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Diploma Thesis

The study of impact of coffee production on rural development and small-Scale farmer in Rwanda"Case study: Rutsiro district”

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Declaration

I declare that I have worked on my diploma thesis titled "The study of impact of coffee production on rural development and small-Scale farmer in Rwanda "case study: Rutsiro district" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on March 26, 2021 _____

Acknowledgment

I would like to thank the Almighty God for his grace in this work.

Deepest gratitude goes to my supervisor Ing. Pavel Kotyza Ph.D. for his support, guidance, patience and immense knowledge in completing this thesis.
My appreciations to the lecturers in the Faculty of Economics and Management for enabling me to continue to learn and acquire skills from the best education.

My special thanks go to Cyimbiri Coffee Processing Factory in Rutsiro district in Rwanda for their support with the data collection. I dedicate this work to my family for always supporting me morally and financially. I also recognize the contribution, encouragement and support for my friends all through my studies.

The study of impact of coffee production on rural development and small-Scale farmer in Rwanda"case study: Rutsiro district”

Abstract

Coffee is a primary export commodity and a major valuable crop in Rwandan economy.
Coffee contributes to a high rate of share in the Rwandan GDP, and it is a key source of job opportunities. Coffee production is increasing and has generated more revenues in the economy, although coffee is the most tradable products, but the farmers have faced certain limitations and obstacles such as low level of technology, lack of knowledge, poor infrastructure and insufficient capital therefore Rwandan government along with other development agencies has implemented major policies and strategies by providing loans, training and other inputs needed by farmers to increase coffee production. The purpose of this study is to assess the impacts of coffee production on Rwandan economy and small-scale farmers and to evaluate the role of government to improve the production of coffee in Rwanda. The study includes a questionnaire, and the case study takes place in Rutsiro district and will include the farmers from Cyimbiri Processing Coffee Factory, the main aim of the survey is to identify the factors that lead to high production of coffee and its benefits on coffee farmers livelihood. The main findings obtained were evaluated by the use of descriptive statistical approach and regression analysis to identify the relationship between factors affecting coffee production. The model found that coffee production has a positive impact on the welfare of farmers and that it is not affected by the age group or income, but rather the size of land.

Keywords: Rwanda, agriculture, coffee, development, economy, farmers

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Abstrakt

Káva je primární komoditou pro vývoz a hlavní cennou plodinou ve rwandské ekonomice.
Káva přispívá k vysoké míře podílu na rwandském HDP a je klíčovým zdrojem pracovních příležitostí. Produkce kávy roste a přinesla více příjmů v ekonomice, ačkoli káva je nejvíce obchodovatelným produktem, ale farmáři čelili určitým omezením a překážkám, jako je nízká úroveň technologie, nedostatek znalostí, špatná infrastruktura a nedostatečný kapitál, proto spolu s rwandskou vládou ve spolupráci s dalšími rozvojovými agenturami zavedla hlavní politiky a strategie poskytováním půjček, školení a dalších vstupů potřebných pro zvýšení produkce kávy ze strany zemědělců. Účelem této studie je posoudit dopady kávy na rwandskou ekonomiku a drobné zemědělce a vyhodnotit roli vlády při zlepšování výroby kávy ve Rwandě. Studie zahrnuje dotazník a případovou studii probíhající v okrese Rutsiro., zahrnující farmáře ze zpracovatelské továrny na kávu v Cyimbiri. Hlavním cílem průzkumu je identifikovat faktory, které vedou k vysoké produkci kávy a její výhody pro obživu pěstitelů kávy. Hlavní zjištění byla hodnocena pomocí deskriptivního statistického přístupu a regresní analýzy k identifikaci vztahu mezi faktory ovlivňujícími produkci kávy. Tento model zjistil, že produkce kávy má pozitivní dopad na dobré životní podmínky zemědělců a že na ni nemá vliv věková skupina ani příjem, ale spíše velikost půdy

Klíčová slova: Rwanda, zemědělství, káva, rozvoj, ekonomika, zemědělci

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List of Abbreviation used in the thesis

BRD	Development Bank of Rwanda
CWS	Coffee washing station
EAC	East Africa Community
FAO	Food and Agriculture Organization
GDP	Gross domestic product
MINAGRI	Ministry of Agriculture and Animal Resources
MINECOFIN	Ministry of Finance and Economic Planning
NAEB	National Agriculture Export Development Board
NISR	National Institute of Statistics of Rwanda
OEC	Observatory of Economic Complexity
PEARL	Partnership for Enhancing Agriculture in Rwanda through Linkages
RDB	Rwanda Development Board
SPREAD	Sustainable Partnerships to Enhance Rural Enterprises and Agricultural Development
UN	United Nations
UNECA	United Nations Economic Commission for Africa
USAID	United States Agency for International Development
VAT	Value-added tax
WB	World Bank

1.INTRODUCTION

Rwanda is a landlocked country located in the Great Lakes region in Africa its capital city is Kigali (Arieff & Terrel 2018). According to MINECOFIN (2014) Rwanda has different sectors such as service, industrial and agriculture-which is the main sector that is creating jobs to many citizens and increasing their livelihoods. Coffee industry in Rwanda is one of the main economic sectors; the main crops that Rwanda exports are tea, coffee and minerals which are traded usually in East African Community (World Bank 2017).

Nzeyimana et al. (2013) indicated that Arabica is the most consumed and cultivated coffee with 95% of all coffee produced in the country while Robusta occupies 5%. Rwanda has made progress in growth, such as boosting agricultural productivity, improving infrastructure and attracting investors. (Koss 2016) mentioned that the major export destination is primarily the United States and Europe; the farmers also added that coffee market is expanding. NAEB (2018) added that the 37% of coffee was exported in Switzerland, 24% in USA, 10% in United Kingdom, 9% in Singapore and 5 % in Belgium. Coffee production has had a positive impact on the lives of farmers and has improved their standards living however they are some challenges the farmers faced but the government played a major role to support them which helped them to produce more and lead to high coffee production and improve the economic development of the country.

East African Community (EAC) is an intergovernmental organizational composed with 6 countries such as Kenya, Rwanda, Burundi, Tanzania, Uganda and South Sudan with the aim of working together, develop economic growth and facilitate free movement of goods through trade and people (Marchand et al. 2017).

The study will switch from theoretical part of the literature review to the practical part that will include the questionnaire. The literature review and the questionnaire will include answers to the research questions. The key focus group are coffee farming families. The main finding and results obtained will be evaluated using the statistical approach method via a regression analysis.

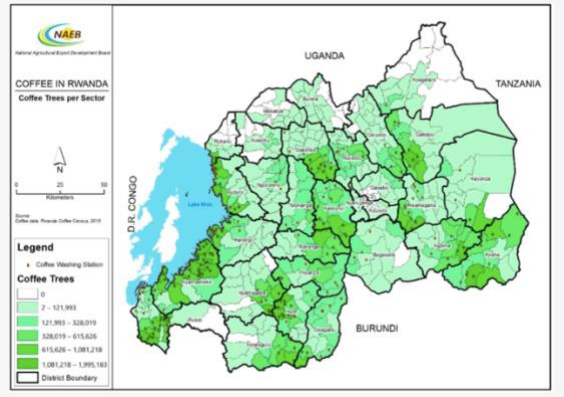
2. LITERATURE REVIEW

FAO (2015) stated that Rwanda is a developing country that depends on agriculture sector, with a population of 12million and 10million of them are engaged in agriculture sector.

