, December 2014

49. USAID. 2016. Anthropometric Data in Population-Based Surveys, Meeting Report, July 14–15, 2015. Washington, DC: FHI 360/FANTA

50. Yamane, Taro. 1967. Statistics, an Introductory Analysis, 2nd Ed., New York: Harper and Row.

ANNEXES

ANNEX 1. PROPENSITY SCORE GRAPHS

Food security
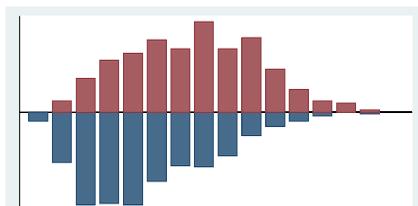
Nutritional status
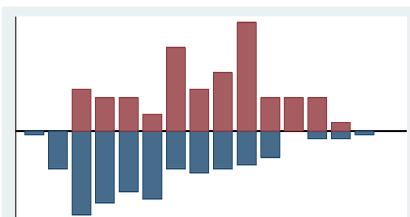
Annual income
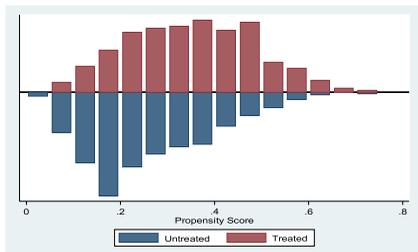
Weekly expenditures
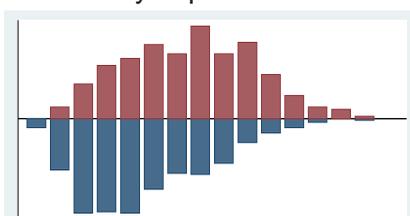
Beans yield
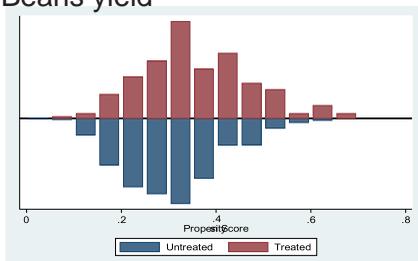
Maize yield
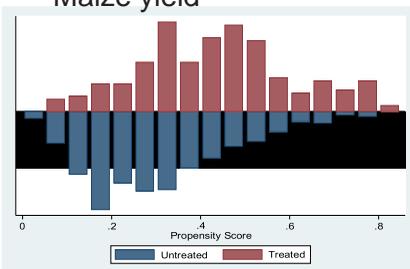
Province (n)	Sampled districts (n)	Sampled sectors (n)	Sampled cells	Number of cows received	Non-Girinka benefi-ciaries	Sample Girinka benefi-ciaries	Non-Girinka benefi-ciaries	Total sample by cell
East 68,965	Bugesera 12,925	Ngeruka 1,326	Nyakayenzi	78	633	2	9	11
			Gihembe	176	959	6	13	18
		Nyamata 1,136	Maranyundo	207	613	3	10	13
			Murama	204	1,369	3	22	25
		Rweru 1,129	Nkanga	189	612	3	6	9
			Batima	213	1,335	4	12	17
		Mayange 1,112	Gakamba	213	648	4	7	11
			Kibirizi	204	502	4	6	9
		Gashora 965	Kagomasi	260	400	2	4	6
			Ramiro	385	968	4	9	12
		Rilima 903	Kabeza	436	543	3	4	8
			Nyabafendwa	342	796	3	6	9
	Gatsibo 16,705	Kiziguro 2,627	Ndatemwa	592	1,157	8	3	10
			Agakomeye	268	1,095	4	2	8
			Mbogo	271	419	4	1	4
			Rubona	455	909	6	2	8
		Nyagihanga 2,084	Nyagitabire	393	1,010	4	6	10
			Mayanjye	315	528	4	3	6
			Gitinda	304	579	3	3	6
			Kibare	293	928	3	5	9
		Remera 1,448	Rurenge	328	456	5	5	10
			Rwarenga	321	979	5	11	16
		Muhura 1,423	Taba	447	1,457	5	12	17
			Rumuri	364	836	4	7	11
		Rugarama 1,297	Kanyagese	338	1,617	5	18	23
			Matunguru	232	593	3	7	10
		Kageyo 1,149	Kintu	380	601	4	5	9
			Nyagisozi	387	907	4	8	12
		Murambi 1,078	Rwimiterere	418	1,005	3	7	10
			Murambi	456	1,423	3	10	13
	Kirehe 10,422	Musaza 1,131	Kabuga	349	1,008	3	10	13
			Nganda	351	835	3	8	12
		Kirehe 1,067	Kirehe	327	751	3	8	11
			Rwesero	429	519	4	6	10
		Gahara 1,105	Nyagasenyi	502	889	4	13	17
			Butezi	365	1,012	3	14	16
		Nyamugari 937	Bukora	136	1,412	2	14	15
			Kagasa	262	1903	3	18	22
		Nasho 908	Ntaruka	242	517	3	7	10
			Rugoma	241	706	3	10	12

