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CATALYSING MARKET PROSPECTS FOR HORTICULTURE  
SMALLHOLDER FARMERS AND SMALL AND MEDIUM  
ENTERPRISES IN RWANDA

# CAULIFLOWER VALUE CHAIN ANALYSIS [VCA] REPORT



Cauliflower as one of the eight horticulture value chain analysis undertaken in Rwanda. The Cauliflower value chain analysis is funded under the Catalysing Market Prospects for Horticulture Smallholder Farmers and Small and Medium Enterprises in Rwanda 5-Year project over the period 2020 to 2025. This value chain analysis has a focus on domestic markets, regional trade and international market for eight target priority commodities defined at proposal level.

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**Cauliflower Value Chain Analysis CLF-2021**

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## **Definition of Terms**

**Actors/Players:** Entities involved in producing, processing, trading or consuming a particular Agricultural product.

**Business Support Service (BSS):** A wide range of services used by entrepreneurs to help them operate and grow their business i.e., Transportation, financial, training etc.

**Destination markets:** Major regional markets mainly sourcing farm produce from either traditional or transitional markets or offering prime prices to suppliers.

**Domestic market:** All trade mechanisms within a country, excluding exports and imports.

**Market Systems:** An advanced market systems tools that seeks to appreciate the partnerships and networks that actually support and maintain a Value Chain.

**Informal markets:** Open-air or enclosed characterized by numerous commodity traders who buy commodities in bulk for resale to other business buyers including retailers and institutions

**Informal traders:** Actors who operate in open-air and / or enclosed markets; they include wholesaler and retailers

**Institutional /formal buyers:** structured buyers who purchase large volumes / bulk and sell or sell in small units to individual consumers. They include hotels, hospitals, and schools among others.

**Retailers:** A market intermediary who takes ownership of the product at the time they receive it. They buy the product in small quantities from wholesalers, farmers or brokers and sell in small quantities to individual and institutional consumers. Retailers may include farmers, traders at roadside and market places, supermarkets and green grocery operators.

**Supply Chain:** A set of linkages between actors where there is no binding or sought –after formal or informal relationships except when goods, services and financial agreements are actually transacted.

**Transitional markets:** Link between the traditional and destination markets and characterized by formalized market days and traders buying farm produce for resale in markets for profit.

**Value chain:** A sequence of related business activities (functions) from the provision of specific inputs for a particular product to primary production, transformation, marketing, and up to the final sale of the particular product to consumers (the functional view on a value chain).

**Value chain strategies:** This is whole system of processes (activities, organizations, structures) that are combined to create value for customers as products move from their point of origin to the end user.

**Wholesaler / Wholesale Buyer:** A market intermediary who takes ownership of the whole product at the time they receive it. A wholesaler buys directly from farmers or brokers and sells in large volumes to other intermediaries who include retailers.



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## List of Acronyms and Abbreviations

AEE	Africa Evangelical Enterprise
AU	Africa Union
BSS	Business Support Services
CV	Commercial Village.
COMESA	Common Market for Eastern and Southern Africa
COZO	Commercialization Zones
CSVA	Comprehensive Food Security and Vulnerability Analysis and Nutrition Survey
EU	European Union
FAO	Food and Agriculture Organization
FCI	Farm Concern International
FGD	Focused Group Discussions
FO	Farmer Organization
GDP	Gross Domestic Product
GOR	Government of Rwanda
Ha	Hectare
INGOs	International Non-Governmental Organizations
Kgs	Kilograms
KII	Key Informant Interview
MINACO	Ministry of Trade & Industry
MINAGRI	Ministry of Agriculture and Animal Resources
NAEB	National Agriculture Export Development Board
NTDs	Non-Trade Barriers
MT	Metric tons
NGOs	Non-Governmental Organization
NTBs	Non-Tariff Barriers
PSTA	Plan for the Transformation of Agriculture
RICA	Rwanda Institute for Conservation Agriculture
RRA	Rwanda Revenue Authority
SACCO	Savings and Credit Co-operative Organizations
SMEs	Small and Medium Enterprise
SWOT	Strengths Weaknesses Opportunities Threats
SPSS	Statistical Package for Social Science
TF	Tearfund
T	Ton
USD	United States Dollar
VCA	Value Chain Analysis

### Exchange Rates and Conversions

Oct 4 2020 Exchange Rates

US Dollar 1=RWF.950

Euro 1=RWF. 1,150

Acre =40.496Ares

Hectares = 100 Ares

# Chapter 1

## Introduction and Executive Summary



### **Cauliflower Value Chain Analysis Report**

Catalysing Market Prospects for Horticulture Smallholder  
Farmers and Small and Medium Enterprises in Rwanda

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## 1.0 Executive summary

The cauliflower value chain analysis is aimed at exploring viable opportunities for farmers, aggregators and export companies in the domestic markets, regional trade and international markets. Globally the cauliflower and broccoli<sup>1</sup> value chain is significant and recorded a consumption of 27 Million tonnes in 2019 which was valued at \$24.2Billion. European Union imports was \$689Million in 2019 while Middle East import value was \$31 Million and USA was \$129 Million. Cauliflower and broccoli consumption in Africa in 2019 were 0.463Million tonnes while import volumes were 3,500 tonnes valued at \$ 3.7Million. The study assessed the cauliflower value chain in Rwanda and below is a dashboard of findings drawn from 537 respondents at various value chain levels which includes farmers, SMEs in Aggregation and processing, input companies, export companies, financial service providers, development partners and Government agencies.

### 1.1 Overview

The value chain analysis was conducted in Rwanda to understand issues along the value chain. The study used both quantitative and qualitative research design to bring out the uniqueness of the individuals, processes and opportunities using a person-centered perspective to understand existing opportunities and gaps in pineapple, gooseberry, chili, onions, garlic, red cabbage, French beans and Cauliflower. Primary data was collected from smallholder farmers, horticultural associations, private sector players, relevant government ministries and departments, research organizations and development organizations/non-governmental organization. Pineapple is one of the main crops grown by small scale farmers in the Eastern Province of Rwanda with an average yield of 16 tons per household per year which is currently inadequate to meet the demand in the country. Production of all types of chilies and capsicum fruits is small, was reported to increase from 4,100 tons in 2010 to 4,500 tons in 2014.

Agriculture 39% of Gross Domestic Products (GDP)  
80% of employment and 63% of foreign exchange  
earnings.

According to demographics results most of the respondents were females (64%) of age between 36-65 years. Crop farming was reported as the main source of livelihood by nearly all farmers (99%) and 99% of farmers in the four districts belong to farmer groups with an objective of saving and investment objectives 91%. Some of the input related challenges experienced are high cost (84% and availability of the needed inputs (53%). Land accessed by a farmer in Rwanda is 0.445 Ha while land cultivated stands at 0.372 Ha which translates to over 83% land. The biggest concern by farmers as they engage in crop production is

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<sup>1</sup> Globally and in major cauliflower and broccoli is managed as a single supply chain as assorted commodities.

excessive use of chemicals which affects their health (76%) and use of chemicals which negatively affects land, water and other production resources (44%). On why store F&V most vegetable farmers (61%) reported to store as they speculate for better prices and 54% store to reserve for future consumption. Overall, all farmers (100%) store fruits in raw form or processed/value added while 60% farmers reported to store vegetables value added form.

Most adult female respondents (67%) are involved in value addition followed by adult males (48%). Nevertheless, lack of technology (68%) was found to be the main reason why most of the farmers are not engaged in value addition in all the districts followed by limited knowledge (57%).

Cauliflower: Cauliflower is only grown in Kayonza 0.011 Ha and Gasabo 0.012 Ha districts. Average farmer land size is 0.449 Ha with only an average of 0.372 Ha under cultivation (83%). Average land allocated to Cauliflower is 0.011 Ha which is only 3% of the accessible land. Most of the farmers (97%) in Kayonza and Gasabo don't grow Cauliflower. Out of 3% who grow Cauliflower only 2% grow it in pure stand while 1% intercrop it with beet root. Only 2% of farmers produce Cauliflower during the main season. Most of the farmers (90%) do grow improved varieties of Cauliflower within the studied districts except in Bugesera (100%) that recycle their previously grown varieties.



Broccoli white is the most preferred variety. Very little agro-inputs are used fertilizer (5%), manure (4%), pesticides (5%), and improved seeds (6%), in Cauliflower production because of high costs. There are very low average yields of Cauliflower 9630.48 Kg/Ha against potential yield of 20999.99 Kg/Ha because of low use of agro-inputs. Most of the produced Cauliflower is sold (90%) and very little is consumed (5%) and lost (4%).

Net profit: RWF. 3,287,300(\$3460.3) (\$Farmgate  
price: RWF. 400/Kg Farmgate: RWF. 400 / Kg

Majority (91%) do not store Cauliflower due to lack of storage facilities in the markets and it is sold raw. Currently the Cauliflower is not processed because majority do not produce it. Very few (2%) do value addition of Cauliflower (Sorting and grading) mostly done by adult females. Most of the Cauliflower (61%) is sold to local markets within the villages and none is exported. Cauliflower has the highest demand gap (93%) in Kayonza and (99%) in Kimirinko markets in the local markets compared to other vegetables. Therefore, you need mobilize farmer to produce more and use agro-inputs in production to satisfy the market. The study reveals other significant issues that have a direct impact of the nature of interventions developed for farmers which are highlight below;

- Majority (91%) do not store Cauliflower due to lack of storage facilities in the markets

and it is sold raw.

- Only 2% do value addition of Cauliflower (Sorting and grading) mostly done by adult females.
- Lack of reliable markets (69%), price fluctuations (44%) and high cost of transport (33%) are the main marketing challenges of Cauliflower.
- When farmers are using the agro-inputs have fear that; excessive use of chemicals could affect their health (76%) and use of chemicals would negatively affect land, water and other production resources (44%).
- Cauliflower can fetch good returns of Net Income (Farm gate) of 3,287,300 RWF /Ha and Net Income (Market gate) of 3,587,300 RWF /Ha.

Fertilizer (5%),  
Manure (4%),  
Pesticides (5%),  
Improved seeds

**Export Markets:** The companies sampled during the survey had no cauliflower and broccoli in their trade portfolio.

27 buyers  
RWF.291  
Million

**Domestic Formal Markets:** The 7 buyers sampled at SMES, hotels and institutional levels had a combined annual of 913 Kg valued at RWF. 494,950 (\$521)

**Domestic and Regional Informal Markets:** The sampled 20 wholesale aggregators supplying domestic and regional markets had a combined annual trade volume of 93.4 tonnes at an annual value of \$306,816 (RWF. 291 Million).

## 1.2 Markets

This study was carried out in four sampled districts; Kayonza, Gasabo, Bugesera and Rwamagana.

Two markets from each of the districts were sampled for the purposes of the study. These include Kayonza and Kabarondo markets in Kayonza district, Kimirinko and Nyabugogo markets in Gasabo district, Nyamata and Ruhuha markets in Bugesera district and Ntunga and Kigabiro markets in Rwamagana district. A variety of horticultural crops (fruits and vegetables) are grown in these districts and thus traded in these and other markets. These include pineapple, cauliflower, onions, French beans, garlic, red cabbage and chili among others.

### 1.2.1 Rwanda production systems

Agriculture is the main player in the economy of the country and accounts for 39% of gross domestic production, 80% of employment and 63% of foreign exchange earnings. The value chain analysis was conducted in Rwanda to understand issues along the value chain.

The study used both quantitative and qualitative research design to bring out the uniqueness of the individuals, processes and opportunities using a person-centered perspective to understand existing opportunities and gaps in pineapple, gooseberry, chili, onions, garlic, red cabbage, French beans and Cauliflower.

Primary data was collected from smallholder farmers, horticultural associations, private sector players, relevant government ministries and departments, research organizations and development organizations/non-governmental organization. Pineapple is one of the main crops grown by small scale farmers in the Eastern Province of Rwanda with an average yield of 16 tons per household per

year which is currently inadequate to meet the demand in the country. Production of all types of chilies and capsicum fruits is small, was reported to increase from 4,100 tons in 2010 to 4,500 tons in 2014.

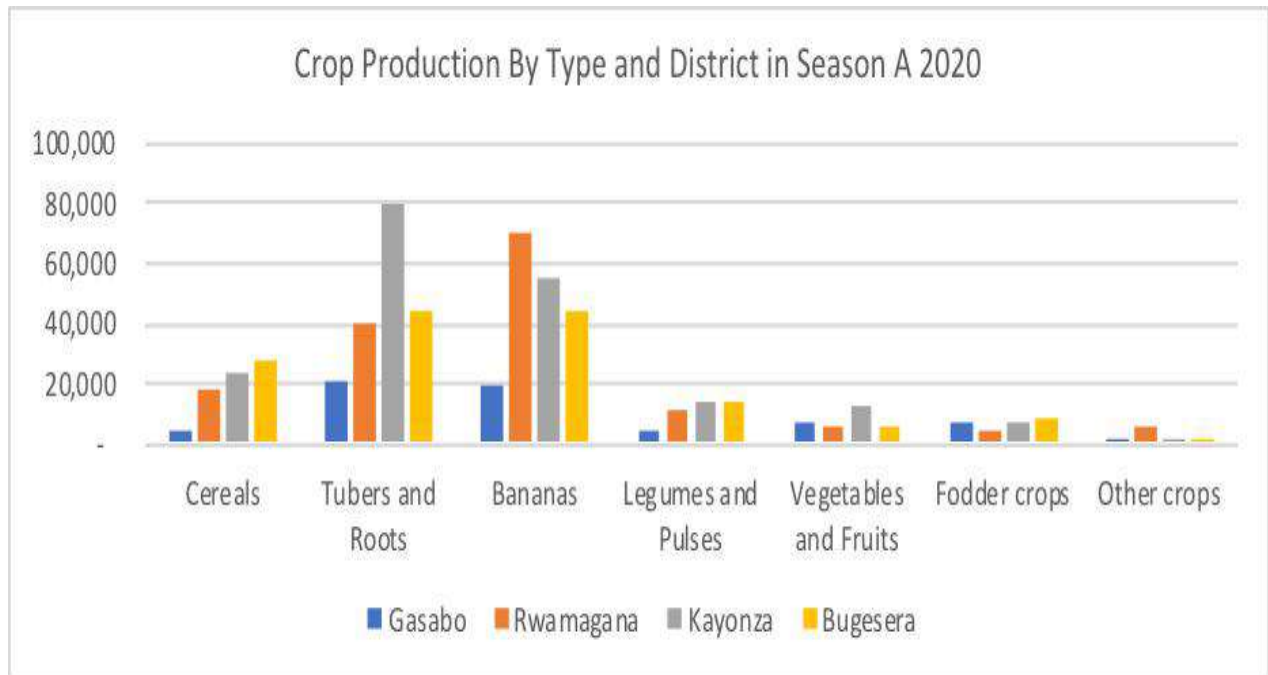


Figure 1: Crop production by types and District in Season A in Rwanda

The profitability for the crops produced in the season C would require further analysis to assess the profitability and sustainability of the current utilization which is partial or fully irrigated land.

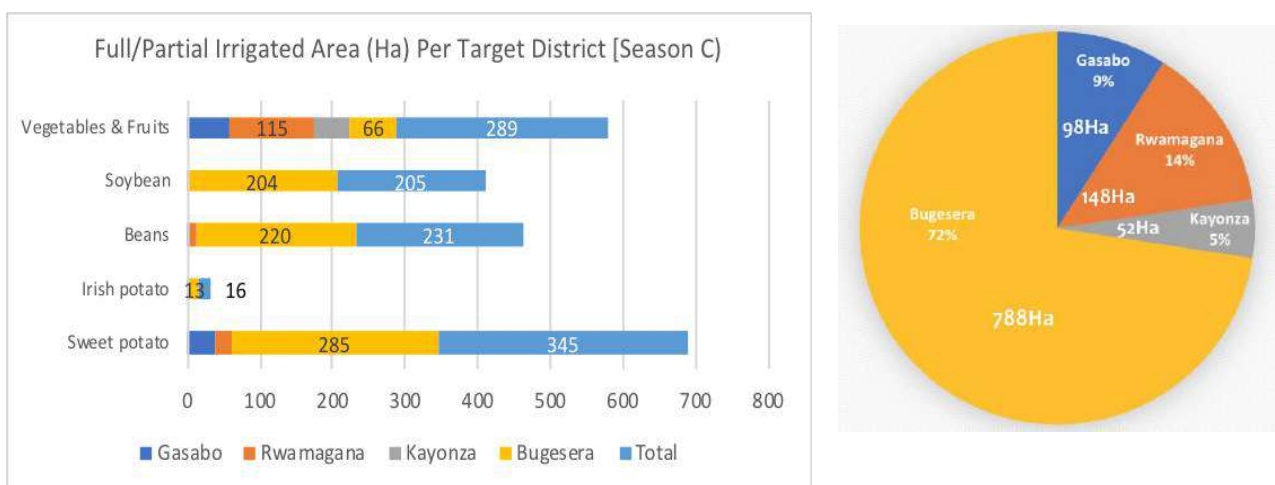
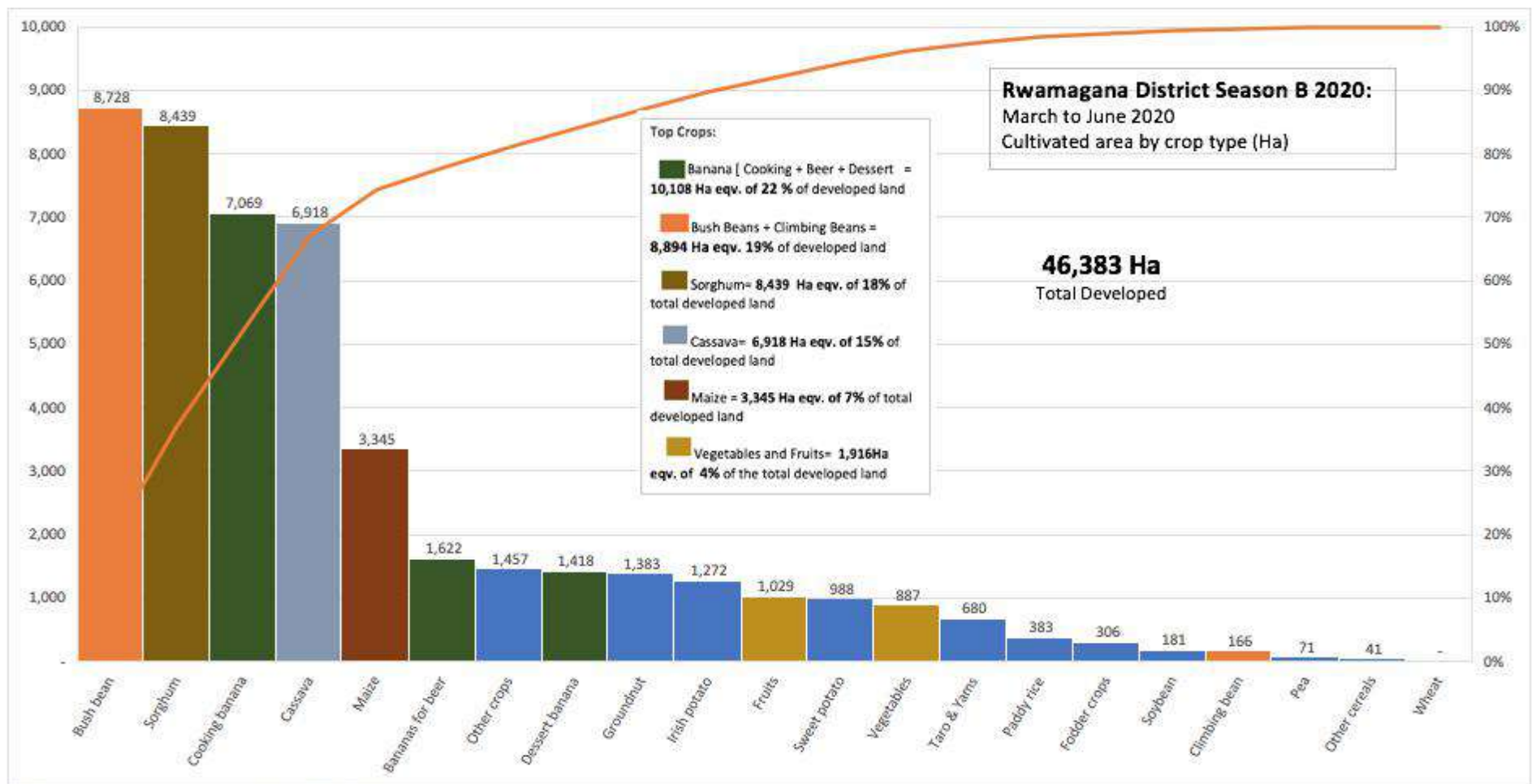


Figure 2: Season C Area Under Full of Partial Irrigation for Target Districts



Source: Adapted and Analysed from NISR, SAS 2020

Figure 3; Cultivated Area by Crop Types for Rwamagana District Season B; 2020

### 1.3 COVID-19 Impact

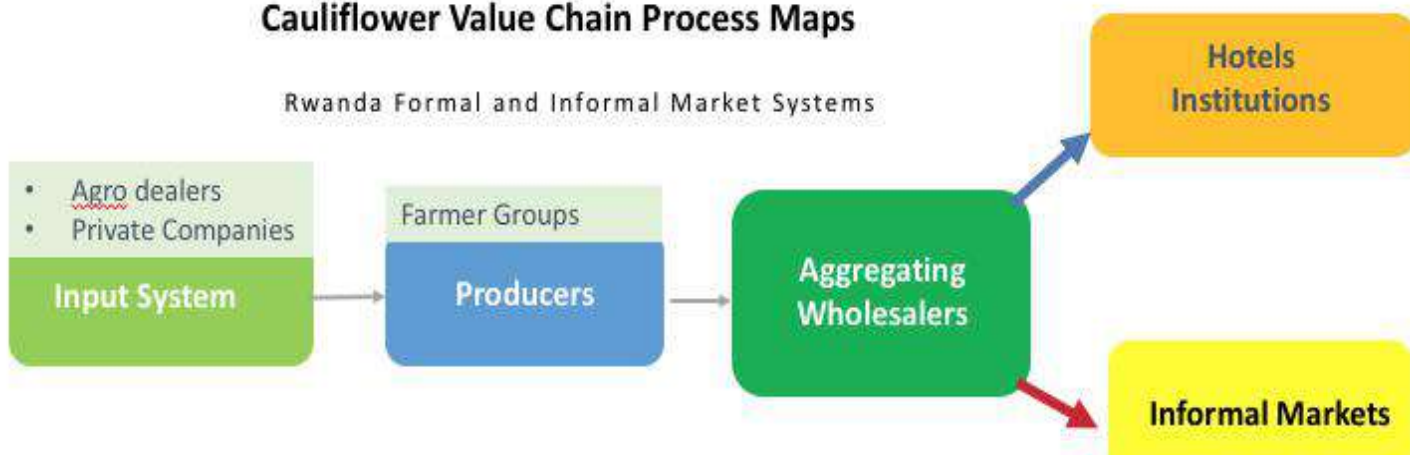
The study reveals new major new expenses that are significantly impacting on aggregation and marketing cost for food. The level of disruptions is significant along food systems are hardest hit on producers and aggregators. The Google community mobility report for Kigali over the period 20<sup>th</sup> October to 1<sup>st</sup> December 2020 reveals that mobility to food-markets, food warehouses and farmers’ markets had dropped by -11% while in Gasabo over the same period it had dropped by -4% which eventually has a direct negative impact on food systems.

19% Increase in marketing costs for farmers

28% increase in supply chain costs for aggregators

### Cauliflower Value Chain Process Maps

Rwanda Formal and Informal Market Systems



In conclusion, Cauliflower Agri-chains are not yet developed in-terms of domestic, regional and international/export markets in Rwanda and multi-stakeholder intervention will see the sub sector thrive and contribute to the country’s economy of the country through better production arrangements. Based on District analysis, the top District for Cauliflower is Gasabo District which is proposed as the only focus due to limited demand level estimated at 260 MT annually.