2.1. Agriculture sector description

The success of Rwanda in the agricultural sector is a key source of jobs and Rwandan economy has been boosted up by the main production and export products which are coffee, tea, pyrethrum and tin which have increased the country's productivity (World bank 2018) & (RDB 2020).

Image 1: Rwandan map



Source: NAEB, 2013

Nzeyimana et al. (2013) mentioned that Arabica coffee is the most consumed and cultivated coffee with 95% of all coffee produced in the country while Robusta occupies 5%. Arabic is primarily cultivated in the West, North and South district of the country because of the high elevation while the Robusta one has a low elevation which is the case of being produced mainly in the East district. In 2019, the Rwandan exports goods decreased due to low global price of goods, resulting in a 6.3% decrease in the export of coffee and tea, while the export of coltan tin and wolfram decreased by 22.8%. Production increased due to high government consumption of 25.6% and 8.5% for the private sector in Q3 of 2019. Rwanda 's economy is projected to grow by 10.9% in the first Q3 of 2019 year, derived from strong result in the manufacturing and service sectors, while agriculture

is expected to grow by 5.8%. In 2018 the exports of goods grew by 10 % while the imports of goods were increased and grew by 25.8%. Rwandan imports increased 2 times than exports.

World bank (2020) observed that in 2019, the inflation was 6.7% due to the seasonal problems such as drought and rain. The main food products that caused a high rate of inflation rate includes vegetables, flour and cereals products. The price rises in rural areas were much higher than in urban areas. Inflation in rural areas was 15.5% higher than urban areas with 6.8%, the situation has increased credit growth by 20.6% and loans have increased to 41.1%. Across the sector, the industrial sector has been identified as one of the fastest growing sectors of bank lending.

World bank (2020) mentioned that the loans taken in agriculture sector in 2019 was 9.8 billion Rwandan Francs and in manufacturing was 121.7billions Rwandan Francs.

2.2. Rwandan coffee background

According to Koss (2016) Rwanda was colonized by the Germans from 1899 and the Belgians took over the Germans after the First World War. The Germans were the first to establish a coffee plantation in Rwanda in 1913, and Brazil was the largest producer in the world in the 1920s, so the Germans pushed hard enough to ensure and help Rwandese to produce a lot of coffee; due to the good soil fertility in Rwanda they had so much of hopes, but it took them 4years to grow a lot of coffee and start exporting coffee abroad. Kamola (2007) added that this is when the Germans began to implement various measures such as taxation in cash rather than in commodity, resulting in high productivity with low quality and low profits for producers because taxes and the cultivation process were burdensome for farmers. Nzeyimana et al. (2013) and Doucleff (2012) added that coffee cultivation started in 1904 with the German missionaries and in the beginning of 1950s, due to well organized farms and weather conditions, it has gradually grown considerable and earned more revenues, and it was also due to government that has begun to regulate all of coffee phases and procedures

Koss (2016) pointed out that the Belgians ordered farmers to cultivate mostly cash crops such as coffee and tea instead of staple food, and that the farmers were not satisfied with the lack of staple food they faced later on. Koss (2016) also stated that Genocide caused low coffee production because everything has been destroyed, and the land has deteriorated so that people have not had enough resources to keep producing as before. However, the government offered assistance to the

citizen to start producing again which led the country to re-export coffee to international markets and coffee accounted for 50% of all exports.

Koss (2016) Arabica coffee originated in South Sudan and was known after arriving in Ethiopia where people started to like it and consume it because of its good quality and taste. Fromm (2015) Coffee was established in the twentieth Century in Rwanda, and in the 1930s its development spread throughout the world. In the 1980s coffee prices began to fall and during 1994 Genocide impacted the coffee price and hitting the minimum level.

NAEB (2019) mentioned that Coffee is a major and significant crop in Rwandan Economy 400,000 smallholders coffee farmers produce and rely on the production of coffee however Transparency report (2019) reported that 500,000 small farmers are the ones that are depending from coffee. Government controls the production of coffee in Rwandan regions and provide technical support, trainings and enhance the policies that assist on the growth of coffee and the improvement of farmers.

2.3 Rwandan coffee overview

RDB (2020) There are different varieties of coffee such as: Caturra, Catuai and Arabica- which is known or called bourbon. Guariso et al. (2012) mentioned that coffee has a positive impact on the Rwandan economy and also listed other 2 main coffee varieties that are grown for drinking such as Robusta and Arabica-is characterized by 60% of the world coffee and it is renowned for its good quality and it is quite expensive compared to other types on the international marketplace.

Robusta accounts for about 40% of the world's coffee and it is a way cheaper to grow and process it and it is resistant to pests. Hoffman (2014) noted that these 2types of coffee originate from Africa and their names are coffea Arabica (Arabica) and coffea canephora (Robusta).

Koss (2016) mentioned that Arabica coffee is characterized by:

- strong demand for altitude in the production process
- High price compared to other types of coffee
- Great quality
- More susceptibility to pests and diseases
- Arabica coffee, has smoother flavor and is sweeter than Robusta

Scott (2015) and Durand (2008) stated that Robusta coffee is characterized by:

- Less demand of altitude in the production
- less prone to pests and and diseases
- Sharper taste and stronger flavor
- Robusta has twice as much caffeine as Arabica
- Robusta is known to have poor quality relative to Arabica
- Produce more fruits and crops

RDB (2020) added that coffee plants grow in September and October and people start harvesting in March and July and produce more than 20,000 tons coffee each year. Guariso et al. (2012) indicated that Arabica coffee exceeds 98% of all coffee produced in Rwanda. In addition to that, Wintgens (2009) stated that the required temperature of arabica to grow well is 22^0C during a daytime and Rwanda's weather temperature matches this condition which makes it to produce the highest quality and standards.

RDB (2020), in 2018, Rwandan coffee was traded on the strongest platform called Alibaba as well as Tmall Global, accelerating the process for consumers to easily obtain products and making them very profitable to sellers and the turnover increased remarkably by 700%.
Rwandan coffee was ranked the top 10 best coffee in the world and has received awards for it.
Guariso et al. (2012) & RDB (2020) agriculture is one of the sectors that engage the majority of the population in Rwanda which is 70%. Moreover, Guariso et al. (2012) said that agriculture is one of the activities that is carried out mainly in the rural areas and contributes 1/3 of national income, therefore the country paid 10% of its budget to improve it. Since 1980, the higher value agricultural nutrition (vegetables, fruits, meat) exported to developing countries has been under 40% and increased in 2003 to 80%.

MINECOFIN (2012) coffee is a crop that has grown dramatically in recent years and become the most tradable products together with tea. Coffee is grown in different areas and each area is cultivated by 3 categories: 47% of the cooperatives, large scale farmers' professionals with 1% and small-scale farmers with 52%. Farmers prefer to work in the associations which help them to trade their products to the open market through coffee exporters. The cooperatives receive more support from the countries, international agencies and other donors to keep farmers progressing

and enhance more productivity. Most of the cooperatives use the insurance that covers them in case of risks and hazards. The farmers can produce between 0.2kg and 2kg of 1tree coffee. Minecofin (2012) coffee prices differ based on quality and license, while those with low quality costs are lower than those with higher quality. In 2012 the certified coffee was between 5$ and 8$. Edge (2014) mentioned that the global production of coffee increased by 2% every year and influenced mainly technical innovations, transformation to coffee from other crops, growing on new land which is the extension of land size.