Province (n)	Sampled districts (n)	Sampled sectors (n)	Sampled cells	Number of cows received	Non-Girinka benefi-ciaries	Sample Girinka benefi-ciaries	Non-Girinka benefi-ciaries	Total sample by cell
South 60,400	Huye 8,024	Maraba 691	Shanga	125	629	4	11	15
		Simbi 674	Kabusanza	200	660	4	12	16
		Gishamvu 664	Nyumba	151	509	4	10	14
		Rwaniro 661	Gatwaro	64	221	4	11	15
	Nyamagabe 8,702	Kibirizi 1,229	Bugarura	130	445	5	4	8
			Ruhunga	116	585	4	6	10
		Kamegeri 1,101	Kamegeri	110	299	4	3	8
			Kirehe	99	275	4	3	7
		Musebeya 1,044	Gatovu	99	413	4	5	8
			Sekera	72	544	3	6	10
		Tare 1,015	Kaganza	146	417	3	5	8
			Nkumbure	135	704	3	8	11
	Nyaruguru 8,896	Rusenge 968	Raranzige	312	729	3	9	12
			Mariba	291	579	3	7	10
		Nyagisozi 864	Nyagisozi	213	791	5	16	21
		Ngoma 837	Mbuye	171	732	5	19	23
		Kivu 797	Kivu	153		5	12	17
West 45,744	Ngororero 8,025	Muhororo 811	Bweramana	223	472	5	16	21
		Nyange 567	Nsibo	259	843	3	16	19
		Kavumu 497	Nyamugeyo	64	787	3	22	24
		Kabaya 471	Gaseke	109	1,081	2	29	31
	Nyama-sheke 8,940	Rangiro 1,152	Gakenke	71	796	4	6	10
			Murambi	70	665	4	5	9
		Nyabitekeri 1,118	Ntango	56	785	4	11	14
			Muyange	50	628	3	9	12
		Kanjongo 799	Kagarama	72	856	4	25	29
		Bushenge 782	Kagatamu	35	614	5	15	19

Province (n)	Sampled districts (n)	Sampled sectors (n)	Sampled cells	Number of cows received	Non-Girinka benefi-ciaries	Sample Girinka benefi-ciaries	Non-Girinka benefi-ciaries	Total sample by cell
North 47,534	Gicumbi 19,415	Muko 1,014	Rebero	298	465	4	3	8
			Cyamuhinda	230	408	3	3	6
		Rukomo 1,326	Munyinya	263	545	5	6	11
			Cyuru	242	674	4	8	12
		Shangasha 1,163	Shangasha	312	473	4	4	8
			Nyabishambi	297	770	4	6	10
		Byumba 963	Nyarutarama	192	1381	3	20	23
			Nyamabuye	183	464	3	7	9
		Rutare 1,033	Gasharu	235	312	4	3	7
			Nkoto	178	316	2.8	3.3	6.7
		Kageyo 998	Nyamiyaga	258	772	4	8	11
			Muhondo	160	637	2	6	9
		Kaniga 1,195	Gatoma	274	412	5	1	7
			Mulindi	266	270	5	1	5
		Bwisige 1,169	Mukono	142	325	5	2	7
			Nyabushigitwa	114	300	4	2	6
		Mukarange 1,120	Rugerero	404	533	5	4	10
			Gatenga	222	302	3	3	5
	Gakenke 8,716	Gakenke 991	Kagoma	311	988	3	9	12
			Buhata	283	1049	3	10	12
		Ruli 725	Rwesero	126	141	5	8	13
		Rushashi 709	Shyombwe	95	322	4	10	14
		Minazi 624	Gasiho	140	537	4	8	12
			Total	**21,494**	**63,884**	**342**	**763**	**1,106**

ANNEXE 3. DATA COLLECTION TOOLS

1. Semi-structured questionnaires for household survey

UBUSHAKASHATSI KURI GAHUNDA YA GIRINKA MU RWANDA

Nimero iranga urugo..