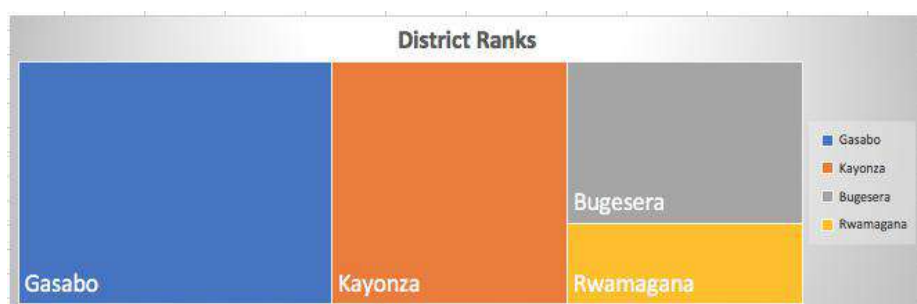
**Ranking Matrix Tables**

*Table 1 Ranking Matrix Table*

Crop	% Of farmers Producing	Rank 1=Highest performing) 4=lowest performing	Commercial Purpose of growing (%)	Rank 1=Highest performing) 4=lowest performing	% Using Improved planting materials	Rank 1=Highest performing) 4=lowest performing	Average Number of seasons	Rank 1=Highest performing) 4=lowest performing	Percent age Yield gap
Gasabo	3.0%	2	100.0%	1	100.0%	1	2	1	14.3%
Kayonza	5.0%	1	100.0%	1	100.0%	1	1	2	94%
Bugesera	0.0%	3.00	0.0%	2.00	0.0%	2	2	1	-
Rwamagana	0.0%	3	0.0%	2	0.0%	2	2	1	0.0%

Farmer level Trade Index (%)	Rank 1=Highest performing) 4=lowest performing	Domestic market supply gap (%)	Rank 1=Highest performing) 4=lowest performing	Annual Domestic markets volumes supply (MT)	Rank 1=Highest performing) 4=lowest performing	Annual Domestic markets volumes Demand (MT)	Rank 1=Highest performing) 4=lowest performing
83.0%	2	82.0%	4	73	1	260	1
98.0%	1	47.0%	3	1	3	10	3



Cauliflower recommended to be promoted in Gasabo only.

# Chapter 2

## Methodology

### 2.0 Methodology

The study used both quantitative and qualitative research design to bring out the uniqueness of the individuals, processes and opportunities using a person-centered perspective to understand existing opportunities and gaps in pineapple, gooseberry, chili, onions, garlic, red cabbage, French beans and Cauliflower. Primary data was collected from smallholder farmers, horticultural associations, private sector players, relevant government ministries and departments, research organizations and development organizations/non-governmental organizations. Overall a total of 890 respondents and a research team of 42 was involved through the study and support on farmer identification by partners.



### 3.1 Sampling procedure and sample size

#### 3.1.1 Individual Interviews:

A purposive sampling method was used to select farming households or farmers from the four (4) study districts of Bugesera, Rwamagana, Kayonza and Gasabo to participate in the interview. A systematic purposive sampling technique as guided by the Yamane (1967) sampling formula was used to sample farming households until when a sample size of 385 households or respondents at 95% confidence level was selected from the four target study districts.

The equation used is specified as follows:

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

Where n is the sample size, N is the population size and e is the level of precision.

Where  $n_0$  is the sample size,  $Z^2$  is the abscissa of the normal curve

that cuts off the  $\alpha$  at the tails representing the significance level,  $e^2$  is the desired level of precision,  $p$  is the estimated proportion of an attribute that is present in the population and  $q$  is given by  $1-p$ .

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2 (.5)(.5)}{(.05)^2} = 385 \text{ farmers}$$

The purposive sampling technique, also known as judgmental, selective, or subjective sampling was used because it is a type of non-probability sampling that is most effective when one needs to study a certain cultural domain with knowledgeable experts within. Well-trained researchers in close collaboration with project implementing partners like African Evangelistic Enterprise (AEE), Farm Concern International and Tearfund selected 485 farming households from the existing farmer organizations across the four districts as illustrated in the table 1. The survey aimed at selecting at least 15 farmers and / or households per each target value chain (chili, pineapple, gooseberry, onion, garlic, red cabbage, cauliflower and French beans) per district to arrive at a sample size of 120 farmers per district. These farmers were validated by Tearfund M&E expert before proceeding to include them in the list of the respondents.

*Table 2 Number districts, sectors, cells, villages, farmers surveyed and response rate*

Name of Districts	Number of sectors	Number of cells	Number of villages	Sample size	Response rate
Bugesera	3	10	51	124	100%
Kayonza	3	6	8	120	100%
Rwamagana	4	9	19	121	100%
Gasabo	5	12	57	120	100%

### 3.1.2 Farmer Focus Group Discussions

Farmer focus group discussions (FGDs) which is a qualitative approach to gain an in-depth understanding of social issues was used to obtain data from a purposely selected group of individual farmers and informal wholesale traders/aggregators. Based on research objectives, a list of questions was developed as a guide for the FGDs. At least ten participants (ensuring a mix of men, women and youth) who are considered large enough to gain a variety of perspectives and small enough not to become disorderly or fragmented (Krueger, 1994) were selected based on the willingness to fully engage in a group discussion. FGDs as a tool was used to collect data that requires concurrence such as severity, frequency, extent of challenges and other cross cutting issues such as gender dynamics, cultural issues, climate adaption, employment, food and nutrition security.

As a result, 8 focus group discussions (2 per districts) were conducted with farmers and 8 focus group discussions were carried out with wholesaler traders/aggregators from 8 main informal markets (2 per districts) and also one FGD was conducted with selected regional/cross-border wholesale traders in Nyamugugu informal market in Kigali.

### 3.1.3 Key Informant Interviews

Key informant interviews were used to gather qualitative data from relevant people who have firsthand knowledge and understanding and can provide insights on fruits and vegetables production, value addition, post-harvest handling & loss and marketing. Also, experts with information/data on policy including existence and non-existence of policies, opportunities,

challenges, potential risks and recommendations for the solutions. A checklist was prepared based on the study objectives and area of expertise for the key informant to guide the interview. A face-to-face or telephone interview techniques was used. Some of the key informants included agricultural experts, research organizations, climate adaptation experts, policy makers, input suppliers, finance institutions, technology service providers, transporters/logistics service providers, processors and/ or formal traders, small and medium enterprise (SMEs), food quality and safety experts, exporters, implementing partners such as INGOs among others. The key informants who provided critical sub-sector macro and micro information and insights.

*Table 3 Summary of key informants interviewed*

Type of Respondent	Total key informants interviewed
Exporters	9
Institutional buyers/SMEs (such as processors, hotel, cooperative, hospital, prison, etc.)	7
Input companies/agro-dealers	8
Financial institutions (banks, Micro-finance, SACCO)	8
Transporters/logistic service providers	4
Ministry of Agriculture and Animal Resources (MINAGRI) such as Director of Agriculture & Natural Resources, Cash Crop Officers, Director General- RICA,	4
Ministry of Trade & Industry (MINACO) - Competition & consumer Protection Officer,	1
National Agricultural Export Development Board (NAEB) - Quality & regulatory Division Manager, Emerging Commodity Division Manager, Planning Division-Focal Person	3
Rwanda Agricultural Board (Deputy Director of Agriculture and extension, RAB Ngoma station	2
Cash crop production Specialist	1
Implementing partners/NGOs	4
Model or best farmer	1

## 3.2 Data Collection, Cleaning and Analysis

### 3.2.1 Data Collection:

The primary data collection took place from October – 16<sup>th</sup> 2020. The quantitative tool consisted of a semi-structured household survey questionnaire while the qualitative tools included focus group discussion and Key Informant Interview checklists. The tools were validated throughout training District Research Supervisor, Enumerators and project implementing staff from African Evangelistic Enterprise and Farm Concern International. Besides, additional secondary data was gathered from authentic and reliable reports and publications.

### 3.2.2 Data Analysis:

Quantitative data (farmer survey) collected through a digital platform and was exported into Microsoft excel version for clean. The cleaned data was later exported to Statistical Package for Social Science (SPSS) for coding, management and analysis. Qualitative data, collected using checklists, flip charts and note books were summarized in designed templates, grouped

and analyzed thematically using quasi statistics. The analysis was then triangulated with information obtained from secondary data/literature review and interviews to arrive at the findings, conclusions and recommendations of the study. The research findings will be submitted to Tearfund and partners for review and feedback. In addition, the final report/findings will be presented to the stakeholders for validation through stakeholders' validation workshop.

### 3.2.3 Quality Control:

Farm Concern International (FCI) designed research tools which were reviewed and validated by Tearfund and African Evangelistic Enterprise (AEE). In addition, EU expert also provided inputs which were incorporated in the final research tools. Further, FCI facilitated two-day training for field District Research Supervisors, FCI and AEE project teams and two-days training enumerators. The training covered essential technical, leadership and logistical features. Research Team Leader and District Research Supervisors conducted regular spot check on a daily basis verifying the accuracy and integrity of the data collected by enumerators. Equally, Data Analyst and Digital Data Collection Platform Administrator reviewed real-time data on rolling basis and provide feedback on daily basis.

### 3.2.4 Findings Validation

The results of the study were presented to key stake holders through 6 Value chain analysis feedback forums i.e. 4Farmer-trader held at each district, 1Exporter -processor feedback forum and 1 Public-private where key participants give feedback that has been incorporated in this report.

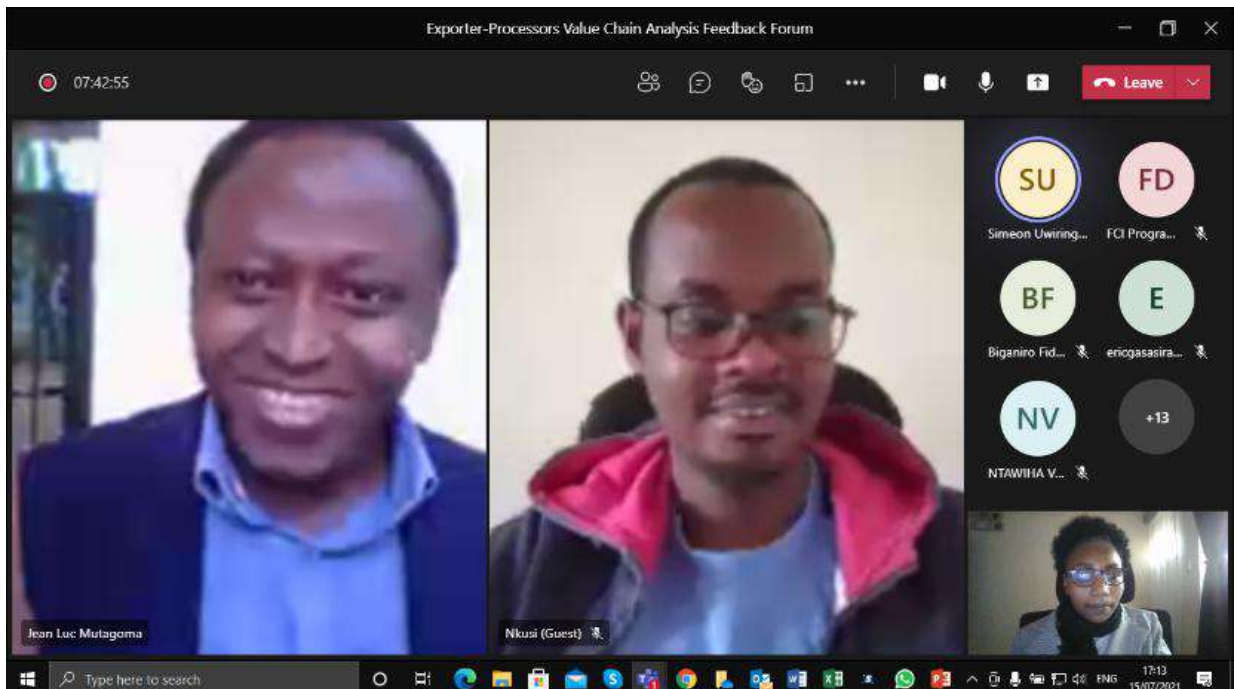


Figure 6 Photo: from the left, Jean Mutagoma Programmes manager-FCI, Emmanuel Nkusi Monitoring and Evaluation Officer Tearfund and Doris Gakii Data analyst, FCI during the Exporter Processor VCA feedback Forum.

# Chapter 3

## Research Findings and Discussions



### 3.0 Results and discussions

#### 3.1 Basic demographics

There were 485 respondents 124 in Bugesera, 120 in Gasabo, 120 in Kayonza and 121 in Rwamagana where females were 64.3% and males 35.7% (Figure 7).

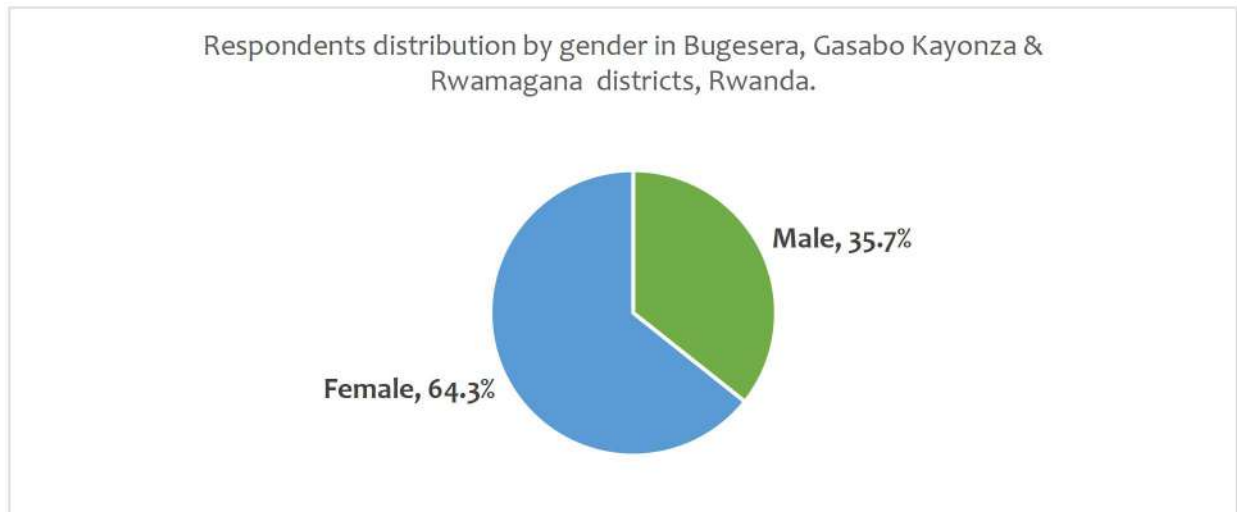


Figure 7: Respondents Distribution by gender heads in Bugesera, Gasabo, Kayonza and Rwamagana Districts, Rwanda

Among the respondents, only 55% were household heads where 75% were male and 25% were female household heads respectively. From the survey, 45% of the respondents were not households. Majority of the household heads (69%) ranged between age of 36-65 years and 28% ranged between ages of 18-35 years i.e., youth (Figure 8). This tallies with national level data that shows that 71% of private households in Rwanda are headed by males and 29% by females though at national level the age of household heads ranges from between 12 to 85 years of age (National Institute of Statistics of Rwanda) (NISR), 2012).

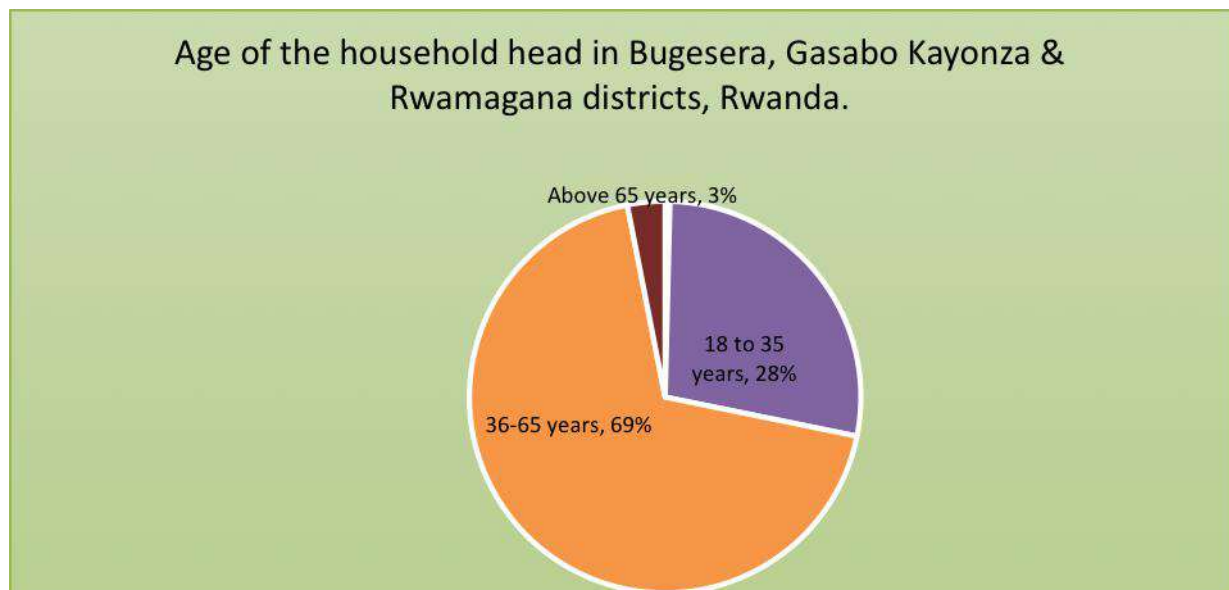


Figure 8: Age distribution of the household heads in the studied Districts

At least 99% of the respondents belonged to a farmers' group and only 1% didn't and whose main purpose was saving and investments (91%), social interest (46%) and farming (44%) both crops and livestock.

The main sources of livelihoods within the studied districts are crop farming (99%), livestock keeping (34%) and casual Labor (13%). Very few are employed (2%) and do business (6%) (Figure 9).

This is so in Rwanda in general with 80% of Rwandans relying on agriculture as their main source of income (Women's Economic Empowerment in Agriculture Knowledge Hub , 2020).

Main sources of livelihood in Bugesera, Gasabo Kayonza & Rwamagana districts, Rwanda.

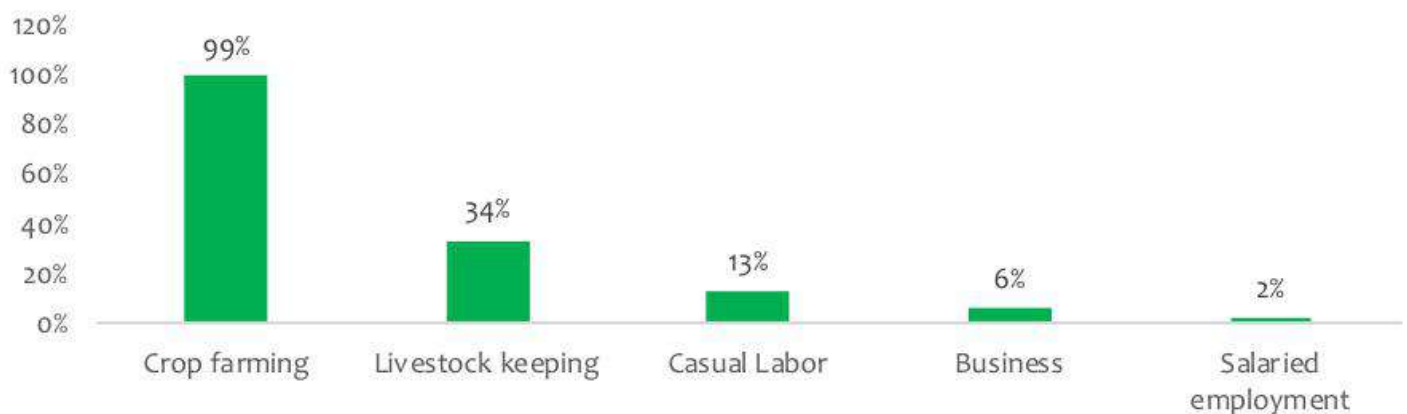


Figure 9: Main sources of livelihoods in Bugesera, Gasabo, Kayonza and Rwamagana Districts

### 3.2 Crop production

Cauliflower is only grown in Kayonza 0.011 Ha and Gasabo 0.012 Ha districts. Average household land size is 0.449 Ha with only an average of 0.372 Ha under cultivation (83%). Average land allocated to Cauliflower is 0.011 Ha which is only 3% of the accessible land (Figure 10).

In Rwanda, land is largely seen as an adult privilege making access to and control over land a major challenge facing rural youth in the mainly agriculture driven country (Misleh, 2014). The focus group discussion revealed this to be true with men and women accessing land equally but youth facing that challenge.



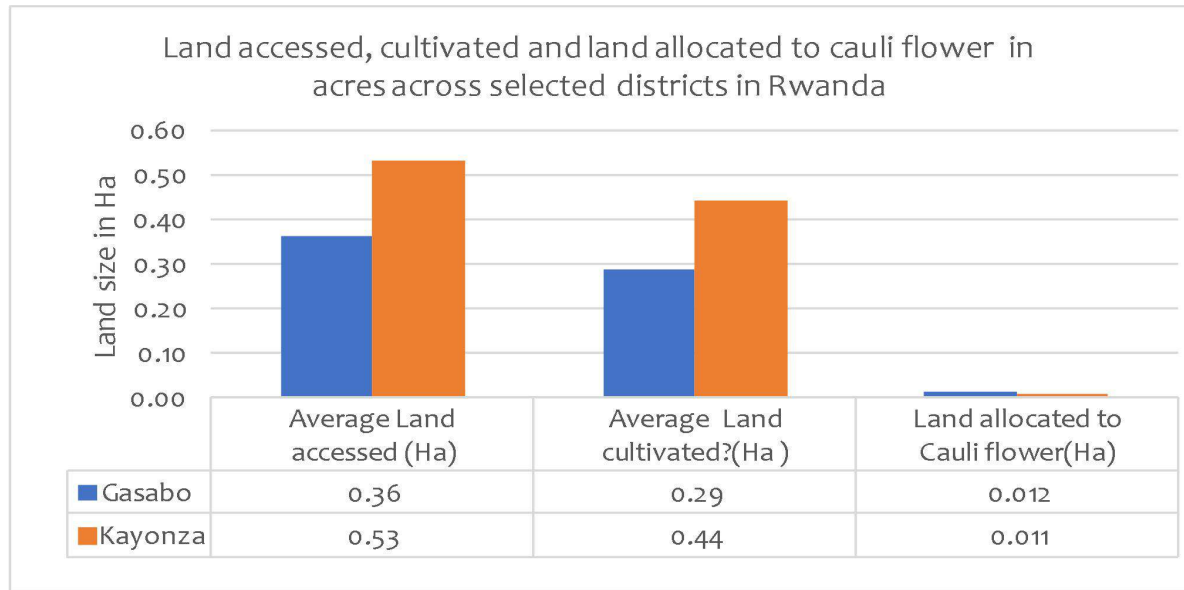


Figure 10: Land accessed, cultivated and allocated to Cauliflower production in the studied Districts

Most of the farmers (97%) in Kayonza and Gasabo don't grow Cauliflower. Out of 3% who grow Cauliflower only 2% who grow it in pure stand while 1% intercrop it with beet root. Only 2% of farmers produce Cauliflower during the main season especially in Gasabo district. Gasabo has two rain seasons per year while Kayonza has one. Most of the farmers (66.7%) do grow improved varieties of Cauliflower within the studied districts except in Bugesera (100%) that recycle their previously grown varieties (Figure 11). Preferred Cauliflower variety in Rwamagana is Broccoli white because it is delicious.

