RICA
Rwanda Inspectorate, Competition and Consumer Protection Authority

A STUDY ON PRICE VOLATILITY IN AGRICULTURE AND LIVESTOCK PRODUCTS

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Consulting firm:
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EXECUTIVE SUMMARY

The objective of this study was to carry out a deep analysis of the causes and consequences of price volatility of agricultural and livestock products on both consumers and producers in Rwanda. The commodities considered in this study include priority crops under the crop intensification program namely maize, rice, wheat, beans, Irish potatoes, cassava, and a few other key commodities like soybeans, meat, milk, and eggs.

The study adopted both qualitative and quantitative methods. The qualitative methods included desk review of relevant documents such as policies, strategies, laws, publications and reports related to production and prices. The key informants' interviews with Government officials, private sector and NGOs were conducted to obtain additional information and examine factors leading to price volatility of agricultural and livestock products. Individual interviews used structured and semi-structured questionnaires to collect information related to price volatility. These interviews targeted producers, traders, processors and individual consumers. Focus group discussions were also carried out to confirm individual survey results.

The calculation of the price volatility was undertaken using the standard deviation of percentage change in prices. This methodology was used to measure the price volatility over time in other studies like Cariappa et al.,2022; Hu et al., 2022; Ribeiro et al., 2020 and de Nicola et al., 2016. The higher the standard deviation, the more volatile the prices change and vice-versa.

Findings indicated that the price volatility of agriculture and livestock commodities is a common phenomenon in Rwanda. Results from secondary data show that the prices fluctuate overtime for all commodities studied. However, some commodities such as rice, Irish potatoes, beans, and eggs are characterized by higher price volatility whereas the rest of the commodities studied showed relatively low-price volatility. The field survey results from consumers, traders and producers affirmed the cases of low and high price volatility nature of various agricultural and livestock commodities. Majority of respondents reported that there is a general disequilibrium between demand and supply and the seasonality nature of agricultural and livestock commodities. This imbalance between demand and supply is likely the main cause of price volatility and affect producers and consumers.

The study revealed that there is inadequate harmonization system for setting-up farm-gate prices for agricultural and livestock commodities. The agricultural commodities considered under this study are produced nationwide in different agro-ecological zones. Each agro-ecological zone has its own specificities in terms of commodity production climate, soil characteristics, labor and access to the market. All these factors affect the cost of production of agricultural and livestock commodities. The study found out that the pricing mechanism in place does not take into consideration the specific factors of production cost. Majority of producers interviewed revealed that the inadequate farm gate pricing mechanism prevails and make them vulnerable to the price volatility.

It was found out that the low productivity has a negative impact on price volatility. The availability and use of agricultural technologies play an important role to increase the production of agricultural and livestock commodities and improve its quality. The study noted that the production of agricultural and livestock commodities is affected by inappropriate use of agricultural technologies leading to low productivity. For example, the price of locally produced rice is volatile and often influenced by the imported

Asian and Tanzanian rice due to inadequate technology.

The commodity value chain organization was found to have impacts on price volatility. The organized platforms of stakeholders play a big role in linking different actors across the value chain and helps to share equitably benefits among the actors. The study realized that for some commodities such as Irish potatoes and maize experience high volatility as a results of inefficient value chain organization. The interviewed producers and traders affirmed that the presence of middlemen in the value chain causes high price fluctuations because of speculations of prices and other associated anti-competitive practices like stock hoarding and market sharing. The volatility problem was found to be also prevailing in all the countries of the region the region as well.

Based on the above findings, the study recommends the following: (i) to establishment the community based food/grain reserves for strengthening direct market linkages, and reduction of exploitative middlemen (ii) to strengthen efforts to increase the local productions and reduced the gap between demand and supply across all commodities; (iii) to create a more effective national governance on prices of agriculture and livestock commodity; (iv) to promote regional integration and improve the business environment and (iv) to develop effective alert system.

LIST OF ABBREVIATIONS AND ACRONYMS

AfCFTA: African Continental Free Trade Area

BNR: National Bank of Rwanda

CBG/FR: Community based food / grain reserve

COMESA: Common market of Eastern and Southern Africa

CPI: Consumer Price Index

EAC: East African Community

EDPRS: Economic Development and Poverty Reduction Strategy

FAO: Food and Agriculture Organization

HIC: High-Income Country

MINAGRI: Ministry of Agriculture and Animal Resources

MINICOM: Ministry of Trade and Industry

NAEB: National Agriculture Export Board

NISR: National Institute of Statistics of Rwanda

NST: National Strategy for Transformation

PSF: Private Sector Federation

PSTA: Strategic Plan for the Transformation of Agricultural

RAB: Rwanda Agriculture and Animal Resources Development Board

RICA: Rwanda Inspectorate, Competition and Consumer Protection Authority

RRA: Rwanda Revenue Authorities

RSB: Rwanda standards Board

SADC: Southern African Development community

SMEs: Small and Medium Enterprises

UMIC: Upper-Middle Income Country

WB: World Bank

WTO: World Trade Organization

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1. INTRODUCTION

1.1. Background of the study

Rwanda aims to transform its economy and improve the lives of all Rwandans by implementing bold ambitions towards self-reliance and competitiveness as embedded in its long term-strategic direction (Vision 2050). The country plans to become an upper-middle income country (UMIC) by 2035 and a high-income country (HIC) by 2050.[1]

In Rwanda, agriculture is one of the major economic activities with 80.1% of the total country households participating in agricultural sector[2], and around 72% of the working population employed in agriculture[3]. The country's economy is dominated by agriculture which has been steadily growing at 7.9% over the past few years. Rwanda's GDP at market prices stood at Frw 2,588 billion in the first quarter of 2022 where agriculture contributed 23%, industry 22% while service accounts for a big share at 47%[4]. This was partly due to Government policies and programs that have consistently supported agriculture transformation and modernization of the sector. These policies include the National Strategy for Transformation (NST1) and Strategic Plans for Agriculture Transformation (PSTAs) which increased productivity of agriculture and livestock. This is also aligned to the 3rd pillar of the vision 2050 "Agriculture for Wealth Creation" which also seek to ensure inclusiveness and total transformation of the sector from substance farming to commercialized value chains[5].

Like the rest of Africa, Rwanda's economy is based on agriculture and the country is committed to implementing SDG Indicators 2.c.1, which covers concepts related to price determination and price volatility. Price fluctuations are a common feature of well-functioning agricultural product markets. However, when these fluctuations become frequent and persistent, they negatively impact the food security systems and commodity value chains.

In the past few years, instability in food prices and partial or complete unavailability of essential food commodities has impacted millions of consumers, affecting their purchasing power, jeopardizing their nutritional status and food security. Most of the priority commodities (maize, rice, Irish potatoes, meat, eggs, etc.) that play a big role in Rwandans' diet have been characterized by price volatility. However, little is known about the underlying causes, patterns, and impacts of the price volatility of agricultural and livestock commodities in Rwanda.

It is against the above background that a study on price volatility in the sector has been thought to deeply assess what could problematic and identify possible solution.

That would inform the Government and stakeholders in designing appropriate strategies and policy to address the matter and ensure that prices of agricultural and livestock products are stabilized while achieving the national development targets.

1 Rwanda long-term development strategy (Vision 2050)
2 (NISR, 2020)
3 Food and Agriculture Organization of United Nations (FAO) report
4 Ministry of Finance and Economic Planning (MINECOFIN), also available at https://www.minecofin.gov.rw/news-detail/economy-grew-by-79-in-1st-quarter-with-key-contributions-from-services-and-industry lastly accessed on 1st March 2023
5 Planning and Policy Blueprint (Vision 2050), 3rd Pillar, p 10, published.

Agricultural and livestock commodity price changes context in Rwanda

In 2022, Rwanda experienced a dramatic increase in prices of food and non-alcoholic beverages. The prices increased to 45% higher in 2022 compared to last five year and 41% higher compared to 2021.[6]There has been price volatility in agricultural and livestock products in the market and it has often been hard to predict the sustainability of prices of agricultural commodities. Prices of staple food dramatically increased, for instance, dry beans and maize grains increased by 121% and maize grain by (102%) more than double. Prices of Irish potatoes and maize flour also sharply increased by 67% and 70% respectively in October 2022 [7].

These price increases are mostly associated with increased fuel and transportation prices, high prices of agricultural inputs, and poor weather conditions that translated to poor season B performance.

The literature shows that different factors, both internal and external, contribute to the price volatility in Rwanda, the common sited ones are climate shock factors, dominance of subsistence agriculture farming, low investment in the sector, inadequate commodity value-chains organization (e.g. existence of middlemen) and seasonality, steady pace increased in fuel and transportation prices, high prices of agricultural inputs, and inadequate technologies [8].

The market of some agricultural commodities in Rwanda is affected by external market prices and regional and global market dynamics. It is common in Rwanda that some imported agricultural commodities are relatively cheaper compared to locally produced commodities such as rice, wheat, soybean, etc. leading to price volatility. In addition, cross-border trade also often affects the price volatility due to differences in costs of production and clear mechanisms of checking the commodity volumes entering and/or exiting the countries.

The price changes of agricultural and livestock products often impact the consumption habits and negatively affect agricultural production and productivity particularly for small-scale farmers who lack technical and financial capacities to cope with unpredictability of market price trends.

1.2. Rationale of the current study

The current study was prompted by the current situation of fluctuating agricultural and livestock market prices which affects the livelihood of the cross section of the population. There arose the need to conduct this study to assess the causes, the impacts and trends of these prices volatility among others and give recommendations on how to deal with that.

The key output expected from the current study is the “final analytical work with recommendations on price volatility of agricultural and livestock commodities.

6 United Nations, Rwanda | update on food security drivers August-October 2022— issue no 63, published.
7 Ibid
8 Idem

1.3. Objectives of the study

The objective of the study was to carry out a deep analysis of the causes and consequences of price volatility of agricultural and livestock commodities on both consumers and producers in Rwanda. The study helped to investigate the current issue of price instability in agricultural and livestock commodities.

The study provided sections in this study report detailing the following:

- Trends and status of agricultural and livestock price volatility in Rwanda and the implication of the current policy framework
- Determinants of price volatility in agricultural and livestock commodities
- Analysis of gap in supply and demand in their effects on price fluctuation agriculture and livestock commodities
- The analysis and results of a systematic assessment of the concept, approaches for formulating and implementing the study options;
- The presentation and analysis of relevant regional and international best practices to be promoted;
- Sound policy recommendations for coping with price volatility in agricultural and livestock commodities.

CHAPTER 2. METHODOLOGY OF THE STUDY

2.1. Approach of the study

According to the nature of the study and intended objectives, the study employed a hybrid approach where both qualitative and quantitative methods were used. The choice of the study design (Mixed/Hybrid Method) is in line with the two main study parts where qualitative approach were used to get insights and in interpretation of different legal frameworks and institutional setup regarding the topic while quantitative approach was also used in quantifying numbers, especially in measuring prices trends as well as the contribution of the agricultural and livestock to the country GDP.

The integration of the two methods (Qualitative and Quantitative) and its preference over others is based on key five considerations, namely:

The study was multidisciplinary and covered opinion/legal part where qualitative was used and other domain (i.e) economic/statistical part where quantitative is more effective,

The study involved collecting and analyzing of both quantitative (closed-ended) and qualitative (open-ended) data,

A mixed method is key in understanding contradictions between quantitative results and qualitative findings,

It provides methodological flexibility, and

The study uses complex procedures in collecting and analyzing data appropriate to each method; and procedures that may implement qualitative and quantitative components either concurrently or sequentially.

The study was undertaken in various steps which include desk review for secondary data collection, field data collection for primary data gathering, data cleaning and analysis, and the results reporting as illustrated in figure 1.

2.1.1. Study area

The study covered nineteen districts of the country as a research area. Districts considered during semi-structured interviews and key consultations were purposely selected, guided mainly by the dominance of proposed value chains where SMEs of interest were involved. Our Team collected data among sampled SMEs operating in various agricultural and livestock products viz. staple crops (maize, rice, Irish potatoes and cassava, wheat), and livestock (dairy, poultry, and piggery for milk, meat, and eggs) across the country.

The sample was purposively selected to include respondents from each of the following major categories along the value chain i.e., producers, traveling, traders, transporters, wholesalers, and retailers.

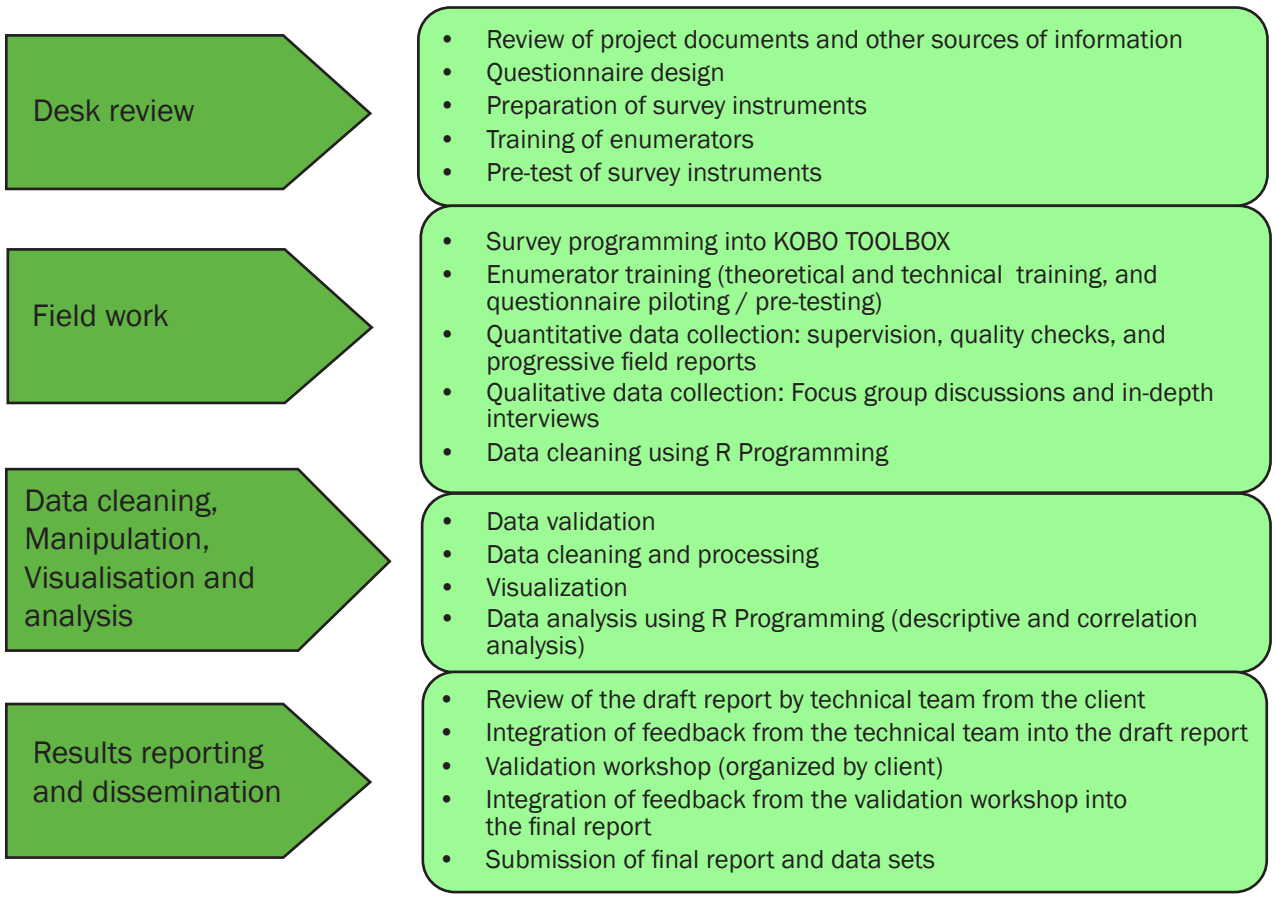

Figure 1. Study design

To obtain respondents SMEs, the purposive sampling technique was used since it was difficult to have or reach the entire population of SMEs (e.g., Etikan et al., 2016). This technique has been used by other similar studies across the different parts of the world such as Pakistan and Sri Lanka (e.g., Shafu et al., 2020; Robinson and Kengatharan, 2020). The selection of SMEs to be interviewed depended on those existing and already known which informed the research team on other

SMEs operating in the respective value chains using both their personal and professional networks. Others considered were from the list of active SMEs already available in the database provided by PSF-Rwanda Chamber of Agriculture and Livestock, RDB and the Department of Statistics in the Rwandan Ministry of Agriculture which collects commodity prices at the marketplaces around the country on different traded commodities.

2.1.2. Sampling procedures for primary data collection

The main objective of this sample survey was to gather data with respect to the changes that have recently been occurring in selected agri-chain values, the salient causes and the consequences of these unpredicted surges and fall in the market price. Given that for each commodity the market players and structure is different. The target groups may differ slightly from commodity to commodity. However, they will include the farmers, and farmer's cooperatives, the

merchants at various levels (wholesaler, retailer), consumers, etc.

an accurate, complete, and up-to-date sampling frame was developed in three stages: (1) Recruited the enumerators (2) the Data enumerators then helped to access administrative data on SMEs registered, their sector of operation, and other information needed in this study , (3) the Data enumerators then purposively selected SMEs operating in staple crops (Maize and Rice Irish potatoes and cassava) and livestock (dairy, poultry, and piggery across the country. Sampling was done from all the major functions actors across the value chain (e.g., primary production, trading (wholesaling and retailing), processing, marketing and support services (e.g., distribution - transport, storage etc.) for each value chain.

The total sample size per value chain was calculated based on the population from the sampling frame and a random process was applied to select SMEs at value chain level. The sample size is equally distributed across the value chains.

For the interviews with stakeholders. To get the number of respondents; the following formula will be used to determine the sample size (Krejcie and Morgan, 1970):

$$n = \frac{x^2 * N * P(1-p)}{(ME^2 * (N-1) + (x^2 * P(1-p)}$$

Where:

n: sample size,

x: Chi-square for the confidence interval (C.I) of 95% at 1 degree of freedom (3.841),

N: Population size (assuming that N>100,000 population),

p: Population proportion (assumed to be 0.50 as no additional information about the population characteristics was provided and since this would provide the maximum sample size),

ME: Desired Margin of Error (6.7%).

Using the formula above, the sample size was found to be 214 to be interviewed which include farmers, wholesalers, retailers and consumers. The distribution of respondents per district is indicated in table 2 while the respondent by commodity and value chain actors are shown in table 3. The selection of the exact SMEs retailers in the markets to be interviewed about the retail prices depended on the list of active SMEs already available in the database provided by MINAGRI's e-soko data and MINICOM (Appendix 1-3)

2.2. Data Collection and Analysis

This study adopted both primary and secondary data collection approaches. The field-based data collection and analysis phase will be done by using a cascading method, whereby the analysis is informed by collecting information initially from the "centre" government and donor level, then at regional district and community levels. This will make it possible first to understand and frame the overall national vision and policy objectives and then to capture the range of views and experiences from a diverse group of stakeholders, as well as to observe the way policy and programmes play out at different levels.

Major steps that will be undertaken include desk review, field surveys of traders of various commodities, farmers and value chain players like processors, key informant interviews, focus group discussions, data cleaning, processing, analysis and reporting. The activities of each step are detailed in Figure 1 while the Evaluation Questions, Information to be collected, and Approach are detailed in Table 1.

2.2.1. Methods of data collection

The analytical work on Price Volatility in agriculture and animal commodities required first the collection of both primary and secondary data. Different data collection methods were utilized to triangulate information and verify its reliability. The data collection methods included collection of secondary data through the literature review, face to face interview with purposely selected key informants, and face to face survey with SMEs. The research team used the data collection tool developed and agreed upon with the client. KOBO TOOLBOX was used to help gather data from the different respondents. Data enumerators for this assignment were trained first before undertaking the data collection exercise. TechScientia's research team also employed standard analytical techniques to analyze data and present findings using appropriate statistical software MINITAB for time series analysis and R programming for other statistical analysis.

2.2.2. Data collection techniques

A three-fold technique of obtaining relevant information were used. These techniques included secondary review of documents and literature, survey of SMEs dealing in agricultural production, processing and selling, and consultations with key informants.

Desk review

The literature review was done by consulting reports and official documents related to the study under investigation, the books, articles of various journals, theses, to provide necessary background of the study.

Secondary Data collection

To explore the price volatility in agriculture and animal commodities, the price volatility in agriculture and animal commodities study used multiple survey datasets and reports generated on different East African countries. It included global, regional, and national survey partners, surveys and reports published by business associations, data from statistical bureaus, and other independent surveys. Furthermore, data were collected on the prices imported and exported agriculture and livestock commodities and the other product that have impact on their prices such as fuel. These data were sourced from RRA, MINICOM and cross border statistical reports.

The Key secondary data was sourced from relevant institutions, both governmental and non-governmental, archiving reports, data of production, import and export, marketing and price information of various agricultural productions of various value chains in the last few decades. The policies dealing with agricultural subsidies and consumer right protection were consulted. The documents reviewed was also included, but not limited to, from MINAGRI's e-soko datasets, reports from MINICOM, BNR, NISR, NAEB, and RICA among other relevant institutions. Reports from the offline and online of nongovernmental organizations such as WB, FAO stat, e-soko, PSF, Various Processors, Importers of farm inputs and agro products, Exporters, large scale producers and farmer's cooperatives were consulted. Different publications, newspapers and other sources like the internet were also consulted. There were also engagements with various institutions and individuals holding the data to obtain them and to identify and source relevant and latest documents for in-country documentation review. Owing to the lack of data on the informal business sector, data gaps were subsequently identified and addressed during primary data collection.

Key Consultations:

For qualitative data collection, the price volatility in agriculture and animal commodities study conducted in-depth consultations with representatives of interest groups/associations relating to the agriculture and animal commodities and government agencies involved in the development of target value chains but also the development of SMEs. The purpose of these consultations was to get an overview of the existence and distribution of the agriculture and animal commodities SMEs in Rwanda. Through the consultations, the research team also gathered information on, but not limited to, the consequences of price volatility of Agricultural commodities to consumers and producers in Rwanda. The research team examined factors leading to price volatility of agricultural products and how they can be addressed. Key consultations were conducted using face to face meetings and helped to identify challenges faced by SMEs as far as the Price Volatility in agriculture and animal commodities are also concerned.