Amazina y'umugenzuzi	Itariki bisuzumiweho

A. AMAKURU RUSANGE (All)

1. Izina ry'ubaza	
2. Itariki ikiganiro gikoreweho	
3. Intara	
4. Akarere	
5. Umurenge	
6. Akagari	
7. Umudugudu	
8. Izina ry'umutware w'urugo	
9. Izina ry'uwahawe inka muri gahunda ya Girinka1	
10. Izina ry'usubiza (Byibuze afite imyaka 18)	
11. Ese usubiza niwe mutware w'urugo? 1=Yego, 2=Oya	
12. Niba ari oya, isano afitanye n'umutware w'urugo: 1=Umugore we, 2=Umugabo we, 3=Umuhungu we, 4=Umukobwa we, 5=umuvandimwe, 99=irindi sano (rivuge)……….	
13. Urugo rwanyu rubamo abantu bangahe?	
14. Umubare w'abafite munsi y' imyaka 18	
15. Umubare w'abafite hagati y'imyaka 18 na 59	
16. Umubare w'abafite hejuru y' imyaka 59	
17. Icyiciro cy'Ubudehe urugo rurimo (1, 2, 3, 4) (*909# irembo)	

B. AMAKURU RUSANGE KU WAHAWE INKA YA GIRINKA
(Girinka beneficiary only)

Ibibazwa	Ibisubizo	Ibisubizo bishoboka
Imiterere y' umuryango		
1. Igitsina cy'uwahawe inka muri gahunda ya Girinka		1=Gabo, 2=Gore
2. Imyaka y'uwahawe inka muri gahunda ya Girinka		
3. Irangamimerere y'uwahawe inka muri gahunda ya Girinka		1=Ingaragu, 2=Arubatse, 3=Yarapfakaye, 4=Ntakibana n'uwo bashakanye, 5=Yatandukanye n'uwo bashakanye byemewe n'amategeko, 99=Ikindi (Kivuge)
4. Ibindi biranga uwahawe inka muri gahunda ya Girinka		1=impfubyi, 2=umuntu ufite ubumuga, 3=ikindi (kivuge)
5. Niba uwahawe inka muri gahunda ya Girinka yubatse, imyaka y' uwo bashakanye		
6. Amashuri uwahawe inka muri gahunda ya Girinka yize		1=nta mashuri, 2=Amashuri y'abakuze/Iga, 3=Yageze mu mashuri abanza ariko ntiyayasoza, 4=Yarangije amashuri abanza, 5=Yize amashuri y'imyuga ariko ntiyayarangiza, 6=Yarangije amashuri y'imyuga, 7=Yageze mu mashuri yisumbuye ariko ntiyayarangiza, 8=Yarangije amashuri yisumbuye, 9=Kaminuza
7. Amashuri uwashakanye n'uwahawe inka muri gahunda ya Girinka yize		

---

[2]Ku rugo rutari rwahabwa inka ya Girinka igisubizo kibe "**N/A**" (Not applicable) mu mwanya w'izina

C. UBUTAKA URUGO RUFITE (All)

1. Ubutaka bwose urugo rufite (muri ha)	
2. Ubutaka bwose urugo rutijwe (muri ha)	
3. Ubutaka bw'abandi urugo rukodesha (muri ha)	
4. Ubutaka bw'urugo bukodeshwa n'abandi (muri ha)	
5. Ubutaka bwose urugo rutije abandi (muri ha)	
6. Ubutaka bwose bwahinzweho imyaka mu ihinga rya 2018A (muri ha)	
7. Ubutaka bwose bwateweho ishyamba mu myaka 2 ishize (muri ha)	
8. Ubutaka bwose bwarajwe mu ihinga rya 2018A (muri ha)	
9. Ubutaka bwose bwari buteyeho ubwatsi bw'amatungo mu ihinga rya 2018A (muri ha)	