2.3.1 Positive Impacts of Coffee Production on Rwandan Economy

According to UN (2021) Rwanda exported 26.102 million kg of coffee and earned $ 82,377,049 in 2018 moreover in 2019 the quantity of coffee exported increased to 26.142million kg of coffee but Rwanda's coffee export sales declined up to $ 74,617,983. Xinhuanet (2019) said that the National Agricultural Exports Board announced that Rwanda's coffee export value rose far more than $ 69 million in 2018 while in 2017 they earned $ 64 million.

UN (2021) demonstrated that in a period of 2016 Rwanda was able to generate $ 59,752,473 with 18,8million kg of coffee however the period of 2015, the country didn't benefit many revenues from coffee because they got 160times less compared to 2016, that means that they earned 372,284$ with 34 thousand kg exported quantity of coffee. According to NAEB (2020), the country generated $ 32,447,244 in 2019 from coffee exports during the first 6 months of the year (January to June) followed by $25,644,364 revenues earned in 2020 during the 1semester of the year the same period of January to June and this revenues declined due to lockdown measures restriction and the closure of the borders. Boudreaux (2009) stated that coffee continues to produce substantial national export revenues: about $47 million in 2008, while in 2007 was $35 million. FAO (2015) noted that after Genocide, Rwanda performed well, that coffee was growing and generated revenues to the country, and that in 1990 and 2004 the Gross Domestic Product per capita (GDP/capita) was $856 and $1426 respectively.

NAEB (2018) the coffee production that was exported from July 2017 till June 2018 was 20,353,423kg with the revenues of $ 20,353,423. NAEB (2016) added that the goal of the country is to continue growing more coffee and to apply a different approach to make it expand but will

be achieved as soon as the US continues to trade with them on international market; Rwandan coffee has spread throughout the world but particularly to the US, UK and Switzerland market. Coffee sector has been reformed by the Rwandan government; over 100washing station coffee have been established; donors have funded the creation of market connections between farmers and international buyers; cooperatives have developed. This improvements in Rwanda have had major positives impacts. Guariso et al. (2012) coffee production has generated more jobs to the population, has increased their wages, and the poverty has been reduced to small-scale farmers in particular.

Murekezi et al. (2014) & Ngango et al. (2019) coffee plays a key role in the development of Rwandan economy. it is a major product of international trade and has offered jobs to people particularly in rural areas. From the 1990s, the government eliminated barriers in the trade of coffee and introducing the benefits for coffee production in organisations, communities and to farmers (Boudreaux 2009).

2.3.2 The impacts of different projects on Rwandan agriculture sector.

Koss (2016) and Steiman (2013) pointed out that Rwanda relied primarily on United States external aids- helped them overcome various obstacles they faced such as: climate issues, low rainfall, gender disparities, land degradation, lack of knowledge and motivation, decline of farmers and certain crop diseases. Koss (2016) mentioned that during the twenty first century, the former president of US Barack Obama sponsored the production of coffee economically and strategically in the republic of Rwanda and Uganda. In 2016, the European Union provided also funding to support the growth of agriculture sector in Rwanda (Koss 2016).

Koss (2016) indicated that between 2000 and 2012, USAID and projects including SPREAD (Sustaining Partnerships to Enhance Rural Enterprise and Agribusiness Development) and PEARL (Partnership for Enhancing Agriculture in Rwanda through Linkages) contributed $12 million to the Rwandan coffee industry leading to high productivity of specialty coffee and increased the average revenues from coffee production, from 75$ annually in 2001 to 400$ annually in 2006.

2.3.3 Positive Impacts of Coffee Production on Farmers

Koss (2016) mentioned that SPREAD (Sustaining Partnerships to Enhance Rural Enterprise and Agribusiness Development) and PEARL (Partnership for Enhancing Agriculture in Rwanda through Linkages) projects have been useful to farmers because they built more washing stations and provided education to farmers. The World Economic Forum (2020) added that after being trained they have been able to produce good quality of coffee and have received more income than before. These opportunities have given them so much potential to be the best sellers on the market. In 2000 there were only 2washing coffee station that did not function properly, but in 2016, the washing station increased to 245. International competition is becoming easier for farmers when they are formed in cooperatives. The cooperatives have opened doors to employment opportunities, increased their knowledge, improved their standard of living and contributed to the development of the country.

According to Alliance for coffee excellent (2020) it was a historic moment in 2008 when Rwanda received a reward for producing the best coffee quality called "cup of excellence" and became the 1st country in Africa to receive that prize and the benefits were shared by farmers and it inspired them to do even better and making them to have more exporters partners and become recognized throughout the world.

Koss (2016) in the twentieth Century, Rwandan was known for producing and trading coffee on international markets as a major export commodity, that benefits and engages 450,000 small scale farmers. After the end of Genocide, the Rwandan government applied a number of policies and strategies to make coffee production industry growing and remarkable. Rwanda export high quantity of coffee mainly in Europe and in the United states.

Fromm (2015) Coffee has generated more income and has helped the farmers to cover different expenses. They are many small-scale farmers around one and half millions who live in terrible conditions; all together with the rest of farmers rely on coffee production and feed their families through profits generated.

Ngango et al. (2019) the study carried out in the northern of Rwanda referred to the positive effects of coffee production in Rwanda and the positive impacts it has had on the lives of farmers such as:

- Increase of knowledge through training
- Access to loans and different grants
- Increased production factors
- A system of cultivation in which farmers cultivate the same crops in the same place over a period of time which is the best way to use the resources
- Consolidation of land that enhances coffee production because of land that is specifically reserved for coffee tree plantation
- Use of diseases tolerant coffee varieties that have saved a lot of damage

2.3.4 Benefits of Coffee Production on the Livelihood of Farmers in Rwanda conducted in various Research Papers.

Below are case studies conducted from different studies demonstrating how coffee production has improved farmers' lives

1.Case Study of Epiphanie Mukashyaka

Koss (2016) mentioned the case study of a woman named Epiphanie Mukashyaka who was restored after the loss of her loved ones (husband, child and other members) due to Genocide against the Tutsi in Rwanda in 1994. She looked after her 7children and found it hard to take all of them care due to low income, so after PEARL project had been set up, she was able to get enough training, asked for a loan from a bank and invested in coffee production and set up her own business called BufCoffee, and her business became successfully and afterward she built 2washing coffee station in Nyamagabe, the southern province of Rwanda. Her business expanded and she was able to employ 4600 women and these women were able to send their children to school and pay for their health care due to the salaries they earned from that work. Since the president and co-founder of BD import Phyllis Johnson became the first to buy her coffee, Epiphanie's coffee became remarkable on the international market for its high quality.

In addition to this, Epiphanie received a prize in 2007 called the Golden cup and in 2008 she received a cup of excellence prize. Epiphanie became one of the most successful coffee producers in Rwanda. She also intended to build the coffee roaster and store to expand her business. Both of

her children went to school and had a better education system and one of her children followed up mother's business and became a Director of BufCoffee company.

2.Case Study of Uwimana Immaculee

Doucleff (2012) reported that a farmer in Rwanda called Uwimana Immaculee, who gained more benefits in coffee production after failing to grow other crops, she began with 100 coffee trees and her business become 3times bigger; she took her 2kids to schools, built a new home and bought a new territory to plant more seeds.

3.Case Study of kopakama coffee cooperative

Koss (2016) has shown another case study of a certified cooperative with 775 participants located in the western part of Rwanda which has also been growing successfully, with the goal of producing high quality coffee and organic coffee. They supported gender balance for everyone involved in coffee production and also women had the same power as men because some women had lost their husbands in Genocide; so, they had equal access to wages and could provide for their families, the cooperative offered training to farmers, encouraged sustainable farming and motivated everyone to make decisions that led to imaginative and creative decisions.