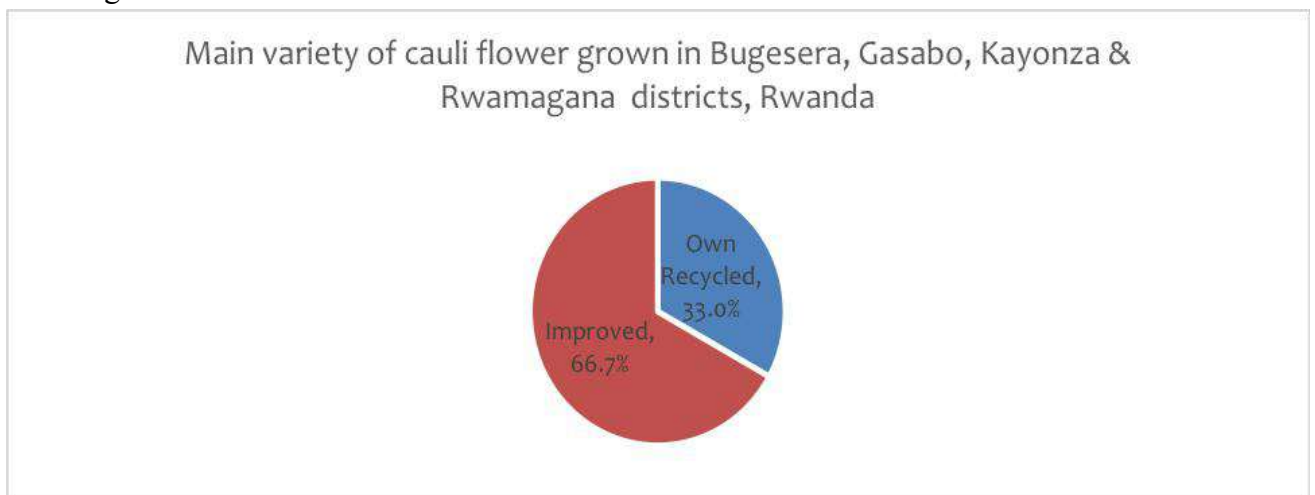


Figure 11: Main varieties of Cauliflower grown in the studied Districts

### 3.2.1 Cauliflower production challenges and proposed solutions

The main production challenges facing cauliflower farmers in the studied districts are high cost of agro-inputs (65%), lack of quality planting material (38%), pest and diseases (33%), frequent drought/ inadequate rainfall (25%), limited farming knowledge (20%) and poor soil fertility (14%)

Production challenges facing cauliflower farmers across districts

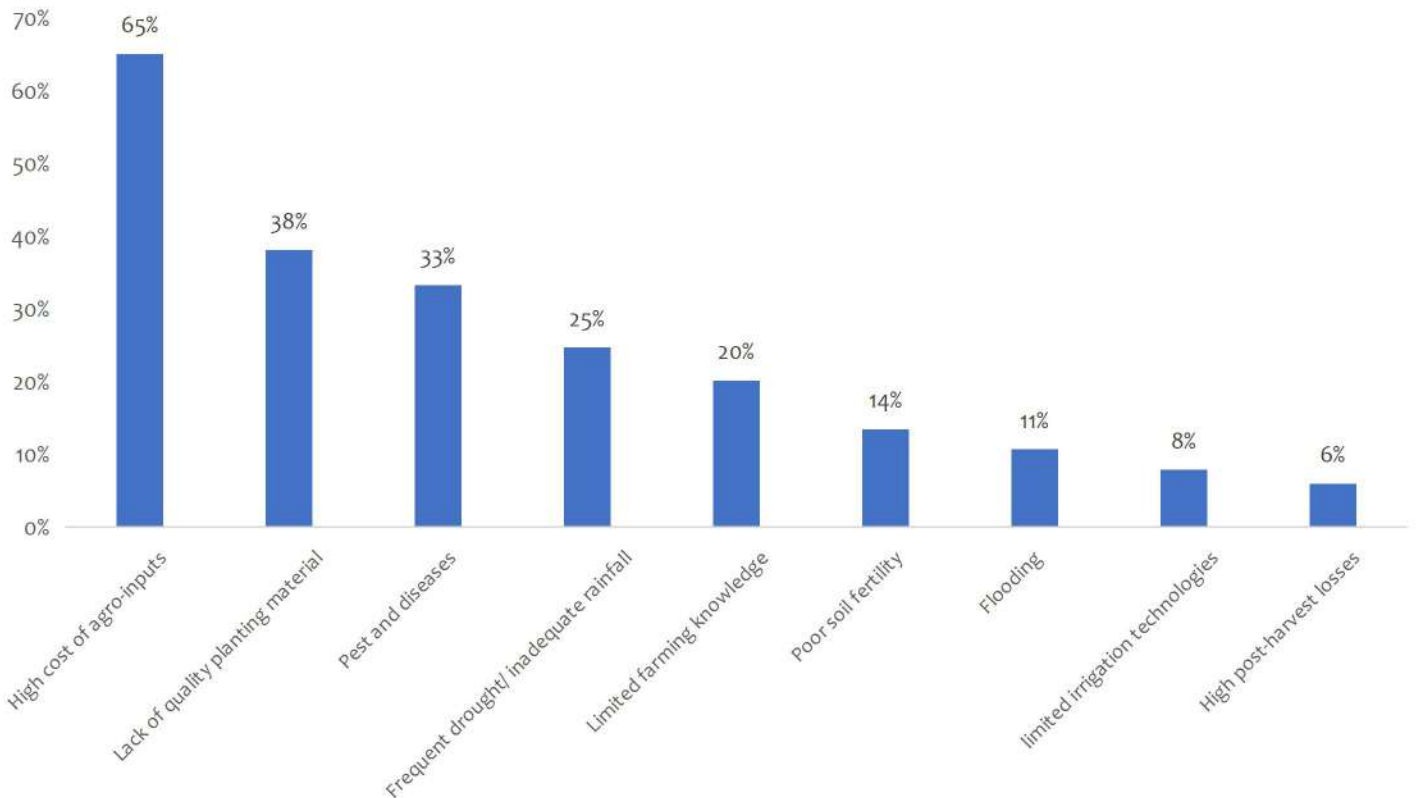


Figure 12: Production challenges facing Cauliflower farmers in the studied districts

### 3.2.2 Farming practices and access to agro-inputs

Among the agro-inputs accessible, only fertilizer (2.5%) and manure (2.5%) are used in Gasabo district while in Kayonza pesticides (5%), improved seeds (6%), fertilizer (5%) and manure (4%) are used in Cauliflower production.

There is no use of machinery in cauliflower production. The main sources of agro-inputs in the studied districts are from agro-dealers (74.6%), neighbors (29.7%) and input companies (28%) (Figure 13) where majority acquire them as a group (56%) and few (44%) individually.

Figure 13: Main sources of agro-inputs in the studied Districts

High costs (84%) and in-availability (53%) are the main challenges faced by the farmers in

accessing and use of the agro-inputs (Figure 14). The high costs of agro-inputs could be due to the country’s geographical structure, Insufficient input stocks, affordability, farmers’ knowledge and skills and incentives.

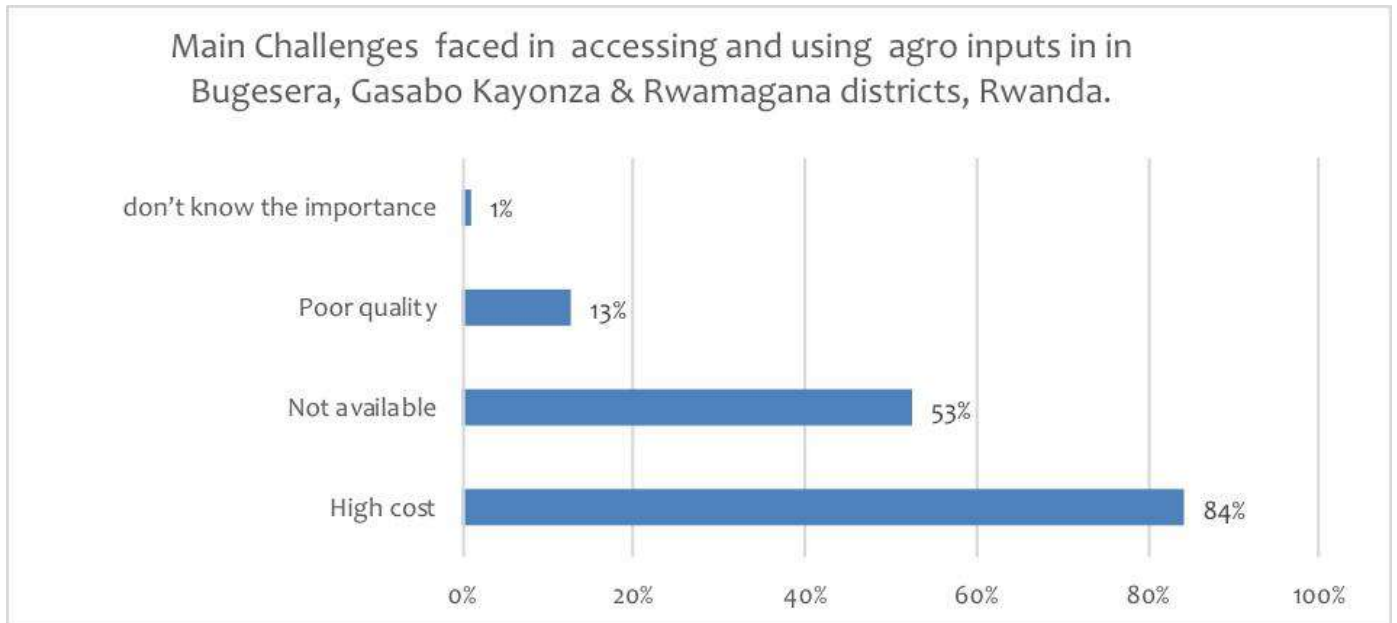
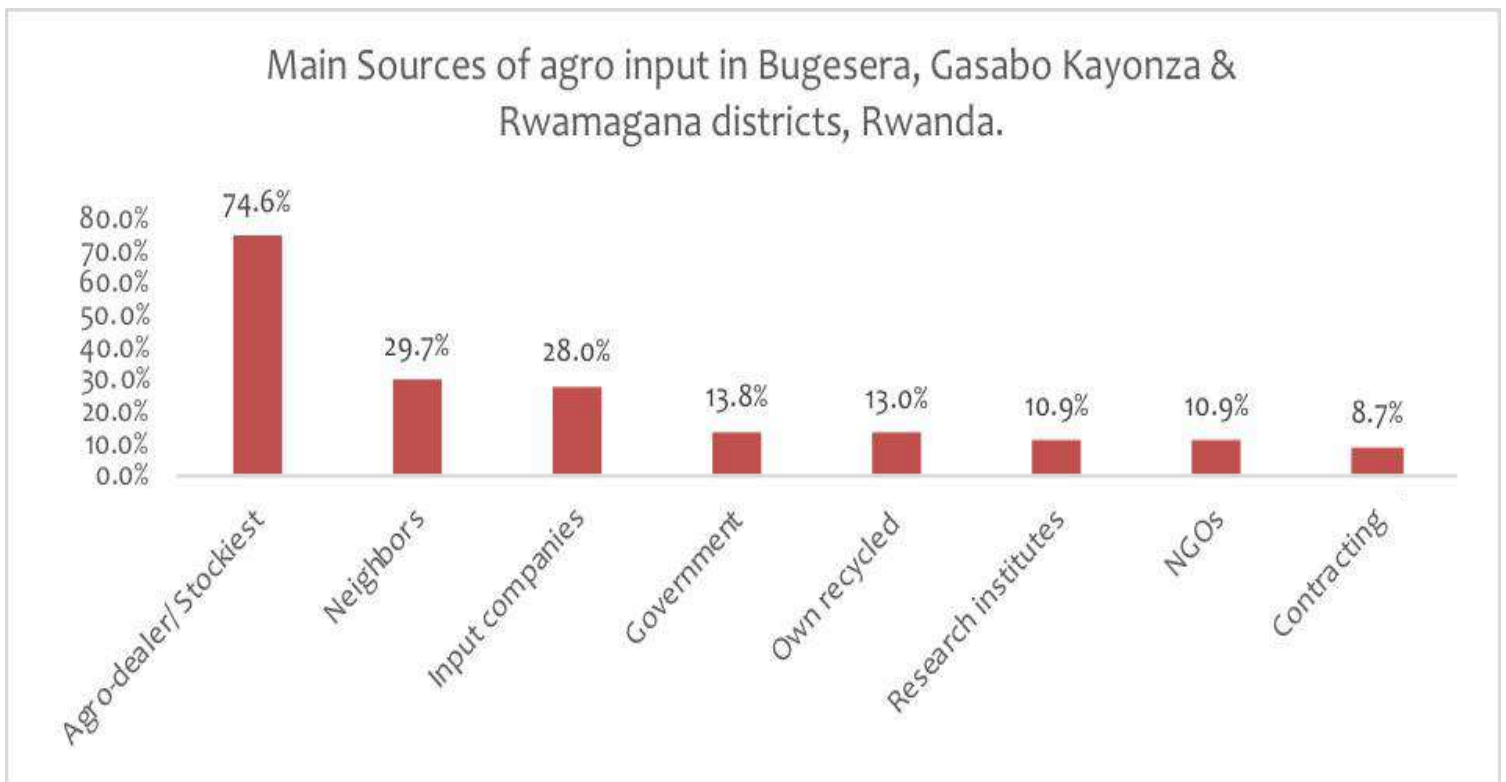


Figure 14: Main challenges in accessing and using agro-inputs



Other challenges in the use of the agro-inputs are delay in delivery (40%), lack of knowledge (13%) and lack of capital (6%). Consequently, when farmers are using the agro-inputs have fear that; excessive use of chemicals could affect their health (76%) and use of chemicals would negatively affect land, water and other production resources (44%).

### 3.2.3 Average current yield, optimal/potential yield and yield gap

Gasabo has average land size of 0.012 Ha while Kayonza has 0.866 Ha. The current yield is high in Gasabo 17,999.89 kg/Ha while Kayonza has 1260.94 kg/Ha where potential yield 20,999.94 kg/Ha giving a percentage yield gap of 14% and 94% for Gasabo and Kayonza respectively as shown below.

Table 4 Average volume harvested, yield and potential yield of Cauliflower within studied districts

District	Average Number of Seasons	Average Land Size (Ha)	Average Volume harvested (kg)	Current yield (Kg/Ha)	Potential Yield (Kg/Ha)	percentage Yield gap (Kg/Ha)
Gasabo	2	0.012	210.0	17,999.89	20,999.94	14%
Kayonza	1	0.866	1092.8	1260.94	20,999.94	94%
Overall	1.5	0.439	651.4	9630.42	20,999.94	54%

Source: HH-EU-Rwanda, 2020

In overall, 91% of the Cauliflower harvested is sold and only 6% is consumed and 4% lost (Table 5)

Table 5 Average volume sold, consumed and loss of Cauliflower within studied districts

District	Average Volume harvested (kg)	Average Volume Sold (kg)	Average Volume Consumed (kg)	Average of Volume Lost (Kg)	Percentage Sold	Percentage Consumed	Percentage lost
Gasabo	210.0	173.3	20.0	16.7	83%	10%	8%
Kayonza	1092.8	1073.8	13.8	5.2	98%	1%	0%
Overall	651.4	623.6	16.9	10.9	91%	6%	4%

Source: HH-EU-Rwanda, 2020

However, from key Informant RAB Research Organization, Improved Orange variety has an optimal yield of 18MT/Ha and 8.5MT/Ha on station and on farm respectively and recommended for Rubavu and Gicumbi Districts. They have also recommended cauliflower to be grown in Western, Northern and Eastern Provinces of Rwanda.

### 3.2.4 Gender participation in farming activities

In Kayonza we have 88% women farmers and 13% youth farmers while in Gasabo women farmers are 75% and no youth farmers. In general, there is no major significant difference in Cauliflower production in-terms of gender, but in Rwamagana adult male and female and youth female, do majority of production (100%). Substantial proportion of adult female do production in Kayonza (88%) while in Bugesera is done by adult male and female and male youth (67%). In Gasabo is done majorly by male youth (75%) (Table 6)

Table 6 Gender participation in Cauliflower production

Gender	Overall	Bugesera	Gasabo	Kayonza	Rwamagana
Adult Male	64%	67%	50%	38%	100%
Adult Female	68%	33%	50%	88%	100%
Youth Male	45%	67%	75%	38%	0%
Youth Female	70%	67%	50%	63%	100%

Source: HH-EU-Rwanda, 2020

### 3.2.5 Gross margin analysis

This study reveals that Cauliflower has a high potential to earn farmers a good return per Are cultivated as shown in the figure 15 Cauliflower can fetch good returns of Net Income (Farm gate) of 3,287,300 RWF /Ha and a Net Income (Market gate) of 3, 587,300 RWF /Ha in Kayonza market.

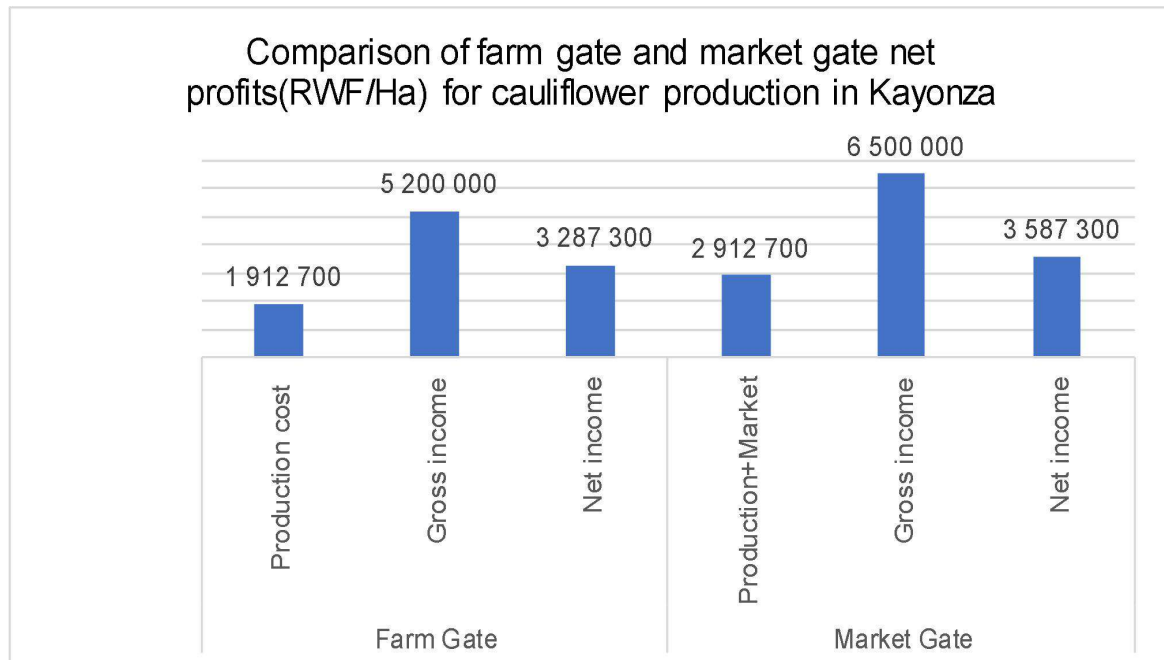


Figure 15; Comparison of farm gate and market gate net profits for Cauliflower

### 3.2.6 Cost drivers

The major cost drivers associated with the production of Cauliflower are related to labor as Cauliflower farming is labor intensive with manure application, planting, land preparation, fertilizer application, packaging, weeding and harvesting all needing labor. Land preparation (15%) and weeding (15%) takes the biggest share. This is demonstrated in Figure 16.

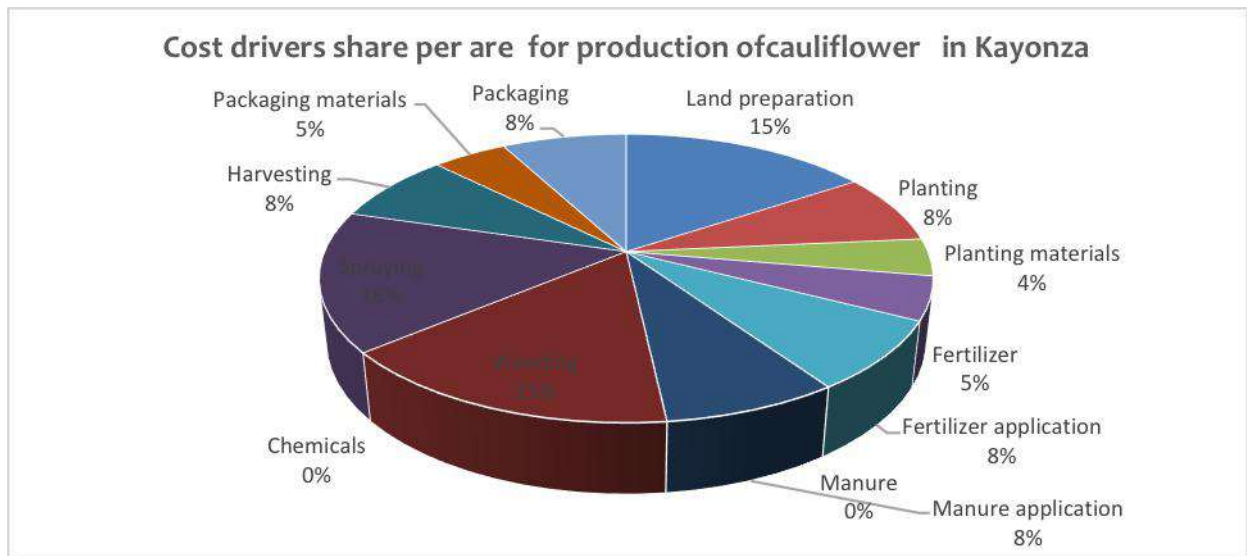


Figure 16: Cost drivers for Cauliflower production in Kayonza District

### 3.3 Potential environmental effects or concerns

The communities raised environmental concerns when rural households engage in the production of Cauliflower and vegetables in general. Use of chemical inputs (fertilizers, pesticides and fungicides) lead to water pollution, threat to biodiversity such as bees and other beneficial insect such as natural enemies to pests. Also, pesticides /chemicals residues may be an issue to human health due to pollution of the air and water; misuses may lead to health issues and death. However, no alarming data were recorded.

### 3.4 Post-harvest handling and storage technologies and value addition

#### 3.4.1 Storage technologies

The storage technology issues were addressed generally for all vegetables and fruits studied. There were no storage facilities in the sampled markets in Kayonza and Bugesera. They use plastic sheets to cover commodities.

They pay a monthly amount (1000 RF) for the security guardians. When it rains or in case of intense sunshine, the commodities perish and they are thrown away or sold at a very cheap price.

However, there was storage in Rwamagana at Kigabiro market in store rooms (1m x 1m capacity). All commodities are stored except pineapples and French beans.

They are rented and charged daily where they pay monthly charge of 5000 RF.

Only 9% of the farmers store vegetables while 91 % doesn't in the studied districts. Only 60% of vegetables are stored when processed while 40% are stored raw where Gasabo processes 92% of its vegetables but Cauliflower is not processed (Figure 17).