D. AMATUNGO URUGO RUFITE N' UBURYO ACUNGWA

I. Ibiranga inka yatanzwe muri gahunda ya Girinka (Girinka beneficiary only)

                         Umunsi   Ukwezi   Umwaka

1. Igihe yaherewe inka ya Girinka):.............../................./............
2. Ubwoko bw'inka mwahawe muri gahunda ya Girinka:
   (1) inyarwanda), (2) icyimanyi, (3) inzungu ....
3. Aho yakomotse/uwayitanze: ……………………………
       1=Akarere/Leta, 2= Abafatanyabikorwa (NGO, institutions)
       3=FARG, 4= Imiryangi nyarwanda itegamiye kuri Leta/Koperative,
       5= Inyiturano, 6= Ubudehe, 99=Ahandi (Havuge) …………..
4. Ikiraro n'imirire by'inka yatanzwe muri gahunda ya Girinka
   4.1. Ufite ikiraro? 1=Yego, 0=Oya
   4.2. Niba ari yego: 1=Kirasakaye, 2=Ntigisakaye, 3) Kirasakaye kandi kirimo sima
   4.3. Ikiraro gifite:.....................1= Uburiro, 2=Urunywero, 3=Byombi
   4.4. Uyigaburira iki? ....1= urubingo, 2= Ibisigazwa by'ibihingwa (imigozi y'ibijumba, ibishogoshogo, imitumba,…), 3 = Ibyatsi

(urwiri, amayore, …) 4=Concentree (ibiryo byo mu nganda), 5=Umunyu/Mineral block, 6=Byose ndayibigaburira, 99= ibindi

4.5. Uyiha amazi (litiro zingahe ku munsi)?....................

4.6. Uteza intanga ?… .....1= Yego, 0=Oya

4.7. Ufite ikayi y'umworozi?....... 1= Yego, 0=Oya

4.8. Ukingiza inka yawe? ……1= Yego, 0=Oya

4.9. Uvuza inka yawe? ……1= Yego, 0=Oya

5. Umukamo n'icyo ukoreshwa

5.1. Inka yawe yarabyaye?............. 1= Yego, 0=Oya

5.2. Inshuro ibyaye: ....

5.3. Yabyaye inyana zingahe?.......................... Ibimasa bingahe...................

5.4. Umubare w'inka afite ubu: ……….

5.5. Mu nka ufite ubu izikomoka kuri gahunda ya Girinka ni zingahe? ………….. Izikomoka ahandi ni zingahe......................

5.6. Amakuru ku nka zikomoka kuri Girinka

Inka	Amezi imara ikamwa	Gereranya umukamo wa buri nka ku munsi (litre/day-mu gitondo na nimugoroba)						Umukamo mwinshi inka yagize-?
		2017	Frw/l	2016	Frw/l	2015	Frw/l	Litiro k'umunsi
1								
2								
3								
4								
5								

5.7. Mujya munywa amata mu rugo?............. 1= Yego, 0=Oya

5.8. Niba ari yego, aturuka he? 1=ku nka ya Girinka, 2= ku nshuti n'abavandimwe, 3= ahandi (havuge):………

5.9. Umukamo wanyu muwugurusha he? ....1= Isoko rikwegereye, 2= Abantu tugemurira, 3= Ikusanyirizo ry'amata, 99= Ahandi (Havuge)

5.10. Waba wararangije kwitura?............. 1= Yego, 0=Oya

5.11. Waba warigeze ugurisha inka ikomoka kuri Girinka?.... 1= Yego, 0=Oya

5.12. Niba ari yego, uzuza imbonerahamwe ikurikira:

Inka	Umubare	Frw yabonye	Yakoze iki?
Izikomoka ku nka ya Girinka			
Izidakomoka ku nka ya Girinka			

II.   Andi matungo urugo rwanyu rutunze (All)

Uzuza iyi mbonerahamwe

No	Itungo	(a) Umubare mutunze	(h) Yaturutse hehe?	Niba waragurishije wakuyemo amafaranga angahe		
				2017	2016	2015
1	Ihene					
2	Intama					
3	Ingurube					
4	Inkoko					
5	Inkwavu					
6	Andi matungo (yavuge)					

a. Aho amatungo yaturutse/isoko y'amatungo:

1= Amafaranga yavuye ku nka ya gahunda ya Girinka, 2=Amafaranga aturutse ku zindi gahunda za Leta (Ubudehe), 3=Kumafaranga aturuka ku miryango itegamiye kuri Leta, 4=ku mafaranga yaturutse ahandi, 5=Nayihawe n'incuti/umuvandimwe , 99=ahandi (havuge)

E. AMAKURU AJYANYE N'IFUMBIRE (All)

1. Ufite ingarani?. ....1= Yego, 0=Oya
2. Ifumbire yawe uyikura mu ngarani nyuma y'igihe kingana iki (amezi)?..................