Coffee cooperatives in Rwanda have played a major role in reducing poverty and have also significantly increased the living conditions of their members. Coffee cooperatives have also led to the country's economic growth and have acted as a tool for rural development. Cooperatives also pay taxes to the Government which are used to construct infrastructure and to provide public goods to the citizens of Rwanda.

4.Case Study of Abahuzamugambi Cooperative

Sustainable growers (2018) said that 70 coffee farmers came together and formed Abahuzamugambi cooperative in 1999 to improve their living conditions and eradicate poverty among them, which has now grown to 1327 members.

Penson (2007) noted that the key operation of the cooperative is the production of coffee, it was sponsored by the USAID and it was the first among other cooperatives to obtain Fair trade Certified in 2002 in Rwanda. Sanni (2010) stated that this coffee cooperative provides job opportunities and allows members to generate extra income. Rwandan coffee farmers have joined Abahuzamugambi cooperative and were then introduced to savings groups that help them in their future planning. Sanni (2010) mentioned several benefits of becoming members such as job opportunities and some of them have bought houses and land, and they were able to pay the school fees to their children. The members of cooperative have gained skills and technological experience to a broader audience which has increased their productivity, in addition to that some of them were able to create the small businesses. The aim of this coffee cooperative in the society is to produce and sell coffee to many consumers; they managed to sell its specialty coffee to the international market where they received the high price. Penson (2007) said that the members have obtained significant economic benefits such as access to health care facilities and better nutrition.

5.Case Study of Habihirwe Charles

Fromm (2015) mentioned in her case study an example of a farmer living in Rwanda in Gakenke region called Charles Habihirwe who started this business and profited significantly from the production of Coffee. Charles has 10 children and a farm of 2hectares, he planted the arabica coffee and other different crops in his land. Through the extension services provided by Dukunde Kawa, he was able to produce and grow more coffee and this service played a big role to his success. Through the loan provision also he was able concentrate on coffee and expanded 100 coffee trees into 4500. By the result of his achievement, he was able to provide an education system to his children and covers his children's expenses such as the health insurance, he was able to purchase a house and he was expected to refund sooner the loan he took. In CAFERWA where associations and farmers sold their coffee has helped him to trade more coffee by buying his coffee as well as supplying him the inputs needed.

2.3.5 Challenges of Coffee Productions on Farmers

Koss (2016) mentioned that coffee was known for the first time in the colonization era. Prior to that period the Rwandese consumed tea, so at that time coffee was not well know which caused people who produced it to suffer a lot and found it unfair due to a lack of market; and low income, the farmers experienced another tragedy during the Genocide against the Tutsi in 1994.
Karuretwa (2002) coffee was produced in Rwanda but not at the highest volume and since late of 1990s it was on the brink of crashing. It was mainly due to a lack of goals and objectives in the sector, lack of information on the international market, lack of knowledge, capital and capabilities, poor infrastructure, a low level of technology, inadequate amount of cherries and a lack of adequate human resources. This has caused the low quantity and quality of coffee production in Rwanda.

Minecofin (2012) added that there is a problem with weather conditions, such as heavy rain, which could kill the crop that gives farmers a loss, but the coffee producers pointed out that these are not the only major challenges they face, adding that the other challenges they face are to export to the international market, where prices are predictable and unstable.

Transparence Report (2019) mentioned that the coffee industry had a difficult time when its price had fallen dramatically in 1990 followed by the year 1994, when coffee production was severely damaged. MINECOFIN (2012) has conducted a study on Coffee in Rwanda and identified some of the challenges and consequences faced by farmers which are the following:

- Insufficient inputs which lead to low productivity of coffee production
- Variation of the price of coffee on the market which is hard for farmers to make enough profits because the price is not stable
- High price which leads to low quantity demand
- Insufficient coffee washing stations which makes cherries worse

Nzeyimana et al. (2013) and Doucleff (2012) enumerated different challenges such as:

- Lack of Institutional and agricultural farm management.
- Pests and diseases that penetrate into coffee beans
- Lack of sufficient knowledge of coffee processing steps.

Ngango et al. (2019) Farmers faced different challenges such as limited means of production, structural change while producing coffee which prevented their production from growing.

However, despite these barriers, farmers have tried to produce efficiently because it is very important for their standard of living.

NAEB (2020) stated that the overall export sales in June 2020 were $ 25,644,364 compared to $ 32,447,244 during 2019, down by 20.97%. This big decrease in income caused by the decline in cross-border trade due to Covid-19.

2.3.6 Major strategies and policy taken by the government to increase the coffee production in Rwanda

Karuretwa (2002) mentioned that the government of Rwanda has imposed different measures to enhance the benefits of coffee by introducing new agriculture machine that will improve the output production efficiently and effectively.

MINECOFIN (2012) also mentioned different strategies and measures used to increase the productivity of coffee production which are the following:

- provision of specialized technology for the production and processing of coffee
- provision of fertilizers, seeds and other inputs needed for coffee to grow
- establishment of cooperatives that will help people to work and save money together
- encouraging investors, stakeholders to support the farmers to increase the output of coffee and savings
- increasing coffee processing regions

According to Ngabitsinze (2012) and (MINECOFIN 2012) corporation with different donors' organizations that provided funding, materials and trainings to increase the quality of coffee enhanced the development of infrastructure; the government has been assisting the promoters who can help farmers to trade coffee and to have a modern collaboration with them throughout the process. The government also set the guidelines and policies of the sector to draw the attention of all farmers who are producing and those who wish to contribute to the sector such as NGOs, private and public actors.

Karuretwa (2002) added that coffee in Rwanda has improved due to the different strategies that the country has put in place. The country is now producing ordinary and specialty coffee.
The only difference is that all the specialty coffee is done at coffee washing stations while the ordinary one is not, and the quality of the coffee is also different. The government has emphasized the competition for coffee-cupping and has granted awards and certificates to those with high and good results for coffee. The government has introduced fair-trade labels to support the coffee growers. Rwanda wants to become a country that is more dedicated to the production of coffee and has applied the approach of producing more specialty coffee called arabica because it has a good quality and its price does not fluctuate on the international market, they are making different innovations to deliver tasty coffee well processed, cleaned and roasted coffee.

However, Ngabitsinze (2012) & NAEB (2019) mentioned that the price of coffee fluctuates due to different conditions in the market, he said that coffee with high specialty is more likely to be stable in price.Guariso et al. (2012) Rwanda has been transformed from a subsistence agricultural economy to a modern one and it is the 5th pillars of vision 2020 set by the government to develop the country, Rwanda has emphasized on different measures to control the demographic rate because they are a lot of population in the country, the rate of poverty in rural areas is significantly higher than in urban areas. Rural development plays a major role in eliminating poverty and to lift people out of poverty. The study indicated that the trade shortage would be reduced by the export of coffee abroad. The people followed the measures set by government such as planting more trees and advertising coffee on the international market, this increased demand for coffee which in return gives a successful profit that benefits not only the farmers but also the whole country.

Minecofin & BRD (2012) Rwanda Development Bank and Opportunity Bank have implemented a strategy in order to help farmers to increase coffee productivity by providing a loan of
$ 8,443,636 to the cooperatives, to the individual businesses, to construct the facilities such as wet milling processing for coffee and build up modern infrastructure. They were a proposal to create a better environment that would increase productivity growth, the loan access was granted to the farmers and to those who have no start-up capital. The government eliminated 18% of the VAT on coffee by helping the farmers to make more profits.