2.2.3. Survey of SMEs (traders and farmers) and Consumers

Primary data collection filled the data gaps identified during the secondary data analysis, verified and supplemented conclusions from other methods used, and also identified new insights on the possible impact of Price Volatility on the targeted SMEs in agriculture and animal commodities' sector. The study used both face to face interviews and computer assisted telephone interviews as the most effective means of reaching the most vulnerable and unorganized groups such as the SMEs. The outcome of the survey is expected to play an instrumental role in informing the stakeholders, government, and potential donor agencies on measures that are necessary to address challenges and build resilience among target SMEs. To reach Rwanda's markets and ensure collection of standard information, the survey tool was translated into Kinyarwanda. The table below describe the information collected and the approach used for each task.

Table 1. Evaluation Questions, Information to be collected, and Approach for information collection

Key activity	Information /data to be collected	Approach for information collection/ analysis
To conduct a deep review and analyze the state of play in agriculture and livestock products value chain and policy framework	Relevant information on policies related to marketing and pricing of agriculture and livestock products, the marketing practices in each value chain of products, Players within each, pricing policies provisions and their enforcement, any artificial restrictions on products prices, recent price changes, events associated with the changes, measures taken by players. The policies in agriculture and trade sectors in relation to consumer right protection were also considered.	Desk review of documents, Time series analysis approaches like trend analysis plot for actual retail prices, key informants, focus group discussion, observations on the practices of various players
To assess the trends and status of price volatility in Rwanda and the implication policy framework	Relevant information/data on changes of the prices, amplitudes and frequencies (time series dataset), reflection or not of the changes in the policy related to agriculture and trade sector.	Desk review, trend analysis, field surveys, key informant interviews, focus group discussion, field survey.
To identify and measures the determinants on price volatility in agriculture commodities	Relevant information on causes of price changes; including but not limited to the availability and prices farm inputs and changes in this regard, the speculations occurrence, natural calamity, petrol prices on international market, the measurement of changes (surge or fall) and of correlation between the suggested causes and the observed changes,	Desk review, key informant interview, focus group discussions, field survey, Econometric Modeling
Analysis of gap in supply and demand in their effects on price fluctuation agriculture commodities	Relevant information on the produced quantity, import, storage if available/ applicable, level of consumption, changes in supply and demand changes in considered periods of time, gaps, products of replacement for the gap, the prices and relationship of gap and prices fluctuation	Desk review, key informant interview, focus group discussions, field survey.
Examine the positive and negative effects of middlemen in the agricultural products value chain and their role.	Relevant information on the players in the agriculture and livestock commodity value chain their role and the share reaped in the chain, need of middlemen, their contribution to the value chain and their remuneration,	Desk review, key informant interview, focus group discussions, field survey.
To assess the consequences of price volatility and unpredictability on the consumers	Relevant information on the consequence of agricultural and livestock product price volatility on their affordability to consumers, linkage between the policies in agriculture and trade sectors in relation to consumer right protection	Desk review, key informant interview, focus group discussions, field survey.
Benchmark from best practices in the regulation of prices of agricultural products	Relevant explanation on the best practice in line with consumer right protection, propositions on their suitability of Rwanda regulatory frameworks,	Desk review, key informant interview, focus group discussions,

2.2.4. Questionnaire development

The semi-structured questionnaire for interview was developed to collect relevant information allowing understanding the extend level of:

- The price of selected agricultural and livestock products has changed in the recent years,
- The causes behind the change's prices and consequences to the consumers
- The view stands of various players in the value chain to the frequent price changes and their reactions,
- The institutional interventions (Subsidies, public and private investments, regulations, etc.) undertaken for production, market regulation and the perceived effects to the price changes,
- Level of production of the commodity, source of supply and relation with the player at down and upper stream players within the value chain,
- The level of availability and affordability of the selected products to the consumers,
- The forces in play for the pricing in the market and the bargaining power of each market players in the selected commodity value chain,
- How conducive are policies and institutional environment for the development of selected commodity industry through the establishment of linkages between farmers processing units, financial institution, merchants, and consumers.

This questionnaire was designed to target a given stratum (stratum as arranged by level of intervention in the value chain) for a selected commodities maize and soybean, meat and eggs milk production, consumption, and sales impact.

This questionnaire was used to collect key relevant information regarding:

1. Businesses of the respondents and the experiences in the targeted commodities.

2. Experienced prices changes (direction of change, amplitude, and frequency),

3. Normal relationship with the partners in the selected commodity business and management of events once the price changes unexpectedly.

4. Source of supply and the customers; how prices volatility affects the normal business,

5. Regulation in term of price and how they cope with them (whether in the favor or against the healthy business)

6. Institutional development and policy if suggested, what will be needed to cover for the side of the response (Proposal for improving the regulatory framework of the sector).

The development of a semi-structured questionnaire was an iterative process that engaged the client and inputs received from the client were incorporated. The questionnaire was structured mainly focusing on different priority agricultural commodities that were previously mentioned:

2.2.5. Training of enumerators and Pre-survey

TechScientia's research team used IT tools (the KOBO TOOLBOX technology installed on handheld mobile gadgets) in the Survey for Primary data collection. A developed semi-structured questionnaire was uploaded to the KOBO TOOLBOX enhanced mobile gadgets linked to TechScientia server so that field data can be captured in real time. This strategy eliminated several shortcomings spanning all stages of data management, including errors during data collection, issue of non-response to sections of the data tool, data entry errors, and false data entries.

To facilitate data collection, enumerators were recruited and trained on the scope of the survey and the data collection questionnaire. There was a field supervisor who coordinated the data collection process to ensure data quality. A total of 10 enumerators collected quantitative data for 5 days using a pre-tested questionnaire via face-to-face interviews. TechScientia's research team organized a three-day training for the enumerators under the support of the field supervisors, where the first two days of training on research ethics and understanding techniques, and final day for pre-testing of tools (mock interview).

2.2.6. The Pilot Survey:

The pilot survey or pretest of the tool was administered among respondents with similar characteristics as the study individuals but not included in the main study. The training was conducted physically. Our firm and the contact person on behalf of RICA collaborated to ensure that the training was well administered and performed before the actual data collection. It helped the team to identify any problems before the main survey and to improve the survey tools and logistics. These were addressed after analyzing those problems.

2.2.7. Field surveys

Primary data was collected through field surveys from various districts' markets for the purpose of supporting the secondary data collected during the desk review. The developed semi-structured questionnaire was loaded into mobile gadgets (both tablets and smartphones) of enumerators; both mobile gadgets were used to avoid stoppages/disturbances resulting from battery shutdowns of one gadget.

The survey was conducted for selected respondents organized by their intervention in the commodity value chains. It was hence focused on selected agri-commodity. Districts where the survey was to take place were selected using purposive sampling based on availability of targeted agricultural commodities.

Table 2. The districts in the sample

S/N	Province	Districts sampled	Number of Respondents
1	Kigali City	1.Gasabo 2.Kicukiro 3.Nyarugenge	18 18 18
2	Eastern Province	1.Nyagatare 2.Kirehe 3. Rwamagana 4. Bugesera	10 10 10 10
3	Northern Province	1.Musanze 2.Gicumbi 3.Gakenye 4. Burenke	10 10 10 10
4	Southern Province	1.Ruhango 2. Huye 3.Nyamagabe 4.Nyaruguru	10 10 10 10
5	Western Province	1.Rutsiro 2.Nyabihu 3.Rusizi 4. Nyamasheke	10 10 10 10

Table 3. Sample of the respondents with respect to commodities and values chain actors

Value chain Commodity	Actors per Value chain						Target District
	Producer	Processor	Whole seller	Retailer	Consumer	Total	
Maize	5	4	3	6	4	22	Nyagatare, Kamonyi, Kirehe, Kicukiro
Rice	4	4	4	4	8	24	Rusizi, Gatsibo, Kirehe, Nyarugenge
Beans	6	1	2	5	5	19	Rwamagana, Burera, Kicukiro
Irish potato	7	1	4	6	6	24	Nyabihu, Musanze, Nyamagabe, Nyarugenge
Wheat	3	2	0	4	4	13	Gicumbi, Nyaruguru, Gasabo
Cassava	5	1	1	4	5	16	Ruhango, Muhanga, Gakenke, Nyarugenge
Milk	4	2	4	6	6	22	Kicukiro, Nyagatare, Nyabihu, Gicumbi
Eggs	3	0	1	3	4	11	Bugesera, Nyarugenge, Rwamagana

Meat	6	1	6	8	12	33	Nyagatare, Gicumbi, Bugesera, Gasabo, Nyarugenge
Total	49	24	25	54	62	214	

2.2.8. Key Informant Interviews (KIIs)

Key informant interviews are qualitative in-depth interviews with people who know what is going on in the community. The purpose of these key informant interviews in this study is to collect information from a wide range of people including community leaders, professionals, or residents who have first-hand knowledge about the price volatility, causes and give ideas on possible interventions. Key Informants (KIIs) were conducted with key respondents from different private and public institutions including MINAGRI, MINICOM, MINALOC, RICA, RURA, RAB, NAEB, PSF, RCVD, BRD, ADECOR, RSB, Specific commodity industry associations like Rwanda Poultry Industry Association (RPIA), Rwanda Pig farmer association (RPFA), Farmers' cooperatives and Cooperative Unions, Traders associations, exporters and importer of farm products, and farm inputs. It aimed to gain these stakeholders' perspectives on the status of price volatility in the market of agri-products, its effect on the business environment, the causes of the frequent and unpredictable changes, the effect on the product availability and affordability to the consumers, the policies in line and proposals of needed regulation. Their views as a comparison with the regional and international practices, if any were also considered with respect to the given value chains.

The KII guide was developed and used to gather information that responds to the need of the study in the identified value chain.

A number of focus group discussions were conducted including each selected commodity stakeholder at various levels of the value chain. The guide questionnaire was prepared by the research team and was used to extract the views of the participants on the issues under investigation by drawing from their experiences.

Table 4. Key players and their roles

Role	Key players consulted	Key information collected
Producers	• Farmers cooperatives, Unions and association committee • Big commercials farmers	• Production cost and their change in the recent years • Presence or not of any subsidy in the production chain, • What are the support services in the regard of the producers • Production levels and prices on the markets and their changes over time • The buyers of their produces • Whether they know/ are in contact with the users of their production • Up to which level they add values to their product (Handling) and VS prices

Role	Key players consulted	Key information collected
Processors	• The staff or owners of the processor	• The cost of the raw material and the price of the finished product • Who are the buyers and the source of the raw material • The regulation and policy (including subsidy and taxes)
Traders	• Transporter of the harvests • Wholesalers and Retailers	• How of the product price changes the • Why the price changes • The perceived causes of price changes • The regulation and policy (Including the price fixation/ artificial pricing)on the selling of the given product and their effect on the prices
Consumers		• Big consumers like the School headmasters.

Different stakeholders of each value chain from private and public institutions, farmers' cooperatives, and associations involved were brought together in focus group discussions to verify the collected information through the face to face survey and Key Informant Interviews and to collect additional information which is inaccessible through a face to face survey and Key Informant Interviews. The focus group discussions (six to eight people) were organized with selected technical /professional stakeholders.

2.2.9. Focus Group Discussions

2.2.10. Quality assurance mechanisms, Ethics, and Collaboration

To ensure data quality, TechScientia recruited research assistants with at least a bachelor's degree in agriculture related field, have experience in mobile data collection using KOBO TOOLBOX, and are able to communicate in English and local language (Kinyarwanda). They were trained, physically, in the survey tool, the purpose of the research project, and how to utilize the KOBO TOOLBOX. Furthermore, the survey programmer included automated data quality checks such as constraints, skip logic, and sensor metadata to monitor the behavior of the research assistants and flag submissions that are outliers in terms of certain sensor statistics. The skip logic also shortened the survey time by asking only relevant questions based on previous responses. TechScientia research team uploaded and synchronized all filled data collection forms daily to the server. No external server is allowed during data collection except the one that was designed to serve for this rapid appraisal survey. Enumerators received feedback on data collection progress and areas of improvement during the exercise.

Concerning Ethical Consideration, the research followed international best practice standards and is subjected to scrutiny by the research team. Our research is underpinned by a commitment to integrity, honesty, and Excellency. All informants were informed on the purpose of the study and asked to give their informed consent to participate in the study. Any identification information about respondents will be confidential and data will be anonymized before sharing it with the research team for analysis. Data collection tools were discussed with the

RICA prior to the beginning of field activities. Additionally, data collection was undertaken in close collaboration with local authorities and the RICA's appointed focal person at each step. The factsheet, draft, and final report will then be submitted for approval.

2.2.11. Data analysis

Following data collection, quantitative data were cleaned using R programming. Our Research team created an R-Script for the data cleaning process and shared it with the client. Quantitative data was then analyzed using R programming software and presented in separate sections disaggregated by agreed-upon criterion. Qualitative data collected from KIIs was transcribed, interpreted, and summarized. The quantitative and qualitative data was then triangulated to establish the validity and reliability of the quantitative data.

A report highlighting key findings was presented in tables and graphs so that the audience following the project-prescribed format can easily understand the findings. The research team also developed a policy brief in the simplest language possible for all stakeholders. This draft report will be shared with RICA's focal person for review, consideration, and integration as part of the finalization process of the final report.

2.3. Measurement and analysis of the level of price volatility

Volatility in this study was concerned with the variability of the price series around its central value i.e., the tendency for individual price observations to vary far from its mean value. Primary and Secondary data extracted from different sources were collected and compiled for selected agricultural commodities in a time series arrangement.

Two kinds of volatility are found in the literature (European Commission, 2009, Matthews (2010) for instance): an historical (realized) volatility and an implicit future volatility. The historical volatility is based on observed past prices. It reveals how volatile a price has been in the past. As for the implicit volatility, it corresponds to the markets' expectation on how volatile a price will be in the future as measured by the value of price options. In this paper we are interested in measuring only the realized volatility based on observed world market prices.

Several historical volatility measurements have been used in various literatures. Researchers have employed measures based on the price levels. They have focused on the standard deviation of prices or of logarithmic prices or on the coefficient of variation which expresses the standard deviation as a percentage of the sample mean.

The calculation of the volatility was undertaken using standard deviation of logarithmic price change variations which was expressed as a percentage of the sample mean. The formula for standard deviation of a time series data can be represented mathematically as:

$$SD = \text{sqrt}\left[\Sigma (xi - \mu)^2 / (n-1)\right]$$

Where:

xi: each individual value in the time series data

μ: the mean of the time series data

n: the total number of values in the time series data

Σ: the summation symbol, which means to add up all the values from i=1 to i=n

The Std Deviation was used to measure the volatility of the price change over time in other

studies like Cariappa et al.,2022; Hu et al., 2022; Ribeiro et al., 2020 and de Nicola et al., 2016.[9],[10]

To analyse the gap between the supply and the demand, annual data on the production level, import, exports, and re-export were used to find the demand of the market in the last 20 years. The cross-border trade data from MINICOM and the production level from NISR of and FAO statistics were used.

Net imports = Total Import - Re-export,

Market demand = Production + Net imports - Export

9 Cariappa, A. A., Acharya, K. K., Adhav, C. A., Sendhil, R., & Ramasundaram, P. (2022). COVID-19 induced lockdown effects on agricultural commodity prices and consumer behaviour in India–Implications for food loss and waste management. Socio-Economic Planning Sciences, 82, 101160

10 Ribeiro, M. H. D. M., & dos Santos Coelho, L. (2020). Ensemble approach based on bagging, boosting, and stacking for short-term prediction in agribusiness time series. Applied soft computing, 86, 105837.

CHAPTER 3. FINDINGS OF THE STUDY

3.1. Introduction

This chapter provides the findings of the study including (i) trends and status of price volatility; (ii) determinants of price volatility; (iii) analysis of pricing policy and regulations; (iv) gap in supply and demand and their effects on price volatility; and (v) regional and international best practices related to price volatility.

3.2. General context of price change

Price volatility is the degree of change in the price of a particular commodity over a given period, while trends, on the other hand, refer to a direction in which prices are moving over a certain period. A trend can be upward, downward, or sideways. An upward trend indicates that prices are generally increasing, while a downward trend indicates that prices are generally decreasing. A sideways trend indicates that prices are relatively stable and not showing a significant upward or downward movement.

Status refers to the position or condition of a particular product or asset in the market. It can be influenced by various factors such as consumer preferences, market trends, brand reputation, and the overall economic environment. The status of a product or asset can impact its price volatility. For example, if a commodity is in high demand due to its common use, prices may be more volatile due to fluctuations in consumer demand. Similarly, if commodity has a high status in the financial market, it may experience greater price volatility due to fluctuations in investor preference. The status of a commodity can impact its price volatility due to the influence it has on supply and demand, consumer preferences, and investor sentiments.

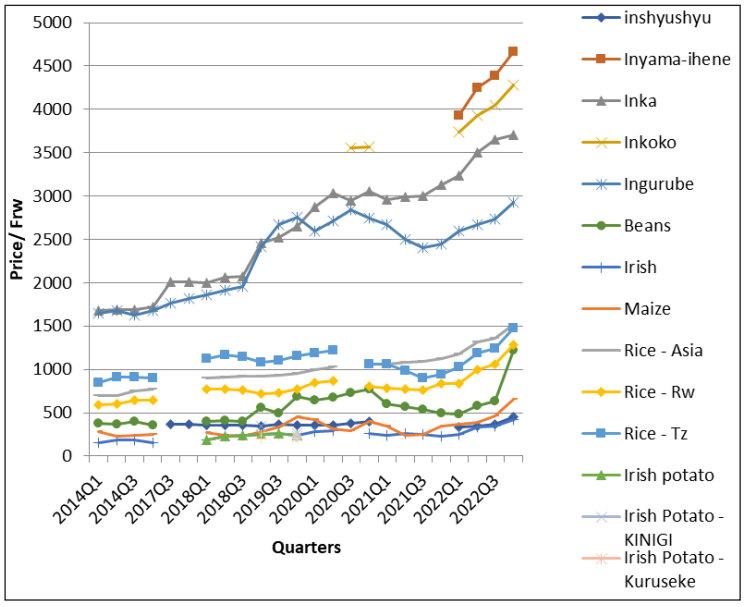

Figure 2. Trends of prices for selected agricultural and livestock commodities
Source: Adapted from E-soko datasets from 2014-2022

Figure 2 shows the trends of prices for selected agricultural and livestock commodities from 2014 to 2022. The analysis indicated that from the year 2014 to 2018, there was a low degree of changes in the prices of most of the selected commodities. From 2019, there was a significant increase in the price changes of most of the commodities, particularly for Rice-Asia, Rice-Rwanda, Rice-Tanzania, and Irish Potato-Kuruseke variety.

This study found out that the price trend of beef consistently increased whereby prices rose from

1693 Frw in 2014 to 3503 Frw/kg in 2022 for beef whereas pork increased from 1677 Frw/kg in 2014 to 2676 Frw/kg in 2022. This shows a sharp increase of 107 % for beef and 60% for pork. The analysis was based on quarter 2 of each year (Figure 3).

The study further revealed that the raw milk prices were relatively stable between 2017 and 2022. The raw milk prices grew from 372 Frw/litre to 385 Frw/litre representing an increase of only 3.5% in 5 years. However, there was a sudden increase of milk price in 2022 (quarter 3) and 2022 (quarter 4) from 347 Frw/litre to 413 Frw/litre representing 19.

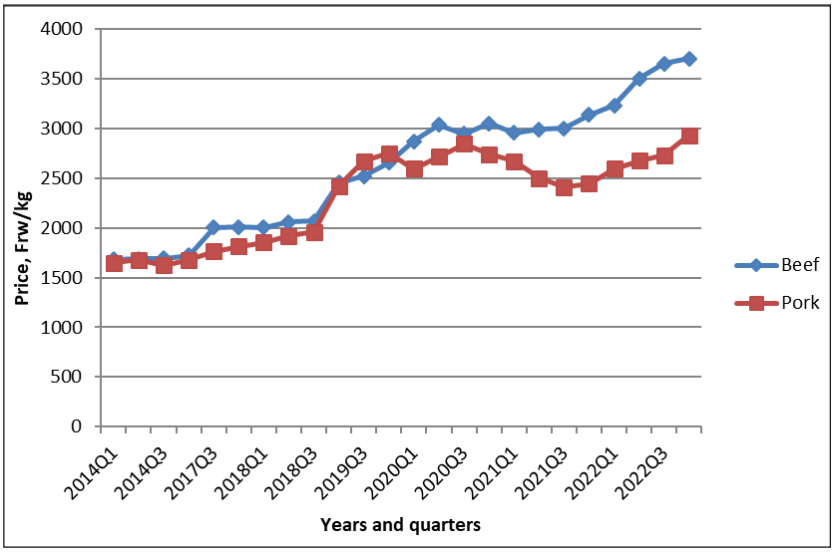

Figure 3. Constant increase of prices (beef and pork).
Source: Adapted from E-soko datasets from 2014-2022

Rice commodities experienced stable prices from 2018 to 2020 with 774 Frw/kg to 806 Frw, a small increase of 4% in 3 years. However, a sharp increase of rice prices was noticed between 2020 to 2022 from 806 Frw/kg to 1281 Frw/kg, implying a sharp increment of 59% in two years (Figure 4).