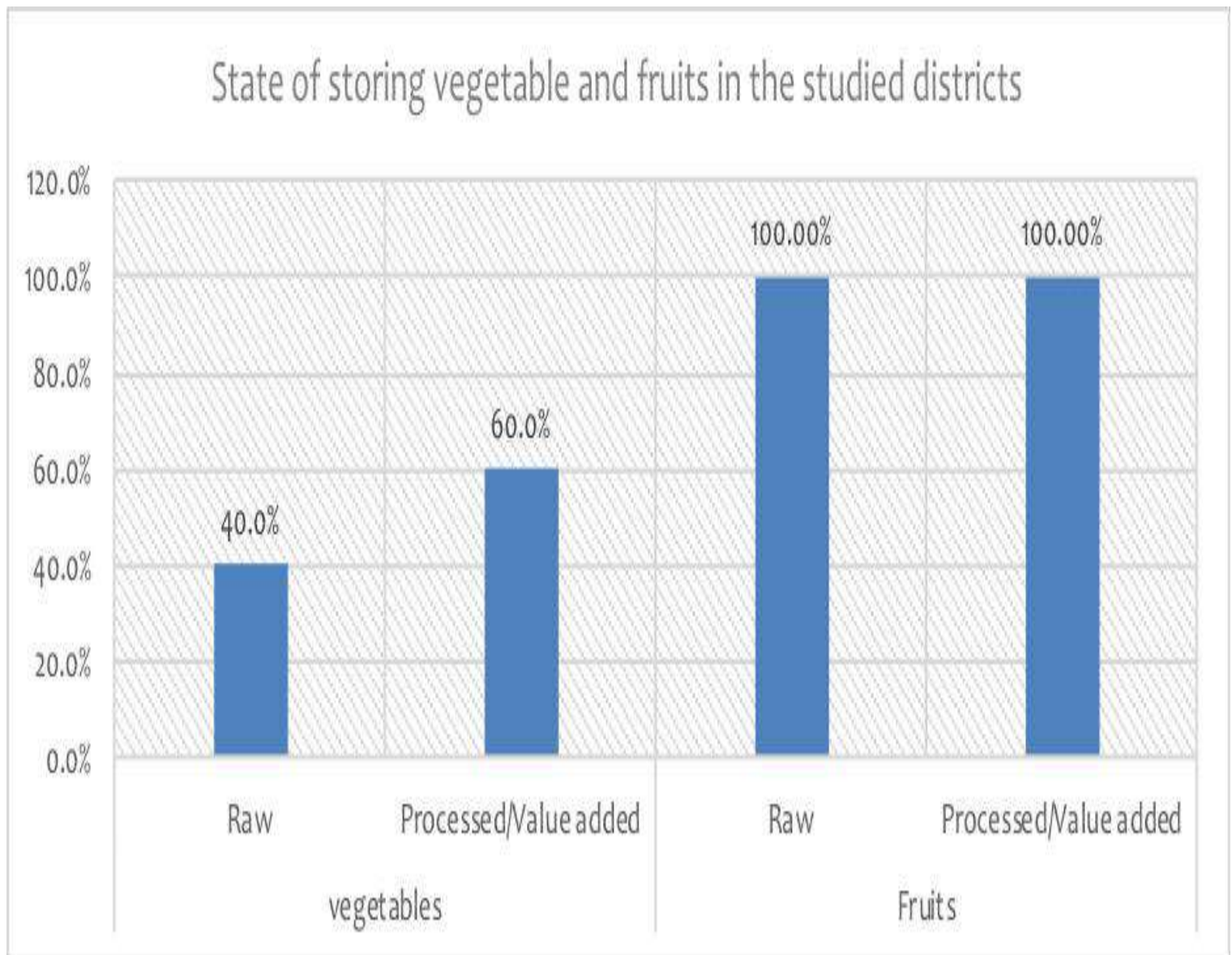
Figure 17: State of storing vegetables and fruits in the studied districts  
CFL-Validated Report -2021

The main storage technology for vegetables was in the main house (15%) and in the cold room (10%) where price speculation (61%), preserving for future consumption (54%) and lack of immediate market for the crop are the main reasons for storing vegetables.

#### 3.4.2 Value addition practices and technologies

Sorting and grading of Cauliflower are the value addition processes practiced in the studied districts. Very few (2.5%) do value addition of Cauliflower with 10% not carrying out value addition because majority (87.5%) do not grow Cauliflower within the studied districts (Figure 18).

The main reasons for not carrying out value addition are lack of technology (68%), limited Knowledge (57%), lack of capital (37%) and lack of markets (16%). This has led to major losses especially with the advent of the COVID 19 pandemic that has seen international trade plummet, placing farmers in Rwanda in a major crisis (Nkurunziza, 2020).



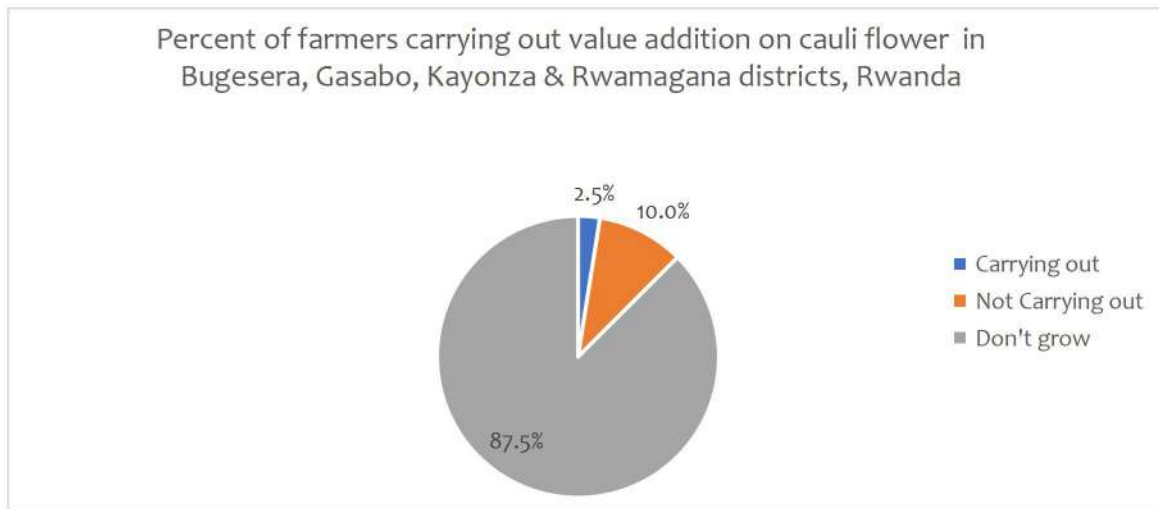


Figure 18: Proportion of farmers carrying out Cauliflower value addition in the studied districts

Also, value addition is mostly done by adult females (62%) in most of the studied districts. However, Adult males do participate in individual district e.g., Rwamagana (100%) while male and female youth (67%) are actively involved in value addition in Bugesera district (Table 7).

Table 7: Gender participation in Cauliflower Value addition

Gender	Overall	Bugesera	Gasabo	Kayonza	Rwamagana
Adult Male	43%	33%	0%	38%	100%
Adult Female	62%	33%	50%	63%	100%
Youth Male	39%	67%	50%	38%	0%
youth Female	39%	67%	50%	38%	0%

### 3.5 Climate adaptation measures

This was done generally for all vegetables studied. Climate adaptation measures adopted by the farmers in the studied districts are summarized in table 8 below.

Table 8: Climate adaptation measures

District/source	Climate adaptation measures/agricultural technologies	Adoption level by farmers	Benefits of adopting the measure with reference to specific fruit or vegetable
Bugesera Director of Agriculture and Natural Resources	Conservation agriculture		Water retention, Soil conservation
	Mulching		Water retention, Weed control
	Zero tillage		Soil conservation measure, reducing production cost
	Climate smart seeds		Adaptation to climate change problems
	Irrigation: Solar irrigation system Mechanical irrigation (watering, pumps)		The solar irrigation system contributes to the carbon footprint reduction It contributes to reduce the cost of production.



Gasabo Director General, RICA	Small scale irrigation and ant-erosion measures.	Eastern province with Government subsidies	Use of solar enabled machine to pump water to water crops (chili, French beans) Rain-water harvesting.
	Greenhouse and hydroponic cultivation	Very few, only seed multipliers and research institutions	Production along the year and non-dependence on climate, limitation of pests and disease contamination.
Kayonza Unit of Agricultural and natural resources	Small scale irrigation	High	The most beneficiaries are vegetable growing.
	Terracing	High	Prevent soil erosion.
	Making some dams	High	Vegetables may grow any time.
	Early maturing varieties	Medium	To be mature beforehand and escape the bad season.
	Agro forestry trees	Small	Fire-wood and forage for animals as well as soil protection hence more yield of fruits and vegetables.
	Bench terracing	96%	Land protection and increase crop productivity.
	Agroforestry tree species planting	91%	Farmers get fruits, animal forage, and increase nutrition of both animal and humans.
	Irrigation systems for fruit crops	85%	Increase soil moisture for some time hence improving yields.
	Nursery pot sowing technology for vegetables	82%	Easy transplanting, quick recovery/growth after transplanting shock
	Mulching	90	Avoid soil loss and maintain soil moisture .

### 3.6 Government policies/strategies for crop production

Government of Rwanda has enforced the following policies and strategies to support crop production to farmers; Tax payment, enhancement of the production level through input payment (i.e. fertilizers, irrigation equipment), promotion of the horticulture export market, business regulations, not taxing fruits & vegetables, forming cooperatives for fruits and vegetables, mobilizing farmers to grow fruits and vegetables, sensitizing traders into cooperatives, promotion of private sector, promoting horticultural crops and gender equality.



### 3.7 Marketing of Cauliflower

The following markets are available in the studied districts; in Bugesera district we had Nyamata, Ruhuha markets, in Gasabo district we had Kimironko and Nyabugogo markets, in Kayonza district we have Kayonza and Kabarondo markets and in Rwamagana district we have Kigabiro and Ntungwa markets. They are all wholesale and retail market types being twice per week except Gasabo which is only retail and once per week. Gasabo District had the highest number of Cauliflower traders (396) followed by Kayonza (4), Bugesera (2) and least was in Rwamagana (1) (Table 9). Compared to other crops, Cauliflower had the lowest numbers of traders in all the studied districts except in Gasabo because its peak month is in the month of December where we have most of the major holidays (e.g., Christmas) within the year.

Table 9: Number of Cauliflower traders in different markets within the studied districts

District	Market names	Retailers	Wholesalers	Brokers	Total
Bugesera	Nyamata	0	2	0	2
Kayonza	Kayonza	2	2	0	4
Gasabo	Kimironko	380	16	0	396
Rwamagana	Kigabiro	1	0	0	1

Generally, Cauliflower is mainly bought by cooperatives (33.4%). Very few go to brokers (16.7%), informal traders (16.7%), institutions (16.7%) and end-consumer (16.7%) respectively (Figure 19). Interestingly, in Kayonza 33% of Cauliflower goes to brokers but in Gasabo is evenly distributed to informal traders (33%) and end consumers (33%). Mostly, Cauliflower is sold collectively (83%) with Kayonza selling it fully collectively (100%). Only 17% is sold individually with Gasabo doing it both collectively (67%) and individually (33%).

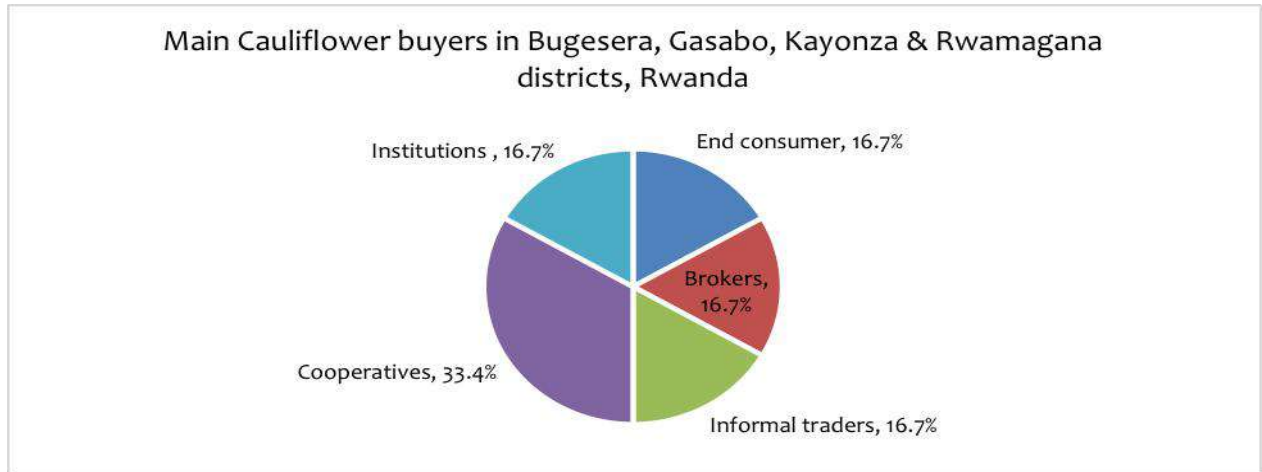


Figure 19: Main Cauliflower buyers in Bugesera, Gasabo, Kayonza and Rwamagana Districts

### 3.7.1 Gender participation in marketing

Marketing is majorly done by adult females (69%) in most of the studied districts except in Bugesera where is done by both male youth (67%) and adult male (67%) respectively. This is because adult females require low investment and they are the source of food and income to their families (Table 10)

Table 10: Gender participation in Cauliflower Marketing

Gender	Overall	Bugesera	Gasabo	Kayonza	Rwamagana
Adult Male	38%	67%	25%	38%	0%
Adult Female	69%	33%	75%	75%	100%
Youth Male	50%	67%	75%	38%	0%
Youth Female	13%	0%	0%	13%	100%

The involvement of youth and women in trading vegetables is generally different depending on the trading level. Women are mostly involved as retailers as they get commodities at the physical market and don't deal with transport costs, and other additional logistics. Youth and women are involved in this trading aspect because there are existing programs at the government level to lift up these specific groups.

Men are mainly wholesalers since they prefer quick money and are physically strong to go far distance sourcing. Most women traders are mainly single mothers and are involved in this business to support their kids. According to group discussions, there is low level of youth engagement because of lack of capital. Women are more involved in bigger number but their investment is very small and many of them are small retailers.

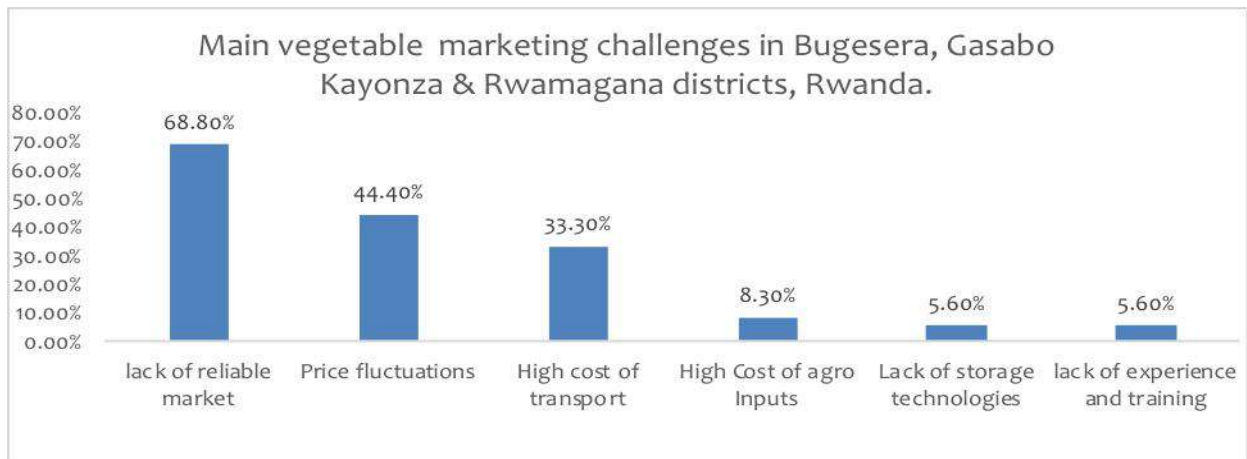


Figure 20: Marketing challenges of vegetables in the studied districts

Lack of reliable markets (69%), price fluctuations (44%) and high cost of transport (33%) are the main marketing challenges of vegetables cauliflower included in the studied districts (Figure 20).

### 3.7.2 Commodity quality requirements for domestic, regional and export markets

In the four studied districts, only 11% of the Cauliflower is sold at town markets within the districts, 61% local market within the villages and 28% not selling at all (Figure 21). Generally, most of the farmers (90%) within the districts studied grow Cauliflower mainly for both food and commercial purposes except in Bugesera (100%) that do for consumption only. Surprisingly, Gasabo sells 100% of its Cauliflower to local markets within the villages and Kayonza 21% to local markets within the villages and 21% to town markets within the districts

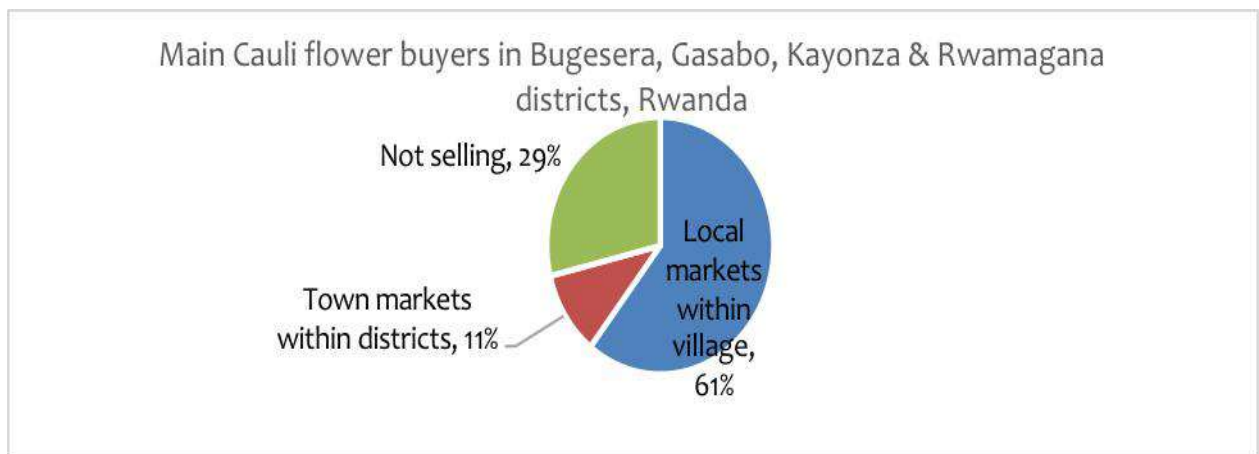


Figure 21: Main buyers of Cauliflower in Bugesera, Gasabo, Kayonza and Rwamagana Districts

### 3.7.3 Annual volumes traded in informal domestic markets, regional markets and private sector

Table 11 shows peak and off-peak months for Cauliflower in the four studied districts. Peak months in Kayonza are in April-May and October-November while in Gasabo Kimironko market is between December and March.

Table 11: Cauliflower Peak and Off-peak months in different districts

District	Market names	Peak Months	Off-peak Months
Bugesera	Nyamata	Jan-May	Jun-Dec
Kayonza	Kayonza	Apr-May, Oct-Nov	Jun-Aug, Jan-Feb
Gasabo	Kimironko	Dec-Mar	Apr-Nov
Rwamagana	Kigabiro	Sep - Apr	May -Aug

The details of annual volumes traded, annual potential value and annual market gap for Cauliflower for the studied districts are shown in Table 12. Nyabugogo market in Gasabo district recorded the highest annual market gap of 135 Mt followed by Kimirinko market (52 Mt) in Kayonza district.

Table 12: Cauliflower annual value, volumes traded &amp; market gap in select markets

District	Market	Annual volumes traded (Tonnes)	Annual value traded (RWF)	Annual market gap (Mt)
Kayonza	Kayonza	1	342,000	10
	Kimirinko	0.3	1,667,250	52
Gasabo	Nyabugogo	73	285,344,850	135
Rwamagana	Kigabiro	0.4	188,100	0.3
Bugesera	Nyamata	20	3,933,000	21

Kayonza district Kayonza market and Gasabo district's Kimironko market have the highest percentage of demand gap of 93% and 99% respectively even compared to other vegetables (Figures 22 and 23). This is because they are the main markets of Cauliflower in the studied districts. Nyamata market in Bugesera has the lowest Cauliflower demand gap being a minor market for this vegetable.

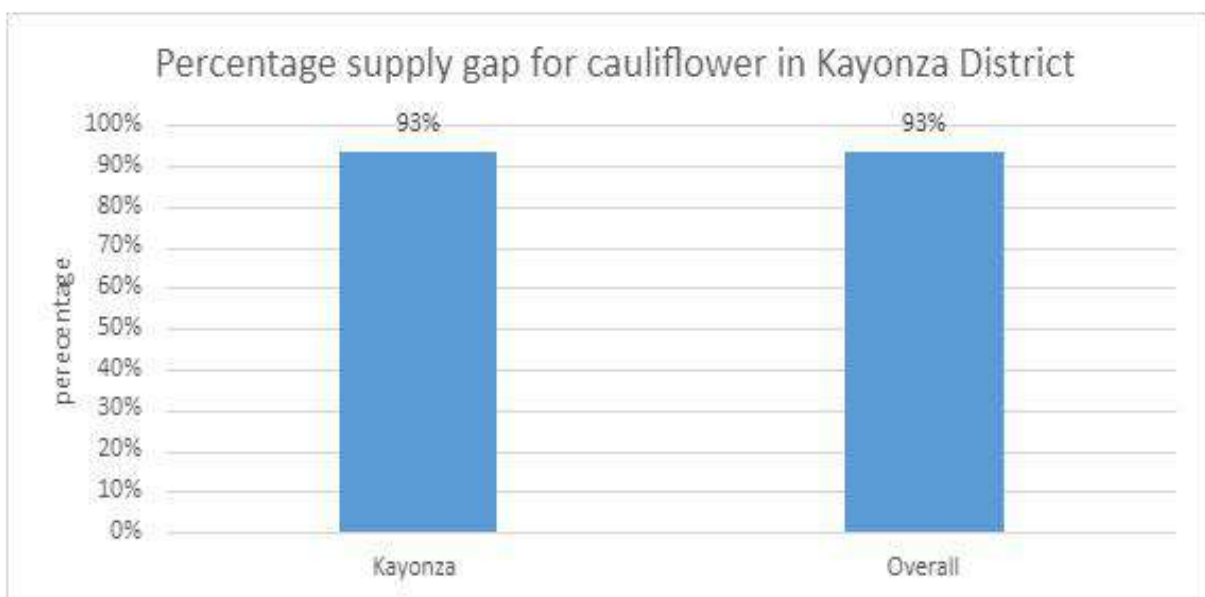


Figure 22: Percentage demand gap for selected fruits vegetables in Kayonza District

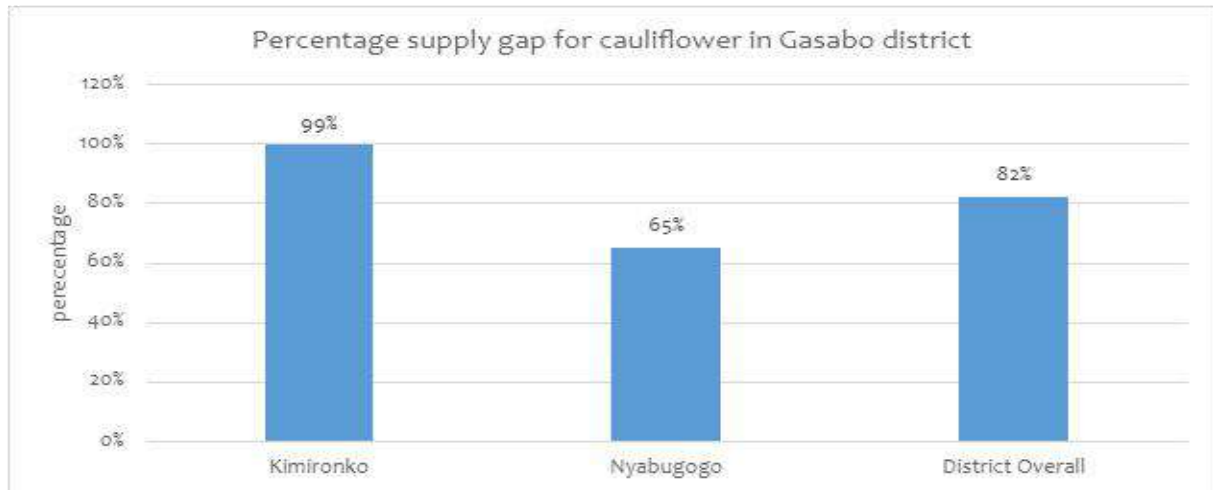


Figure 23: Percentage supply gap for selected fruits and vegetables in Gasabo District

### 3.7.4 Price trends

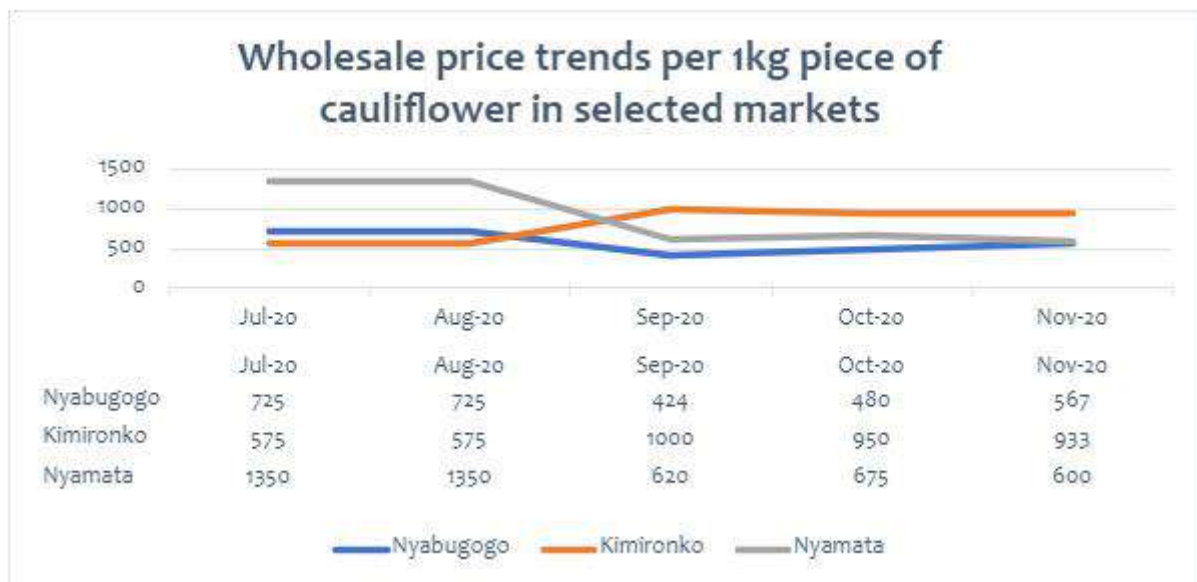


Figure 24: Wholesale price trends per kilogram piece of Cauliflower in selected markets

Wholesale price trends per kilogram of Cauliflower in selected markets are shown in Figure 24. Wholesale prices are high in July and August but drop in September to November in Nyamata market. However, in Kimironko market, prices are low in July and August but raise in September to November. Prices are more or less constant in Nyabugogo.