Ibitebo	Amabase	imifuka/utudeyi	Ingorofani

3. Ugurisha ingana iki? .... kg
4. Ku mafaranga angahe?............. Frw/kg

F. UMUSARURO W'IBIHINGWA (All)

1. Ibihingwa bitatu by'ingenzi:…………………………

Igihingwa	Umusaruro muri Kg (ibihe by'ihinga bibir bishize, 2018A- 2017B)						
	Ihinga rya 2017B			Ihinga rya 2018A			
	Ubuso (Ha)	Ingano	Igiciro ku kilo	Ubuso (…)	Ingano	Igiciro ku kilo	
Ibigori							
Ibishyimbo							
Ibirayi							

G. IBYO INKA YA GIRINKA YABAGEJEJEHO (Girinka beneficiary only)

1. Uzuza iyi mbonerahamwe

	Inyungu k'urugo	Hitamo ugihwanye n'ukuri	Frw byatwaye
1	Gusana cyangwa kwubaka inzu		
2	Amafaranga y'ishuri		
3	Kwishyura ubwishingizi bwo kwivuza (mitiweli)		
4	Inkwano		
5	Kugura ubutaka		
6	Gukora biyogaze		
	Izindi nyungu (zivuge)		

2. Izindi nyungu zikomoka ku nka ya Girinka:
   1. Kwigirira icyizere
   2. Gutwerera
   3. Kwiyungura ubumenyi n'ubunararibonye/amahugurwa
   4. Kugurisha ifumbure yanjye nkabona amafaranga
   5. Kuba mbasha kugura inyongeramusaruro (Bought inorganic fertilizer, seeds)

6. Kuba mbasha kujya mu matsinda (ibimina, koperative, amatsinda yo kubitsa no kugurizanya n'ibindi)
7. Kuba narabashije kurenga icyiciro cy'ubudehe narimo
…………………………………

3. Watubwira intumbero (imigambi, intego) yawe mu minsi iri imbere?
....

H. AMAKURU AJYANYE NO KWIHAZA MU BIRIBWA (All)

1. Mu bihe by'ihinga 2017A na 2017B, wamaranye igihe kingana iki umusaruro wawe w'ibinyampeke n'ibinyamisogwe by'ingenzi?

No	(a) Ubwoko bw'igihingwa	(b) Izina ry'igihingwa	(c) wamaranye umusaruro (umubare w'amezi)	(d)Urakeka ko ubu noneho (2018 A) umusaruro wawe uzawumarana igihe kingana iki? (umubare w'amezi)
1	Ikinyampeke cy'ingenzi			
2	Ikinyamisogwe cy'ingenzi			

2. Hari amezi mutabonye ibyo kurya bihagije mu umuryango wanyu mu mezi 12 ashize? 1=Yego, 2=Oya

Niba igisubizo ari "Oya" jya ku kibazo cya 5 kijyanye n'uko ibyokurya byabonetse n'uko byakoreshejwe.

3. Niba igisubizo ari "Yego", ni ayahe mezi mutabonyemo ibyokurya bihagije urugo rwanyu mu mezi 12 ashize (Uzuza imbonerahamwe ikurikira)

No	Ukwezi	• Ni muyahe mezi mutari mufite ibyo kurya bihagije urugo rwanyu? 1=Yego, 0=Oya
1	Werurwe 2017	
2	Mata	

No	Ukwezi	• Ni muyahe mezi mutari mufite ibyo kurya bihagije urugo rwanyu? 1=Yego, 0=Oya
3	Gicurasi	
4	Kamena	
5	Nyakanga	
6	Kanama	
7	Nzeri	
8	Ukwakira	
9	Ugushyingo	
10	Ukuboza	
11	Mutarama 2018	
12	Gashyantare 2018	

4. Mu mezi mwabuze ibyo kurya bihagije mwabyitwayemo mute?

No	Uko mwabyitwayemo	a. Byarabaye? 1=Yego, 0=Oya	b. Niba mwarakoresheje ubwo buryo, mwabukoresheje inshuro zingahe?1
1	Kwikopesha ibyokurya ku umucuruzi cyangwa kuguza amafaranga yo kugura ibyokurya		
2	Kugabanya inshuro abagize urugo barya k'umunsi		
3	Umugore wo mu rugo yagabanyije ingano y'ibyo yajyaga arya		
4	Umugabo wo mu rugo yagabanyije ingano y'ibyo yajyaga arya		
5	Abana bo mu rugo bagabanyije ingano y'ibyo bajyaga barya		