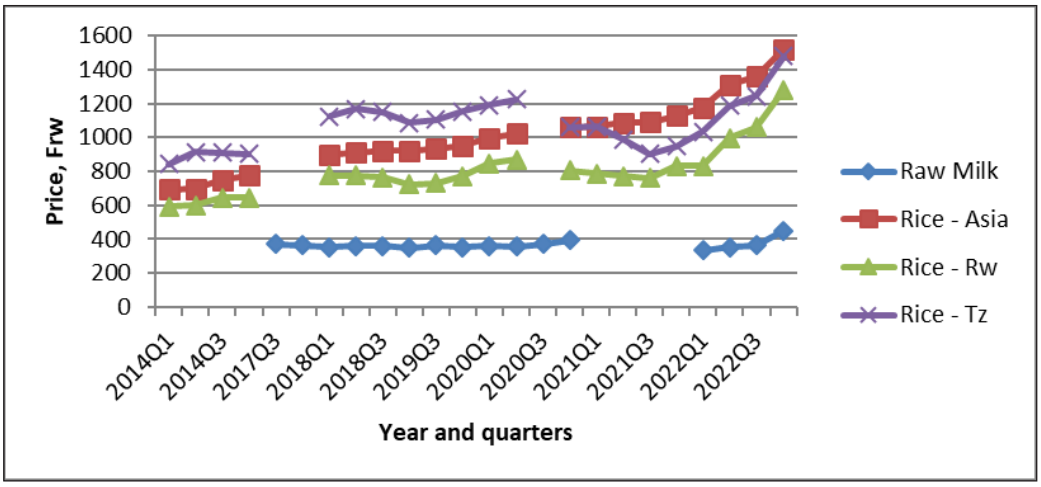

Figure 4. Price fluctuations of rice and milk

From 2014 to 2018, beans commodity prices had a slight decrease from 350 Frw/kg to 313 Frw/kg representing a decrease of 12% in four years. However, a sharp price increase of 90% was realized between 2020 (676 Frw/kg) and 2022 (1281 Frw/kg).

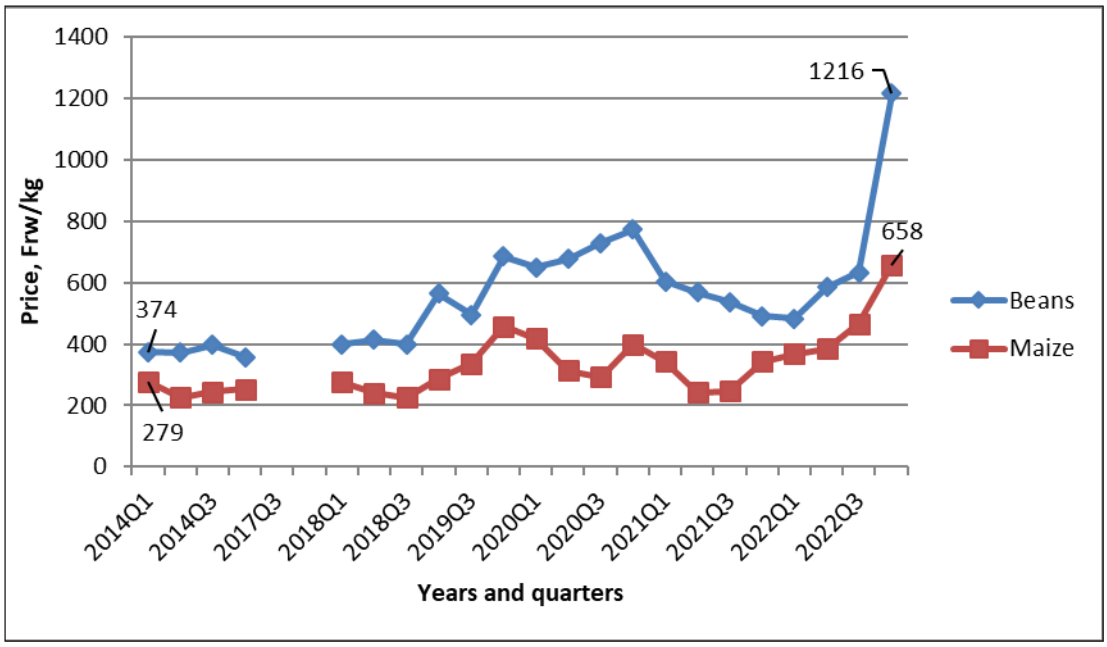

Figure 5. Prices fluctuation for beans and maize
Source: Adapted from E-soko datasets from 2014-2022

The study noticed a volatile fluctuation for maize prices from 2014 (226 Frw/kg) to 2022 (385 frw/Kg) in Q2, an increase of 70.4%. However, maize prices experienced quarter tailored sharp variations (increases/decreases). For example, in 2014 Q4 (254 Frw/kg) and the maize price increased to 658 Frw/kg representing a percentage change of 159%. The highest price fluctuation are registered in quarter 4 corresponding to the month of October to December (table 5).

Table 5. Maize price fluctuations in FRW/kg

	2014	%	2019	%	2020	%	2021	%	2022	%Change from 2014 to 2022
Q1	279	20.1	335	24.5	417	-17.7	343	7.3	368	31.9
Q2	226	27.0	287	9.4	314	-22.9	242	59.1	385	70.4
Q3	244	37.7	336	-12.8	293	52.9	448	4.0	466	91.0
Q4	254	80.3	458	-12.7	400	-14.5	342	92.4	658	159.1

3.3. Analysis of price volatility, of selected value chains

The study analyzed the price volatility of ten selected agricultural and livestock commodities. The analysis used both secondary and primary data. The secondary data were provided by MINAGRI e-Soko information system, MINICOM, BNR and NISR while primary data were collected using individual survey, key informants' interviews and focus group discussions.

This section presents the findings on price volatility for selected commodities, their determinants and their impact on consumers and producers calculated using the e-Soko data set from 2014, and the analysis of gap between the internal production and the market demand. The market demand was derived from the production level import, exports, and re-export in the last 20 years and the average price with data from FAO, NISR and MINICOM cross border trades.

3.3.1. Maize commodity price volatility

3.3.1.1. Analysis of price volatility in maize commodity.

Figure 6 provides data on the price volatility of maize in Rwanda over a period of eight years, from 2014Q1 to 2022Q4. The volatility of maize prices, which is a measure of how much the prices of maize deviate from the average price, has constantly been high and relatively stable. It ranged from as low as 12.01% in 2019Q2 to as high as 16.05% in 2014Q1. This indicates that the prices of maize in Rwanda have been fluctuating over time, with some quarters experiencing high volatility even greater than 15%.

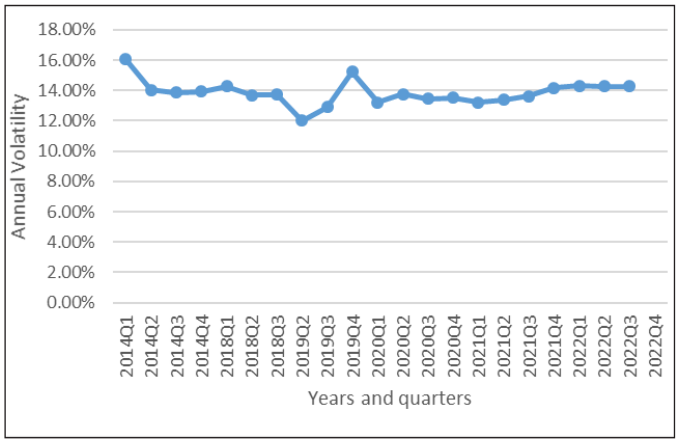

Figure 6. Maize commodity price volatility
Source: Adapted from E-soko datasets from 2014-2022

The maize farmer interviewed (98.8%) indicated that this commodity benefited enormous support from the GoR such as subsidized hybrid seeds and fertilisers, pesticides, crop insurance, extension services to increase maize productivity. In addition, the GoR through various de-risking programmes supported maize farmers/cooperatives by providing post-harvest facilities such as driers and storage bins. All these factors contributed to the increase in production over the years. However, the price change in maize value chain was found to occur on seasons basis dropping at time of harvest and increasing gradually increasing. This is due to the presence of business practice of hoarding the maize produce.

3.3.1.2. Maize production, market demand and price fluctuation

The study observed that maize market demand has increased tremendously in the last two decades while the supply followed the same trend with a continuous gap noticed between demand and supply between 2000 and 2022. However, it was also noted that the demand

was slightly higher than the supply in the same period. The maize commodity experienced an increase in production from 2008 to 2013 which could be attributed to the GoR efforts through the Land consolidation policy and the Crop Intensification Programme (CIP). However, there was a sudden drop in maize production from 2014 to 2017 with a slight recovery between 2018 and 2022.

The decrease in production was attributed to the Maize Lethal Nechrosis disease followed by 2016 dry spells, fall armyworms in 2017 and COVID-19 pandemic that drastically reduced maize production. Farmers contend that there is acute need for irrigation to counteract the recurrent and prolonged dry seasons. Key informants from MINAGRI argued that irrigation infrastructure is very important, but they are very expensive for the big farm acreage. Besides, the agriculture sector is often underfunded as required by Malabo declaration.

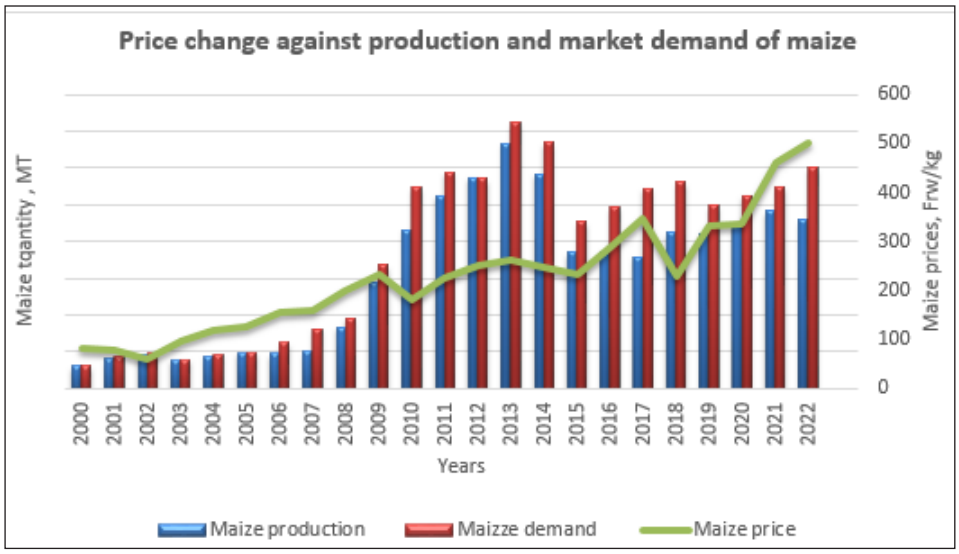

Figure 7. Production, demand, and price of maize
(Adapted from FAO, NISR and MINICOM data)

The study noted that maize price changes over the period of 2000-2022 between 83 Frw/kg in 2000 and 500 Frw/kg in 2022, representing 502.4% increase. The maize price shows an increase as the gap increases between the demand and production with exception from 2021 to 2022 (Figure 7). The maize price shows that the bigger the gap, the higher the price and vice-versa. Therefore, the gap between the market demand and internal production is one of the determinants of the price and price volatility and most the increase in price.

3.3.1.3. Main causes of price volatility and recommendations in maize

The causes of price fluctuations for maize are summarized in the table below 6 with the recommendations specific to this commodity.

Table 6. Main causes of price volatility and recommendations in maize

Causes of price volatility /price changes	Recommendations
• Price changes in maize value chain are generally seasonality based (dropping at time of harvest and increasing gradually) • Presence of malpractices by business actors and middlemen who buy and hoard the maize produce for excess profits. • Low maize production due to pests & diseases (fall army worms, MLN) and periodic climate shocks. • Increased maize demand and consumption widening the gap between the market demand and internal production	i. To strengthen the buying of surplus as buffer stock at central and district levels at competitive price at harvesting time while promoting private grain reserves to counteract the seasonality price changes. ii. To elaborate and enforce regulations on middlemen and business actors' operations to counteract their malpractices and speculations. iii. To assess, analyze and revise the existing GoR pricing scheme for agricultural products to make it more inclusive to all actors (for example Replicate the farmer gate price setting system of seed to other commodities) iv. To strengthen efforts to increase maize production (irrigation, disease control and other production inputs) to meet the market demand. v. To link maize value chains actors (farmers, traders, consumers, etc.) through information sharing mechanisms and platforms.

3.3.2. Rice commodity price volatility

3.3.2.1. Price volatility analysis of rice commodity.

The price volatility analysis for rice commodity was carried out on three types of rice found in Rwandan markets, namely Rwandan rice, Tanzania rice and Asian rice. The study used data for the period from 2014 to 2022.

The analysis of collected data shows that the price volatility of "Tz Rice" has been relatively stable over the years, with the highest volatility being 1.17 % in 2018Q1 and the lowest volatility being 0.16% in 2020Q1. The price volatility of locally produced rice, "Rice Rw", has shown a similar trend in volatility compared to "Tz rice" with the highest volatility being 0.91% in 2021Q4 and the lowest volatility being 0.80% in 2021Q1. The annual price volatility of Asian rice shows the highest volatility compared to the other types of rice. The highest value of volatility was 8.60% in 2021Q4 while the lowest volatility was 0.76% in 2021Q1.

The analysis of data collected from the survey indicated that 76. 3 % of rice consumers affirmed higher volatility levels in rice marketed in Rwandan. The 0.87% of traders reported higher volatility of imported rice while 88% of interviewed rice farmers indicated that the price at farm-gate level is relatively stable. They further contended that the minimum price is set at each season after the consultation of farmers representatives, the ministry of agriculture and the ministry of trade and other stakeholders in respective value chain commodities. The minimum gate price factors in the production expenses incurred by the farmers and the expected productivity in various parts of the country to ensure that the farmers are not disadvantaged.

The study noted that the volatility of Rwandan rice is a result of low productivity and preference of locally rice produced. The analysis revealed

that the cost of production of Rwandan rice is higher which makes it sometimes more expensive compared to imported rice.

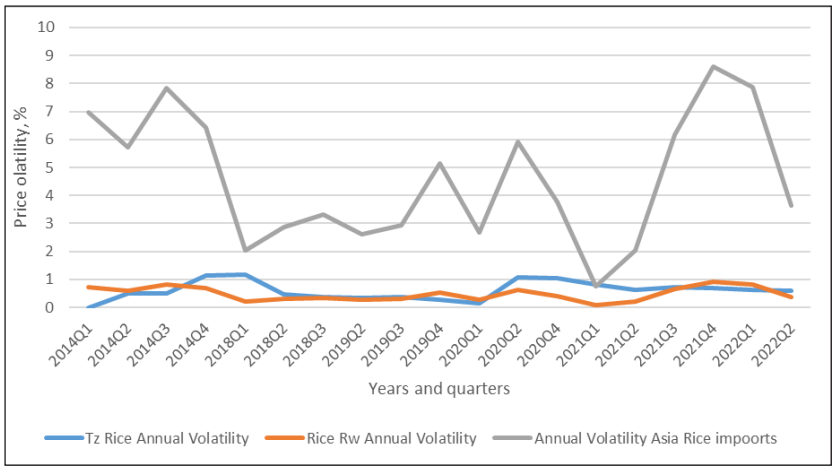

Figure 8. .Eight years trend of price volatility for rice commodity in Rwanda
Source: Adapted from E-soko datasets from 2014-2022

Consultations with stakeholders indicated that the volatility observed in Asian rice is likely related to global market dynamics, inflation, pandemics, geopolitical tensions, and import tariffs (for example in 2018, the average import tariff for Rwanda in rice was 44.2%[11]).

Key informant interviews with MINICOM, MINAGRI and RRA revealed that the COVID-19 pandemic and geopolitical conflict (Ukraine-Russia war) have contributed to the price increase of Asian imported rice from 2019 to2022. In addition, consultations with the Consumer Protection platform revealed that there is lack of a clear agricultural and livestock commodities pricing policy and regulations. The absence of pricing policy and regulations results in uncontrolled and unstable prices which negatively affect consumers and producers.

3.3.2.2. Rice production, market demand and price fluctuation

The study observed that rice market demand has slightly increased year after year between 2000 and 2008 while the supply followed the same slight increase. It was also noted that the demand was slightly higher than the supply in the same period. The study further noted that the gap between the demand and supply continuously widened from 2008 to 2022. This could reflect the current shift in rice consumption and dietary habits portrayed by Rwandans in the last few years.

With a steep increase from 2021 to 2022, the price of rice exhibits a sustained increase corresponding to the widening disparity between supply and demand (Figure 9). From 2019 to 2022, the COVID-19 pandemic and the Ukraine-Russia conflict affected the rice prices because of high costs of the imported cereal grains including rice. The price of rice demonstrates that the price rises and falls depending on how wide the gap is. As a result, one of the factors affecting the price change is the discrepancy between internal rice production and market demand. The rice prices are much dependent on external market dynamics (import cost, increase in prices of petroleum products, external inflations and recently the consequence of COVID-19 pandemic and the Russia-Ukraine crisis) and the increasing local market demand.

The minimum price is set at each season after the consultation of farmers representatives, the ministry of agriculture and the ministry of trade and other stakeholders in respective value chain commodities. The minimum gate price factors in the production expenses incurred by the farmers and the expected productivity in various parts of the country to ensure that the farmers are not disadvantaged.

11 Fastest Growing Market, 2020-2021, Rice in Rwanda. https://oec.world/en/profile/bilateral-product/rice/reporter/rwa

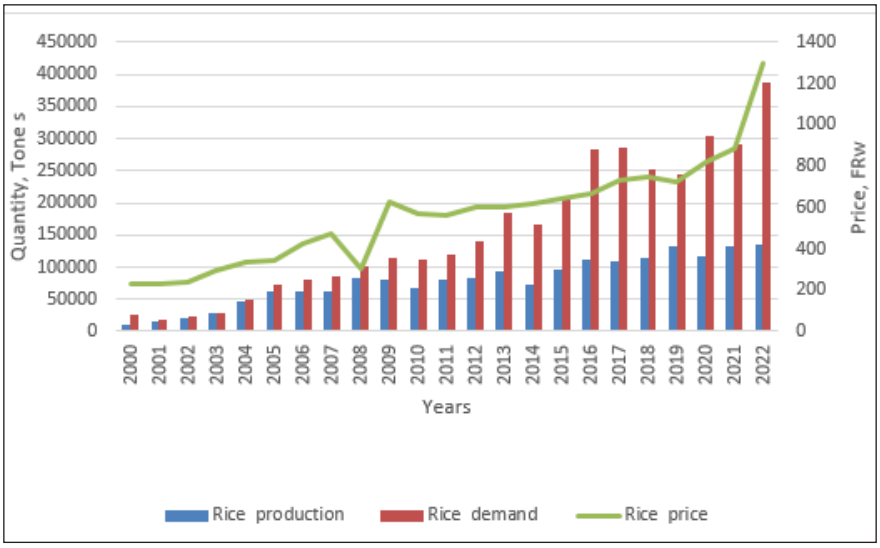

Figure 9. Production, demand, and price of rice fluctuations

3.3.2.3. Main causes of price volatility and recommendations in rice

The causes of price fluctuations for rice are summarized in the table below 7 below together with the recommendations specific to this commodity.

Table 7. Main causes of price volatility and recommendations in rice

Causes of price volatility /price changes	Recommendations
• Low productivity, • Post harvest losses • Low quality of locally rice produced. • Higher cost of production of Rwandan rice • Import tariff on imported rice. • Global market dynamics	i. To promote rice production technologies (improved varieties, agronomic practices, irrigation, etc.) to increase the productivity. ii. To improve the quality of locally produced rice through appropriate rice processing. iii. To promote a participatory rice value chain pricing scheme iv. To revise rice farm gate price each season while considering the global market dynamics v. To assess, analyze and revise the existing GoR pricing scheme for agricultural products to make it more inclusive to all actors (for example Replicate the farmer gate price setting system of seed to other commodities).

3.3.3. Wheat commodity price volatility

3.3.3.1. Analysis of price volatility in wheat commodity.

The price volatility of wheat commodity has fluctuated over time. The higher volatility is found in some quarters showing increases and others decreases. The price volatility of wheat was highest volatility.

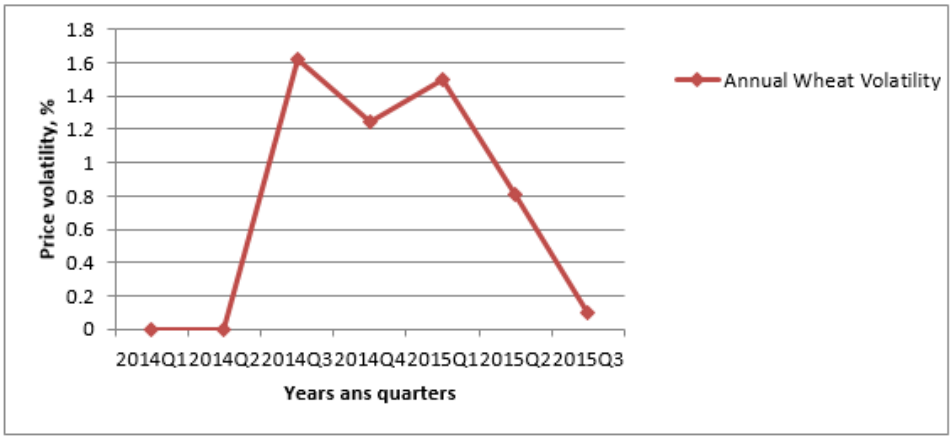

Figure 10. Price volatility of wheat
Source: Adapted from E-soko datasets from 2014-2022

ty was registered in 2014Q3 with 1.6%. (Figure 10)

The study results show that 91.6%of interviewed consumers confirmed that there has been a relative stability of wheat prices. However, the 96.3% of interviewed wheat baking flour experienced high price volatility.

The analysis revealed that the locally produced wheat is not sufficient to cover the market demand and the cost of production of wheat is higher which makes it relatively expensive compared to imported wheat. In addition, the promoted varieties are not meant for baking resulting to the dependence on imported wheat.

Consultations with stakeholders indicated that the volatility observed in wheat baking flour is likely related to global market dynamics, inflation, geopolitical tensions.

3.3.3.2. Wheat production, market demand and price fluctuation

Wheat consumption has tremendously increased while the production that showed no significant increase very recently. Therefore, the price of wheat and wheat products is governed by the international market change. The average price increased normally up to 2017, and from 2018 is having a steeper increase (figure 11).

The price increases in last five year could be attributed to the fluctuations in fuel prices, the consequence of COVID-19 pandemic and the recent Russia-Ukraine crisis. The wheat prices are much dependent on external market dynamics (import cost, external inflations) and the increasing local market demand.