### 3.7.5 Commodity trade routes

For Rwamagana District, Cauliflower comes from Nyabugogo Market in Gasabo to Kigabiro Rwamagana. For Kayonza District comes from Musanze and Nyabihu districts to Nyabugogo market then to Kayonza. For Gasabo District comes from Gicumbi and Rubavu to Kigali and Kimironko then to Nyabugogo then to Nyarugenge. For Bugesera District comes from Gisenyi and Byumba to Kigali then to Nyamata. It should be noted that for cauliflower agri-chains are not yet developed in-terms of domestic, regional and international/export markets.

### 3.7.6 Logistical cost analysis

Most of the costs goes to COVID-19 related costs (26%) and (28%), Packaging (16%) and (9%) and transport (16%) and (17%), security (13%) and (14%) as traders source Cauliflower from Nyabugogo in Kayonza to Kigabiro market in Rwamagana during peak and off-peak season (Figure 25&26) respectively. Generally, there are no significant difference in costs between the peak and off-peak season.

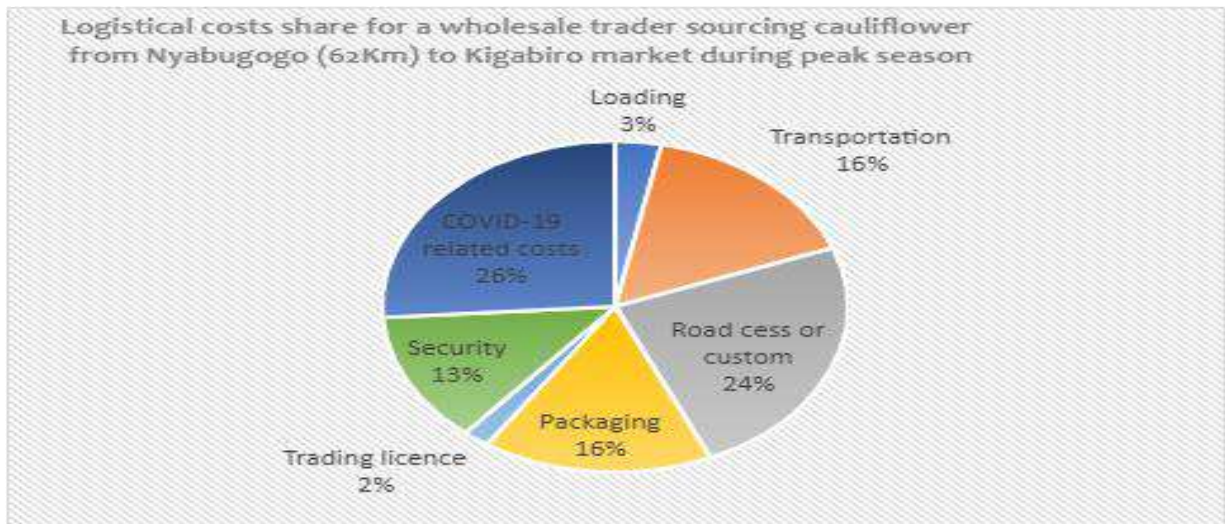


Figure 25: Logistical cost analysis of Cauliflower peak season

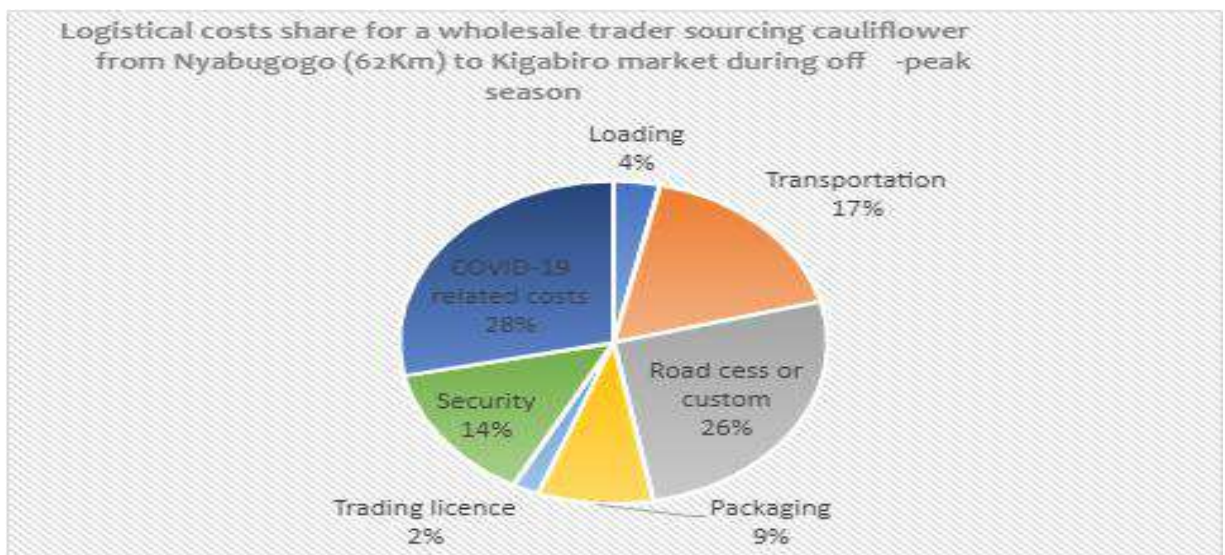


Figure 26 Logistical cost analysis of Cauliflower off-peak season

### 3.7.7 Governance of the chain and challenges in marketing

The government through the Ministries of Agriculture and Trade, NAEB and RSB regulates the horticultural crops value chains in general by:

- I. Facilitating trade certification processes
- II. Formulating policies and strategies to upgrade horticulture

III. Formulating and implementing agricultural export policies

IV. Enforcing quality standards requirements.

The market challenges of Cauliflower and the proposed solutions are summarized in Table 14 below.

Table 13: Summarized Market challenges and solutions in all the studied Districts

Challenges	Solutions
Inadequate supply	Mobilize farmer to produce more to satisfy the market.
Highly perishable	Train farmers on post-harvest handling Encourage cooperatives for direct access to market
Lack of storage facilities	To construct storage facilities at market level.
Long distance to sourcing areas	Promote farmers near market to produce
Low prices for non-flesh produce	Promote better storage facilities Provide ready market
Shortage of markets	Consumer awareness Linkage to formal markets e.g., export
Few stands for traders	Expand market
Transportation cost is high	Encourage cooperatives to facilitate transportation
Poor road infrastructure causing delay and damage	Improve road infrastructure
Covid-19 days restrictions yet tax is monthly	Government to reduce taxes
Poor quality from farmers	Train farmers on post-harvest handling
Consumers have low knowledge on the produce	Consumer awareness Nutritional value campaigns
High logistical costs	Government to regulate costs Traders to consider sourcing closer to markets
A lot of road side retailers pausing competition	Encourage retailers to join the markets
Insufficient starting capital	Facilitate access to financial services
A few farmers are growing the vegetables targeted	Create farmer awareness
Low production	Improve irrigation systems Train farmers on production practices
Price fluctuations	Linkage to better markets

It should be noted that small-holder farmers are not able to determine the prices, therefore the market decides on the pricing favoring the wholesaler and retailer eventually the farmer doesn't benefit.

### 3.8 Effects of COVID 19 pandemic on Cauliflower business

In the studied districts, they were all affected by the pandemic as follows;

- Low consumer demand
- High spoilage due to lack of market
- Shift working system reduced number of working days
- Extra costs for masks, sanitizers and soap lowering profits.
- Early closure of the market leading to loss of the purchase
- Lack of transport from and to market



- High cost of transport
- Low prices for non-fresh commodities
- Low supply of the produce
- Taxes remain the same and less working hours
- High competition from people who lost their jobs
- Lack of market due to low demand
- Loss of export markets as well
- Reduced number of working days
- Reduced income since farmers were spending more at household

### 3.9 Access to agricultural services

The main types of business support services accessed by the farmers in the studied districts are financial services (88.5%), agricultural extension services (20.8%) and input services (11.5%) while crop insurance and marketing services (2.3%) are the least accessible (Figure 27).

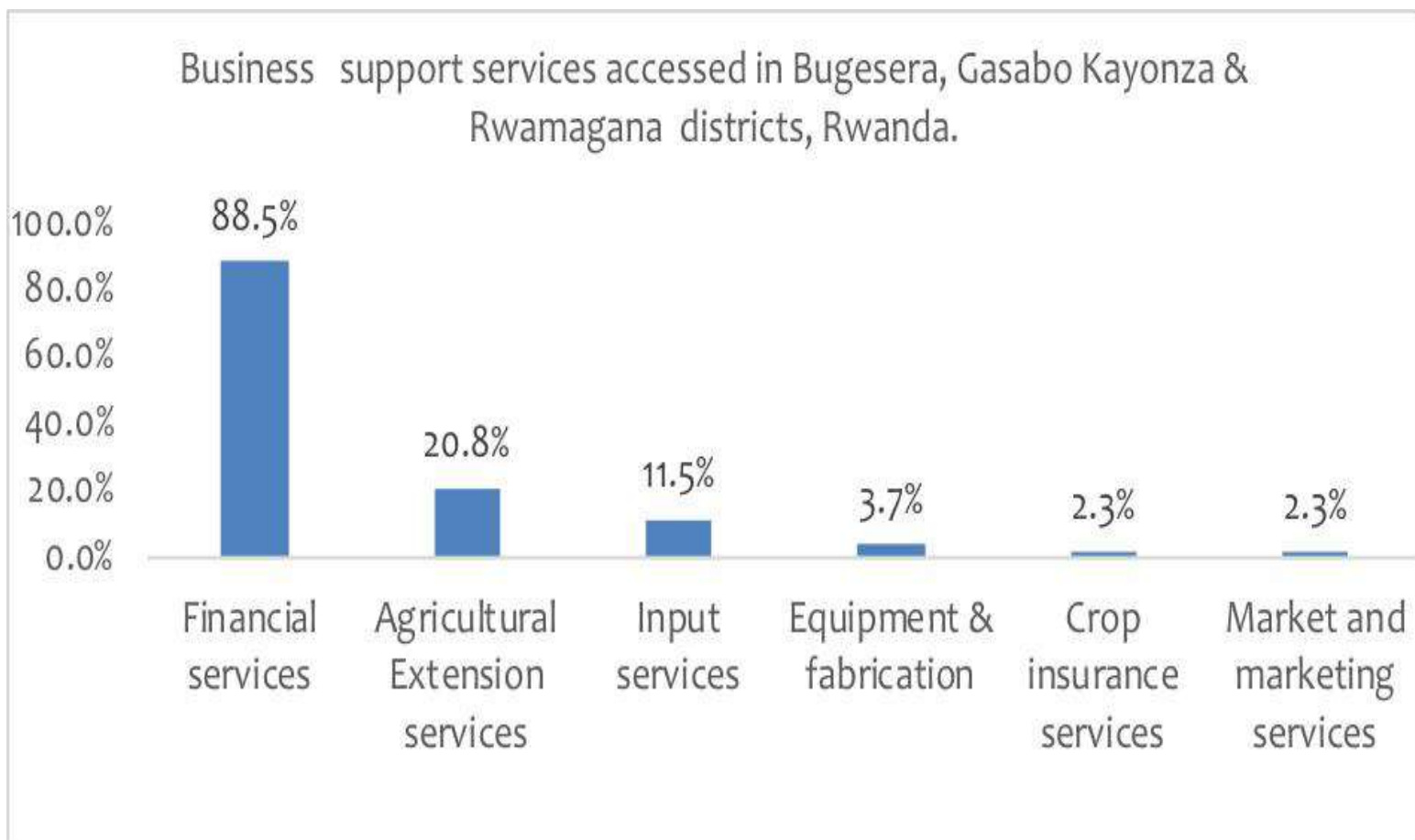


Figure 27 Business support services accessed by the farmers in the studied districts

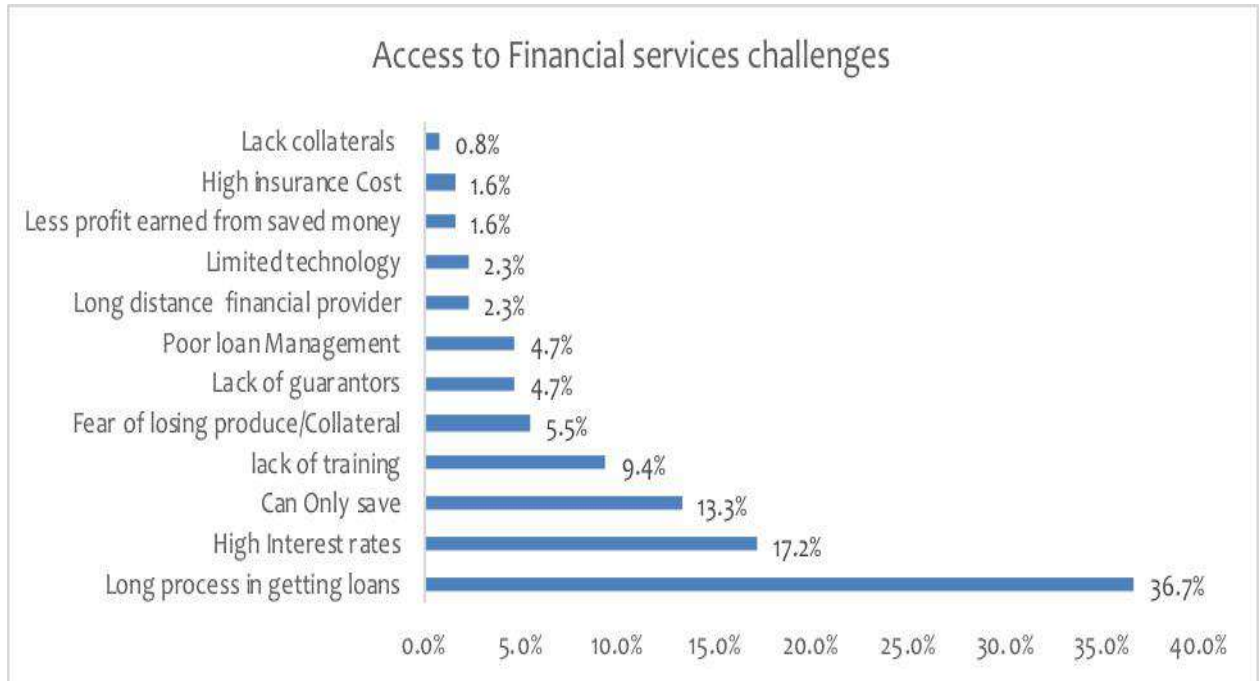


Figure 28 Challenges of access to financial services

The main financial service received is loans and savings (99%), while farming training (97%) and input sales (64%) are the main support services in agricultural extension services and input services respectively. Long process of loans (36.7%), high Interest rates (17.2%) and mandatory to save (13.3%) are the main challenges faced in financial service support (Figure 28) while limited training (76.8%) and few training officers (16.1%) are the main challenges faced in agricultural extension services. Insufficient supply (41.7%) and high cost (30.6%) are the main challenges in input support services.

### 3.10 Youth and women opportunities along Cauliflower value chain

The key opportunities for youth and women along Cauliflower value chain are summarized in Table 14 below.

Table 14: Opportunities for youth and women along Cauliflower value chain

Main opportunities	Main challenges
Support to access to financial services	Tradition limiting women to take great adventures if the husband is not willing
Gender equality and equity policy (for both youth and women)	Community
Education for all	Physical nature (women) limiting them to some activities

### 3.11 Key Informant SWOT<sup>2</sup> analysis

The Cauliflower SWOT Analysis were conducted with Director of Agriculture and Natural Resources, Cash Crop Officer and Director General, RICA and summarized in Table 15 below.

Table 15: Key Informants SWOT Analysis for Cauliflower

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Cauliflower is highly nutritious vegetable (high in vitamin C and a good source of folate)</li> <li>• Fit is easy to grow and production practices are similar to white and red cabbages</li> <li>• Availability of fertile soil in some of the project target districts</li> <li>• Good climate conditions (cool moist climate) which is experience in some part of the country</li> <li>• Existence of farmer cooperatives (producers) cultivating white cabbage</li> </ul>	<p><b>Weakness</b></p> <ul style="list-style-type: none"> <li>• Limited data is available to determine the regional and export market opportunities</li> <li>• It not widely grown by large population of farmers</li> <li>• Limited access to quality agro-inputs</li> <li>• Weak and unstructured market (not exporter was identified)</li> <li>• Very limited research conducted on cauliflower (limited information) in Rwanda</li> <li>• Lack of storage facilities</li> <li>• Unknown to most of the population and very farmers (particularly women) are growing with low productivity levels</li> <li>• Expensive and unavailable planting materials (seeds)</li> <li>• Crop has not been promoted</li> <li>• Insufficient market information</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Sufficient water for irrigation, thus creating business opportunities for irrigation equipment suppliers to deliver to farmer cooperatives.</li> <li>• Opportunity for private sector to invest in cold rooms/storage</li> <li>• Emerging hotels and restaurants providing formal markets</li> <li>• Cauliflower provide opportunity for agri-nutrition marketing in local (consumers/farmers), regional and export market</li> <li>• Better employment for women and youth</li> <li>• There unlocked export market for cauliflower</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Price fluctuations,</li> <li>• Pest and diseases attack</li> <li>• Climate and weather hazards</li> <li>• Limited research/information about the crop</li> <li>• High cost of inputs</li> </ul>

### 3.13 Cauliflower flowchart/process map

The Cauliflower value chain process and flow chart is summarized in the figure 29 below. The input suppliers include Kayonza Phagrimuri who sells cauliflower seeds through seed distribution systems. We have financial institutions like Kayonza Sacco which provide agricultural loans to the farmers. Research institution like Kayonza RAB provide seed technologies research. Midland Hotel is one of the formal buyers of cauliflower which engage on contractual buying with farmers. Some of the informal markets include Kayonza, Nyamata, Nyabugogo and Kimironko markets.

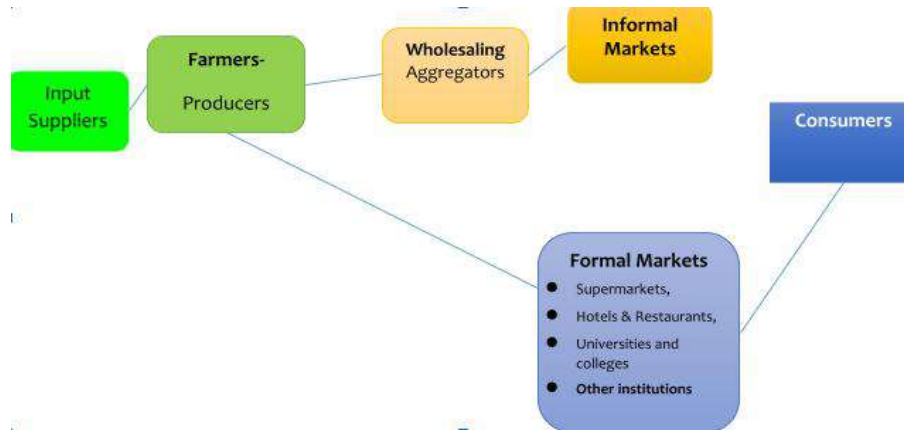


Figure 29: Cauliflower flow chart

### 3.14 Functional analysis of the Cauliflower value chain

Cauliflower value chain functional analysis is summarized in table 17 below where details on value chain stage, functions involved, main agents involved, concentration of agents and output have been outlined.

Table 17: Cauliflower value chain process

Stage	Functions involved	Main agents involved	Concentration of agent	Output
<b>Production</b>	Nursery, Land preparation, Input application (seeds sets, fertilizers and pesticides), planting, weeding, maintenance of the crop up to harvesting	Farmers, Agronomists Agro-dealers, Input suppliers, individual/cooperatives.	Farmer, Gicumbi and Rwamagana districts,	Fresh produce
<b>Import</b>	Pest analysis and inspection, Importing seed	RICA, Agro-dealers	MINAGRI, Kigali	Import certificate for seed, Seed stocks
<b>Primary Marketing</b>	Farm gate, Aggregation,	Farmers, Brokers, Wholesalers, Company buyers, Retailers	Gicumbi, Nyabugogo	Fresh produce
<b>Primary processing and value addition</b>	Sorting, grading and packaging	Farmers, Wholesalers, Retailers	Kigali, Rwamagana	Fresh produce
<b>Marketing in informal and formal markets</b>	Local Commercialization	Supermarkets, hotels, restaurants, prison, university student hostels	Kigali, Rwamagana	Fresh cauliflower
<b>Export</b>	Transport to cold room, Sorting & weighing, Packaging	NAEB, Exporters		



Figure 30 Kayonza-Kabarondo Sector Farmer FGD

## 4.0 Conclusions and recommendations

### 4.1 Conclusion

In conclusion, the cauliflower value chain has major opportunities for smallholder farmers, aggregators and exporters however, a structured partnership across the value chain is required. The following are key aspects gathered through the study;

- Majority of the respondents were females of age between 36-65 years. There is need to promote gender equality.
- Majority belonged to a farmers' group and only whose main purpose was saving and investments which need to be encouraged.
- The main source of livelihoods is crop and livestock farming which is a delicate sector and need to be fully supported by the government.
- Very little land is allocated for Cauliflower production therefore you need mobilize farmer to allocate more land for Cauliflower production
- Most of the farmers do not grow Cauliflower in Kayonza and Gasaho because it is a very new crop. We need to promote production of Cauliflower in other regions like Rubavu and Gicumbi Districts and also in Western, Northern and Eastern Provinces of Rwanda. Consumer awareness and research on Cauliflower production is also needed.
- Most of the farmers grow improved varieties of Cauliflower which need to be encouraged where Broccoli white is the most preferred variety because it is delicious. Farmers can also grow Monera F1 and Caspa F1 and Snow ball which have been recommended by research institutions.
- The main production challenges facing farmers is high cost of agro-inputs and therefore we need to facilitate access to financial services.
- Very little agro-inputs (Fertilizer, manure, pesticides and improved seeds) are used in Cauliflower production because of high costs. Therefore, farmers need subsidies and facilitate access to financial services.
- There are very low yields of Cauliflower because of low use of agro-inputs. Farmers need subsidies and facilitate access to financial services. We can also improve irrigation systems

to increase production.