No	Uko mwabyitwayemo	a. Byarabaye? 1=Yego, 0=Oya	b. Niba mwarakoresheje ubwo buryo, mwabukoresheje inshuro zingahe?1
6	Gusimbuza ibyo kurya bisanzwe bigurwa ibindi byokurya bihendutse		
7	Hari imitungo yagwatirijwe cyangwa yagurishijwe		
9	Kuguza ibyokurya ku baturanyi		
11	Guca inshuro (ugahembwa ibyokurya/ bidatetse)		
12	Gahunda za Leta (VUP…)		

1Inshuro zingahe?   :
1=Gake cyane, 2=Rimwe na rimwe, 3=Kenshi, 4=Burigihe

5. Mu mbonerahamwe ikurikira harimo ibibazo bisaba amakuru ajyanye ibyariwe mu cyumweru gishize

Guhera ku munsi (nk'uyu w'icyumweru gishize) mu rugo rwanyu mwigeze murya kimwe mu byokurya bikurikira?	Q1 Mwarabiriye ? 1=Yego 0=Oya	Q2 No	Q3 Mwaguze ibingana iki?	Q4	Q5	Q6 Mwariye ibingana bite bivuye mu umusaruro wanyu	Q7	Q8	Q9 Mwariye ibingana bite muhawe n'abandi?	Q10	Q11
			Uko bingana	Igipimo	Mwatanze amafaranga angahe ? (FRW)	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga (Frw)
Banza usubize yego cyangwa oya ku rutonde rukurikira rw'ibiryo/ibinyobwa. Hanyuma kubyashubijwe yego ubaze ibibazo uhereye kuri Q3 ukageza kuri Q1											
Ibinyampeke											
Ibigori bibisi		101									
Ibigori byumye		102									
Ifu y'ibigori		103									
Ifu y'imvange		104									
Umuceri		105									
Uburo		106									
Ingano		107									
Amasaka		108									
Ifu y'ingano		109									
Amandazi, Chapati		110									

Umugati		111									
Ibindi (bivuge)_____		198									
Ibindi (bivuge)_____		199									
Ibinyabijumba n'ibitoki											
Imyumbati y'Imiribwa		201									
Imyumbati yumye		202									
Ifu y'imyumbati		203									
Ibirayi		204									
Ibijumba		205									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Guhera ku munsi (nk'uyu w'icyumweru gishize) mu rugo rwanyu mwigeze murya kimwe mu byokurya bikurikira?	Mwarabiriye? 1=Yego 0=Oya	No	Mwaguze ibingana iki?			Mwariye ibingana bite bivuye mu umusaruro wanyu			Mwariye ibingana bite muhawe n'abandi?		
			Uko bingana	Igipimo	Mwatanze amafaranga angahe? (FRW)	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga (Frw)
Banza usubize yego cyangwa oya ku rutonde rukurikira rw´ibiryo/ibinyobwa. Hanyuma kubyashubijwe yego ubaze ibibazo uhereye kuri Q3 ukageza kuri Q1											
Amateke		206									
Ibitoki bitekwa		207									

Ibindi (bivuge)_____		298										
Ibindi (bivuge)_____		299										
Ibinyamisogwe												
Ibishyimbo byumye		301										
Amashaza yumye		302										
Ubunyobwa		303										
Soya		304										
Ibindi (bivuge) _____		398										
Ibindi (bivuge) _		399										
Imboga												
Karote		401										
Ibitunguru		402										
Tungurusumu		403										
Amashu		404										
Isombe		405										
Epinari		406										
Inyanya		407										
Intoryi		408										
Ibishyimbo by'ibitonore		409										

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Guhera ku munsi (nk'uyu w'icyumweru gishize) mu rugo rwanyu mwigeze murya kimwe mu byokurya bikurikira?	Mwarabiriye? 1=Yego 0=Oya	No	Mwaguze ibingana iki?			Mwariye ibingana bite bivuye mu umusaruro wanyu			Mwariye ibingana bite muhawe n'abandi?		
			Uko bingana	Igipimo	Mwatanze amafaranga angahe? (FRW)	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga (Frw)
Banza usubize yego cyangwa oya ku rutonde rukurikira rw'ibiryo/ibinyobwa. Hanyuma kubyashubijwe yego ubaze ibibazo uhereye kuri Q3 ukageza kuri Q1											
Urunyogwe		410									
Imiteja		411									
Imboga gakondo		412									
Ibihaza		413									
Imbwija		414									
Ibindi (bivuge		498									
Ibindi (bivuge)		499									
Imbuto ziribwa											
Imineke		501									
Amacunga/ Amaronji		502									
Indimu		503									

			Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Avoka		504									
Amapera		505									
Imyembe		506									
Ipapayi		507									
Marakuja		508									
Watermelon		509									
Ibinyomoro		510									
Mandarine		511									
Inanasi		512									
Ibindi (bivuge)		598									
_____	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Guhera ku munsi (nk'uyu w'icyumweru gishize) mu rugo rwanyu mwigeze murya kimwe mu byokurya bikurikira?	Mwarabiriye? 1=Yego 0=Oya	No	Mwaguze ibingana iki?			Mwariye ibingana bite bivuye mu umusaruro wanyu			Mwariye ibingana bite muhawe n'abandi?		
			Uko bingana	Igipimo	Mwatanze amafaranga angahe? (FRW)	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga (Frw)
Banza usubize yego cyangwa oya ku rutonde rukurikira rw'ibiryo/ibinyobwa. Hanyuma kubyashubijwe yego ubaze ibibazo uhereye kuri Q3 ukageza kuri Q1											
Ibindi (bivuge)_____		599									

Inyama n'amasamaki											
Inyama z'inka		601									
Inyama z'ingurube		602									
Inyama z'ihene		603									
Inyama z'intama		604									
Inyama z'inkwavu		605									
Inyama z'inkoko		606									
Amagi		607									
Amata n'ibiyakomokaho											
Inshyushu		701									
Ikivuguto		702									
Foromaje		703									
Amavuta											
Ubuto		801									
Amamesa		802									
Marigarine		803									
Amavuta y'inka		804									
Ibindi(bivuge)		898									
Ibindi(bivuge)		899									

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Guhera ku munsi (nk'uyu w'icyumweru gishize) mu rugo rwanyu mwigeze murya kimwe mu byokurya bikurikira?	Mwarabiriye? 1=Yego 0=Oya	No	Mwaguze ibingana iki?			Mwariye ibingana bite bivuye mu umusaruro wanyu			Mwariye ibingana bite muhawe n'abandi?		
			Uko bingana	Igipimo	Mwatanze amafaranga angahe? (FRW)	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga	Uko bingana	Igipimo	Agaciro kabyo mu mafaranga (Frw)
Banza usubize yego cyangwa oya ku rutonde rukurikira rw'ibiryo/ibinyobwa. Hanyuma kubyashubijwe yego ubaze ibibazo uhereye kuri Q3 ukageza kuri Q1											
Ibinyobwa											
Ubushera, igipende, ikigage, amarwa		901									
Inzoga z'ifuro zipfundikiye (primus, mutzig, skol, amstel, virunga, …)		902									
Urwagwa		903									
Fanta (Orange, Citron, Panache, Coca, Fiesta)		904									

Imitobe		905										
Ikawa/Icyayi		906										
Ibindi (bivuge)___		998										
Indyoshyandyo												
Isukari		1001										
Umunyu		1002										
Urusenda		1003										
Ibindi birungo		1004										
Ubuki		1005										
Ibindi (bivuge)_____		1098										
Ibindi (bivuge)_____		1099										

6. Guhera ku munsi nk'uyu w'icyumweru gishize mu rugo rwanyu haba hari ibindi mwatanzeho amafaranga bitari ibyo kurya?.......... 1=Yego 0=Oya

7. Niba ari yego uzuza iyi mbonerahamwe ikurikira

N0	Ibindi bitari ibyo kurya mwatanzeho amafaranga	Amafaranga mwatanze

2. **FGD guide questions**

Girinka Impact assessment Focus Group Discussion

FGDs (Girinka beneficiary not selected for interview (2), Non-Girinka beneficiary (2), Head of village (1), Security Village (1), Girinka Committee member (2 :Youth and woman), Sector veterinary (1), Sector Social Affairs (1) =10