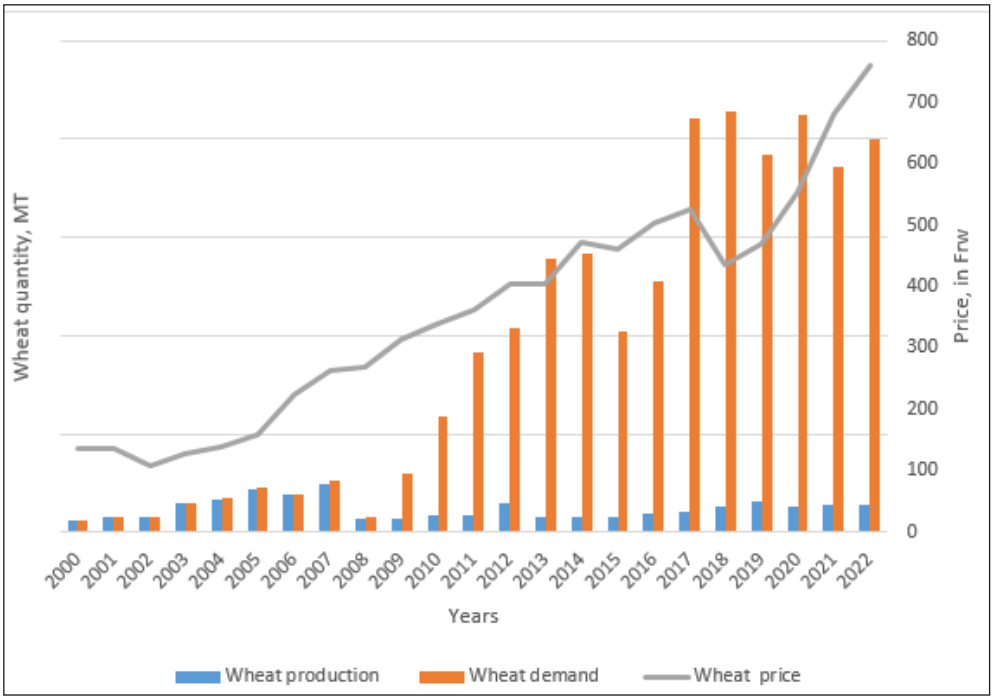

Figure 11. Production, demand and price of wheat

3.3.3.3. Causes of price volatility and recommendations in wheat commodity

Table 8 summarizes es of price fluctuations for wheat and specific recommendations to this commodity.

Table 8. Main causes of price volatility and recommendations in wheat

Causes of price volatility /price changes	Recommendations
• Global market dynamics, inflation, geopolitical tensions and import tariffs, • Very low local production compared to market demand (e.g. In 2018 the local production 13,475MT against the market 210,362 MT making only 6.4%), • Post harvest losses and low quality of wheat locally produced, • Very high cost of production of Rwandan wheat,	i. Establish a market information system to avail appropriate information about prices and stocks and shocks levels to cater for the global market dynamics. ii. To promote the wheat production technologies (improved varieties, agronomic practices, etc.) to increase productivity. iii. To improve the quality of locally produced wheat through appropriate post-harvest handling and processing.

3.3.4. Bean commodity price volatility

3.3.4.1. Analysis of price volatility in bean commodity

The price volatility of beans has fluctuated over time as shown in figure 12. The price volatility of beans was lower in 2014Q3 with 0.53% while the highest volatility was registered in 2022Q3 with 2.05%. In general, the price volatility of bean commodity has been stable over time. The study results show that 92.5%of interviewed consumers confirmed that there has been a relative stability of bean prices from 2014 to 2021. Exception is observed from 2022Q1 to 2022Q4 whereby price volatility increased from 1.3 % to 2.05% which is reflected on the price hike from 483 Frw/kg to 1216 Frw/kg.

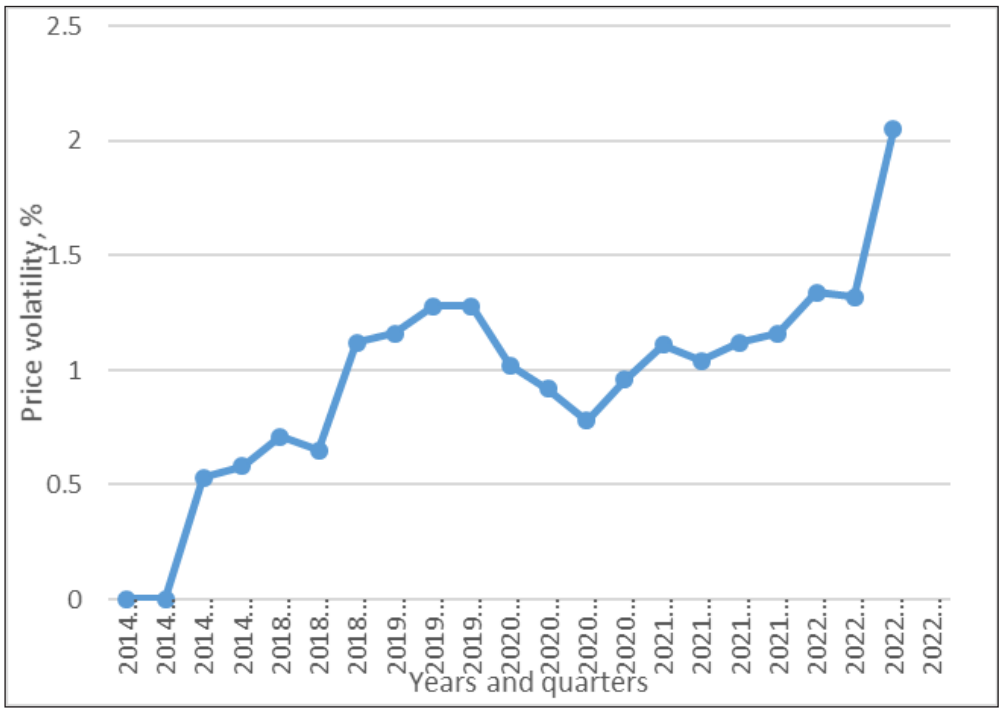

Figure 12. Bean price volatility
Source: Adapted from MINAGRI E-Soko Information System (2014-2022)

The study also noted that the stability of bean prices was due to the relative tallying of the supply and demand. However, the price changes were noticed based on the seasons. The supply-demand mismatch was registered between 2019 and 2022 partly because of climate shocks that affected bean production and increment of internal demand due to high consumption of beans leading to hiking of prices.

The consultations with the key informants noted that the relative stability of bean price over the years (before 2021) was likely due to the dominance of locally produced beans on the market, implying limited cross-border trade effect. Small changes observed from quarter to quarter were likely dependent to the seasons where price decreases at harvest time and often increases toward the next bean cultivation season. The study also noted inappropriate bean value-chain coordination whose distribution is dominated by informal middleman speculations leading to price fluctuations with middlemen reaping the bigger share. Business agents practicing hoarding were also mentioned to be the causes of seasonal price change

The exceptional price increase in the year 2022 was due to the climate shocks and stresses experienced which caused the reduction of production. This argument is also confirmed by MINAGRI (2022) that indicated the production decrease from 491,976 to 449, 489 MT in the year 2021 to 2022, respectively.

The price fluctuations were reported to be mostly season based. At the time of harvest the surplus could be kept in buffer stock and district grain reserve to cater for the seasonality price changes.

3.3.4.2. Beans production, market demand and price fluctuation

The study exhibits a very narrow gap between the bean production and demand (Figure 13). The price change is steady with a small rise in 2008 and a small fall in 2009.

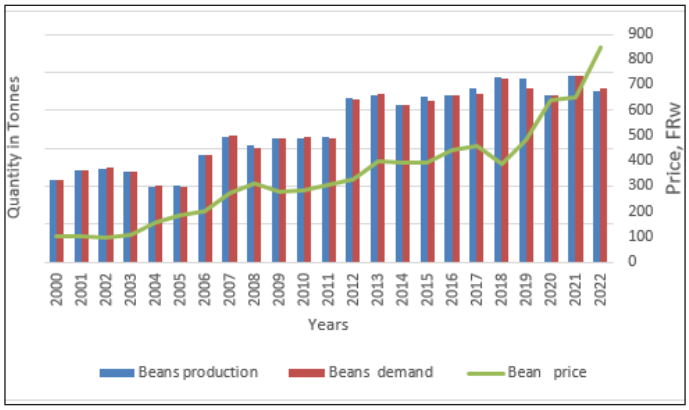

Figure 13. Production, demand, and price of bean

Another steep increase in price is observed in 2018 to 2021. The surplus in production of 2008 seems to influence the price to go down from an average of 312.9 Frw to 276.2 Frw. The price has then increased gradually up to 456.5 Frw in 2017 before it fell again to 387.6 Frw in the next year of 2018. It is noticeable that, in 2017 there, was also a surplus production. Production and the demand showed a link especially with the surplus leading to the price fall.

3.3.4.3. Main causes of price volatility and recommendations in beans

The causes of price volatility and recommendations for beans commodity are summarised in the table 9 below.

Table 9. Main causes of price volatility and recommendations in beans

Causes of price volatility /price changes	Recommendations
• Inappropriate bean value chain coordination whose distribution is often influenced by informal middlemen and business actors' speculations, • Price changes in bean value chain are generally seasonality based (dropping at time of harvest and increasing gradually) • The low bean production due to climate shocks, • Increase of internal demand due to high consumption of bean leading to hiking of prices	i. To strengthen the bean value chain coordination mechanisms through information sharing mechanisms and platforms among the actors. ii. To elaborate and enforce regulations on middlemen and business actors' operations to counteract their malpractices and speculations. iii. To strengthen efforts to increase bean production (irrigation, disease control and other production inputs) to meet the market demand.

3.3.5. Soybean commodity price volatility

3.3.5.1. Analysis of price volatility in soybean commodity.

Based on the study findings, soybeans exhibited low price volatility in the years 2014 and 2015. The highest volatility was registered in 2015Q3 (0.54%) while the lowest was in 2014Q3 (0.20%) as shown on figure 14.

The results of the survey indicated 78.3% of respondents affirmed that the price of soybean has been quite stable. Consultations with key stakeholders revealed that this commodity receives the GoR support in the form of input subsidy and this has contributed to the relative increase in production. Consultation further indicated that demand of soybean is higher than the local production and a big share of the locally produced soybean is used in the processing of nutritious food (AIF) and for animal feed.

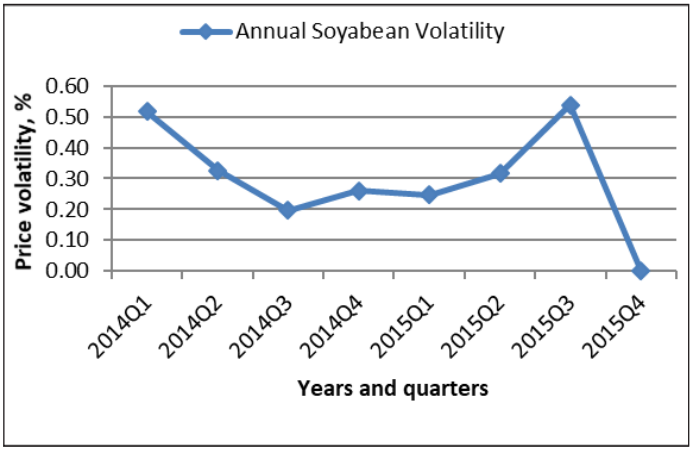

Figure 14. Price volatility of soybean

Source: Adapted from E-soko datasets from 2014-2022

3.3.5.2. Soybeans production, market demand and price fluctuations

Soyabean demand consumption has tremendously increased while the production that showed no increase very recently. The price of soyabean products is governed by the international market change. The average price increased normally up to 2017, and from 2018 is having a steeper increase (figure 15).

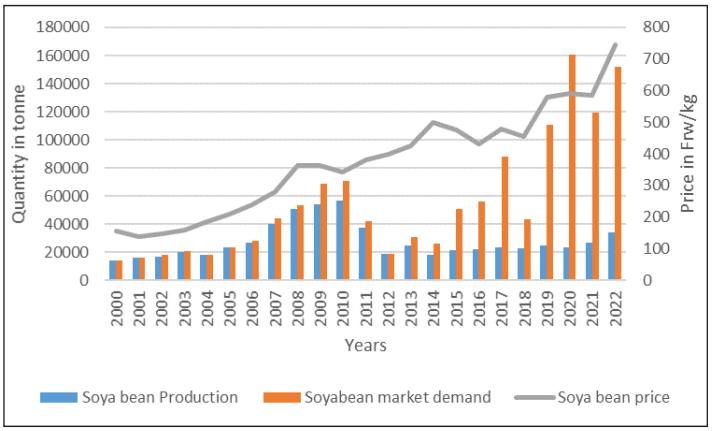

Figure 15. Production, demand, and price of soybean

(Adapted from FAO, NISR and MINICOM data)

The price increases in the last five years could be attributed to the consequence of COVID-19 pandemic and the recent Russia-Ukraine crisis which lead to the fluctuations of global fuel prices. For example, the fuel at filling station in Rwanda costed approximately1055 Frw/litre in 2018 and by 2022 the price had risen to 1600 Frw/litre. These fuel prices fluctuations have directly or indirectly negatively influenced the hiking of food prices in Rwanda.

3.3.5.3. Main causes of price volatility and recommendations in soyabeans

The table 10 below summarizes the causes for price volatility in beans commodity and suggests recommendations.

Table 10. Main causes of price volatility and recommendations in soyabeans

Causes of price volatility /price changes	Recommendations
• Low production vs. market demand (for human consumption and animal feeds) • Price changes in bean value chain are generally seasonality based (dropping at time of harvest and increasing gradually) • Global market dynamics and import tariff on imported soyabean	i. To enhance efforts of soya bean production (irrigation, disease control and other production inputs) to meet the market demand, ii. To strengthen the bean value chain coordination mechanisms for information sharing mechanisms and promote the platforms creation among the actors, iii. To create a market information system to provide pertinent data on prices, stocks, and shock levels to address the dynamics of the global market.

3.3.6. Irish potatoes commodity price volatility

3.3.6.1. Analysis of price volatility in Irish Potatoes

The study found out that, overall, Irish potato prices in Rwanda varied widely from one quarter to another, and that the price is generally volatile. The Irish potatoes market prices ranged from 151 Frw in 2014Q1 to 416 Frw in 2022Q4. The price volatility of Irish potatoes varied widely from 22.3% in 2014Q3 as the highest to 11.8% in 2020Q3 as the lowest indicating that the price was relatively volatile between 2014 and 2022 (Figure 16).

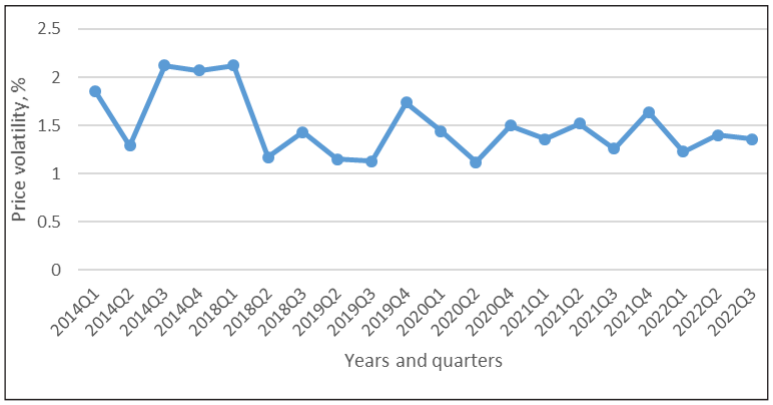

Figure 16. Irish potatoes price volatility

The study results from interviewed producers indicated that 89.9% of the respondents confirmed that Irish potatoes prices have constantly increased, year after year, from 2014 to 2021. In addition, the same respondents indicated a sharp increase of potatoes prices throughout 2022 (figure 17). The 82.2% of interviewed consumers concurred with the producers on the increase of Irish potatoes prices.

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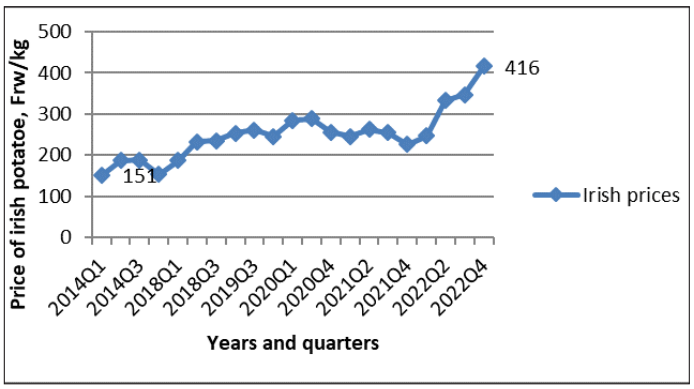

Figure 17. Irish potatoes price changes

In addition, the same respondents indicated a sharp increase of potatoes prices throughout 2022 (figure 17). The 82.2% of interviewed consumers concurred with the producers on the increase of Irish potatoes prices.

Consultations with key informants indicated that the volatility observed in Irish potatoes prices is likely related to the high cost of inputs (fertilizers and pesticides) due to global market dynamics and inflation. Furthermore, key informant interviews revealed that the COVID-19 pandemic and geopolitical conflict (Ukraine-Russia war) have contributed to the increase in input prices which negatively affected the cost of production. Consultations with key stakeholders from district officials stated that some farmers do not use appropriate agronomic practices particularly crop rotation techniques, low use of organic & inorganic fertilizers and pesticides leading to low productivity. In addition, district officials reported that potatoes farmers do not have bargaining power due to the perishability nature of Irish potatoes commodity. This obliges farmers to abruptly sell their produce sooner after harvest.

The study findings noted that 75.4% of interviewed farmers indicated that the cost of labor has drastically increased from 500 Frw to 2000 Frw from 2014 to 2022 and this has led to the high prices of Irish potatoes. Furthermore, the study shows that 35.6% of farmers interviewed revealed that some of their fellow farmers often skip cultivation seasons due to lack of capital and untimely delivery or availability of seeds. The study also noted inappropriate Irish potatoes value-chain coordination leading to price fluctuations.

3.3.6.2. Irish potatoes production, market demand and price fluctuation

The Irish potatoes production has increased steadily from 2000 to 2013. During the same period, the study realized that there was no significant gap between the production and demand (Figure 18). However, from 2014 to 2022, both the production and demand dropped drastically and the gap between the production and demand remained insignificant.

The price fluctuation curve shows a steep price increase from 2015 to 2017 and from 2019 to 2022 where the average price has almost doubled from 232.7 Frw to 446.01 Frw.

Consultations with key stakeholders revealed that the decrease in production from 2013 to 2014 resulted from inefficient Irish potatoes value-chain organization, obsolete varieties used, high cost of production leading to the reduction of the area under potatoes commodity.

Figure 18. Irish potatoes production, market demand and prices *(Adapted from FAO, NISR and MINICOM data)*

3.3.6.3. Main causes of price volatility and recommendations in Irish Potatoes

The main causes of price volatility in Irish potatoes with suggested recommendations are given in the table 11.

Table 11. Main causes of price volatility and recommendations in Irish Potatoes

Causes of price volatility /price changes	Recommendations
• High cost of inputs (fertilizers and pesticides) due to global market dynamics and inflation plus high cost of labour (labor cost drastically increased from 500 to 2000 Frw/day from 2014 to 2022). • Inadequate agronomic practices, particularly crop rotation techniques, low use of organic & inorganic fertilisers and pesticides leading to low productivity. • Low bargaining power of farmers due to the perishability nature of Irish potatoes commodity obliging farmers to abruptly sell their produce sooner after harvest. • Farmers skip cultivation seasons due to lack of capital and untimely delivery or availability of seeds. • Inappropriate Irish potatoes value-chain coordination leading to price fluctuations.	i. To support in-country private investment for agricultural input production (fertilizers and pesticides) to counteract global dynamics, ii. To promote the Irish potatoes production technologies (improved varieties, seeds, agronomic practices, etc.) to increase the productivity, iii. To strengthen the linkages between farmers and micro finance institutions and ensure affordability of the loan interest considering the nature of agricultural business such as seasonality. iv. To strengthen the Irish potatoes value chain coordination mechanisms for information sharing mechanisms and empower the platforms of various actors. v. To strengthen the value addition on Irish potatoes commodities to counteract the perishability challenges (potatoes snack production, cold chains system) vi. To promote contract farming contract farming to countercheck the unpredictability in prices.

3.3.7. cassava commodity price volatility

3.3.7.1. Analysis of price volatility in raw cassava commodity.

The study noticed that the price volatility of raw cassava was lower in 2014Q1 with 0.0% while the highest volatility was registered in 2014Q2 with 3.6% (Figure 19).

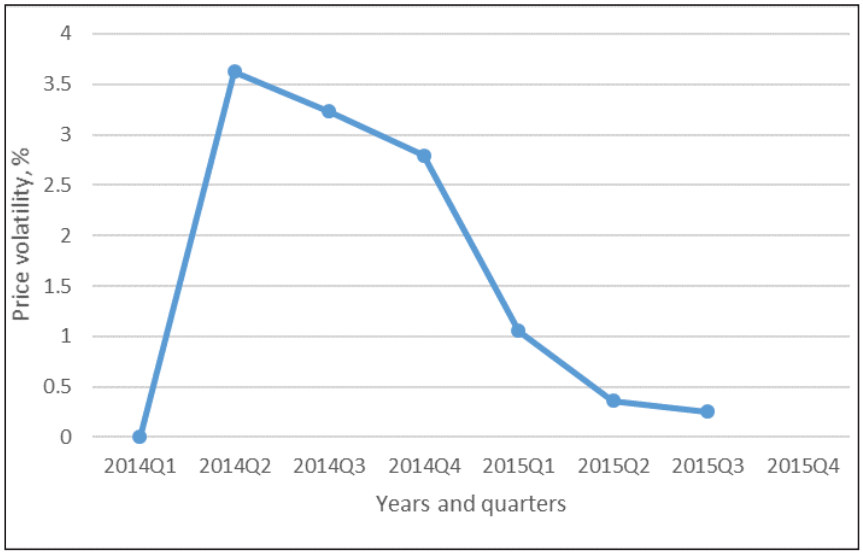

Figure 19. Price volatility of cassava
Source: Adapted from E-soko datasets from 2014-2022

The interview results reveal that 81.7% of consumers confirmed that there has been a relative stability of raw cassava prices. The interviewed traders (96.3%), however, put forth higher price volatility in processed cassava flour. They argued that the volatility observed is likely due to the varieties from which the flour is processed (Imituburano, etc.).