- Most of the produced Cauliflower is sold and very little is consumed and lost which should be encouraged.
- Majority do not store Cauliflower due to lack of storage facilities in the markets and it is sold raw, therefore we need to promote construction of storage facilities at market level.
- Currently the Cauliflower is not processed because majority do not produce it therefore, we need to create awareness to the farmers on the opportunities of growing Cauliflower e.g., readily markets from emerging hotels
- Very few do value addition of Cauliflower (Sorting and grading) mostly done by adult females because of lack of technology and limited Knowledge. We need to train farmers on post-harvest handling and value addition technologies and promote education for all.
- Kimironko in Gasabo and Kayonza in Kayonza district are the only key markets for Cauliflower. Therefore, other markets need to be expanded through creation of awareness to the farmers.
- Cauliflower is mainly bought by cooperatives and sold collectively as a group which should be promoted.
- Marketing is majorly done by adult females because they require low investment. Gender equality and equity policy (for both youth and women) need to be promoted.
- Lack of reliable markets, price fluctuations and high cost of transport are the main marketing challenges of Cauliflower. We need to facilitate linkage to better markets. Cooperatives need to be encouraged to facilitate transportation of products. Also, Government to improve road infrastructure.
- Most of the Cauliflower is sold to local markets within the villages and none is exported. Therefore, we need to promote consumer awareness and Linkages to formal markets like export.
- There are very high demand gaps for Cauliflower in the local markets compared to other vegetables. Therefore, you need mobilize farmer to produce more and use agro-inputs in production to satisfy the market.
- Cauliflower agri-chains are not yet developed in-terms of domestic, regional and international/export markets. Therefore, you need mobilize farmer to produce more and use agro-inputs in production to satisfy the market.
- Most of the costs goes to COVID-19 related costs, packaging and transport as traders source Cauliflower. Therefore, Government needs to reduce taxes to cushion farmers from COVID 19 shocks.
- Financial services, agricultural extension services, and input services are the main types of business support services accessed by the farmers and this need to be encouraged and promoted.
- Long processing of loans and high Interest rates are the main challenges faced in financial service support. Financial institutions need to fasten the loan processing and reduce loan interest rate to farmers.
- Cauliflower can fetch a good Net Income (Market gate) of 3, 587,300 RWF /Ha, therefore farmers in other regions like Rubavu and Gicumbi Districts and also in Western, Northern and Eastern Provinces of Rwanda need to be encouraged to grow cauliflower.

## 4.2 Recommendations

### 4.2.1 General recommendations

1. Cauliflower is unknown to general population of Rwanda and therefore, promotion of the value chain needs to be gradual/phased (introduction through set up of demonstration farms, trainings on good agronomic practices, post-harvest management,

- etc.; cultivation for household consumption and market-led production to respond to identified market demand)
2. Promote production of crop varieties that are demanded by local, regional and international markets through development of partnership with research organizations, input companies, exporters and government extension agents,
  3. There is need to set up horticultural technical working group with representation exporters, informal wholesalers, Rwanda Research Board, input companies, NAEB, MINAGRI, financial institutions, farmers and project team for effective consultations and dissemination of agricultural information (access to markets, finance, inputs, etc)
  4. Develop partnerships (including contracts) between farmers/cooperatives and traders (exporters, institutions buyers and informal wholesale traders) with clear requirements (varieties, volumes, prices, payment modalities, production practices, production schedules, etc) before engaging farmers in production and later starts looking for market

#### 4.2.2 Specific recommendations

Value chain-wide solutions creates an inclusive cauliflower value chain that is profitable and further increases the role of youth, women and men. The following table summarizes activities for immediate implementation.

A. PRODUCTION		
1.	Farmers/farmer groups	a) Introduction of cauliflower to farmers. The crop is widely unknown by the large population, therefore, there is need to awareness creation in terms of training farmers on good agronomic practices including set up of cauliflower demonstration farm. Farmers should be sensitized about it's nutrition value.
2.	Yield	a) After empowered farmers with necessary farming knowledge and skills, there need to provide access to quality inputs and continuous trainings by linking them to input suppliers and agricultural extension officers. b) Since this crop is new, farmers input need subsidies and access to financial services to buy agro-inputs
5.	Post-harvest handling	a) Farmers to be post-harvest handling technologies and promote education for all. Also link the actors to ready markets from emerging hotels. Farmers in existing farmer groups can be taught on simple technologies and can be facilitated to buy the equipment/ technologies, the farmers can also be linked to financial services for access to capital to acquire more technologies
6.	Local and regional markets	a) Target households and families has the first consumers (markets) through conducting consumer awareness on the nutritional benefit of this crop through agri-nutrition campaigns in community meetings, schools, dispensaries/hospitals and supermarkets. b) Farmer groups can also target emerging hotel and restaurant markets both locally and regionally
7.	International markets	a) Work closely with current exporters to explore international markets in Europe, Middle East and USA markets. Once the market demand is assured and contract signed between farmers and exporter, farmers can now transition cauliflower to commercialization phase.
8.	Cushioning farmers	a) Government needs to reduce taxes to cushion farmers from the impact of COVID-19 shocks and also improve road infrastructure

Table 18: Summary of recommendations

### 5.0 Summary of Indicators

The high-level summaries of key findings have been provided in the dashboard below which highlights 45 parameters of the 100 parameters gathered through the study. The dashboard further summarizes key findings of the indicators that would further contribute towards M&E. The dashboard focuses on selected parameters however, the report offers further in-depth discussions on production systems, gender, environmental aspects, marketing systems, financial services, COVID-19 impact and solutions discussed by various levels of direct and indirect value chain actors.

Table 19: Overall Cauliflower Value Chains Analysis Findings Dashboard

No.	Parameter	Overall Findings
1.	Current Yield	• 9630.42 Kg/Ha
2.	Potential Yield for Rwanda	• 20,999.94 Kg/Ha
3.	Yield Gap	• 11,369.41 Kg/Ha
4.	Land Allocation	• 0.011 Hectare Average land size allocated to Cauliflower
5.	Inputs Use	<ul style="list-style-type: none"> <li>• Fertilizer (5%)</li> <li>• Manure (4%),</li> <li>• Pesticides (5%),</li> <li>• Improved seeds (6%)</li> </ul>
6.	Input services	<ul style="list-style-type: none"> <li>• 12% Farmers recorded inputs services access</li> <li>• 40% farmers recorded agro-inputs delayed delivery</li> <li>• 13% of farmers reported lack of knowledge on inputs</li> </ul>
7.	Production Cost	• Production cost / Ha = RWF. 1,912,700 (\$ 2013.37)
8.	Farmgate Net Profit/Ha	• RWF. 3,287,300 / Ha = \$ 3460.31
9.	Farmgate Prices	• RWF. 400 / Kg
10.	Farmers Marketing Cost	• Marketing costs / Ha= RWF 1,000,000 (\$ 1052.63)
11.	COVID-19 Farmer's New Costs	• RWF.1500 additional marketing costs for farmer COVID-19 related costs
12.	Market Gate Price	• RWF.500/Kg
13.	Market gate Net Profit/Ha	• RWF. 3,587,300 = \$ 3776.11
14.	Women Farmers	• 64% of Farmers are Women • Ages: 36-65 Years
15.	Producing Districts	• Kayonza (0.011 Ha)



		<ul style="list-style-type: none"> <li>• Gasabo (0.012 Ha)</li> </ul>
16.	Varieties produced	<ul style="list-style-type: none"> <li>• Snowball</li> </ul>
17.	Varieties demanded by domestic and regional markets	<ul style="list-style-type: none"> <li>• Monera F1 and Caspa F1, Snow ball</li> </ul>
18.	Varieties demanded by international export markets	<ul style="list-style-type: none"> <li>• No findings</li> </ul>
19.	Sale and consumption	<ul style="list-style-type: none"> <li>• Sale (90%) Household and Consumption consumed (5%)</li> </ul>
20.	Post-Harvest Losses	<ul style="list-style-type: none"> <li>• 4% losses on average</li> </ul>
21.	Mode of selling	<ul style="list-style-type: none"> <li>• Collectively -83.4%</li> <li>• Individually: -16.6%</li> </ul>
22.	Farmgate Buyers	<ul style="list-style-type: none"> <li>• Co-operatives: 33.3%</li> <li>• End Consumer: 16.7%</li> <li>• Institutions: 16.7%</li> <li>• Aggregators: 33.3%</li> </ul>
23.	Value addition	<ul style="list-style-type: none"> <li>• 2% mainly sorting and grading mostly done by adult females.</li> </ul>
24.	Aggregators cost drivers	<ul style="list-style-type: none"> <li>• Packaging (16%) and transport (17%)</li> </ul>
25.	COVID-19 Impact	<ul style="list-style-type: none"> <li>• 28% increase in aggregation cost due to COVID-19 related costs</li> </ul>
26.	Health Concerns	<ul style="list-style-type: none"> <li>• 76% of the farmers very concerned on potential negative effect on health from excessive use of chemicals</li> </ul>
27.	Environmental Concerns	<ul style="list-style-type: none"> <li>• 44% of farmers raised concerns on that use of chemicals will negatively affect land, water and other production resources</li> </ul>
28.	Local marketing channel	<ul style="list-style-type: none"> <li>• 61% of Cauliflower farmers sold to local markets within the villages</li> </ul>
29.	Export	<ul style="list-style-type: none"> <li>• 0% N/B: No international export was recorded</li> </ul>
30.	Extension and Training	<ul style="list-style-type: none"> <li>• 97% access training and 21% farmers access extension on cauliflower</li> </ul>
31.	Crop insurance	<ul style="list-style-type: none"> <li>• 2% farmers access crop insurance</li> </ul>
32.	Working Capital	<ul style="list-style-type: none"> <li>• Lack of capital (6%).</li> </ul>
33.	Loans and savings	<ul style="list-style-type: none"> <li>• 99% of farmers access loans and savings</li> <li>• 77% lack training on financial services</li> </ul>
34.	Marketing Challenges	<ul style="list-style-type: none"> <li>• 69% of farmers lack of reliable markets</li> <li>• 44% of farmers concerned on price fluctuations</li> </ul>
35.	Domestic and Regional Markets	<ul style="list-style-type: none"> <li>• \$306,816 (RWF. 291 Million) annual trade value for 20 major aggregators for domestic and regional markets</li> <li>• 93.4 tonnes at an annual volume traded</li> </ul>
36.	SMEs and Institution Markets	<ul style="list-style-type: none"> <li>• RWF. 494,950 (\$521) for 7 buyers sampled at SMES, hotels and institutional levels had a combined annual of 913 Kg volume</li> </ul>
37.	Aggregators, SMEs and Institutions	<ul style="list-style-type: none"> <li>• RWF. 291 Million Annual purchases of cauliflower &amp; broccoli for 27 buyers sampled as lead buyers</li> </ul>

38.	Potential demand	<ul style="list-style-type: none"> <li>• 1,357 Mt is current demand for above sampled 27 buyers</li> </ul>
39.	Supply Gap	<ul style="list-style-type: none"> <li>• 93% supply deficit</li> <li>• 7% of Cauliflower demanded is what farmers supplied</li> <li>• 99% supply deficit for Kayonza District</li> </ul>

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## Annexes

### Annex I District Comparison Data Across Target Value Chains

#### 1. Current, potential yield and yield gap

Bugesera’s biggest yield gap is in onion while the lowest is in red cabbage.

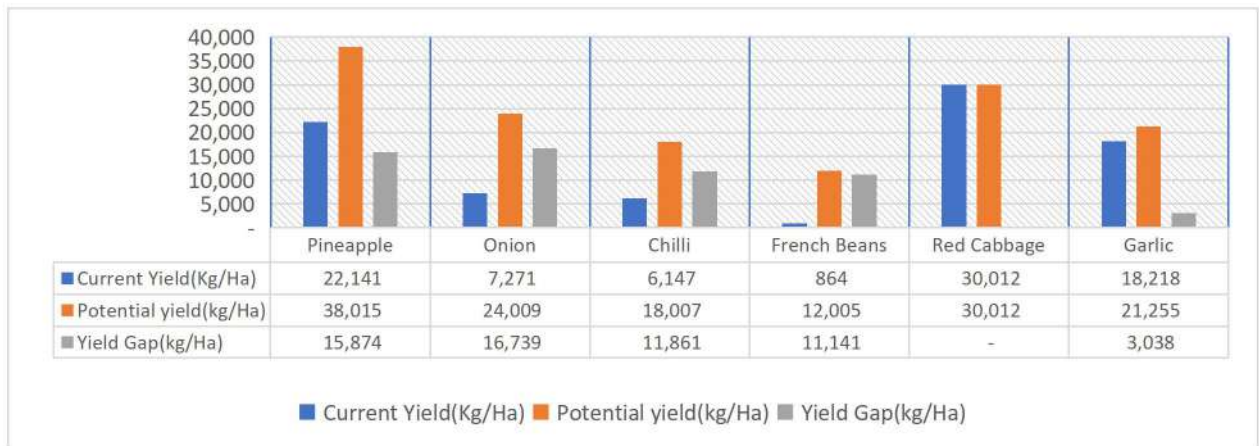


Figure 31 Current and potential yield/ha and yield gap for targeted horticultural crops in Bugesera District

Kayonza’s highest yield gap is in onion production whilst the lowest is in French beans.

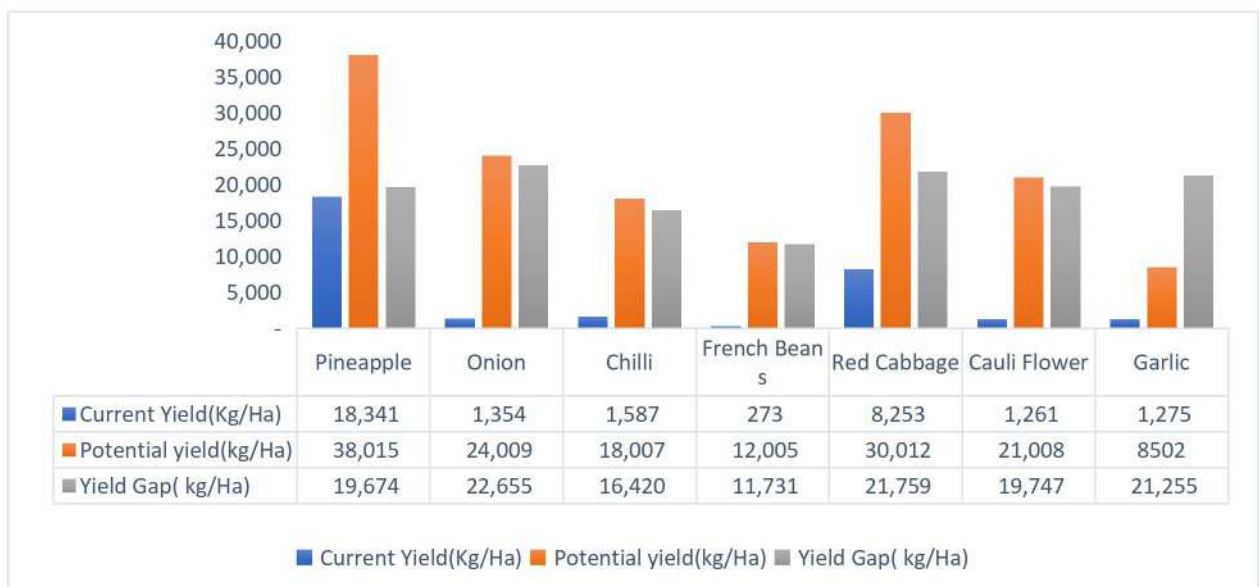


Figure 32: Current and potential yield/ha and yield gap for targeted horticultural crops in Kayonza District

Gasabo’s largest yield gap is in pineapple production whilst the lowest is in Cauli flower.

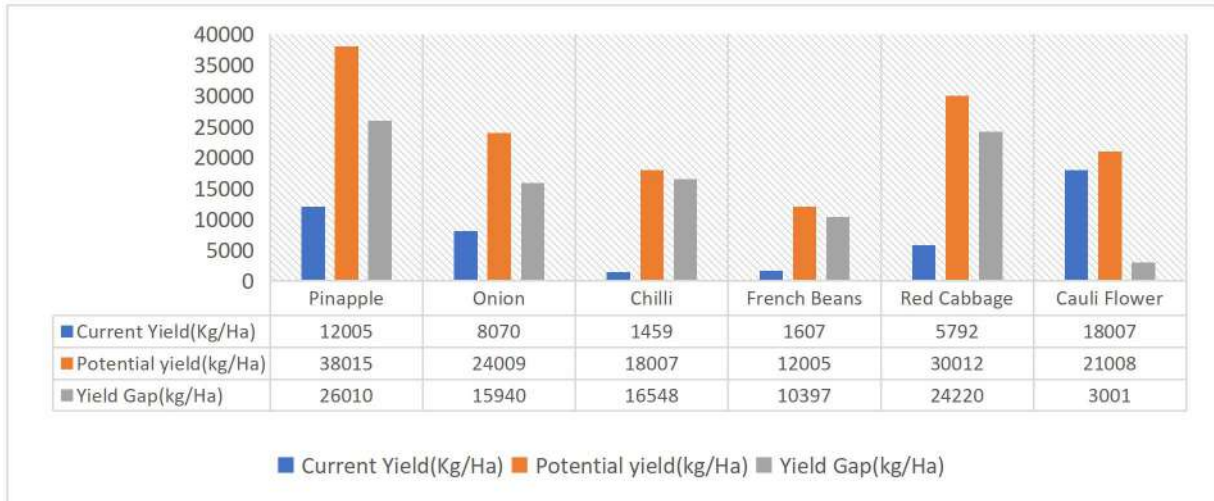


Figure 33: Current and potential yield/Ha and yield gap for targeted horticultural crops in Gasabo District

Rwamagana’s highest yield gap is in pineapple while its lowest is in French beans.

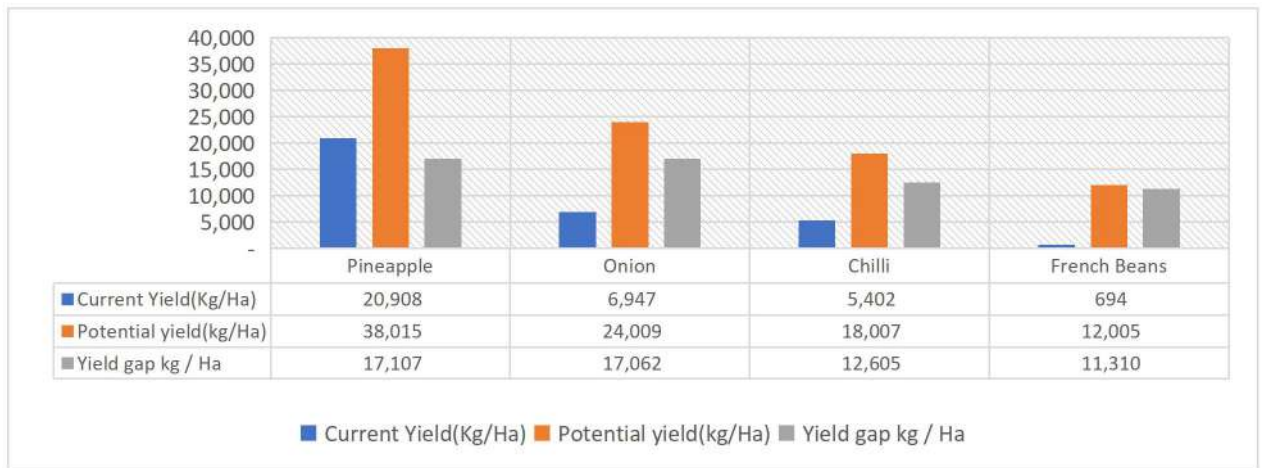


Figure 34: Current and potential yield/ha and yield gap for targeted horticultural crops in Rwamagana District

2. Land allocation (Ha)

In Kayonza district, French beans and Onions have the highest land allocations whilst cauliflower and red cabbage have the least.

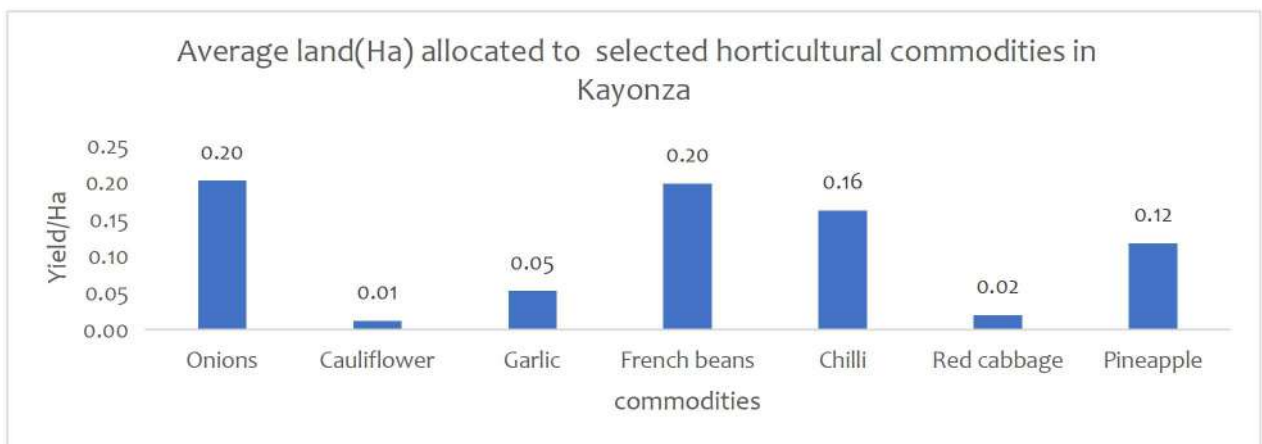


Figure 35: Average land allocated to targeted horticultural crops in Kayonza District

In Bugesera the highest land is allocated to pineapple whilst the least is allocated to red cabbage.

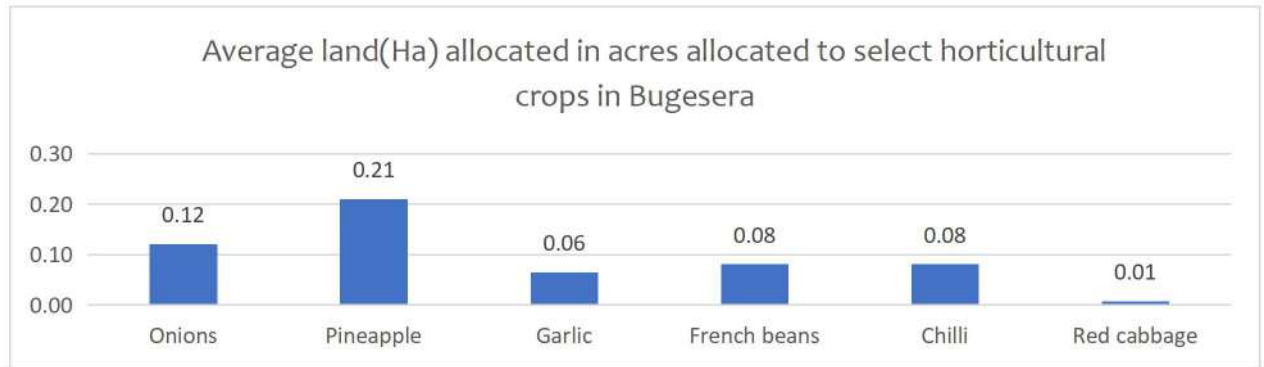


Figure 36 Average land allocated to targeted horticultural crops in Bugesera

In Gasabo the highest land allocation is to chili whilst the least is to cauliflower.

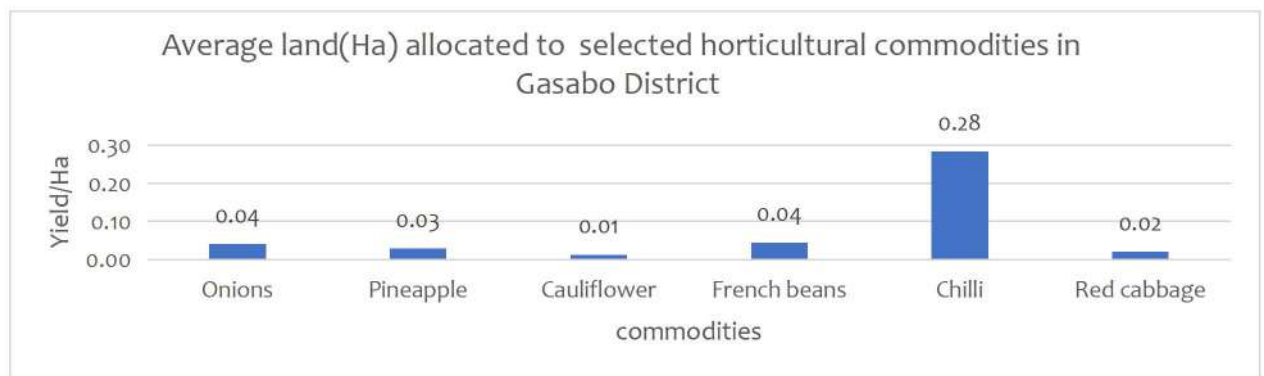


Figure 37: Average land (Ha) allocated to targeted horticultural commodities in Gasabo

In Rwamagana, the highest land allocation is to pineapple whilst the least is to onions.