Doucleff (2012) stated that the government began to regulate the production of coffee after its introduction which benefited many farmers to get more profits and keep running their business because the government was able to set the prices, but after the Genocide in 1994 the industry was privatized which accelerated also the coffee trade on international markets.

The study of Ngango et al. (2019) has assessed the technical effectiveness and the opportunities offered to small- scale coffee farmers in the Northern Province. The study found that coffee was more sensitive to chemical substances, followed by other inputs such as natural fertilizer, soil, workers and pesticides. it has been reported that the more the factors of production rise, the greater the rise in coffee production, which is something that small-scale coffee farmers benefit from. The results demonstrate that training, the loans provisions, the land consolidation and the enhance of different seeds of coffee have improved the coffee production produce which has resulted in a better standard of living for farmers. The study also proposed that in order to produce efficiently and effectively, farmers should be provided with sufficient training and the provision of loans to small scale farmers who do not have enough capital, especially in the countryside to enable them to gain more knowledge and skills. The study recommended that research on coffee be undertaken in order to analyse the possibility of success and the constraints that could arise in order to plan accordingly and set out measures to fight against it, they mentioned the example of pests and disease that destroy crops and suggested the use of crops that can resist those diseases such as BM139. They also suggested that the method of growing 1crop in the same field during a specific period and a combination of land would increase productivity and take less time.

They realized that technology is not yet introduced in coffee production in Rwanda because it is expensive, and that mountain hills are hard to cultivate and poor roads are difficult for the transport, but they recommended it for better and more efficient outputs.

Karuretwa (2002) and Ngabitsinze (2012) Rwandan is known as a coffee producing country and delivers high quality and excellent coffee, in 2014, only 40% were fully washed and aiming to increase more washed and specialty coffee to 71% in 2018, and the buyers rate Rwandan coffee as a good quality that have been increasing. Guariso et al. (2012) analysed the transition from normal coffee to specialty, he determined all the process needed to get coffee served on the table, the coffee washing differentiation, the challenges and the expected benefits of coffee.

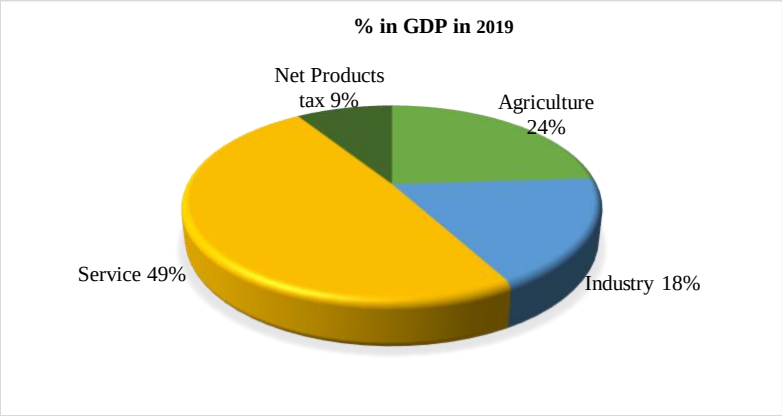
2.4 Contribution of Agriculture, Industry and Service Sector in GDP

World Bank (2018) mentioned that agriculture accounts for 31.5% of the GDP and is known to engage around 75% of Rwandan employees. The agriculture sector accounts 91% of internal food consumption and generates 70% revenues of all commodities exported.

Moreover, Pinard et al. (2014) added that coffee itself generates 27% of export revenues.

NISR (2019) demonstrated the GDP shares in 3different sectors. In 2018 the Service sector accounts for 48%, the agriculture sector accounts for 29% and the industrial sector accounts for 16% and the 7% remaining was assigned to the net products tax. NISR (2019), private sector investment amounted to 78% of all GDP in 2018 while government spending amounted to 15%.

Figure 1: Share of Agriculture, Industry and Service Sector to GDP in 2019



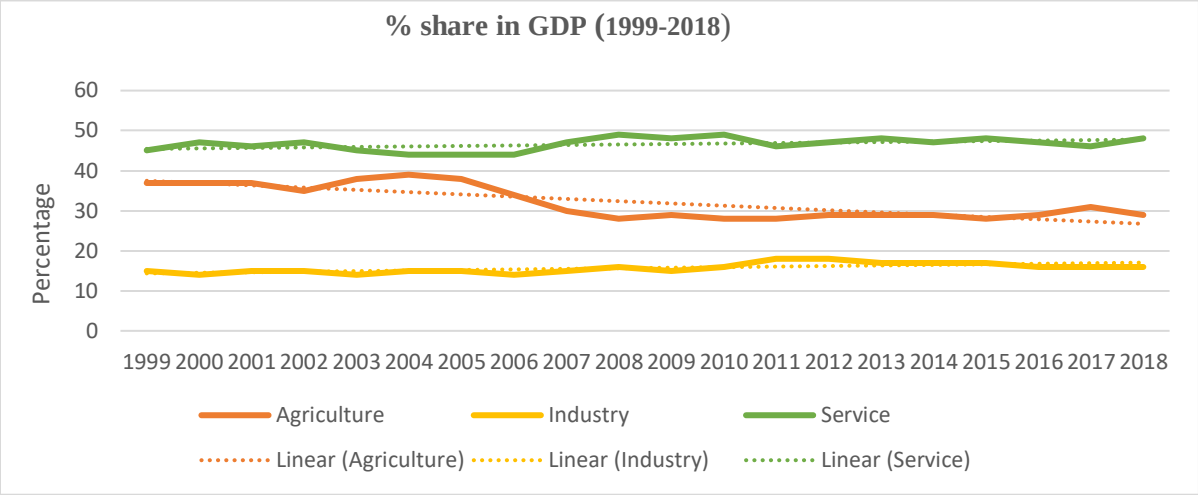
(Source: Own calculation based on NISR, 2020)

NISR (2020) demonstrated the shares of 3 different sectors in 2019 to GDP. Agriculture: 24%, industry: 18%, Service: 49% whereas the 9% left was taxed on the net product. The agriculture sector was boosted by coffee which increased by 7% and tea with 3% respectively.

The figure shows how service sector contribute high share to GDP compared to other sectors. both agriculture and manufacturing contributing much less to what the service sector does. Service sector is known to contribute a large proportion followed by Agriculture sector.

NISR (2019) reported that GDP was about 7.6 billion Rwf in 2017, which increased in the year of 2018 to 8.189billion Rwf. NISR (2020) indicated that GDP increased by 9.4% in 2019 to 9.105billion Rwf.

Figure 2: Percentage share of Agriculture Industry and Service Sector in Rwandan GDP



(Source: Own calculation based on NISR 2019)

The graph shows the trend lines between the three different industries. The percentage share of the service sector rose further to GDP relative to other services and the proportion started to rise since 2007, followed by the agricultural sector, which had a sharp decline in 2005 and increased again from 2009 and the manufacturing sector, which has the lowest proportion among other sectors and has started to increase in 2015.