Consultations with key stakeholders indicated that the low volatility observed in raw cassava is likely related to perennial nature of cassava crop. Cassava is harvesting progressively all year through.

3.3.7.2. Cassava production, market demand and price fluctuation

The study noted that between 2000 and 2012, the production and demand continued to almost tally. For example, in 2005 alone, the production was 781639 MT while the demand was 781334 MT exhibiting a minor gap of 305 MT (Figure 20). However, the gap between the production and demand slightly widened from 2013 to 2022.

The study noted that the prices of cassava rose from 76 Frw/kg in 2000 to 400 Frw/kg in 2022, an increase of 557.8 %. The study further found out that there was a relative steep increase of cassava prices from 2002 to 2007 and from 2019 to 2022 with some levels of fluctuations in the remaining years. A steep increase in cassava price was observed between 2020 to 2022, where the price doubled from 200 Frw to 400 Frw.

The price fluctuations were noted where there was a gap between production and demand. The prices fluctuated likely due to occurrence of pests and diseases (CMD and CBD) which have affected production, increased urbanization and change of consumption in dietary habits. The study also noted that the establishment of Kinazi Processing Plant in 2012 could have contributed to the increase of demand in raw cassava and therefore increase of cassava prices.

The study recommends to the GoR to strengthen efforts in cassava production in order to fill gap between the production and demand.

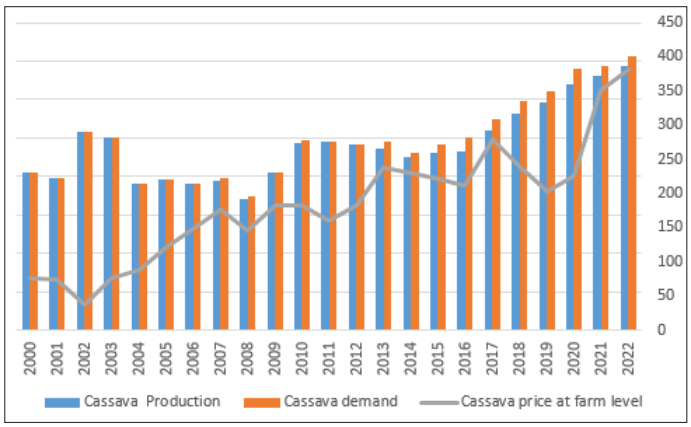

Figure 20. Production, demand and price of Cassava

3.3.7.3. Main causes of price volatility and recommendations for cassava

The main causes of price volatility in cassava commodity with suggested recommendation are given in the table 12.

Table 12. Main causes of price volatility and recommendations in cassava

Causes of price volatility /price changes	Recommendation
• Low maize production due to pests & diseases (CMD, CBD) and periodic climate shocks. • Cassava varieties that do not the consumer preferences (Imituburano,...) • Increased cassava demand and consumption widening the gap between the market demand and internal production	i. To promote cassava varieties that are resistant to pest and diseases, resilient to draught and meet the consumer preferences. ii. GoR to strengthen efforts in cassava production in order to fill the gap between the production and demand.

3.3.8. Milk commodity price volatility

3.3.8.1. Analysis of price volatility in raw milk commodity.

The study noted that the volatility of milk prices was relatively stable from 2018 to 2020. However, a sharp increase in volatility was observed from 2020Q4 to 2022Q4 (Figure, 21). The survey data indicated that 73.5 % of milk consumers affirmed low volatility levels in milk. The 80.1% of traders reported lower volatility of milk while 68.7% of interviewed livestock farmers indicated that the price volatility was relatively stable.

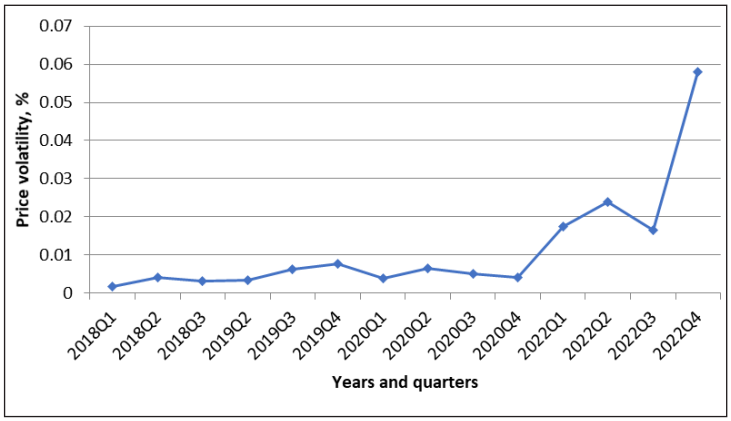

Figure 21. Price volatility of milk

The study noted that the low volatility of milk likely resulted from the GoR supported pricing guidelines. Also, the low volatility in milk was also attributed to the GoR programmes that support the milk production while also promoting local consumption of milk through various programmes (e.g One cup for child and school feeding).

3.3.8.2. Milk production, market demand and price fluctuation

The study observed that milk production has increased together with the milk demand. For example, production and the demand were almost the same in 2000 (107,905 MT, 108,019 MT). In 2021, production (205,371 MT) and the demand (207,306 MT) were also with slight increases as illustrated by figure 22.

The consultations with key stakeholder indicated that the increase of milk production was likely due to GoR efforts to increase milk production through different programmes (Girinka programme, promotion of improved breeds and animal feeds, etc.). Likewise, the study revealed that the milk demand increase was a result of GoR efforts to promote the consumption of milk and milk products (e.g. One cup of milk per child) which has led to the increase of per capita consumption of 37.3 litre in 2010 to 75.3 litre/year in 2021.

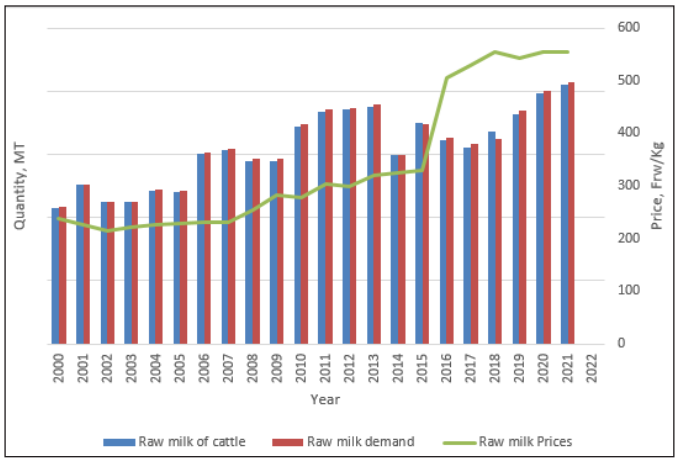

Figure 22. Milk production, market demand and prices
Source: Adapted from E-soko datasets from 2014-2022

The average annual milk price changed slightly with shallow increases between 2000 to 2015. However, from 2015 to 2021, the milk prices steeply increased from 328 Frw/litre to 555 Frw/litre respectively. The consultations with stakeholders indicated that the stability in milk prices from 2000 to 2015 was due to organized milk value chain and GoR efforts in providing guidelines for milk pricing and post-harvest infrastructures development (Milk Collection Centres, Milk cooling machines, cold-chain transport facilities, etc.). However, farmers (63.7%) raised the issues of pricing mechanisms; they argued the pricing scheme does not engage all the milk value chain actors. They further contended that the cost of production is higher than the fixed price and this leads to farmers loss and prioritizing other farm activities. The price increase observed from 2016 to 2018 was due to climate shocks (dry spells) which reduced greatly the production and the GoR decision to increase milk prices.

3.3.8.3. Main causes of price volatility and recommendations for milk

The main causes of price volatility in milk commodity with suggested recommendations are given in the table 13.

Table 13. Main causes of price volatility and recommendations for milk

Causes of price volatility /price changes	Recommendations
Milk pricing mechanism is not fully participatory. The fixed price is less attractive compared to the cost of production of raw milk. This often leads to prioritizing other farm activities by farmers. Low production of milk caused by climatic shocks, diseases, animal production technology, Increase in milk consumption habits.	To support an inclusive pricing mechanism in raw milk value chain, To assess, analyze and revise the existing GoR pricing scheme for agricultural products in order to make it more inclusive to all actors (for example Replicate the farmer gate price setting system of seed to other commodities) To continue and enhance the GoR support for increased milk production through improved animal production technology (breading, animal feeding, animal health, etc) and development of milk post-harvest infrastructure (Milk Collection Centres, Milk cooling machines, cold-chain transport facilities, etc.).

3.3.9. Meat commodity price volatility

3.3.9.1. Analysis of price volatility in meat commodity.

The result from the study provides data on the price volatility of meat in Rwanda over a period of eight years, from 2014Q1 to 2022Q4. The volatility of meat prices has been relatively stable. It ranged from as low as 0.00% in 2017Q4 to as high as 2.66% in 2014Q3. This indicates that the volatility of meat prices has been fluctuating slightly over time, with some quarters showing high volatility.

The results of consumer survey indicated that 79.4% of interviewees affirmed the low price volatility in meat sector. The 81.6 % interviewed traders reported also the low price volatility of meat on the market while livestock farmers approved that there is no volatility. Consultation with key stakeholders indicated that the low volatility observed in meat is likely due to the stability nature of meat supply chain. Slaughterhouses reported that the minor fluctuations exist, and they are due to the annual seasonal festival such as Christmas, easter, new year, Eid al fitr.

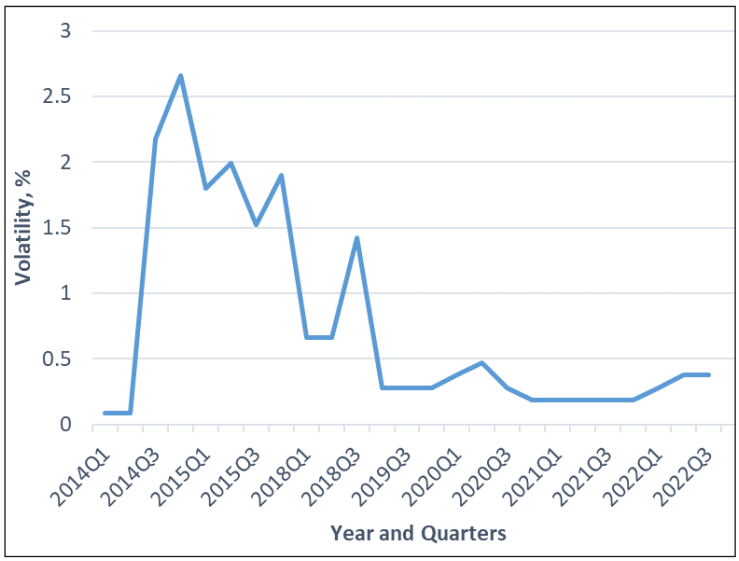

Figure 23. Price volatility of meat

3.3.9.2. Meat production, market demand and price fluctuation

The study found out that the meat production and demand increased at a relatively equal proportion in the last two decades. The study also noticed that the increase in meat production correlate with the increase in livestock population. The increase in the meat demand is likely related to the boom in the service industry (tourism, hotels, restaurant).

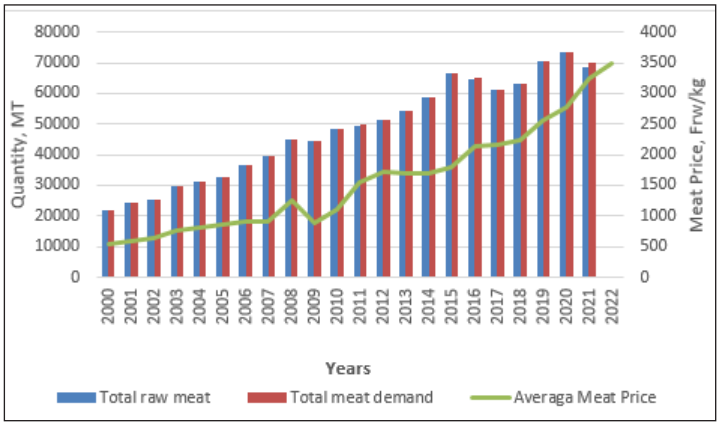

Figure 24. Meat production, market demand and price
(Adapted from FAO, NISR and MINICOM data)

The change in meat prices has been characterized by the steady increase except in the year 2008 to 2009 where a decrease is observed from 1254 Frw/kg to 879 Frw/kg, respectively. Comparatively, a steeper increase of the average meat price was 2227 Frw/kg in 2018 and 3500 Frw/kg in 2022, respectively (Figure 24).

3.3.9.3. Main causes of price volatility and recommendations for meat

The causes of price volatility together with the suggested recommendations in the meat commodity value chain are summarized in table 14.

Table 14. Main causes of price volatility and recommendations for meat

Causes of price volatility /price changes	Recommendations
• Increased meat demand/consumption • Low meat production which does not meet the demand (Whatever is produced it is consumed internally) • Seasonal festivals • High cost of production in meat due to rising of feeds prices, labour, drugs, etc.	i. To strengthen the supply chain of meat and meat products in order to consistently meet the demand which keeps increasing due urbanization, improved livelihoods and changes in food habits. ii. To streamline the production and align it with the seasonal festival demand, iii. To strengthen the GoR efforts in the increase of production through animal production technology (breading, animal feeding, animal health, etc) and development of meat post-harvest infrastructure (Slaughterhouses, cold chain system, etc.).

3.3.10. Egg commodity price volatility

3.3.10.1. Eggs production, market demand and price fluctuation

The study revealed that the egg production and demand were trending on equal pace from 2000 to 2013 (figure 25). However, from 2014 to 2021, the egg production and demand almost doubled compared to previous years. The increase in egg production was a result of GoR efforts through promotion of improved chicken breeds, chicken feeds and insurance scheme.

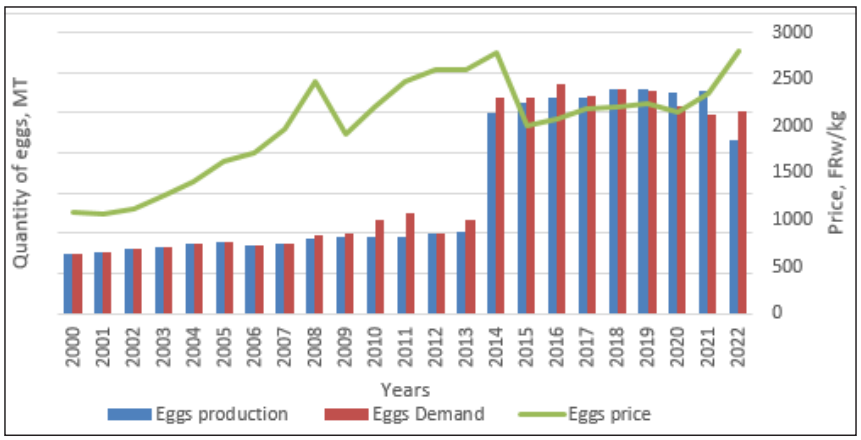

Figure 25. Eggs production, market demand and prices

The market demand for eggs was concurrently increasing with the egg production due to GoR efforts to promote nutritious diets among the children through "one egg per child programme". The study noticed also an increased demand which resulted from cross-border trade between Rwanda and DRC. For example, between 2013 and 2022, exports of eggs registered an increase from 166.6 MT to 1086.6 MT.

The study revealed that the egg prices gradually increased from 2002 to 2014, 2009 to 2014 and 2020 to 2022, respectively. The increase in egg prices resulted likely from low production while the decrease in prices from 2014 to 2015 was likely influenced by the production increase which doubled in the same period.

3.3.10.2. Main causes of price volatility and recommendations for eggs

The causes of price volatility together with the suggested recommendations in the eggs commodity value chain are summarized in table 15.

Table 15. Main causes of price volatility and recommendations for eggs

Causes of price volatility /price changes	Recommendations
• Low egg production compared to the demand. • Increase in consumption habit, • High cost of egg production inputs mainly chicken feeds,	i. To increase egg production through strengthen efforts in portion of improved chicken breeds, chicken feeds and insurance scheme. ii. Increase the production of raw material for animal feed (maize and soyabean) and ensure the availability of other animal feeds ingredients (leftover of fish, seashells, sunflower cakes, vitamins, etc.)

3.4. Effects of middlemen in the agricultural products value chain

The middlemen are the business agents playing the role to link the farmers to traders and final markets in the commodity value chain. Despite their role, farmers tend to lose out to middlemen who extract the most profit from the produce. In commodity value chains where middlemen are active, farmers often have weak bargaining power to negotiate attractive prices for the produce. The weak bargaining power stems from a lack of outside options (in terms of buyers), market knowledge and information, lack of patience, high transport cost and the perishable nature of the commodity.

The volatility study categorized four types of middlemen. The first category comprises of people buying the pre-harvest plantation (Abotsi), the second category includes brokers/commissioners who link the farmers with traders, the third category is constituted by traders who buy the produce and take it to the other markets while the fourth categories are businessmen who buy the produce from farmers and hoard it for later sales.

The interviewed maize, beans and Irish potatoes farmers affirmed working with middlemen and argued that they face several risks. The most significant risks cited are (i) the lack of financial means to cater for the family needs and/or to maintain the plantation, (ii) the middlemen threatening to abandon farmers locality in favour of more profitable localities, (iii) the risk of not being able to sell the produce due to perishable nature of commodity, (iv) the risk of delay in the next season and (v) the risk of oversupply of farm produce.

In addition to these risks, farmers reported that transport and storage infrastructures are often lacking or costly particularly for rural farmers.

The study found that the exploitative middlemen dominating markets have a negative impact on the income of farmers and disincentivize farmer production. Therefore, the study suggests the establishment of Community based food/grain reserves where actors share responsibility and benefits.

3.4.1. Community based food / grain reserve (CBG/FR)

The government of Rwanda through the MINAGRI initiated the national strategic grain reserve with mandate to ensure national food security, mitigate the impacts of potential shocks to the food supply, and reduce malnutrition and hunger among the population, while avoiding market distortion. Since the establishment of national strategic grain reserve, grains of different crop were collected from big farmers / cooperatives and stored in the national grain reserve to assist during the acute food emergencies period or significant shortfall in production causing rampant inflation in staple food prices. However, the study noticed an inadequate linkage between smallholder farmers and the national grain reserve. In some cases, the national strategic grain reserve was supplied by middlemen who took a big share to farmer's produce leading to low income of small holder farmers. Hence, this study recommends to establish the community based grain /food reserve which can be used to release food to the local markets to stabilize the market price in their proximity and in the country to avoid the middlemen's exploitation. Farmer, farmer's groups, farmer associations, and community-based organizations can support storage activities within their village that ultimately creates complementarities between the national grain reserve and community food /grain reserve. This model will substantially increase the bargaining power for rural communities and reduce the price volatility. Farmers

will be given coupons representing individual farmers' stocks. These coupons can be used by farmers to access loans that would reduce the predations of exploitative middlemen prevailing during the harvesting time.

Currently, there is no CBG/FR operating model; nevertheless, private storages have been established by private individuals/traders located in villages. Since the CBG/FR approach aims to build a strong grain/food reserve system, all potential stakeholders involved in production of the commodity value chain in the village will be encouraged to become the CBG/FR members. These include farmers, group, association, cooperatives, agro dealer, rural grain trader, rural grain transporter and financial institution etc.

The CBG/FR will have internal rule and regulations that will govern its functioning. In this line, the CBG/FR members will elect their representatives who, in turn, will put in place a steering committee in charge of the day to day management and other urgent matter. All the members of the CBG/FR will meet at the beginning and at the end of the season to discuss on the preparation of the season within the village; the storage facility need and status, market availability and opportunities and the linkages with the proximity financial institution for the smooth implementation of seasonal activities.

3.5. Analysis of policies and programmes on Price volatility in Rwanda

The Rwandan government has implemented a range of agricultural policies aimed at reducing price volatility in the agricultural and livestock sectors. These policies are designed to increase productivity, improve market efficiency, and promote value addition, all of which can help to stabilize prices and reduce the impact of price volatility on farmers and consumers.

Some of the key policies implemented by the Rwandan government to address price volatility in the agricultural and livestock sectors include Land use consolidation policy (2007), National agricultural policy (2010, revised in 2018), National food and Nutrition policy (2013) and Rwanda Trade Policy (2010). Different strategic documents were also developed to implement the policies. These include NST1, PSTAs, Vision 2050, etc. These policies and strategies are designed to improve the resilience of the agricultural sector, reduce the impact of price shocks, and promote sustainable development.

From the strategic documents, Rwanda has put in place many programmes such as

- Crop Intensification Programme (CIP) (input subsidy, insurance scheme, Strategic grain reserve, infrastructure development)
- Livestock Intensification Programme (Girinka, AI, Small stock program, insurance) scheme)

3.5.1. Effect of CIP on the price volatility

The Crop Intensification Programme (CIP) continues to be the main driver of crop production for ensuring food security and self-sufficiency. This program was designed around three pillars

notably land use consolidation, proximity advisory services and use of improved inputs (seeds, inorganic fertilizers).

Through this programme, subsidized inorganic fertilizers, maize, wheat, and soybean improved seeds were distributed to farmers across the country. This has led to increased agricultural production and productivity and production area to meet needed market demand, thus contributing to the stability of prices volatility (figure 26).

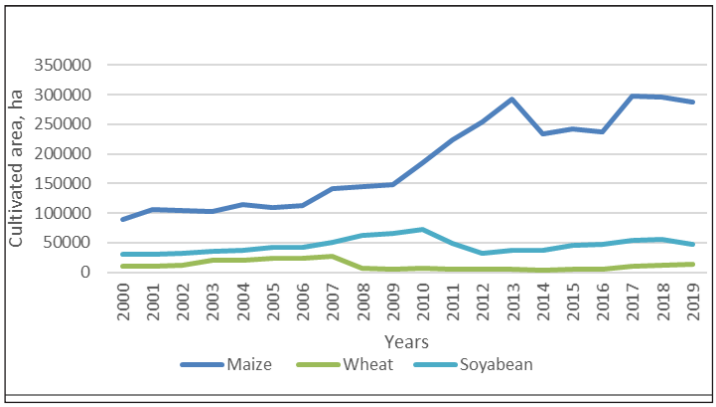

Figure 26. Contribution of CIP to the increase of consolidated area
(Adapted from FAO, data)

These efforts have had an in increasing the production of various crops, but the bar is still low from filling the demand gap. The price increases as is noticed despite the subsidies, the price would be much instable without subsidies and farmers would be more constrained.