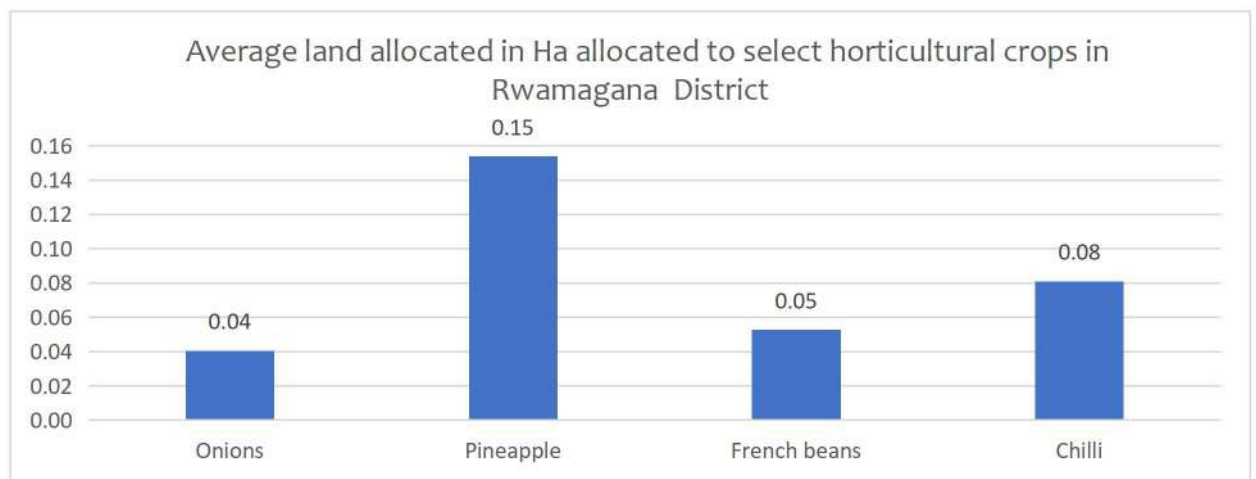


Figure 38 Average land (Ha) allocated in acres allocated to targeted horticultural crops in Rwamagana

### 3. Agro-inputs use

In Bugesera the highest number of farmers using improved seeds are those farming red cabbage whilst the least are garlic growing ones.

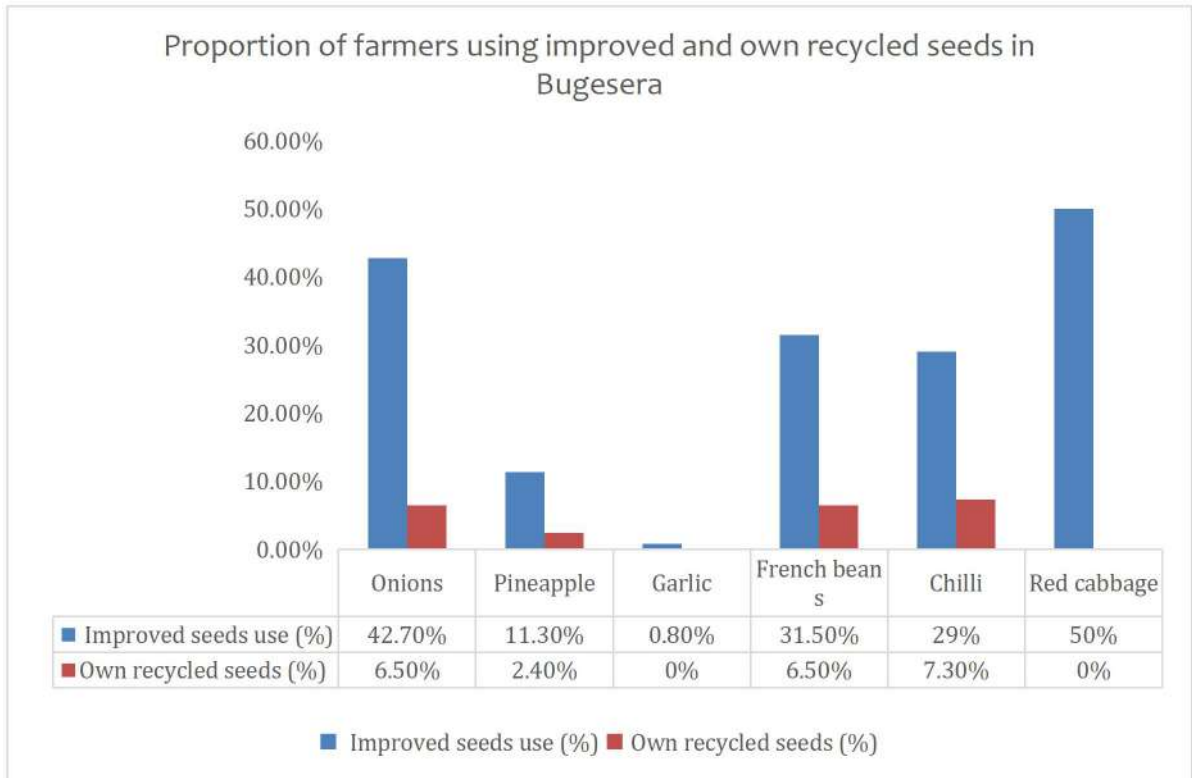


Figure 39 Farmers accessing and using improved and own recycled seeds in Bugesera

In Bugesera the highest number of farmers using fertilizer, agri machinery and pesticides are for red cabbage.

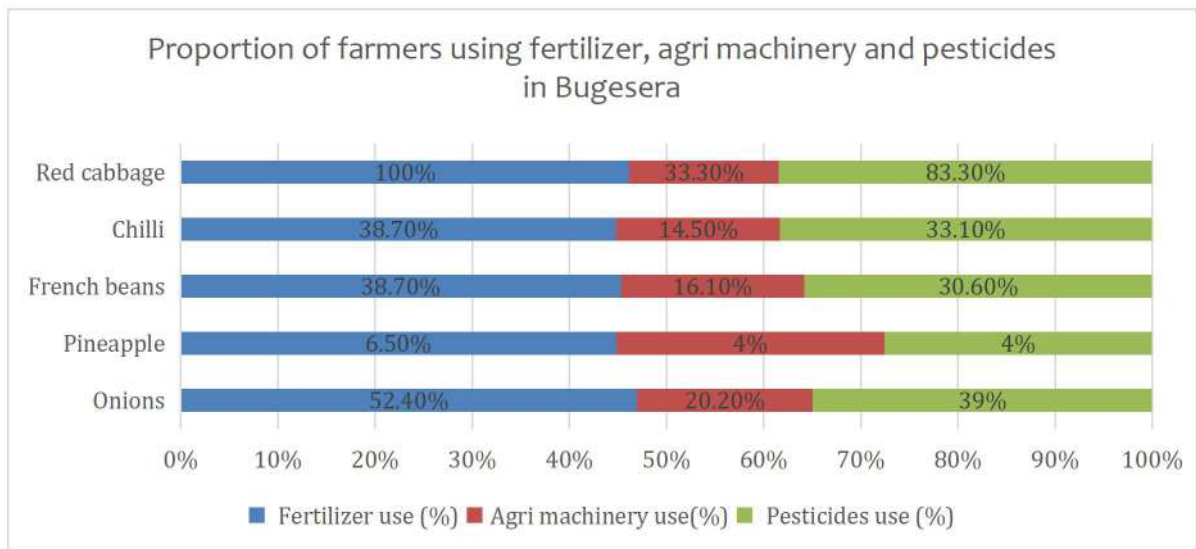


Figure 40: Farmers accessing and using selected agro-inputs in Bugesera

In Kayonza the highest number of farmers using improved seeds are those farming red cabbage whilst the least are garlic growing ones. Red cabbage applies the highest input use (fertilizer) and only chili applies agri machinery use.

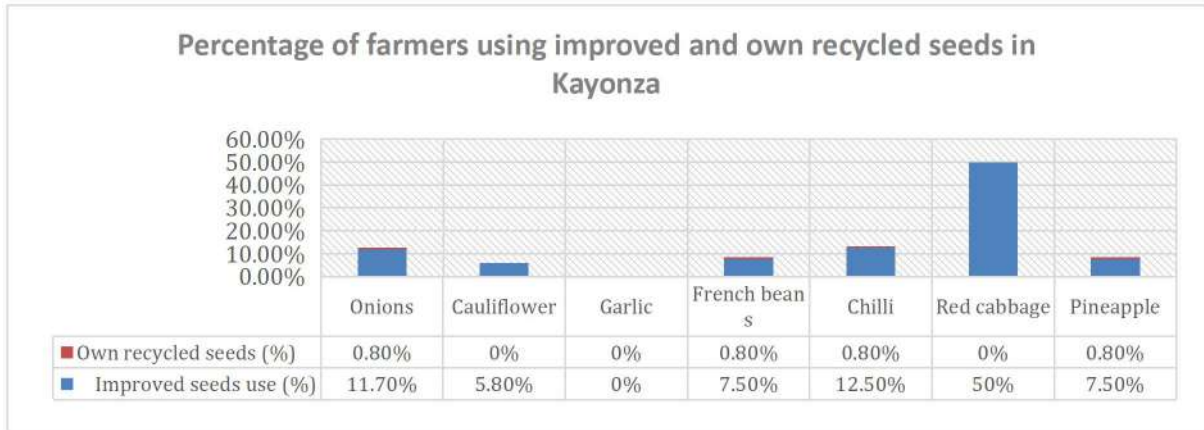


Figure 41 Farmers accessing and using improved and own recycled seeds in Kayonza

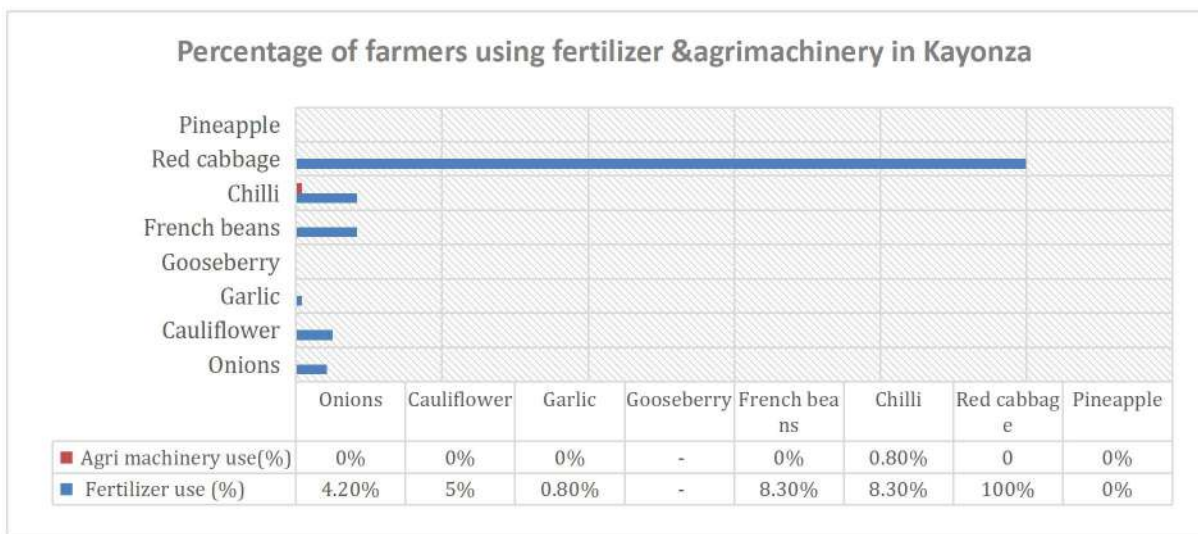


Figure 42 Farmers accessing and using selected agro-inputs in Kayonza

In Gasabo the highest number of farmers using improved seeds are those farming red cabbage and French beans whilst the least are onion growing ones. Red cabbage has the most input use.

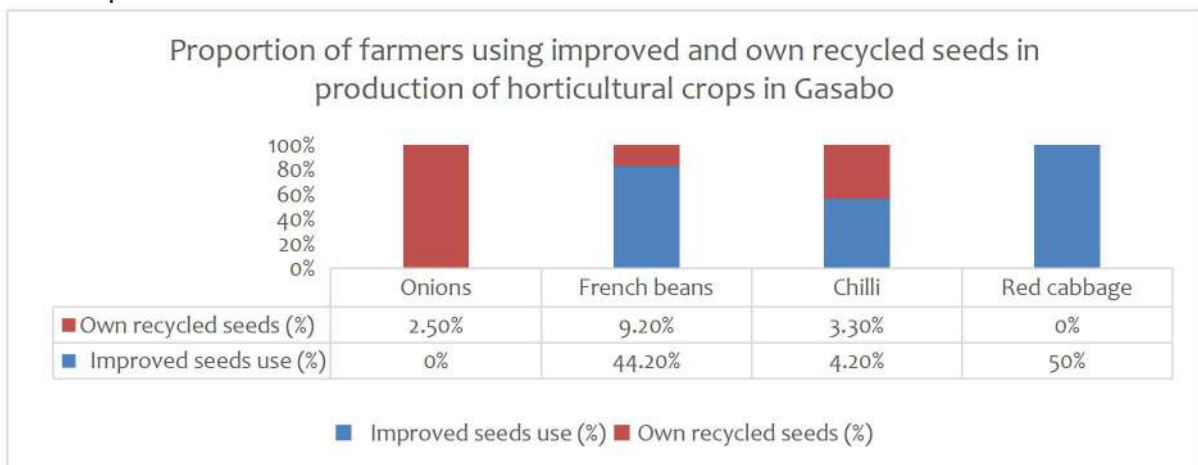


Figure 43 Farmers accessing and using improved and own recycled seeds in Gasabo

Percentage of farmers using fertilizer, agri-machinery and pesticides in production of horticultural crops in Gasabo

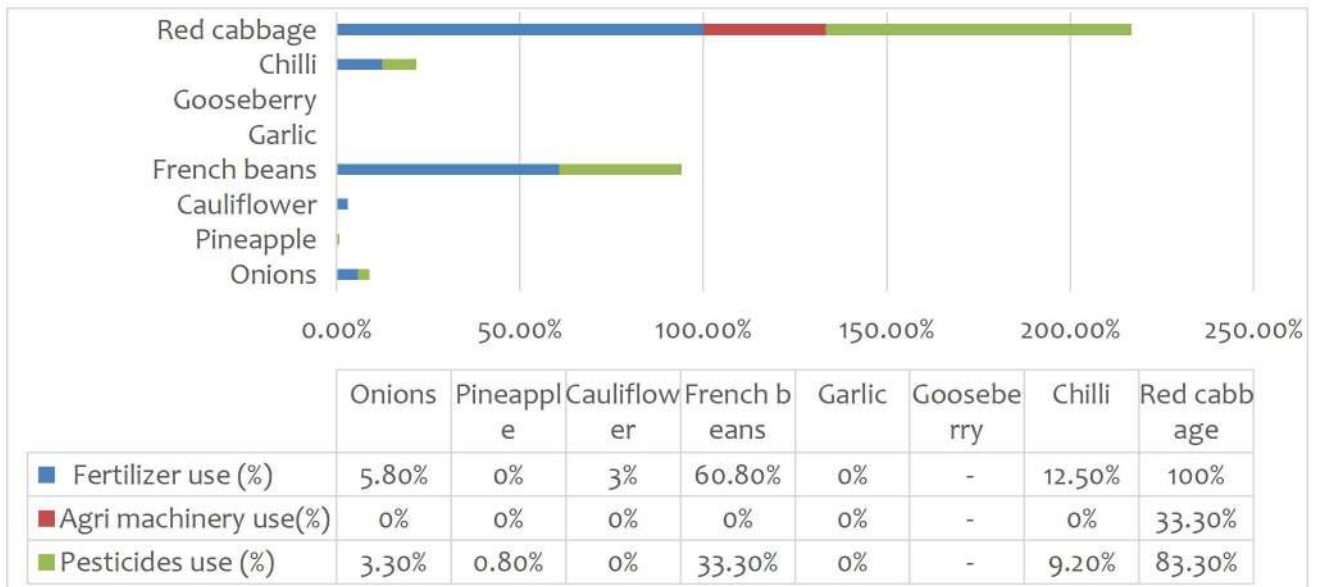


Figure 44 Farmers accessing and using selected agro-inputs in Gasabo District

In Rwamagana the highest number of farmers using improved seeds are those farming French beans cabbage whilst the least are garlic growing ones.

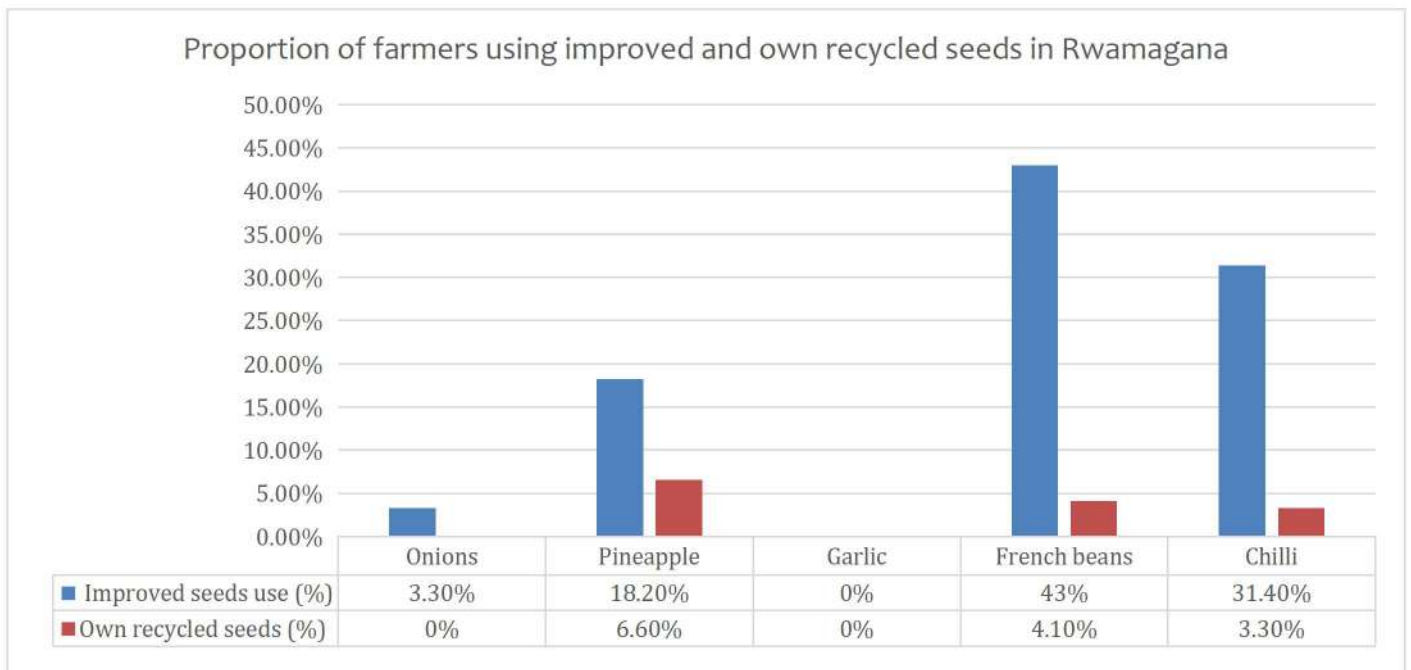


Figure 45 Farmers accessing and using improved and own recycled seeds in Rwamagana



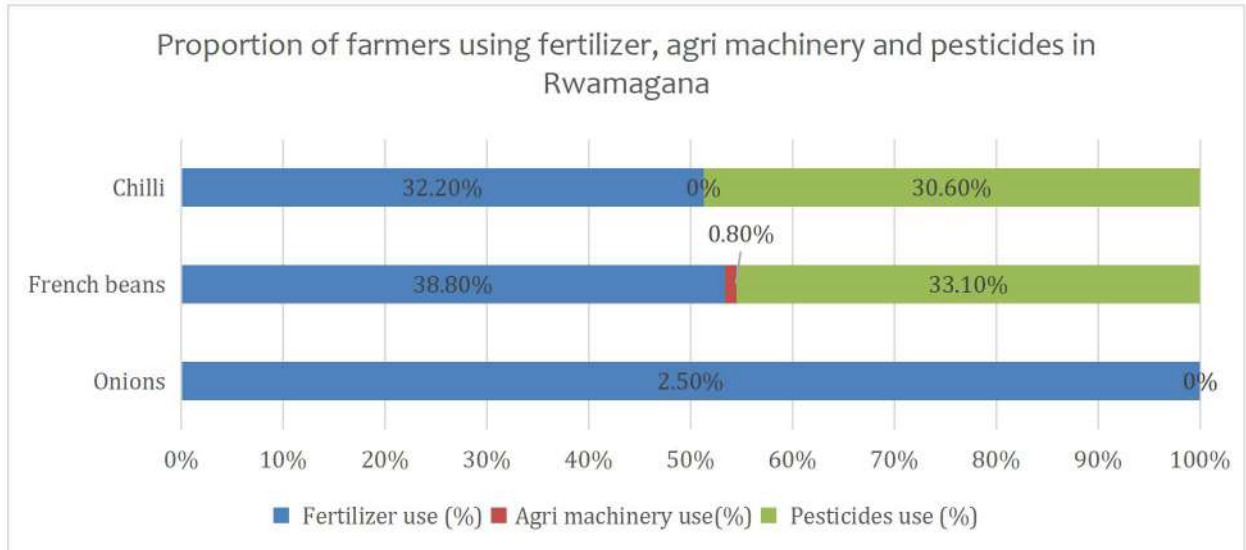


Figure 46 Farmers accessing and using selected agro-inputs in Rwamagana District

#### 4. Total Annual volumes (MT) Traded in Domestic markets

Gasabo and Rwamagana have highest volumes traded in a value chain

Figure 47: Volumes (MT) Traded in Bugesera District

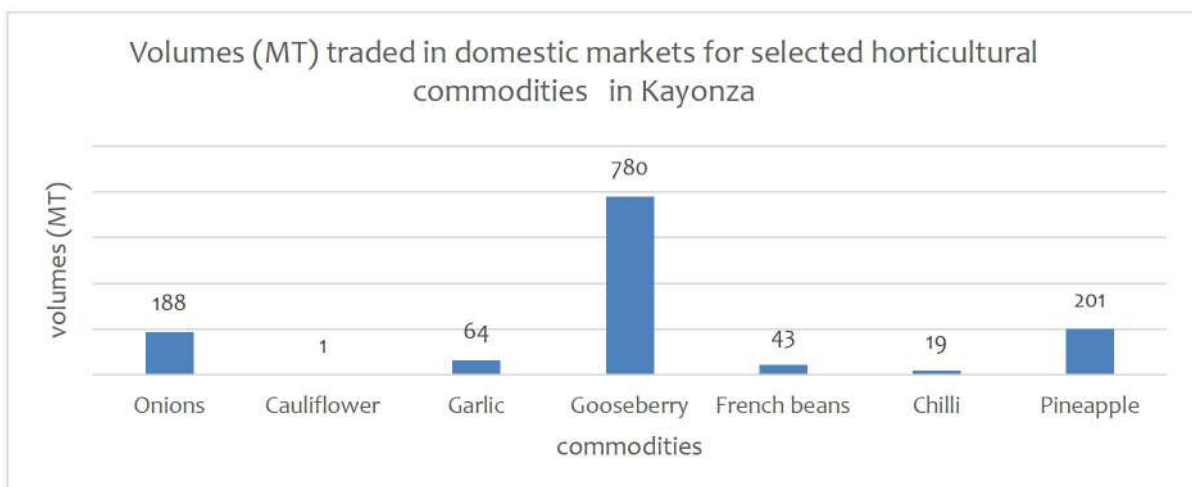
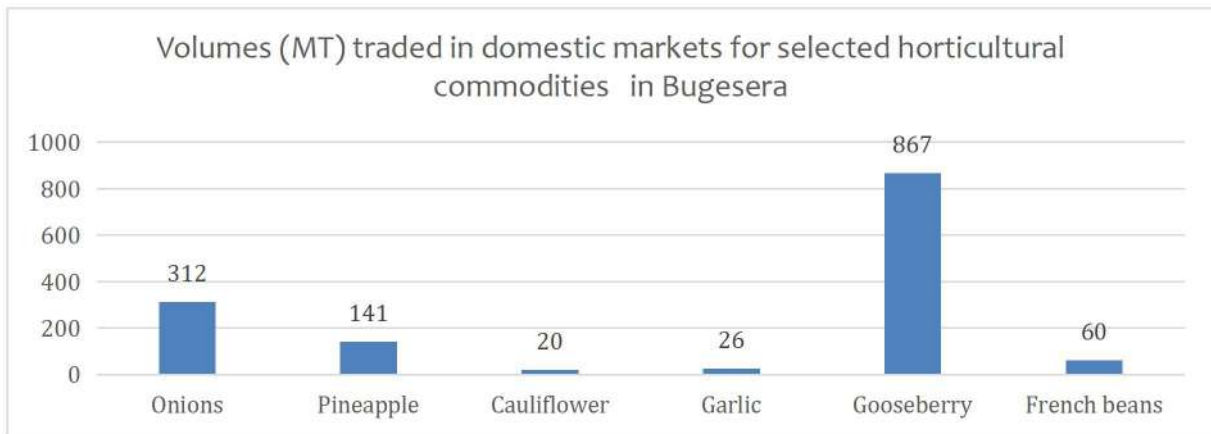