OEC (2019) found that Coffee was among the largest exports of commodities in Rwanda and accounted for $7 5.5 million in 2019 and constituted about 5.6% of the overall value of exports. In 2018, they coffee export value was coffee $78.1million and with about 4.57% of the overall export value and this shows that it has increased during this time period. MINAGRI (2021) indicated that in Rwanda the agriculture sector contributed 29% to GDP and the sector has grown by 6% in 2018. Agriculture Gender Strategy (2010) indicated that in Rwanda agriculture sector contributed 63% of revenue on foreign exchange, and 70% of export revenues and accounted around 40% of GDP. Agriculture employs above 80% of population and the most of these population are women with 86% while men account of 14%

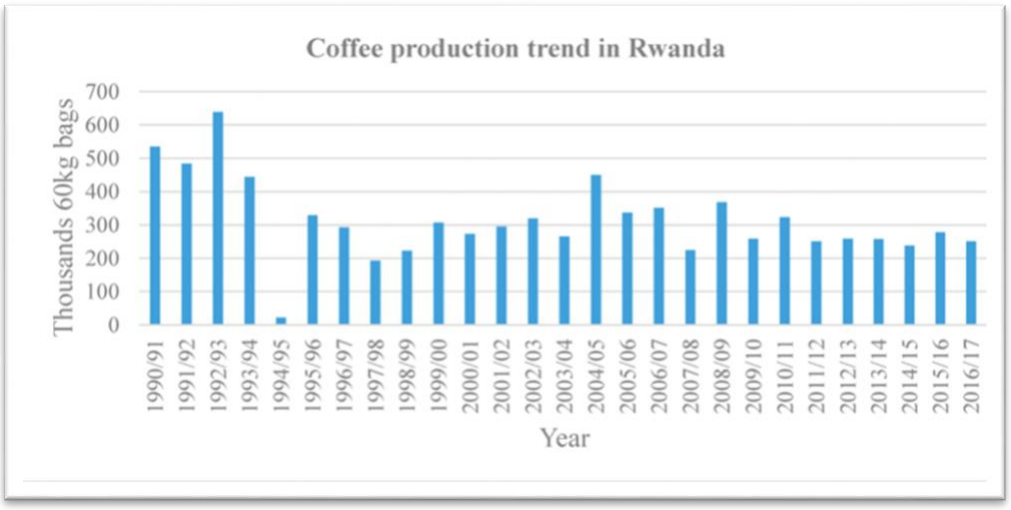
Table 1: Annual percentage GDP growth rate changes of Agriculture, Industrial and service sector

	2012	2013	2014	2015	2016
Agriculture	6.5%	3.3%	6.6%	5.0%	3.9%
Industry	8.4%	9.3%	11.0%	8.9%	6.8%
Service	11.6%	5.2%	7.0%	10.4%	7.1%
GDP growth rate	8.8%	4.7%	7.6%	8.9%	5.9%

(Source: own calculation based on World Bank 2017)

Table 1 indicated the changes in GDP growth rate and it has increased mainly in 2012 and 2015 and after decreased in a year of 2013, 2014 and 2016.

Figure 3: Rwandan coffee production trend



Source: International Coffee organization, 2017

International Coffee organization (2017) the coffee production has reduced from 1994 because of genocide which destroyed the country completely and the coffee sector began to recover but not fully in the beginning of 1995; the figure 3 shows that each year the quantity of coffee that are produced are different and the increase or decrease of outputs depend on different circumstances.

2.5. Procedures of Coffee Production

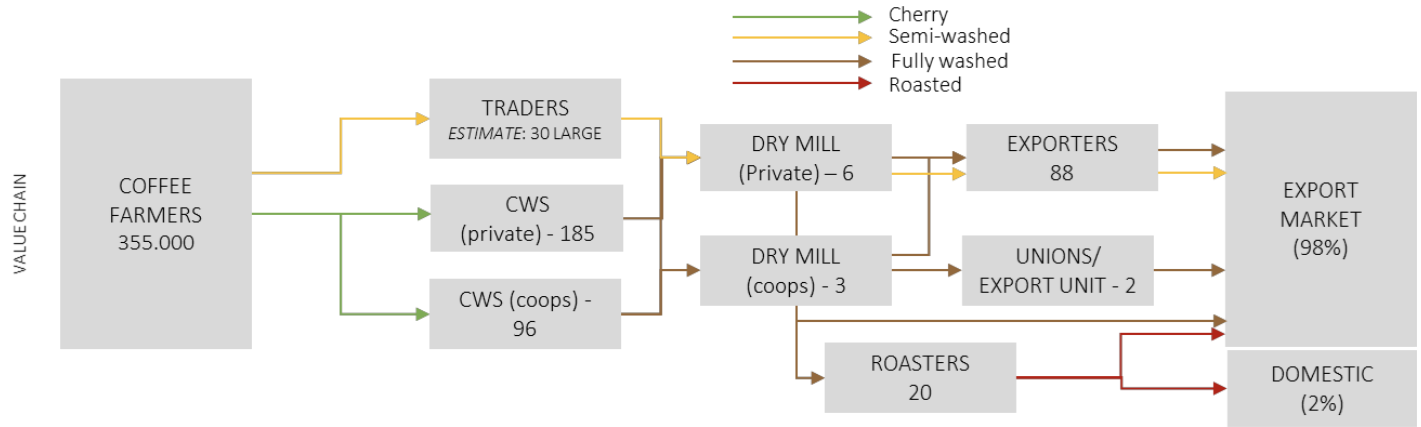
Koss (2016) listed different specifications required to produce coffee.

Coffee beans must be cultivated and grown at least 3years. After that, farmers apply a wet processing approach which is modern and better for good quality, but other farmers apply a dry processing approach which is traditional but without good quality which has resulted in a lower cost. The coffee washing station is used to clean coffee in various location with different methods, the farmers need to learn how to maintain, to preserve and to fully wash the coffee in order to achieve very positive results.

2.5.1 Process of coffee value chain in Rwanda

Agri logic (2018) mentioned that in Rwanda, the semi washed coffees are mainly exported to Switzerland, and the full washed to the US. Over the years, output has declined dramatically, but the quality has risen tremendously: from 30 % of fully washed coffee in 2010 to 60% in 2016. The wet processing coffee are known to be of high quality and have seen a tremendous growth in numbers from 2 to300 coffee washing stations in 2002. Transparent Report (2019) farmers grow coffee cherries and take them to the washing station. Coffee is processed in washing station, dried and are packaged. Coffee is sold and exported on international markets.

Image 2 Rwanda's coffee value chain in 2018



Source: Agri Logic, 2018

Agri logic (2018) around 355,000 coffee farmers cultivate coffee on 37,500 ha, and Rwanda coffee production is driven by a few medium to large traders and exporters, such as RTC, IMPEXCOR, Dormans and RWACOF. There are two major characteristics of coffee value chain seen above such as the fully washed and semi-washed (ordinary) coffee. there are currently licensed export 88 firms, but approximately 1/2 of them are successful coffee exporters and around 200 Coffee washing Stations (CWSs), from which 96 are cooperatives. Rwanda has moved from 5 trading partners overseas to more than 40 since 2012, and among those exports market include the UK, France, the Netherlands, Norway and Poland; other European countries indicated the potential expansion in the coffee specialty market. Before exporting coffee, it is important to give the sample to the consumers to try it and, as soon as they want it, the buyers must send the same type of coffee that have been sent as samples. The taxes that are charged on the unprocessed goods are usually lower than the finished commodities. The European Union imposes a tariff of 7.5% on roasted coffee.

According to SelinaWamucii (2021) the Rwanda's coffee price per kg in 2020 was between $3.44 and $3.22 per kg, the price has changed during different period, in 2015 the price per kg was US$3.39 in 2015 and US$3.44 in 2017. Doucleff (2012) coffee production has increased, and the price has also increased steadily. In 2000, 1kg of regular coffee was 0.20$ and in 2011 the price was 3.50$ which indicates a significant effect on farmers and how valuable this coffee is to the economy.