To ensure national food security, lessen the effects of possible seasonal shocks to the food supply, and decrease malnutrition and hunger among the population while preventing market distortion the strategic grain reserve was put in place in 2009 under CIP Programme. The underlying logic was the fact that the Government had to be prepared to protect the poor and vulnerable at time of scarcity of staple foods. As a result, the Rwandan government decided to invest in the construction of modern storage facilities through MINAGRI to support the provision of effective and affordable storage solutions for food grains in the nation and thus reduce post-harvest losses. Seasonality was ranked as the second causes of price fluctuation and the rate of 16%, while in case of frequency of price changes. In many seasonal commodities, the prices reduce at time of harvest and increase at time of planting season causing price fluctuation.

3.5.2. Effect of Livestock Intensification programme on price volatility

The Livestock Intensification Programme (LIP) is the main driver of livestock production for ensuring food security and self-sufficiency in animal products. This program has contributed to the increase of livestock production, Artificial Insemination, small livestock distribution to farmers, and insurance schemes for cattle, pigs and poultry.

This has led to increased agricultural production and productivity to meet needed market demand, thus contributing to the stability of prices volatility.

The program has contributed to an increase in livestock production in Rwanda - especially milk production and products, reduced malnutrition, and increased incomes. For example, Girinka Program increases livelihoods through increasing milk consumption and income production while reducing poverty through dairy cattle husbandry. In this program, from its inception in 2007 up to end June 2022, Girinka program has provided 427,576 cows to 427,576 Rwandan poor families (Minagri, 2022). Moreover, effort was made to increase the number of small livestock population such as poultry, pigs, goat and rabbit. The number of heads of animal both cattle and small livestock has increased (Figure 27). The increase of the livestock for milk, eggs

and meat production have had an accompanying production of these livestock products.

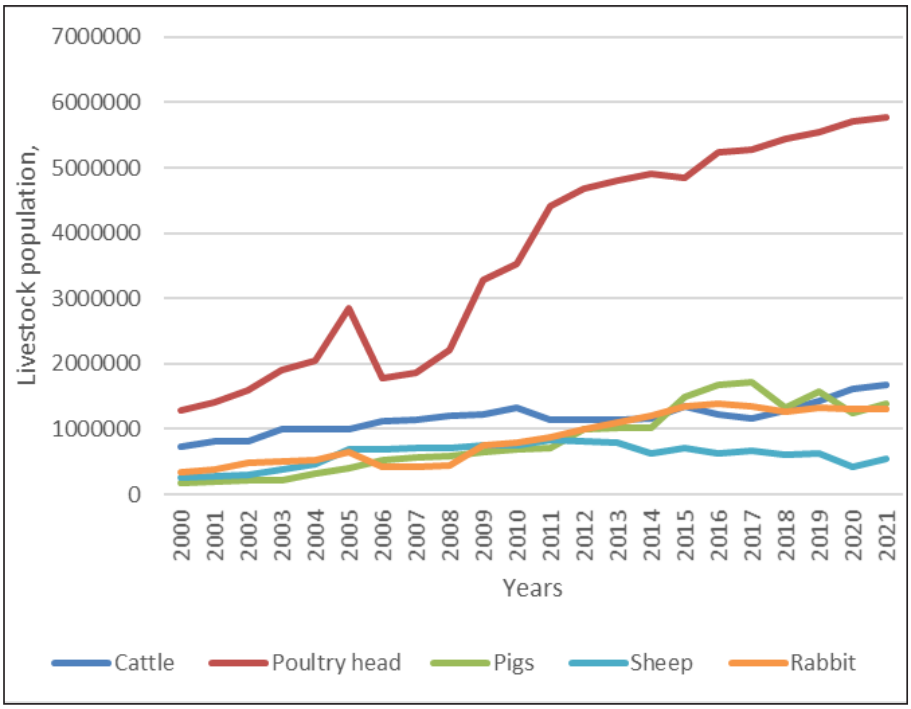

Figure 27. Contribution of LIP to the increase in livestock population
(Adapted from FAO, data)

3.6. Price regulations and consumer protection rights

The Government of Rwanda has put in place various institutions and policies and implementation modalities to protect and promote interests of consumer rights and ensuring healthy and competitive business environment. In line with the Rwanda long-term development blueprint (Vision 2050) that sets out the country's target of achieving upper-middle-income status by 2035 and high-income status by 2050 and the country seven years program (NST1 2017-2024) which also transform agriculture from substance to commercial farming and other sector specific policies, a remarkable progress translated into improved wellbeing of citizen has been recorded [12].

3.6.1. Pricing Framework under Competition and Consumer protection Policy and Law

The first competition and consumer protection policy was adopted in 2010 by the Ministry of Trade and Industry (MINICOM) to set Rwanda on a path to modernise its legislative and regulatory framework for trade and investment, with the aim of fostering a modern and competitive private sector. The policy was developed with the aim of transforming Rwanda's economy into a private sector stirred country towards

12 The the Republic of Rwanda 7 Years Government Programme: National Strategy for Transformation (NST 1) 2017 – 2024, also available at the link: https://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database//NST1_7YGP_Final.pdf lastly accessed on 3rd May 2023.

the realisation of the long-term socio-economic development strategy (Vision 2020/2050).

The policy was also formulated to contribute to the wider government Economic Development and Poverty Reduction Strategy (EDPRS) by strengthening the policy, institutional and legal framework under which the private sector operates. The policy which is still in force provides for a wider vision of incorporating the interests of consumers, emerging entrepreneurs and existing firms through the promotion of free and active competition in Rwandan markets; protecting the ability of cooperation to penetrate international markets as well as allowing foreign investors to do business in Rwanda.[13]

The policy envisioned enactment of a clear competition legal framework as well as options for institutional architecture. In that vein, law n° 36/2012 of 21/09/2012 on competition and consumer protection was enacted. The law aims at encouraging competition in the economy by prohibiting practices that may undermine normal and fair competition. It is also meant to ensure the promotion and protection of consumer rights [14].

Additionally, and in the spirit of establishing a supportive institutional framework, article 5 of the law provided for the establishment of a dedicated agency to administer competition and consumer protection matters. As such, law N° 31/2017 of 25/07/2017 establishing the Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA) and determining its mission, organization and functioning was enacted. RICA's establishment was in line with the broad policy ambitions and responding to several regulatory obligations under the East African Community Competition Act, 2006 as amended.

Overall, the policy helped in improving trade environment and attracting foreign direct investment, providing consumers with wide variety of choices as well as establishing a supportive legal and institutional framework. Nevertheless, the policy objectives were confined to vision 2020 and its seven years implementation strategy EDPRS1 which was recently replaced by 2050 and NTS1 respectively hence the need for policy review.

The policy played a vital role in improving Rwanda's position in the World Bank ease doing business index. Currently Rwanda ranks best in East Africa, second in Africa and among only two African countries alongside Mauritius ranked among the top 50 globally [15]. It is important to underscore that the policy aligned to the previous long-term development strategy (Vision 2020) and accordingly helped in the realization of the strategic objectives under it.

The Government of Rwanda understood that both regional and international cooperation in trade and development among others is pertinent to promote competition and consumer protection, hence Rwanda joined regional economic blocks including COMESA and the EAC.

The country has also signed and ratified the agreement establishing the Africa Continental Free Trade Area (AfCFTA) under which the protocol on competition will be adopted. The AfCFTA Competition protocol is expected to play a vital role in the realisation of Vision 2050 objectives including attaining Upper-Middle Income Country (UMIC) by 2035, and a High-Income Country (HIC) by 2050. The protocol is also aligned with Africa's Agenda 2063, EAC's Vision 2050 and Agenda 2030 of the Sustainable Development Goals (SDGs).[16]

13 USANASE Aimee, institutional framework for consumers in Rwanda, University of Rwanda, published

14 Ministry of Trade and Industry, Rwanda, Competition and Consumer Protection policy, 2010, Kigali, July 2010 also available on https://www.minicom.gov.rw/fileadmin/user_upload/Minicom/Publications/Policies/CompetitionPolicy_September_2010-3.pdf lastly accessed on 3rd May 2023..

15 World Bank Doing Business Report, 2022

16 Rwanda Vision 2050

3.6.2. Commodities Pricing under Competition and Consumer Protection Policy

Since 1995, Rwanda started reforms geared at modernizing trade, investment and industrial development with the aim of fostering a modern and competitive private sector. Several policies and laws including the competition and consumer protection policy 2010 and the law 2012 as well as the law n° 35/91 of 5th august 1991 governing the organisation of internal trade (o.g. 1991, p 1138) modified and supplemented by law n°15/2001 of 28/01/2001 (o.g. nº 3 of 1/2/2001 were adopted to ensure that the economy is fully liberalized. The competition and consumer protection law prohibits any practice that may restrict competition and do not leave any room for any government entity to set prices of commodities. Furthermore, the aricle 3 of the law n° 35/91 of 5th august 1991 governing the organisation of internal trade (o.g. 1991, p 1138) modified and supplemented by law n°15/2001 of 28/01/2001 (e.g. nº 3 of 1/2/2001 clearly stipulate that pricing of good and services is determined by free market competition "Except where there is proof of trade malpractices, as stipulated in article 4, the pricing of goods and services shall be regulated by the free market competition" [17].

On the other hand, article 4 of the afore-mentioned law gives the Minister holding internal trade in his responsibility to intervene in the distribution channels of goods and services where trade malpractices are discovered on the market and the article limits his/her competence to few interventions including fixing the prices of commodities by a Ministerial Decree.

Consumer protection laws in Rwanda are not directly related to agriculture commodity price volatility. When agriculture commodity prices are volatile, consumers may be affected in several ways. For example, if the price of staple foods such as rice or maize rises sharply, consumers find it difficult to afford these items, and are negatively impacted on their standard of living. Additionally, in some cases, unscrupulous suppliers may take advantage of price volatility to engage in fraudulent or deceptive practices, such as mislabeling or adulterating products.

Some of the key consumer protection laws in Rwanda include:

- Law No. 03/2012 of 13/02/2012 related to competition and Consumer Protection establishing the rights and responsibilities of consumers and suppliers, including provisions for product safety, advertising and labeling standards, and the protection of consumer interests,
- law n° 35/91 of 5th august 1991 governing the organisation of internal trade (o.g. 1991, p 1138) modified and supplemented by law n°15/2001 of 28/01/2001 (o.g. nº 3 of 1/2/2001
- Law No. 12/2012 of 21/05/2012 on Food and Pharmaceuticals regulating the production, distribution, and sale of food and pharmaceuticals products in Rwanda, including standards for packaging, labeling, and advertising.
- Law No. 35/2016 of 08/09/2016 on Product Liability establishing liability for manufacturers, importers, and sellers for harm caused by defective products.
- Ministerial Order No. 10/03 of 21/06/2017 regulating prices of goods and services: This order provides guidelines for setting prices of goods and services in Rwanda. It requires suppliers to use transparent and fair pricing mechanisms and prohibits price fixing, price collusion, and other anti-competitive practices.
- Ministerial Order No. 01/2014 of 23/01/2014 determining the margin of

17 Article 3 of the law n° 35/91 of 5th August 1991 governing the organization of internal trade (o.g. 1991, p 1138) modified and supplemented by law n°15/2001 of 28/01/2001 (o.g. nº 3 of 1/2/2001

benefit for distributors of pharmaceutical products: This order sets the maximum margin of benefit that pharmaceutical distributors can charge for their products in Rwanda. The margin is determined based on the cost of the product and is aimed at ensuring that pharmaceuticals are affordable for consumers.

3.6.3. Food price increases in the Regions

The study noticed that the price increases exacerbated from the year 2020. This situation is not an isolated case of Rwanda. In the East African country, a similar trend was observed. As example the comparison in dome for the year 2022 using the food inflation.

In Rwanda all the price changes are congruent observed are with the consumer price index and the food inflation. NISR, 2022 reported that the urban CPI increased by 21.6 percent on annual basis (December 2022 and December 2021) while rural CPI increased by 39.2 percent on annual basis and decreased by 2.5 percent on monthly basis. The annual average inflation rate between December 2022 and December 2021 was 13.9 percent. The CPI for food and non-alcoholic beverages increases from 143.9% in January 2022 to 218.6% in December 2022 (Figure 28)[18].

In the region the situation in similar trend with then price increase mainly of food items. Living expenses in Eastern Africa are more expensive in comparison to previous years. With food inflation averaging 27.2 percent in Eastern Africa, the cost of living for households is rising as a result of rising food costs in 2022. The food increase in price twelve-month food inflation (food and non-alcoholic beverages) was 6.3 % in Tanzania, 10 to 50 percent above previous year in Burundi[19].

- According to the "Institut des Etudes Statistiques du Burundi" the Consumer Price Index has increased by 30 percent from July 2021 to July 2022. This increase was only of 14.8% in the previous years. Annual inflation of +18.9% is due to food prices which increased by 24.5%, mainly:
- Breads and cereals contributed to the increase of 36.5%, consisting mainly of rice and corn, up 44.5% and 30.8% respectively.
- Oils and fats contributed to the increase of 33.0%, composed mainly of palm oil, up 33.0%.
- Vegetables contributed to the rise of 19.3%, consisting mainly of dried beans, cassava flour and fresh tubers, up 20.4%, 17.6% and 18.6% respectively.[20]

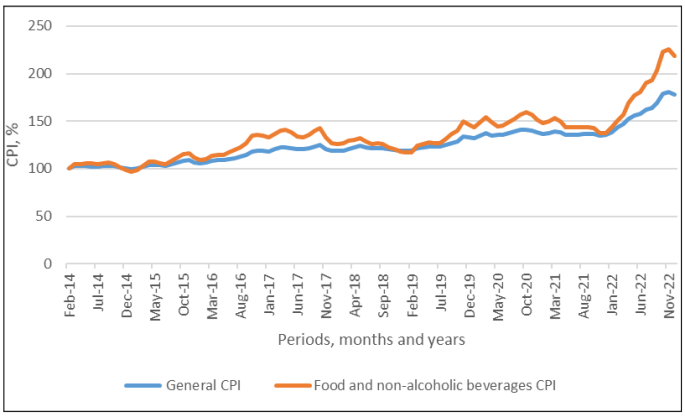

Figure 28. Consumer price index in Rwanda from 2014 to 2022
(NISR data)

In Uganda, the Inflation as measured by the Consumer Price Index for Uganda for 12 months to May 2022 increased to 6.3 percent, up from 4.9 percent registered in April 2022. This was mainly driven by the increases in the prices of commodities under; 'Food and Non-Alcoholic

18 NISR, 2023, Consumer Price Index (CPI) December 2022
19 Eastern Africa Market and Trade Update - 2022 Q4, January 2023https://reliefweb.int/report/burundi/eastern-africa-market-and-trade-update-2022-q4-january-2023
20 https://www.insbu.bi/?p=265

Beverages' (11.0 percent)[21]. The cost of food has increased the most, with inflation rate of 25.6%. Above-average prices were recorded in all markets, with prices of beans, maize, and cassava increased by 11 to 30 percent from August to September 2022. Prices in September remain above the five-year average, driven by 3 consecutive seasons of below-average crop production and high transportation and fuel costs. Inflation has increased rapidly in 2022, reaching 10.7% in October.[22]. Similar trend was observed in Kenya where annual food inflation was at 13.8 percent in December 2022; staple food prices in monitored markets remain unseasonably high, driven by four successive below-average production seasons, high fuel and transportation costs, high local demand, and reduced cross-border imports from Uganda and Tanzania. In December 2022, dry maize grain prices ranged from 35-140 percent above the five-year average, with most monitored markets reporting prices around 70 to 100 percent above the five-year average.

In Tanzania, the year 2022 showed a comparatively stable food price. The exchange rate, coupled with fuel subsidies, helped contain consumer price inflation to just 4.8%, well below the regional average of 10%. Even though global food prices rose due to severe drought which damaged domestic food production, pushing cumulative food-price inflation to only 6.6% during the first nine months of 2022[23].

Countries under shock due to abrupt price increase can undertake some interventions such as (i) price control, (ii)source for import of food items of prime necessity, (iii) reducing taxes and tariffs (in some cases) to lower domestic prices, short-term food, (iv) cash transfers to preserve purchasing power of the most vulnerable.

3.6.4. Price regulation in other countries and its effects

The 2010 study by Karugia et al, (2010) found that domestic prices in East African countries were more volatile than the corresponding global prices. These findings are corroborated by Minot, (2010) who found that food prices were much more volatile in Sub-Saharan Africa than in other regions and much more volatile than commodity prices on international markets.

Governments around the world may consider implementing price controls on agriculture and livestock commodities for several reasons: Food security and affordability, Income redistribution and poverty alleviation, Market stability and volatility management, Political and social stability and Strategic national interests. While price controls may be implemented with good intentions, their effectiveness, and potential unintended consequences should be carefully evaluated. Balancing the objectives of affordability, market efficiency, and the long-term sustainability of the agricultural and livestock sectors is crucial for governments when considering price control policies.

Many countries attempt control the prices the petroleum product and food and beverages top the list of the targeted product. There is greater diversity in the approaches taken by different countries for price controls on food and beverages. Among these controls, dairy products such as milk, butter, and cream, along with rice, are the most regulated commodities, with a higher number of countries implementing price controls on these items. Experience in price regulation by different and the results under various studies are summarized below.

Price Controls in Kenya: Price Control (Essential Goods) Bill of 2009 aimed to establish a parliamentary act that mandated the control of prices for essential goods and related purposes. This involved setting maximum retail and wholesale prices for ten specific goods: maize, maize flour,

21 UBOS, 2022.
22 https://erccportal.jrc.ec.europa.eu/ECHO-Products/Echo-Flash#/daily-flash-archive/4663
23 The WB in Tanzania, https://www.worldbank.org/en/country/tanzania/overview

wheat, wheat flour, rice, cooking fat (or oil), sugar, paraffin, diesel, and petrol. The Bill stated that the forces of supply and demand had been unable to lower the prices of these goods, necessitating the need for price control to safeguard the public from exploitative and unethical business practices.

The rationale behind this legislation was the belief that market forces of supply and demand were unable to effectively lower the prices of these goods, leading to concerns about exploitative and unethical business practices. The intention was to protect the public from such practices and mitigate the impact of food scarcity experienced by ordinary citizens.

Based on Kenya's Price Control (Essential Goods) Bill of 2009, it is important for a price regulator in Rwanda to carefully analyze the outcomes and implications of the Price Control (Essential Goods) Bill in Kenya. By examining the effectiveness and challenges associated with implementing price controls on essential commodities, regulators can gain valuable insights and make informed decisions.

The price control act showed its long-term weaknesses, given the persistent commodity price volatility in Kenya, policy options to deal with price volatility even to regulated commodities. These include supply response stimulating programmes such as governments buying surplus as buffer stock at competitive prices; input subsidy programmes; food for work programmes targeted to the poor working in agriculture; and establishing market information systems to avail better information about prices and stock levels.

Price Control in India: In 2006, India implemented direct price controls on 354 drugs with the aim of reducing their prices. However, reports suggest that this objective was not achieved. According to the Financial Express in August 2006, drugs that came under price control either disappeared from companies' product lists or were outsourced to subcontractors. The sustained decrease in prices enforced by the regulatory body led to many manufacturers exiting production, resulting in the government having to rely on expensive imports. Additionally, established players ceased manufacturing drugs for serious diseases like TB and Malaria. The report also highlighted that the imposition of price controls contributed to an increase in counterfeit drugs and a rise in the seizure of sub-standard anti-TB products in India.

Observers argue that to position India as a global hub for drug manufacturing and research, the government should encourage competition, remove control measures, and implement price monitoring mechanisms. They contend that the price controls have clearly failed to achieve their intended objectives.

Price Controls in Ghana: The Ghanaian government implemented the "1962 Control of Prices Act" to enforce price and quantity restrictions on 2,800 selected consumer products. This measure aimed to serve as a social policy instrument, protecting the interests of the poor and reducing income inequality by preventing importers and local manufacturers from earning excessive profits. The controlled products included items such as vehicle spare parts, tobacco, salt, tires, flour, imported rice, sugar, sardines, corned beef, oats, soap, matches, evaporated milk, butter, margarine, tea, instant coffee, aluminum corrugated sheets, textiles, liquid gas, spirits, batteries, and cement.

However, according to Killick (1973)[24], these price controls proved largely ineffective. The controlled prices tended to rise almost as quickly as the actual market prices. This occurred due to periodic upward adjustments made by controllers who faced pressure from larger trading companies and had to respond to changing local and international market conditions. Killick (1973) also observed that the price controls resulted in shortages and opened doors for corruption and other fraudulent activities. Overall,

24 Killick, T. (1973). Price controls in Africa: the Ghanaian experience. *The Journal of Modern African Studies, 11(3), 405-426.*

the controls were mostly disregarded and only a few shops in rural and urban areas adhered to them. Eventually, the controls were abandoned in the early 1970s. It becomes evident that the implementation of price controls through the "1962 Control of Prices Act" in Ghana did not yield the desired outcomes. The objective of protecting the interests of the poor and reducing income inequality by preventing excessive profits from importers and local manufacturers were not effectively achieved. This was due to periodic adjustments made by controllers who faced pressure from larger trading companies and had to respond to changing market conditions. The price controls also led to shortages and created opportunities for corruption and fraudulent practices.

Price Control in Tanzania: The Regulation of Prices Act of 1973 established a comprehensive system of price controls in Tanzania. Before the act, price controls were limited to a small number of essential items in urban areas, such as beer, matches, sugar, beans, rice, wheat and maize flour, bread, grey sheeting, and khanga, a popular clothing material. However, by May 1973, the number of items subject to price controls had expanded to four hundred. The timing of the act was likely influenced by various factors. The Arusha Declaration in 1967 led to increased economic regulation, including the nationalization of rental housing, the implementation of a highly progressive income tax, and the consolidation of the rural population in villages.