Figure 48: Volumes (MT) Traded in Kayonza District

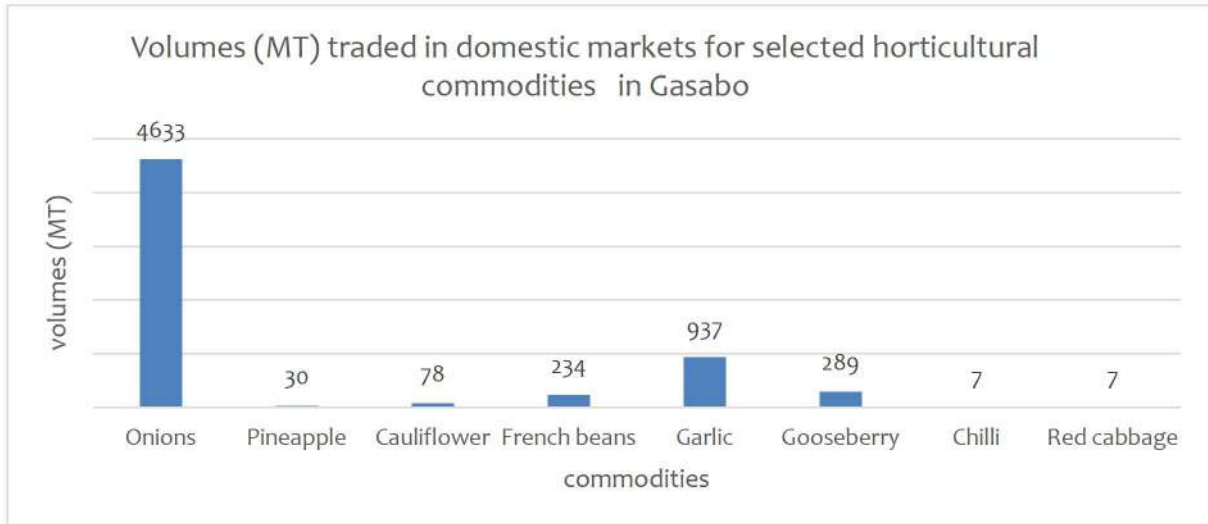


Figure 49 Volumes Traded (MT) in Gasabo District

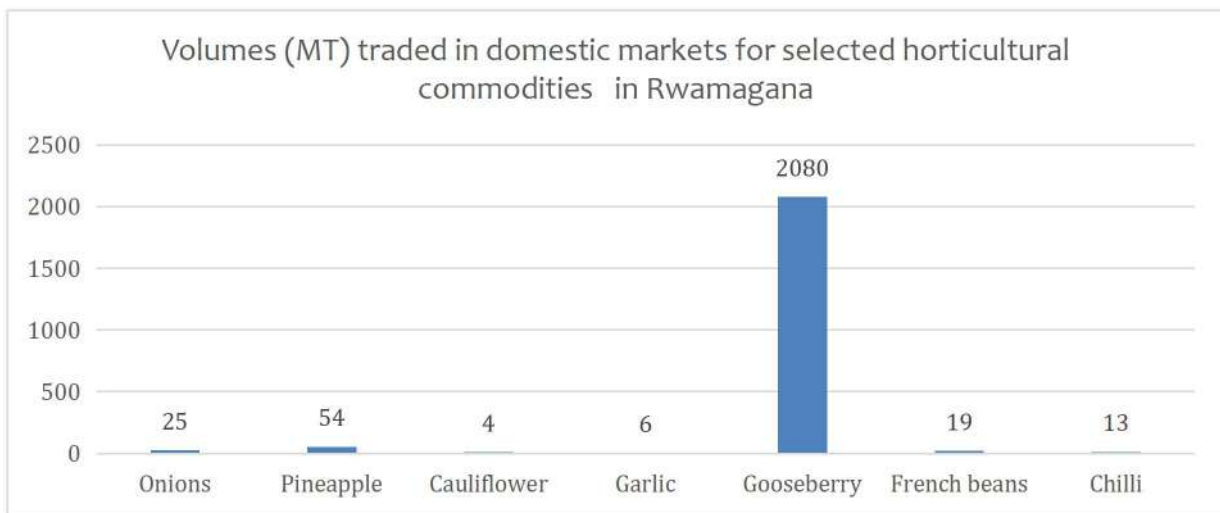


Figure 50 Volumes (MT) traded in Rwamagana District

- Percentage of farmers carrying out value addition on targeted horticultural crops across districts

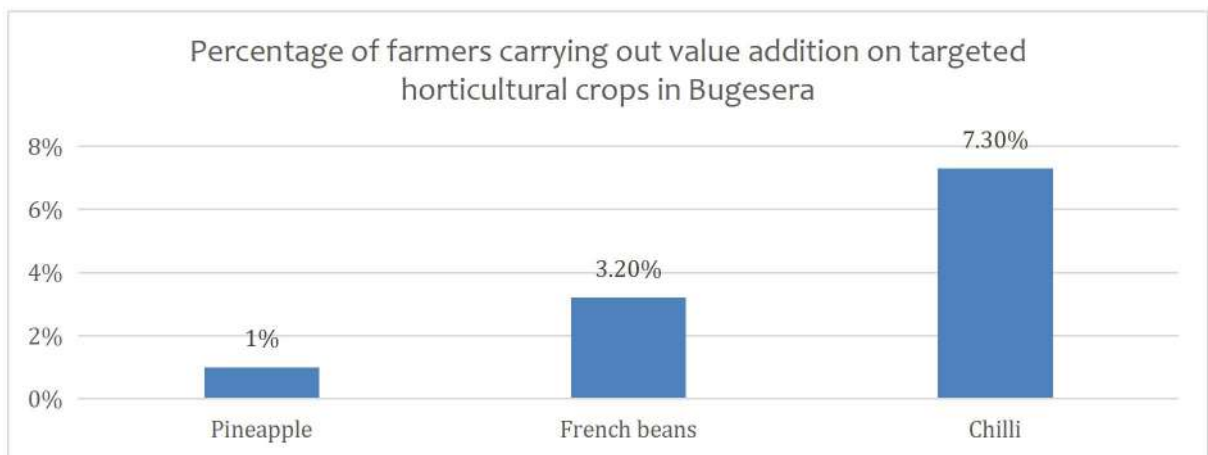


Figure 51 Percentage of farmers carrying out value addition on targeted horticultural crops in Bugesera

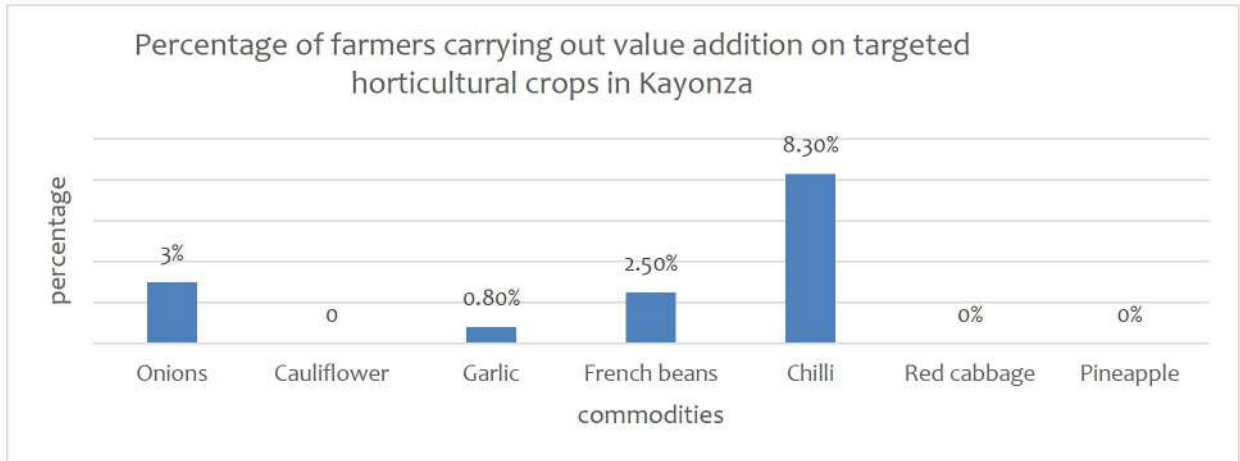


Figure 52 Percentage of farmers carrying out value addition on targeted horticultural crops in Kayonza

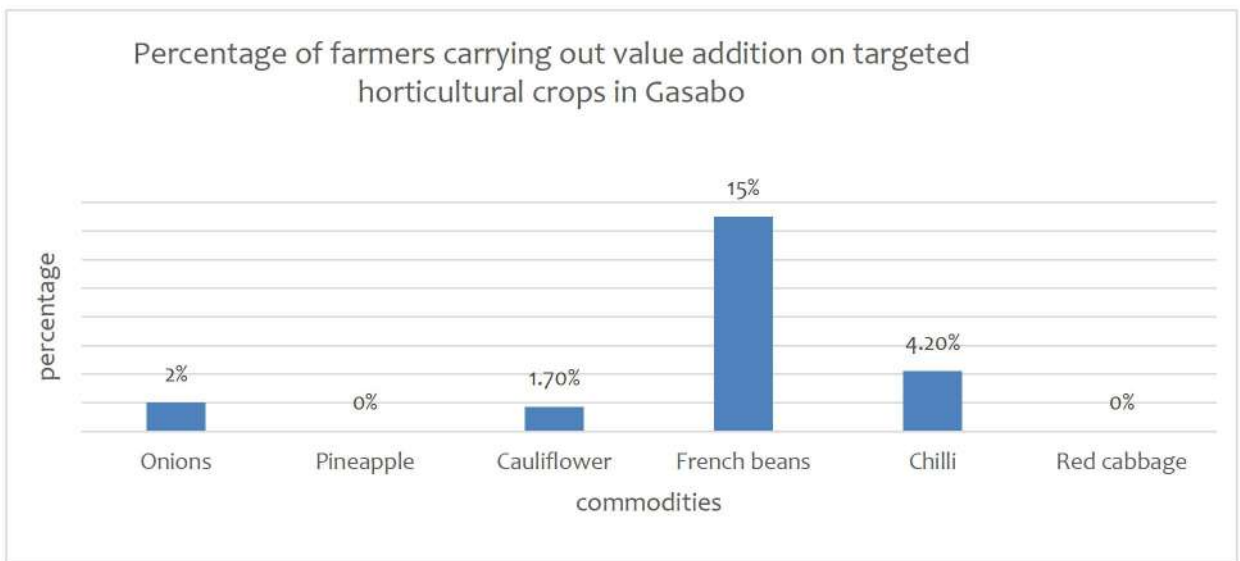


Figure 53 Percentage of farmers carrying out value addition on targeted horticultural crops in Gasabo

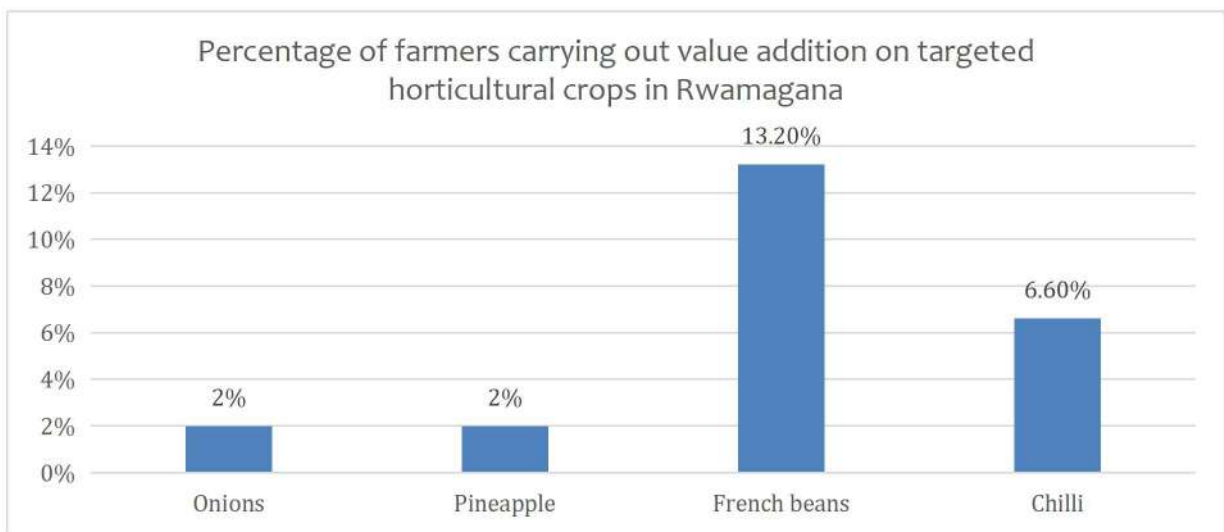


Figure 54 Percentage of farmers carrying out value addition on targeted horticultural crops in Rwamagana

Gasabo and Rwamagana carry out the most value addition but record the highest postharvest losses

6. Percentage post-harvest loss experienced across districts for targeted horticultural crops

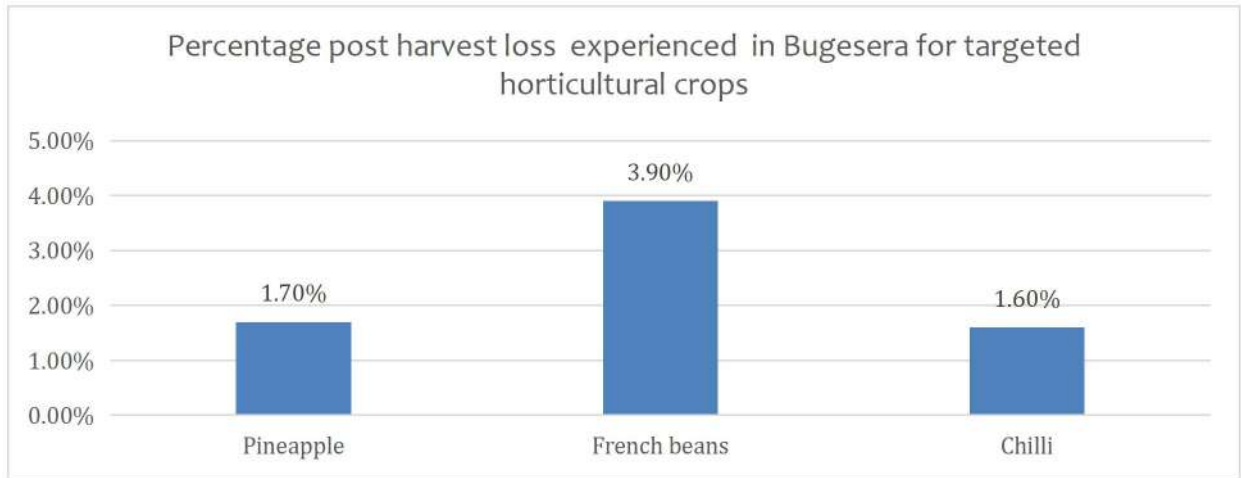


Figure 55 Percentage post-harvest loss experienced in Bugesera for targeted horticultural crops

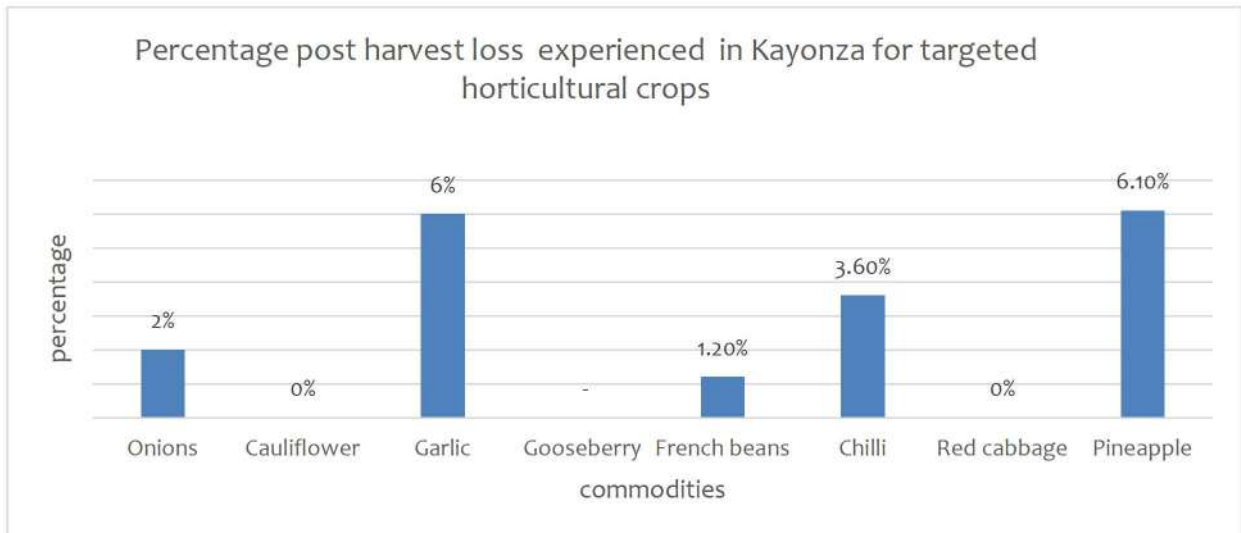


Figure 56 Percentage post-harvest loss experienced in Kayonza for targeted horticultural crops

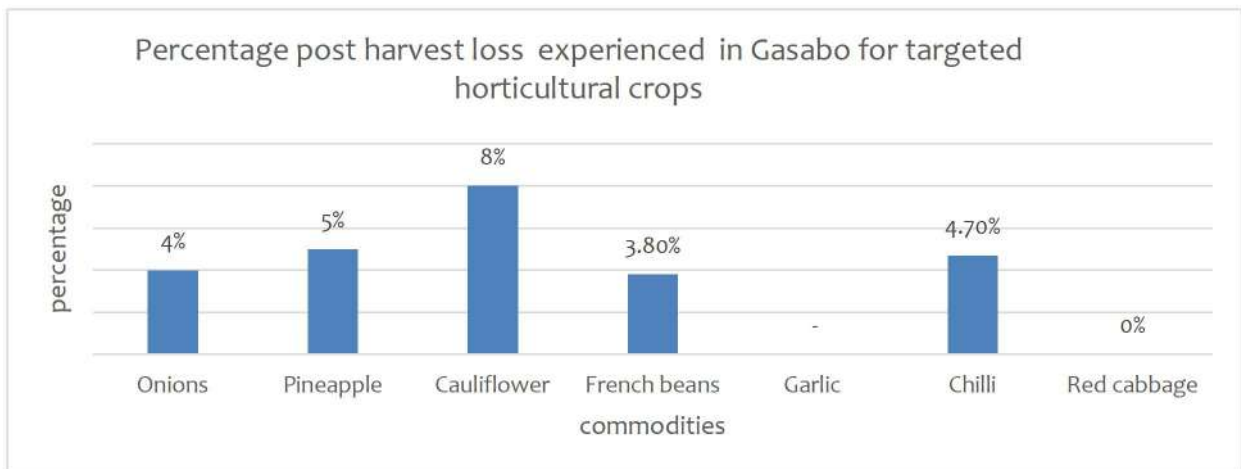


Figure 57 Percentage post-harvest loss experienced in Gasabo for targeted horticultural crops

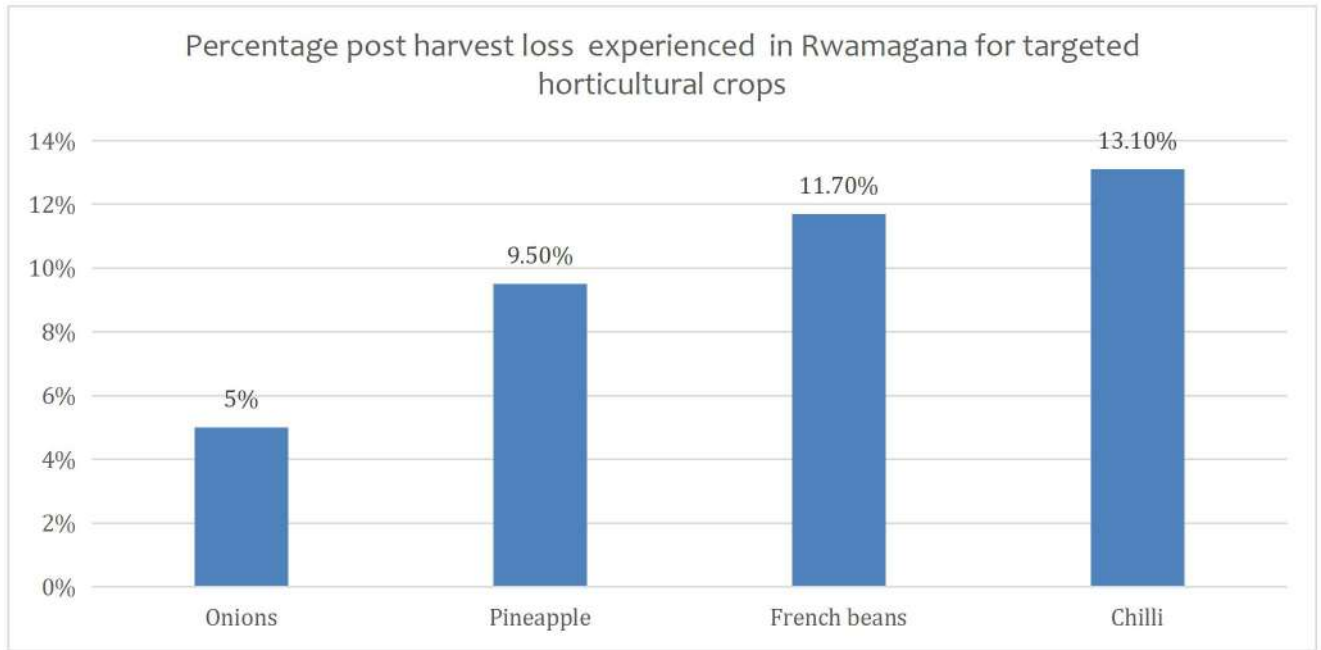


Figure 58 Percentage post-harvest loss experienced in Rwamagana for targeted horticultural crops



European Union



## CAULIFLOWER VALUE CHAIN ANALYSIS REPORT



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