2.5.2 Coffee Procedures

Transparency report (2019) mentioned different stages of coffee production in Rwanda:

Plantation

The small farmers cultivate coffee, once the cherries have grown up, they supply them to the washing stations to process them, some grow coffee for their own consumption others grow coffee for sale, and the harvesting season started from March to August depending on the region.

Processing

The industry staffs have given trainings to farmers on how to identify cherries before delivery; the workers have their particular way of handling, processing and organizing the cherries obtained.

Fermentation, washing and drying

The coffee is washed and dried directly from the sun in a dry bedding. The time of fermentation for coffee is around 10-12hours.

Coffee production calendar

According to Transparency report (2019) mentioned that Rwandans start harvesting coffee in between February and august and then NAEB (2019) added that coffee flowering begins in late June until August and the harvesting cycle starts in February or March depending on the location until August.

Climate

Safari & Guariso et al. (2012) Rwanda is a landlocked country located in central East Africa and bordered by Democratic Republic of Rwanda, Uganda, Burundi Tanzania.

Safari (2012) & Ngango et al. (2019) reported that Rwanda has a tropical climate with an average of 20℃ which is suitable for coffee production. The country has a two-year rainy season

2.6 East African Community (EAC)

UNECA (2016) mentioned that EAC is an intergovernmental organizational made up of 6 countries such as Kenya, Rwanda, Burundi, Tanzania, Uganda and South Sudan.

There are different aims and objective of EAC which are the following:

- to set up a single currency
- to create a common market
- to improve partnership among member states
- to stabilize peace and security
- to enhance the development and economic growth through industrialization

EAC (2018) mentioned that EAC's treaty was signed in 1999 and entered into operation in 2000. This community has 168.2 million inhabitants and a cumulative GDP of US$ 155.2 billion, and it is one of Africa's fastest expanding trade blocs.

Centre du commerce international (2020) indicated some strategies and measures that have been mentioned in the EAC coffee business forum to boost the coffee output.

- the EAC is implementing to foster collaboration between the public and private sectors in order for them to make investments that will improve coffee production.
- The community is lifting trade barriers for coffee production, which will expand market among member countries
- They are providing financial support to coffee industry in order to boost the output as well as empowering women in the coffee industries.
- Respecting and achieving standards requirements and provides the recognition for the country that produced the best coffee quality.
- countries must ensure that their infrastructure is well managed to achieve the advantages of coffee exports on international markets
- the countries must put in place the technologies that will boost the production

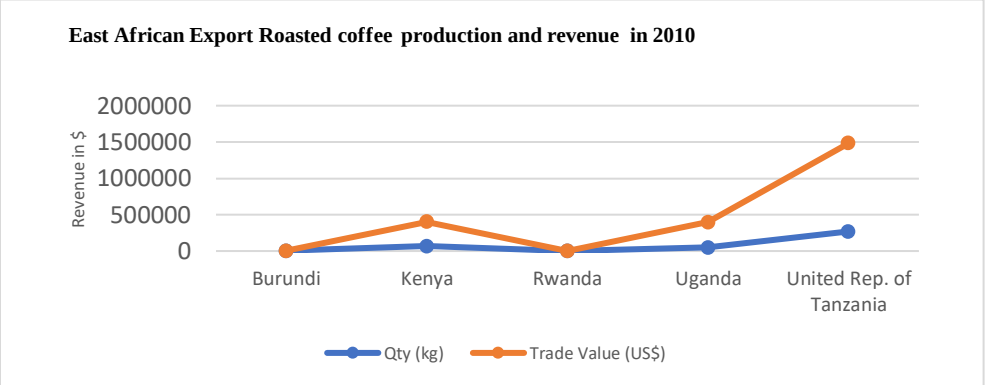
Koss (2016) EAC are classified by the UN as the least developed countries. This organization was formed to ameliorate the development and economic status of African countries. EAC is growing specialty coffee of good quality which will offer member states the advantage of competing and winning the international market in the years to come which will enable them to achieve their development objectives, especially in Rwanda because it is leading other countries to produce more specialty coffee. Agricultural Gender Report (2010) the EAC countries depend on coffee exports and most of the coffee is produced by small-scale farmers who rely on coffee as cash crops. East African community (2012) mentioned that the member states' goal is to support the growing industries, in which competitive advantages are possible and the coffee production is including in the growing industries, the most countries that have this advantage are Rwanda, Kenya and Tanzania. Coffee significantly contributes to the East African Community (EAC) countries.
Marchand et al. (2017) they are different principles and regulations in this organizational including the free movement of people and the free trade which assist the exchange of goods and services through export and import. EAC (2019) estimated that the GDP of EAC in 2018 was US$ 193 billion with a population of 177.2 million while UNECA (2016) estimated that EAC's GDP in 2014 was $159.5 billion with a population of 168.5 millions of populations. In 2018, Rwanda became a top nation with an economic boom of 8.6% in 2018, among others. World bank (2020) although the average GDP in EAC was expected to drop from 5.6 % in 2018 to 5.4% in 2019, Rwandan economy increased in 2019, driven largely by spending of most public and private sectors.

2.6.1 Coffee Overview in EAC

EAC produce coffee and supply them in mostly the European Union, EAC works together and serve different nations as one market (EAC markup 2020). At Arusha International Conference Centre, the various obstacles faced by the EAC Community were addressed and a strategy was developed to remove barriers to trade coffee which increase the production of coffee in EAC. According to Koss (2016) Arabica coffee is popular and produced more in EAC except for Uganda which focuses mainly on the production of Robusta coffee among all other African countries. Nyangweso & Odhiambo (2008) pointed out that since 1994, the government of Rwanda privatized the coffee industry and eliminated the tax on coffee exporters in order to promote and grow more coffee in the region, giving Rwandan farmers so many benefits. USAID (2010) coffee exports in Rwanda accounts for 70% of all foreign earnings. Koss (2016) listed the most coffee producing countries, such as Brazil as the largest coffee producer with a market share of 34% followed by Vietnam, Indonesia, Columbia and Africa (Ethiopia was the largest coffee producers compared to other African countries). The top 5 importers of coffee include: France, Germany, Italy, US and Japan

Comparison of coffee export productions and revenues within East African Community countries 2010 – 2018

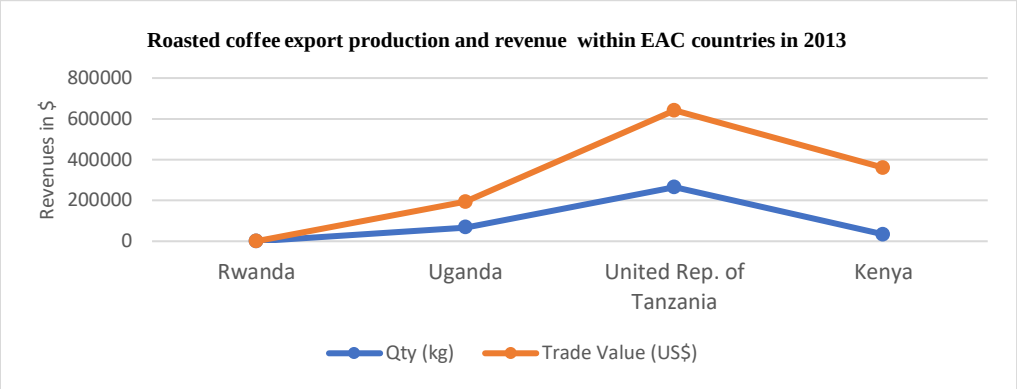
Figure 4: Comparison of coffee export productions and revenues within EAC 2010



(Source: own calculation based on United Nations 2020)

In comparison to other EAC countries, in 2010, the Republic of Tanzania was the first to export more quantity of coffee and to generate a lot of revenues compared to other EAC countries, followed by Kenya and Uganda. The figure shows that Rwanda and Burundi were the least coffee-exporting countries and thus generated less revenues.