The results of the Regulation of Prices Act of 1973 in Tanzania showed the successes (Protection of low-income groups, limiting monopoly pricing power) but also the failures (macroeconomic shocks and economic imbalances, reduced incentives to produce, market-oriented development approach).

Potential impacts and unintended consequences of price controls on agriculture and livestock commodities

Implementing price controls on agriculture and livestock commodities can have various impacts and unintended consequences. Here are some insights into their potential effects: reduced investment and innovation, supply chain disruptions, market inefficiencies and black-market activities, disincentives for production, impact on small-scale producers, Market distortions and unintended consequences. While price controls may aim to address affordability and income distribution concerns, they have significant implications for the agricultural and livestock sectors. Regulators need to weigh the intended benefits against the potential negative consequences to ensure that the desired objectives are effectively achieved.

Price control can be used a short-term intervention while on the long run the efficient and competitive productions should be put forwards.

CHAPTER 4. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

4.1.1. Price volatility of agriculture and livestock commodities is common phenomenon in Rwanda.

The study noted that agricultural and livestock commodities prices fluctuates over time for all commodities. The study also found out that some commodities such as rice, irish potatoes, bean and eggs are characterized by higher price volatility. Other commodities showed relatively low-price volatility. The survey results from respondents (consumers, traders, producers) affirmed the low and higher price volatility nature of agricultural and livestock commodities. Majority of respondents reported that there is a general disequilibrium between demand and supply of agricultural and livestock commodities. This imbalance between demand and supply is likely the main cause of price volatility and affect producers and consumers.

4.1.2. There are inadequate farm gate price establishment mechanisms

The agricultural commodities considered under this study are produced nationwide in different agro-ecological zones. Each agro-ecological zone has its own specificities in terms of commodity production climate, soil characteristics, labour and access to the market. All these factors affect the cost of production of agricultural and livestock commodities. The study found out that the pricing mechanism in place does not take into consideration the specific factors of production cost. Majority of producers interviewed revealed that the inadequate farm gate pricing mechanism prevails and make them vulnerable to the price volatility.

4.1.3. Low productivity has a negative impact on price volatility.

The availability and use of agricultural technologies plays an important role to increase the production of agricultural and livestock commodities and improve its quality. The study noted that the production of agricultural and livestock commodities under consideration was affected by low use of agricultural production technologies. For example, the price of locally produced rice is volatile and often influenced by the imported Asian and Tanzanian rice as a result of inadequate technology used.

4.1.4. Commodity Value chain organization impacts the price volatility.

The commodity values chain organization plays a big role in linking different actors across the value chain and helps to share equitably benefits among the value chain actors. The study realized that for some commodities such as Irish

potatoes and maize experience high volatility as a results of inefficient value chain organization. The interviewed producers and traders affirmed that the presence of middlemen in the value chain causes high price fluctuation that affects the affordability of these commodities for the consumers.

4.2. General recommendations

i. Establish the Community based food / grain reserves (CBF/GR)

This study recommends to establish the community based grain/food reserve to store food/ grains and release them the local markets to stabilize the market price in their proximity and in the country as a whole to avoid the middlemen's exploitation. Farmer, farmer's groups, farmer associations, and community-based organizations will support storage activities that will ultimately link these community food / grain reserves to the markets and/or the national grain reserve. This model will substantially increase the bargaining power for rural communities and reduce the price volatility. Farmers will be given coupons representing individual farmers' stocks. These coupons can be used by farmers to access loans that would reduce the predations of exploitative middlemen prevailing during the harvesting time.

ii. To strengthen efforts to increase productivity for all commodities through irrigation, disease control and other production inputs to meet the demand:

Given the variety of conditions, climate shocks, diseases, pests, and the requirement for a sustainable use of natural resources, it is crucial to achieve a significant increase in agricultural production and productivity to meet the market demand that is always increasing.

iii. To create a more effective national governance on prices of agriculture and livestock commodity:

More transparency on the agricultural commodity stocks and better access to information on markets, business transactions of agricultural products, etc. would reduce excessive volatility. It would also help avoid counterproductive decisions by policy makers and market participants. It is therefore urgent to (i) develop information-sharing tools and a network of key players to improve the availability and access to existing data and market-relevant information at the national level; (ii)strengthen data collection and analytical capacities as well as dissemination networks; (iii) analyze price transmission mechanisms across the country to better understand linkages within domestic markets and mitigate negative consequences of external volatility through risk management tools.

iv. Promote regional integration and improve the business environment:

The GoR should increase efforts to support the building of well-functioning regional markets for agriculture and livestock commodity to open intra-regional trade opportunities and better connect farmers to the market.

v. To develop effective alert systems

The GoR needs to pursue the setting up of alert system for producers and consumers and be prepared to act before the crisis starts to respond timely. National information-sharing initiatives such as the e-soko would need stronger support

not only to provide commodity prices but also to predict the price trends. The sharing of e-soko information could be, also, enhanced to reach more audience and help in business decision making.

4.3. Specific recommendations

The recommendation addressed to various value chains actors are summarized in Table 16 below.

Table 16. Challenges and recommendations for different actors.

Sno	Actors	Challenge to over-come	Recommendation
1	MINICOM	Pricing policies for agri-cultural commodities are not value-chains inclu-sive. Presence of malpractices by business actors and middlemen	To review and enforce government policies and strate-gies that stabilize prices. To engage commodity value-chain actors, particular-ly private sector, and platforms in commodity pricing schemes. To predict price fluctuations and plan for timely reme-dies to fill the gap (where to sources imports). To elaborate and enforce regulations to prevent the malpractices.
2	MINAGRI	Insufficient buffer stocks and district grain re-serves Low private sector invest-ment in agriculture pro-duction and processing	To introduce and support community-based food/grain reserves. To strengthen grain buffer stocks to prevent price vola-tility. To support private investment engagement in the agri-culture sector particularly in storage and value addition
3	MINECOFIN	Agriculture sector is underfunded vis-à-vis Malabo agreement.	To comply with Malabo Declaration on accelerated Agri-culture Growth which sets a minimum budget for agricul-ture sector (10% of national budget).
4	RAB	Low agriculture produc-tion vs market demand	To continue supporting agriculture production through improved technologies and development of post-harvest infrastructures both for crops and livestock commodi-ties.
5	BNR	Low farmer access to financial credits/loans	Review financial regulations to make loan rates afford-able for farmers.
6	RRA	Relatively high import tariffs for rice, wheat, and soybean	To continue reviewing the import and export tariffs that promote agriculture development and consumer access to basic food
7	RICA	Presence of malpractices by business actors and middlemen	To enforce regulations to prevent the malpractices and to empower inspection services.

Sno	Actors	Challenge to over-come	Recommendation
9	Industries	Low level of value-addition and processing Inadequate linkages and coordination among the value-chain actors	To strengthen the value addition for agricultural commodities (rice, maize, cassava, Irish potatoes, milk, etc.) to counteract the perishability challenges and ensure consumer satisfaction. Liaise with downstream and upstream actors to share market prices information (contract farming).
10	Traders	Presence of malpractices by business actors and middlemen	To ensure the compliance with existing regulations
11	Farmers and farmers' associations	Low agriculture productivity due to: Low farmers 'access to credits/loans Low farmer adoption of technologies Low farmers' bargaining power. Weak farmers' organization in handling their ready produce.	To link with Finance institutions (SACCOs, banks) and insurance companies. To change mindset and adopt high production technologies. To strengthen farmers' organisations (cooperatives and platforms) to have a stronger voice in the sector. To establish community based food/grain reserve create linkages between farmer organisations and Finance institutions (SACCOs, banks) to establish community grain reserves to store farmers' harvest. Farmers will be given coupons representing individual farmers' stocks. These coupons can be used by farmers to access loans that would reduce the predations of exploitative middlemen prevailing during the harvesting time.
12	Finance institutions (SACCOS, banks)	Inadequate banks 'loan products to agriculture sector	To adapt loans/credits to agriculture sector conditions (seasonal nature)

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ANNEXES

Annex 1. Survey questionnaires

Questionnaire/ Ibibazo

DATE OF INTERVIEW (itariki):	☐☐/☐☐/☐☐☐☐ *DD / MM / YYYY*
Name of interviewer (Ubaza):	

I. IDENTIFICATION QUESTIONS/ Aho Ibazwa ryabereye	
1. Province (intara)	1. Southern (Amajyepfo) (__) 2. Northern (Amajyaruguru) (__) 3. Eastern (Uburasirazuba) (__) 4. Western (Uburengerazuba)
2. District (Akarere)	……..
3. Sector (Umurenge)	…….
4. Cell (Akagari)	…….
5. Village (Umudugudu)	……..
6. Location (Aho utuye)	Urban (Mu mujyi) (__) Semi-Urban (Mu nkengero z'Umujyi) (__) Rural (Mu cyaro) (__)
7. Geo-localization coordinate (GPS)/ Gugata GPS	
8. Phone Interview Ibaswa yabereye kuri telephone	
9. Names of Enumerator (Amazina y'Ubaza) 10. Phone number (telephone)	
11. Names of Supervisor (Amazina ya Superivizeri)	Karuranga Canesius Harerimana Leonce Shakiru MUHAMADI Urinzwenimana Clement

12. Name of the supervisor (Amazina ya Superivizeri)	
II. INTERVIEWEE CHARACTERISTICS (Ibiranga Ubazwa)	
13. Names of the respondent (Amazina y'ubazwa) 14. Phone number (telefone)	
15. Sex (igitsina)	1. Male (Umugabo) (__) 2. Female (Umugore) (__)
16. Marital status (Irangamimerere)	Single/*Ingaragu* (__) Married/*Uwashatse* (__) Widow/widower /*Umupfakazi* (__) Separated (*separated*)/*Utabana n'uwo bashakanye* (__) Divorced (*legally separated*)/ *Watandukanye n'uwo bashakanye* (__)
17. Age of farmers in years? (Imyaka y'ubukure y' umuhinzi)	
18. Commodities on which the respondent is working on *(igihingwa /itungo/ n'ibibikomokaho akoraho)*	1. Maize/ *Ibigori* 2. Beans/ *Ibishyimbo* 3. Irish potato/ *Ibirayi* 4. Rice /*Umuceri* 5. Wheat/ *Ingano* 6. Cassava/ *Imyumbati* 7. Milk and milk products/ *Amata n'ibiyakomokaho* 8. Meat /*inyama* 9. Eggs / *Amagi*
19. Which step of the value chain does the respondent operate on ? *(Ni ku ruhe rwego rw'uruhererekane nyongeragaciro ukoraho)*	Farming/production(*Ubuhinzi/Ubworozi*) Agro-Processing (Kongera agaciro) Transportation/ distribution (Ubwikorezi) Trading /wholesaling (Umucurizi uranguza) Trading / retailing (Umucurizi udadaza) Customer/ Umuguzi

III. PRODUCTUION STEPS AND INPUTS/ UBUHINZI N'UBWOROZI, N'INYONGERAMUSARURO	
20. **What are the main inputs of the production**? (Ni ibihe bintu by'ibanze ukoresha muri aka kazi kawe)?	1. Seed /*Imbuto* 2. Fertilizer (Organic and chemical)/ *Amafumbire* 3. Animal/ *Amatungo* 4. Pesticides/Drugs / *Imiti* 5. Fodder/ *Ubwatsi* 6. Animal feed/*Ibiryo by'amatungo* 7. Off-farm raw material/ umusaruro udatunganyije 8. Fuels/ energy / Ibikomoka kruri petiroli 9. Other Utilities/ *Izindi serivise* 10. Labour/ *Abakozi* 11. Crop and livestock insurance/ *Ubwishingizi bwo mu buhinzi* 12. Other_specify /*ikindi_kivuge* ……..
21. Are the prices of these inputs regulated/ Ese ibiciro by'ibi bikoresho biragenzurwa?	1. Yes/ Yego 2. No /Oya 3. I do not know / Simbizi
22. What are the price regulation/policies do you remember on this input. / *Ni ayahe mategeko abigenga*	
23. Who are the policies enforcers (Ni bande bagenzura ko ayo mategeko akurikizwa)	Local government offices MINICOM MINAGRI RICA RAB NAEB RURA Police Other/specify: ……..
24. Are any these inputs subsidized? / *Ese kuri ibibikoresho by'ibanze hari nkunganire ujya ubona*	1. Yes/ Yego 2. No /Oya
25. If yes, which one of these inputs are subsidize? *Niba ari yego ni ibihe ubonaho nkunganire?*	Subsidy on farm machinery / Ku mamashini Subsidy on irrigation equipments / Mu kuhira

	Subsidy on seeds/ ku mbuto Subsidy on Fertlizer/ ku mafimbire Subsidy on chemical/drug / ku miti Subsidy on crop/animal insurance scheme/ ku bwishingizi Subsidy on services received/ kuri service zo mu buhinzi Other/specify: …….. ibindi, bivuge ….
26. Who bears the subsidy cost? *Ni nde wishyura iyo nkunganire?*	Government/ *Leta* International organization (such as NGO, Embassy, UN agency,…)/ *Imiryango mpuzamahanga* Private / *Abikorera* Other, specify / *Abandi, bavuge*
27. Do you think the subsidies help to stabilize the price of end product? *Ese nkunganire ku nyongerera musesaruro yaba ifasha mu kugabanya imihindagurikire y'ibiciro by'ibikomoka ku buhinzi ku masoko?*	1. Yes/ Yego 2. No /Oya 3. I do not know / Simbizi
28. If yes, how? Niba ari yego sobanura	
29. If no how? Niba ari oya sobanura	
30. Who Buys your production/ Ni nde ugura umusaruro wawe	Traders / Umucuruzi Processors / Uruganda Direct consumers / Umuguzi usanzwe Cooperative /Cooperative National strategic grain reserve / Ibigega by'igihugu bihunika imyaka
31. Who decides the price of your end product? / Ni nde ugena igiciro mugurishaho umusaruro?	Market forces / *Biterwa n'igiciro cy'isoko* Cooperative / *Koperative* Buyers' negotiation / *Ubwumvikane ku isoko* Government fixes price ranges/ *Leta igena ibiciro* No idea / *Simbizi*
32. How does the price does change price of Agricultural commodity? / Ese ubona ibiciro bihinduka mu kihe kerekezo ?	Small increasing/ Bizamuka gake gake Big increasing / Bizamuka byihuse Small decreasing/ Bimanuka gake gake Big decreasing Bimanuka byihuse Both ways / Rimwe birazamuka, undi bikamanuka

33. How frequent does the big change occur/ Almost? ugereranije ihindagurika riza mu gihe kingana gite	1. Daily / Buri munsi 2. Weekly / Buri cyumweru 3. Monthly / Buri Kwezi 4. Seasonally / Buri Gihembwe 5. Biannually / Nibura kabiri mu mwaka 6. Annually / Buri mwaka 7. Very frequent and not predictable / Ni kenshi kandi bitunguranye
34. Does the change of the production cost go directly with the end product price? / Ese igiciro cy' umusaruro gihindukana n'ikiguzi cyo guhinga?	Yes / Yego No /Oya Do not know / Simbizi
35. How do you judge the supply of the commodity on the market? (Note : Reproduces the questions according to the number of commodities/ *Ese ugereranya ute ingano y' umusaruro uboneka n' ibikenewe ku isoko*	1.Just as required /Birangana 2.Not sufficient (Demand is higher than supply)/ Ntuhagije 3. More than required (Demand is lower than supply)/ Urenze ukenewe 4.Keep fluctuating by season/ Birahindagurika bitewe n'igihe 5. No idea / Simbizi
III. FACTORS/ DRIVERS OF PRICE VOLATILITY FOR AGRICULTURAL PRODUCTION STEP / IBITERA IHINDAGURIKA RY'IBICIRO BY'IBIKOMOKA KU BUHINZI	
36. Are the prices of the agricultural products unstable? Ese ibiciro by'ibikomoka ku buhinzi birahindagurika koko ?	Yes / Yego No /Oya Do not know / Simbizi
37. If yes, Product wise, which one of the following are more unstable? / Niba ari yego, ni izihe ubona ibiciro byabyo bindagurika kurushaho?	Maize grain/ Ibigori Maize flour / Ifu y'ibigori Beans Grain / Ibishyimbo Irish potato tuber/ Ibirayi Rice grain/ Umuceri Wheat grain/ Ingano Cassava flour/ Imyumbati Milk and milk products/ amata n'ibiyakomokaho Inyama Pork / ingurube Chicken / Inkoko Eggs /Amagi Other/specify: …….. ibindi, bivuge
38. What are the causes of the instability of the price of agricultural products? Ese ni	Unorganized production / Imihingire itanoze Unpredictable market/ Shift in demand and supply / Ibibazo mu masoko

iyihe mpamvu ibiciro by'ibikomoka ku buhinzi bihindagurika cyane?	Middle men cost / unstructured and uncontrolled distribution chain/ Abamanyi batuma igiciro gihindagurika Fluctuation of inputs cost/ Ikiguzi nacyo kirahindagurika Climatic hazards affecting production/ ikirere Periodicity/ bihundukana n'igihe ku buryo buhoraho Seasonality/ bihindukana Ibihe by'ibinnga International market prices/ Isoko mpuzamahanga Imported products /Ibyo tuzana mi gihugu Export of the local production / ibyo twohereza mu mahanga Change of the dependent cost like fuel Lack of regulations to stabilize the price? / Ibiciro by'ubwikorezi na petirori Other/specify: …….ibindi, bivuge ….
39. How can the price instability of agricultural products be addressed? Hakorwa iki mu guhanagana n'ihindagurika ry'ibi biciro?	Using production technologies to cope with climatic risks (e.g. by planting drought-resilient crop varieties or investing in irrigation methods)/ Guhinga kijyambere Future market prediction/ contract farming / Kwita ku masoko no ku by'ingenzi bikenewe Agricultural production insurance/ Ubwishingizi bw'ibihingwa Value addition and storage of agro products / Kwita ku ruhererekane nyongeragaciro no kuguhunika umusaruro neza Pricing policy / Kwita ku mategeko agenga ibiciro kandi arengerea abaguzi Subsidizing the production? Nkunganire ku muhinzi Subsidizing the product on the market? Nkunganire ku muguzi Other/specify: ……..ibindi_bivuge

IV. EFFECT OF PRICE VOLATILITY AND MEASURES PROPOSED (for all steps)_ INGARUKA Z'IMIHINDAGURIKIRE Y'IBICIRO N'INGAMBA ZAFATWA	
40. Do you think price volatility of Agricultural commodities has a negative effect on Producers? Ese ubona ihinduka ry' ibiciro ribangamira umuhinzi/ umworozi/ inganda ?	Yes / Yego No /Oya Do not know / Simbizi
41. Do you think price volatility of Agricultural commodities has a negative effect on consumers Ese ubona ihinduka ry' ibiciro ribangamira umuguzi?	Yes / Yego No /Oya Do not know / Simbizi
42. In your opinion, what do you see as the most pressing consequences of price volatility of Agricultural commodities to consumers and producers in Rwanda today. Ni izihe ngaruka mbi iri hinduka rigira ku muhinzi/umworozi cg se ku muguzi	• Increase in prices will cause the market of those products to shrink as consumers reduce the quantity bought.(Umuguzi ntashobora kugura ibyo akeneye) • The increase in prices attracts more supply of the products and may favor the suppliers to invest in production of those commodities. • The decrease in prices of agricultural commodities will encourage consumers to buy more while it can discourage producers from investing in its production. • No effect as far as the commodities we have on the market are concerned Other specify
43. Are there actions that should be taken to help reduce the consequences of price volatility of Agricultural commodities to consumers and producers in Rwanda? Ese ubona hari icyakorwa ngo ingaruka ziterwa n'ihindagurika ry'ibiciro zirindwe?	Yes / Yego No /Oya Do not know / Simbizi
44. What do you think should be done to slow consequences of price volatility of Agricultural commodities? Urumva hakorwa iki?	1. Government intervention/ Leta ibifatire ingamba 2. Forming consumers associations/ amashyirahamwe y'abahinzi 3. Forming suppliers associations/ Amashyirahamwe y'abahi 4. Contract farming/ guhingira ku masezerano y'abaguzi 5. Other specify …… ibindi_bivuge