Venue: (51Sector)-select village nearby sector office

1. Inkomoko ya Girinka mu murenge wanyu? Sources of Girinka Funds/ Partners National/International

2. Impacts (mubona ya Girinka mu murenge ni izihe?. .....)

3. Udushya: Innovations/Girinka- Inka y'isanamitima- Inka y'akaguru- Guhanahana inka

4. Ibipimo by'ifumbire :

Ibitebo	Amabase	imifuka/utudeyi	Ingorofani

5. Ibipimo by'amata

Akajagi	Akabiri	Akatanu	Akarindwi

6. Ibipimo by'amavuta yo guteka

Ikiyiko (gereranya ml zingahe)	Ikoroboyi (Gereranya ml zingahe)	Ikindi gipimo 1 gikoreshwa kivuge (Gereranya ml zingahe)	Ikindi gipimo 2 gikoreshwa kivuge (Gereranya ml zingahe)	Ikindi gipimo 3 gikoreshwa kivuge (Gereranya ml zingahe)

7. Ibipimo by'isukari

Ikiyiko (gereranya ml zingahe)	Ikoroboyi (Gereranya ml zingahe)	Ikindi gipimo 1 gikoreshwa kivuge (Gereranya ml zingahe)	Ikindi gipimo 2 gikoreshwa kivuge (Gereranya ml zingahe)	Ikindi gipimo 3 gikoreshwa kivuge (Gereranya ml zingahe)

8. Ibipimo by'umunyu

Igipimo 1 (gereranya ml zingahe)	Igipimo 2 (Gereranya ml zingahe)	Igipimo 3 gikoreshwa kivuge (Gereranya ml zingahe)	Igipimo 4 gikoreshwa kivuge (Gereranya ml zingahe)	Igipimo 5 gikoreshwa kivuge (Gereranya ml zingahe)

9. Inyungu ku baturanyi

Benefits to the Community (Inyungu ku baturanyi):-FGDs

1. Kubakamira?
2. Kubaha ifumbire?
3. Kuboroza?
4. Kubaha akazi? Labor- and- employment of vets
5. Unity and reconciliation
6. Livestock infrastructure/MCC/Diary plant

10. Inyungu ku bidukijije

Benefits to the Environment (Inyungu ku bidukijije): FGDs

1. Kurwanya isuri/ Ubwatsi atera ku miringoti?
2. Biogaz murazifite? Yes/No

11. Challenges mubona muri Girinka ni izihe?

1. Resistance mu kubaka ibiraro
2. Igikumba/Ikiraro rurange
3. Imyumvire ituma bagurisha inka/ Kuzimya igicaniro
4. Imirire itanoze/Ubwatsi/Concentree zihenze.
5. N'ibindi…...... (……)

3. **Key informants' guide**

Key informants (MINAGRI/DG Livestock (1), RAB/ Head of DPT (1), NGOs (Heifer (1), Send a Cow (1), MSAADA(1), FARG (1), V/ce Mayor Social Affairs (10)/ FED (10), Districts vets (10)=25

Venue: Working place

1. Sources of Girinka Funds/ Partners from:
    - National
    - International
2. Impacts (za Girinka mu gihugu/mu karere/ mubona ari izihe?…..........)
3. Udushya: Innovations/Girinka- Inka y'isanamitima- Inka y'akaguru- Guhanahana inka
4. Benefits to the Community (Inyungu ku baturanyi): ahatanzwe Girinka
    3. Kubakamira?
    4. Kubaha ifumbire?
    5. Kuboroza?
    6. Kubaha akazi? Labor- and- employment of vets
    7. Unity and reconciliation
    8. Livestock infrastructure/MCC/Diary plant
5. Benefits to the Environment (Inyungu ku bidukijije)…. ahatanzwe Girinka
    1. Kurwanya isuri/ Ubwatsi atera ku miringoti?
    2. Biogaz urayifite?
6. Challenges mubona muri Girinka ni izihe?
7. Resistance mu kubaka ibiraro
8. Igikumba
9. Imyumvire ituma bagurisha inka/ Kuzimya igicaniro
10. Imirire
11. N'ibindi…….. (……)

4. Data sheet for anthropometric measurements.

(1) Anthropometric survey data form

(2) Akarere:…………………………………………………………………...

(3) Ubaza:…………………………………………………………………...

no y'umwana	Amazina ya nyirurugo	Umurenge	Akagari	Amazina y'umwana	Igitsina (M/F)	Itariki yavutseho (dd/mm/yyyy)	Ibiro bye (kg)	Uburebure (cm)
1								
2								
3								