45. Which product do you consume most? Ni ibiki ugura buri munsi?	
46. How much is the current retail price of this product per 1 kg? Bigura angahe ku kiro?	
47. Do you think the current retail price of 1kg is affordable? Ese ubona iki giciro cyorohera abaguzi?	Yes / Yego No /Oya Do not know / Simbizi
48. Are middlemen beneficial in the agricultural products value chain? Ese abacuruzi ubona hari icyo bafasha mu ruhererekane nyongera gaciro?	Yes / Yego No /Oya Do not know / Simbizi
49. If yes, how are they beneficial? Niba ari yego, ni gute?	• They provide a link between suppliers and consumers/ Ni abahuza • The help in the distribution of the commodity/Bafasha mu guherererekanya • Other specify……. ikindi_kivuge
50. If No, how are they detrimental Niba ari oya, ni gute	
51. What can be done to make them also survive (*hakorwa iki kugirango bareke kubangamra inyungu rusange zabaguzi nabacuruzi*)?	• Allow them to operate independently/ Kubareka bakikorera nta nkomyi • Form cooperatives to compete with them/ Gukora amakoperative y'abahinzi • Government should remove them completely/ Leta ikababuza burundu • I don't know/ simbizi • Other specify…… ikindi_kivuge
52. What are the negative effects of middlemen? NI ibihe bibazo biterwa n'abacururuzi-bamama	• They exploit suppliers by giving them low prices/_Banyunyuza umuhinzi/umworozi bamugurira igiciro gito cyane • They exploit consumers by raising prices Banyunyuza umuguzi bamugurisha igiciro gito cyane • They are robbers/ Bariba • Other specify……. ikindi_kivuge
53. Recommend actions that should be taken to help reduce the negative effects of middlemen? Ni izihe ngamba zafatwa ngo hirindwe abamamyi?	• Disband the middlemen in agricultural products/ Kubabuza ku bikomoka ku buhinzi /bworozi byose • Put in place strict measures to control their operations/ Gushyiraho ingamba

	n'amategeko bigenzura ibyo bakora n'uko babikora kose • I don't know / Simbizi • Other specify/ ikindi_kivuge
CONSUMER RIGHTS PROTECTION vs AGRICULTURAL AND TRADE POLICY _ AMATEGEKO ARENGERA UMUGUZI MU BIKOMOKA KU BUHINZI	
54. Do you think it's important to know your rights as a consumer? Ese ubona ari ingenzi kumenya uburenganzira bw'umuguzi?	Yes / Yego No /Oya Do not know / Simbizi
55. As an agricultural producer consumer, what are some of the rights that you may know? Ese hari uburenganzira bw'umuguzi uzi	➢ Right to Information/ Kugira amakuru ➢ Right to Access/ Kubona ibyo ushaka ➢ Right to Quality of Service/ guhabwa serivisi nziza ➢ Right to Fairness/ ➢ Right to Complain/ Kubaza aho bitagenze neza ➢ Right to Safety and security/ Kugira umutekano ➢ Consumer Education/ guhugurwa no gusobanurirwa ➢ Accurate Bills / guhabwa inyemezabwishyu kandi y'ukuri ➢ Privacy/ Kugiriwa ibanga ➢ Nothing / nta na kimwe nzi
56. Do you think agricultural policies play a role in helping to achieve the consumer rights protection? / Ese ubona amategeko yo mu buhinzi afasha kurengera umuguzi ?	Yes / Yego No /Oya Do not know / Simbizi
57. What are some of the agricultural policies and regulations you think to have an impact on the consumer rights in Rwanda? Ni ayahe mategeko n'amabwiriza yo mu buhinzi ifite icyo amariye/ cg atwaye umuguzi?	➢ Market intervention polices/ price threshold settings/ Gushyiraho ibiciro ➢ Productivity oriented polices/ Ambwiriza agamaije kongera umusaruro ➢ Protectionism polices (Quota policies)/ kurinda ibicuruzwa by'imbere bagabanya ibiva hanze ➢ Agri-Subsidies/ nkunganire ➢ Tax alleviation / gukuraho cg koroshya imisoro ➢ Do not know / Simbizi
58. Do you think trade policies play a role in helping to achieve the consumer rights protection? Ese ubona amategeko	Yes / Yego No /Oya Do not know / Simbizi

akurikizwa mu bucuruzi afasha kurengera inyungu z'umuguzi?	
59. Do the agricultural policies/ programmes give sufficient priority to consumer right protection? Ese ubona amategeko n'amabwiriza yo mu buhinzi afasha yita cyane ku muguzi ?	Yes / Yego No /Oya Do not know / Simbizi
60. To what extent do you agree with this statement? The policy on Agriculture helps in stabilizing the prices of Agricultural producce. / Ubibona ute ? amategeko n'amabwiriza yo mu buhinzi afasha kurinda ihindagurika ry'ibiciro by'ibikomoka ku buhinzi.	1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree 1= simbyemera na busa 2 = simbyemera, 3 = ndifashe, 4 = Ndabyemera and 5 = Ndabyemera cyane
61. To what extent do you agree with this statement? The policy on Trade helps in stabilizing the prices of Agricultural producce. / Ubibona ute ? amategeko n'amabwiriza yo mu yo mu bucuruzi afasha kurinda ihindagurika ry'ibiciro by'ibikomoka ku buhinzi.	1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree 1= simbyemera na busa 2 = simbyemera, 3 = ndifashe, 4 = Ndabyemera and 5 = Ndabyemera cyane
62. Among the following regulatory policies, which ones are you familiar with? / Muri aya mabwiriza, amategeko n'ingamba ni ibihe ubona bikorwa	✓ The formation of the agricultural market infrastructure, / Gushyiraho amasoko y'ibikomoka ku ubuhinzi n' ubworozo ✓ Creation of conditions for manufacturers to choose distribution channels on an alternative basis/ Gufasha inganga guhitamo aho bakura umusaruro ✓ The organization of auctions/ Kugura mu buryo bwa cyamunara ✓ State intervention in the pricing processes in the agricultural sector/ Leta ishyiraho ibiciro byo mu buhinzi ✓ Purchasing products to replenish government reserves or by selling them from these reserves/ Leta kugurira abaturage umusaruro maaze ikawuhunika iteganyiriza ahazaza ✓ Removing intermediaries from product distribution channels. / Guca abamamyi ✓ Information on existing prices transmitted to agricultural producers/ Amakuru ku biciro agezwa ku bahinzi ku gihe

	✓ Manufacturers are provided with pricing information / inganda nazo zihabwa amakuru ku biciro ✓ Establishing service/ marketing cooperatives/ Gushyiraho inzira zihamye z'umusaruro na serivisi zo ku wucuruza ✓ joint processing of products and trade to avoid monopoly/ kwirinda kwikubira masoko hashyirwaho iyongeragaciro rihuriweho ✓ other, please specify….. / ikindi_kivuge
63. Do you thing they help to stabilize the prices? Ese ubona bifasha kurinda ihindagurika ry'ibiciro by'ibikomoka ku buhinzi ?.	Yes / Yego No /Oya Do not know / Simbizi

Thank you ! / MURAKOZE !

Annex 2. List of the key informants and KII guide

Institutions	Name	Title
MINAGRI/	Patrick	DG Agricultural Modernization
MINAGRI -	Arnold Ishimwe	Market Analyst
MINAGRI-	Octave Nshimiyimana	DG agriculture Value chain and trade,
MINAGRI	Tugizimana Joas	M&E Specialist
NAEB - Marketing specialist	Mr. Alexis NKURUNZIZA	Divisio manager for traditional commodity
RAB	Dr. Uwamahoro Florence	DDG
RAB-	Kamaraba Illuminée	Post harvest Division Manager
JICA-	Pascal Furaha	Program Coordinator
ADECOR - (consumers rights)	Damien Ndizeye	Consumers rights
Federation des Cooperative de Maises au Rwanda (FCMR)	TUGIRINSHUTI Evariste	Member
Rwanda Poultry Industry Association (RPIA);	BUTARE Andrew	Member
Rwanda Pig farmer association (RPFA)	SHIRIMPUMU Jean Claude	Member
Federation of Wheat Cooperatives (RFWC)	MUTANGANA Simon	Member
Africa Improved Food Rwanda (Maize)	Cyiza David	Local Sourcing manager
MINIMEX Ltd (producer of fine maize products)	Moses/Claude MANSELL	Production Manager
MİNİCOM	Jeam Baptiste Ukwizagira	Statistician
MINICOM	Dativa	Value Chain Specialist
National Dairy Farmers Federation of Rwanda (NDFFR)		
Rwanda Cassava Cooperatives (RWCCF)		
Federation Rwandaise des Cooperatives des Theiculteurs (FERWACOTHE)		

Institutions	Contacts
Association of Cassava Processors and Exporters in Rwanda (ACPER);	muhizijotham@yahoo.fr,
NISR	ibrahim.byiringiro@statistics.gov.rw
Proxifresh Rwanda	kevin@proxifresh.com
National Dairy Farmers Federation of Rwanda (NDFFR)	ggahiga@gmail.com
Rwanda Cassava Cooperatives (RWCCF)	Harerimana2025@yahoo.fr

Federation Rwandaise des Cooperatives des Theiculteurs (FERWA-COTHE)	karamaga2020@yahoo.fr
Rwanda Horticulture Interprofessional Organization (RHIO)	kazimotocan@yahoo.fr

Appendix 3 KII Question guide

Cause of price volatility, action to be taken in the value chain, policies, and regulations.

1. What are the factors that lead to price volatility of agricultural and livestock products (select the commodity)?
2. What are the most effective measures that should be taken to address short, medium, and long-term impacts of price volatility to consumers and producers in Rwanda today?
3. Do you think the quantity supplied led to instability in prices on the market?
4. In your opinion, what are consequences of price volatility of Agricultural commodities to consumers and producers in Rwanda today?
5. Are there actions that should be taken to help reduce the most pressing consequences of price volatility of Agricultural commodities to consumers and producers in Rwanda?
6. Do you think it's possible to predict the market prices of agricultural products in each period?
7. Do you think the subsidies (domestic and international) have contributed to the Price Volatility/ or stability in agriculture and livestock commodities?
8. Give us your opinion on how the received subsidies can help to reduce the adverse effect of price volatility agricultural commodities.
9. What are the positive and negative effects of middlemen in the agricultural products value chain?
10. Do you think the current market prices of agricultural products are affordable to majority of consumers.
11. How are the Agricultural policies addressing the consumers rights protection (Right to Information, Right to Access, Right to Quality of Service, Right to Fairness, Right to Complain, Right to Safety and security, Consumer Education, Accurate Bills, and Privacy)?
12. What adjustments are required in agriculture and trade sectors to promote consumer right protection?
13. Which policy measures does Rwanda have on the regulation of prices of agricultural and livestock products?
14. Have they been successful/effectiveness in addressing the regulation of prices of agricultural products?
15. What gaps in the regulatory framework need to be addressed without causing undue constraints on the innovativeness and competitiveness in the country?
16. How can price regulatory policies help in the achievement of economic growth and social welfare of the citizens?

Appendix 4. Tables of Volatility of individual commodity

Table 7. Eight years trend of price volatility for rice commodity in Rwanda

Years(Q-Q4)	Tz Rice Annual Volatility	Rice Rw Annual Volatility	Annual Volatility Asia Rice imports
2014Q1	#VALUE!	73.52%	697%
2014Q2	0.5	60.34%	572%
2014Q3	0.51	82.54%	783%
2014Q4	1.12	67.83%	643%
2018Q1	1.17	21.44%	203%
2018Q2	0.45	30.26%	287%
2018Q3	0.39	35.10%	333%
2019Q2	0.34	27.51%	261%
2019Q3	0.37	30.93%	293%
2019Q4	0.28	54.17%	514%
2020Q1	0.16	28.18%	267%
2020Q2	1.08	62.42%	592%
2020Q4	1.03	39.65%	376%
2021Q1	0.81	7.97%	76%
2021Q2	0.63	21.44%	203%
2021Q3	0.73	65.17%	618%
2021Q4	0.7	90.69%	860%
2022Q1	0.63	82.82%	786%
2022Q2	0.6	38.52%	365%

Source: E-soko datasets from 2014-2022

Table 8. Beans price volatility

Years(Q-Q4)	Price	Change (%)	Quarterly Volatility (%)	Annualized volatility (%)
2014Q1	374			0
2014Q2	372	-0.01		0
2014Q3	397	0.07	0.06	0.53
2014Q4	358	-0.10	0.06	0.58
2018Q1	399	0.11	0.07	0.71
2018Q2	413	-0.04	0.07	0.65
2018Q3	398	-0.35	0.12	1.12
2019Q2	565	0.13	0.12	1.16
2019Q3	496	-0.32	0.14	1.28
2019Q4	685	0.05	0.14	1.28
2020Q1	649	-0.04	0.11	1.02

2020Q2	676	-0.08	0.10	0.92
2020Q3	729	-0.06	0.08	0.78
2020Q4	773	0.25	0.10	0.96
2021Q1	604	0.06	0.12	1.11
2021Q2	567	0.05	0.11	1.04
2021Q3	537	0.09	0.12	1.12
2021Q4	491	0.02	0.12	1.16
2022Q1	483	-0.19	0.14	1.34
2022Q2	586	-0.08	0.14	1.32
2022Q3	633	-0.65	0.22	2.05
2022Q4	1216	0	0	0

Source: Adapted from MINAGRI E-Soko Information System (2014-2022)

Table 9. Analysis of price volatility in Irish Potatoes

Years(Q-Q4)	Irish	% Change	Volatility (%)	Annualized Volatility (%)
2014Q1	151	-21.4%	19.5%	1.85
2014Q2	187	-0.5%	13.6%	1.29
2014Q3	188	20.6%	22.3%	2.12
2014Q4	153	-20.1%	21.8%	2.07
2018Q1	187	-21.6%	22.3%	2.12
2018Q2	232	-1.3%	12.4%	1.17
2018Q3	235	-7.4%	15.1%	1.43
2019Q2	253	-3.1%	12.1%	1.15
2019Q3	261	6.3%	11.9%	1.13
2019Q4	245	-15.1%	18.3%	1.74
2020Q1	285	-1.0%	15.2%	1.44
2020Q2	288	11.8%	11.8%	1.12
2020Q4	256	4.4%	15.8%	1.50
2021Q1	245	-6.7%	14.3%	1.36
2021Q2	262	2.7%	16.0%	1.52
2021Q3	255	12.1%	13.3%	1.26
2021Q4	226	-8.9%	17.3%	1.64
2022Q1	247	-29.9%	13.0%	1.23
2022Q2	333	-4.1%	14.8%	1.40
2022Q3	347	-18.1%	14.3%	1.36
2023Q4	416			

Source: MINAGRI E-Soko Information System (2014-2022)

Table 10. Analysis of price volatility in Maize value chain

Years(Q-Q4)	Maize price	%change	Volatility (%)
2014Q1	279	0.21	16.05%
2014Q2	226	-0.08	14.04%
2014Q3	244	-0.04	13.87%
2014Q4	254	-0.08	13.94%
2018Q1	276	0.14	14.29%
2018Q2	241	0.06	13.69%
2018Q3	226	-0.24	13.74%
2019Q2	287	-0.16	12.01%
2019Q3	336	-0.31	12.89%
2019Q4	458	0.09	15.25%
2020Q1	417	0.28	13.21%
2020Q2	314	0.07	13.76%
2020Q3	293	-0.31	13.46%
2020Q4	400	0.15	13.53%
2021Q1	343	0.35	13.22%
2021Q2	242	-0.02	13.39%
2021Q3	248	-0.32	13.63%
2021Q4	342	-0.07	14.16%
2022Q1	368	-0.05	14.32%
2022Q2	385	-0.19	14.27%
2022Q3	466	-0.35	14.28%
2022Q4	658		

Source: MINAGRI E-Soko Information System (2014-2022)

Table 11. Prices volatility in the cow value chain

Years	Prices Inka	% Change	Volatility
2014Q1	1682	7.426549	NA
2014Q2	1689	7.431636	0.00095
2014Q3	1693	7.433075	0.00019
2014Q4	1723	7.45008	0.01768
2017Q3	2005	7.602401	0.19607
2017Q4	2011	7.60589	0.00323
2018Q1	2003	7.601402	-0.00399
2018Q2	2060	7.631916	0.02924
2018Q3	2071	7.635304	0.00514
2019Q2	2457	7.806546	0.17024
2019Q3	2519	7.83122	0.0325
2019Q4	2654	7.884869	0.07882
2020Q1	2872	7.962067	0.07669
2020Q2	3037	8.017476	0.05927
2020Q3	2947	7.988204	-0.00943
2020Q4	3051	8.022897	0.0112
2021Q1	2955	7.99149	-0.01032
2021Q2	2993	8.003029	0.00468
2021Q3	3000	8.006368	0.00245
2021Q4	3134	8.049825	0.04212
2022Q1	3232	8.082402	0.04022

Source: E-soko datasets from 2014-2022

Table 12. Analysis of price volatility in Meat

Years	% Change	Quarterly Volatility	Annualized Meat Price Volatility
2014Q1	0.00	0.01	0.09
2014Q2	0.00	0.01	0.09
2014Q3	-0.02	0.23	2.18
2014Q4	-0.48	0.28	2.66
2015Q1	0.21	0.19	1.80
2015Q2	-0.06	0.21	1.99
2015Q3	-0.15	0.16	1.52
2015Q4	0.33	0.20	1.90
2017Q3	0.00	0.00	0.00
2017Q4	0.00	0.00	0.00
2018Q1	-0.03	0.07	0.66
2018Q2	-0.01	0.07	0.66
2018Q3	-0.17	0.15	1.42
2019Q2	-0.02	0.03	0.28
2019Q3	-0.05	0.03	0.28
2019Q4	-0.08	0.03	0.28
2020Q1	-0.06	0.04	0.38
2020Q2	0.03	0.05	0.47
2020Q3	-0.03	0.03	0.28
2020Q4	0.03	0.02	0.19
2021Q1	-0.01	0.02	0.19
2021Q2	0.00	0.02	0.19
2021Q3	-0.04	0.02	0.19
2021Q4	-0.03	0.02	0.19
2022Q1	-0.08	0.03	0.28
2022Q2	-0.04	0.04	0.38
2022Q3	-0.01	0.04	0.38
2022Q4	0	0	0

Years	% Wheat Price change	Std Dev of %Price change	Annual Wheat Volatility
2014Q1	-0.004	N/A	N/A
2014Q2	0.000	N/A	N/A
2014Q3	0.040	0.17	1.62
2014Q4	-0.305	0.13	1.25
2015Q1	0.009	0.16	1.50
2015Q2	0.166	0.09	0.81
2015Q3	0.136	0.01	0.10

Years	%Cassava Price change	Quarterly Volatility	Annual Cassava Volatility
2014Q1	-0.03	N/A	0

2014Q2	0.03	0.38	3.628
2014Q3	0.07	0.34	3.231
2014Q4	-0.61	0.29	2.793
2015Q1	0.04	0.11	1.055
2015Q2	0.12	0.04	0.362
2015Q3	-0.12	0.03	0.251
2015Q4	N/A	N/A	

Years	%Cassava Price change	Quarterly Volatility	Annual Cassava Volatility
2014Q1	-0.03	N/A	0
2014Q2	0.03	0.38	3.628
2014Q3	0.07	0.34	3.231
2014Q4	-0.61	0.29	2.793
2015Q1	0.04	0.11	1.055
2015Q2	0.12	0.04	0.362
2015Q3	-0.12	0.03	0.251
2015Q4	N/A	N/A	

Price volatility of soybean

Years	%Soybean Price change	Quarterly Volatility	Annual Soybean Volatility
2014Q1	-0.10	0.05	0.52
2014Q2	0.00	0.03	0.33
2014Q3	-0.01	0.02	0.20
2014Q4	0.04	0.03	0.26
2015Q1	0.04	0.03	0.25
2015Q2	-0.01	0.03	0.32
2015Q3	0.13	0.06	0.54
2015Q4	N/A	N/A	#VALUE!

Milk Prices

Quarter	Price	% Change	Volatility	Annual volatility
2017Q3	372	5.918893	-	-
2017Q4	365	5.918893	-0.0032	-
2018Q1	354	5.872118	-0.0047	0.0017
2018Q2	360	5.886104	0.0024	0.0041
2018Q3	359	5.883322	-0.0003	0.0031
2019Q2	348	5.852202	-0.0053	0.0035
2019Q3	364	5.891644	0.0064	0.0062
2019Q4	353	5.866468	-0.0043	0.0076
2020Q1	359	5.883322	0.0029	0.0038

2020Q2	356	5.874931	-0.0014	0.0066
2020Q3	374	5.924256	0.0082	0.0051
2020Q4	395	5.978886	0.0094	0.0042
2022Q1	333	5.808142	-0.0290	0.0174
2022Q2	351	5.860786	0.0090	0.0240
2022Q3	363	5.894403	0.0057	0.0166
2022Q4	449	6.107023	0.0745	0.0579

Source: E-soko datasets from 2014-2022

Appendix 5. Stakeholders' comments and actions taken.

	Key point	Description	Action taken and comments
1	Why was only one source of data used?	To check the other sources of price's data for example CPI.	NISR, MINAGRI, FAO, MINICOM data have been consulted and included in the report (Refer to all Gap, calculated from Production by NISR, Cross border trade from MINCOM data). Consumer price index, NISR CPI was used in comparison to other countries in the regions (Refer to page 59-63).
2	To look for farmers gate prices	To be specific on the way farm gate price is set on each commodity. What are the factors taken into consideration in setting the price gate	Comment addressed through all the report (Pages 36, 37, 51).
3	Role and effect of middlemen	In some commodity value chain, middlemen are needed. Differentiate the roles and side effects. • *Abotsa (selling before even before harvest* • Those practicing hoarding, • Businessmen. (How to streamline them/ their platform and their regulations) How integrate the middlemen in the system (Voucher system,) Effect of middlemen on price volatility (regression analysis).	A section on the Effects of middlemen in the agricultural products value chain is added (Page 54) The recommendations for the middlemen operation after assessing their role in specific commodity value chains were given. (Refer to recommendation of each commodity, Pages 33,36, 38,41, 43, 45, 47, 52, 53, 64, and 65)
4	Causes of price hikes (Volatility)	To be more precise in these terms. Ensure that the report more specific commodity wise	The comments have been addressed throughout the report. The main causes of price fluctuations are summarized for each commodity (pages 33,36, 38,41, 43, 45, 47, 52 and 53,)
5	World is now connected	To see what is happening elsewhere regionally and internationally. Ex Kenya/case of What we are exporting and importing price and price change.	The Comment was addressed (page 60-65)
6	Check the good practice in price regulation in other countries	To crosscheck price regulatory policies in other countries.	The Comment was addressed with good practices (page 61) and price regulation effects (page 62).

	Key point	Description	Action taken and comments
7	Recommendation by categories of actors including regulators	To be more specific and possibly with timelines. Conditions of the changes 9	The comments have been addressed throughout the report The recommendation are summarized for each commodity (Pages 33,36, 38,41, 43, 45, 47, 52, 53, 64, and 65) in addition challenges and specific recommendations addressed to each commodity value chain actors are gives (page 66)
8	Clarity of the data presented and the report	Link the data in figure and table with their discussion	The comments have been addressed throughout the report. Appropriate labeling of Charts and figure was addressed
9	Impact of price setting on price volatility	Prices are fixed by concerned authorities/institutions. Does it affect the price? Is it fair to consumers, businessman and farmers?	The Comment was addressed (pages 62-64)
10	Impact of subsidies on Price fluctuations/ volatility	Subsidies are given to support production of priorities crops. What if the subsidies are not provided?	The comments have been addressed throughout the report.
11	Connecting farmers with off takers (Minimex, AF farm, ...),	Example: Contract farming, green cob, ...	The comment has been addressed (Pages 48 & 67). The establishment of community based food/grain reserve was proposed among one of the recommendation (Pge 54-55)
12	All the actors in the value chain are not satisfie once the price is fixed.	-Recommend the regulators with respect to how the pricing is done,	Participatory/ inclusive approach across all the actors in commodity value chains in price setting. Comment addressed in throughout the document.