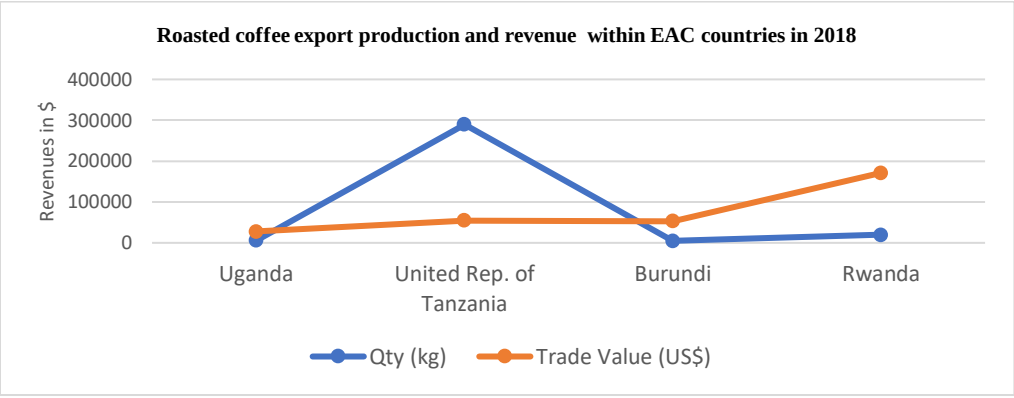
Figure 5 : Comparison of coffee export productions and revenues within EAC 2013



(Source: own calculation based on United Nations 2020)

Comparing the EAC countries, in 2013, the Republic of Tanzania was the first to export more quantity of coffee and to generate more revenues compared to other EAC countries, followed by Uganda to export more coffee; and Kenya to generate more revenues. The figure shows that Rwanda was the least coffee-exporting country and generated less revenues. By comparing the years 2010 and 2013, Kenya has significantly increased more revenues in comparison with other nations.

Figure 6 : Comparison of coffee export productions and revenues within EAC 2018



(Source: own calculation based on United Nations 2020)

Comparing the EAC countries, in 2018, the Republic of Tanzania was the first to export more quantity of coffee while Rwanda was the first to generate more revenues. The figure shows that

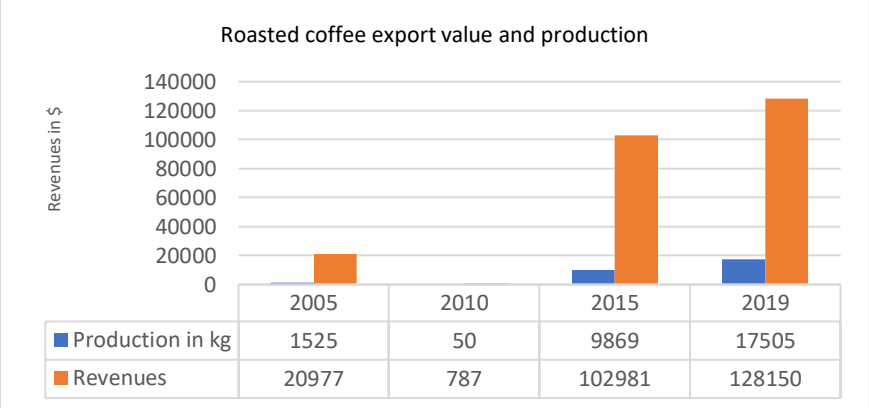
Uganda and Burundi were the least coffee-exporting countries and they generated even less revenues. By comparing the years 2013 and 2018, Rwanda has improved significantly its revenues in comparison with other nations, which indicates how the country's export of coffee have improved.

2.6.2 Coffee Exports production and Coffee Exports Revenues

According to NAEB (2019) Rwanda has had a positive impact on the balance of Trade and has provide different opportunities to farmers and other actors in agricultural. Agriculture earned $428,916,000 in 2017. Rwandan agricultural sector has increased annually and is expected to reach around 1billion $ in 2024.

RDB (2020) mentioned that there are 3different continents in which Rwanda exports coffee which includes: United States, Europe and Asia. NAEB (2019) Rwanda export more than 60% of its coffee to the countries of the European Union, exports 20% of its Coffee to the United States and limited quality to Asia and the rest of the world.

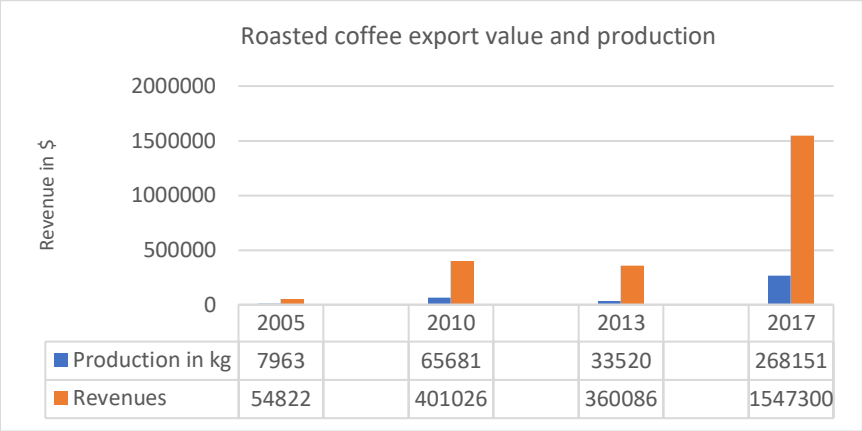
Figure 7: Rwanda's coffee exports production and coffee exports revenues



(Source: own calculation based on United Nations 2020)

The production of coffee and its revenues have declined in 2010 and started to recover from 2015, by 2019 the revenues have risen at the highest rate in comparison with another period.

Figure 8 : Kenya coffee exports production and coffee exports revenues

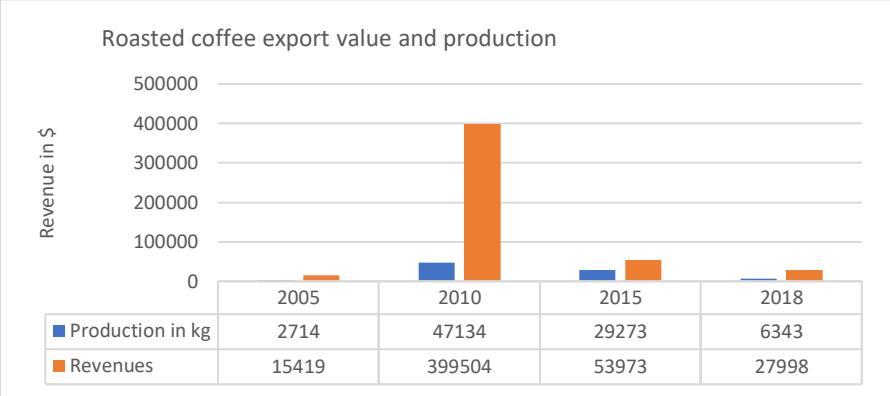


	2005	2010	2013	2017
Production in kg	7963	65681	33520	268151
Revenues	54822	401026	360086	1547300

(Source: own calculation based on United Nations 2020)

In Kenya, the production of coffee and its revenues increased each year and in 2017, the coffee revenues boosted and made a great impact.

Figure 9: Uganda coffee exports production and coffee exports revenues

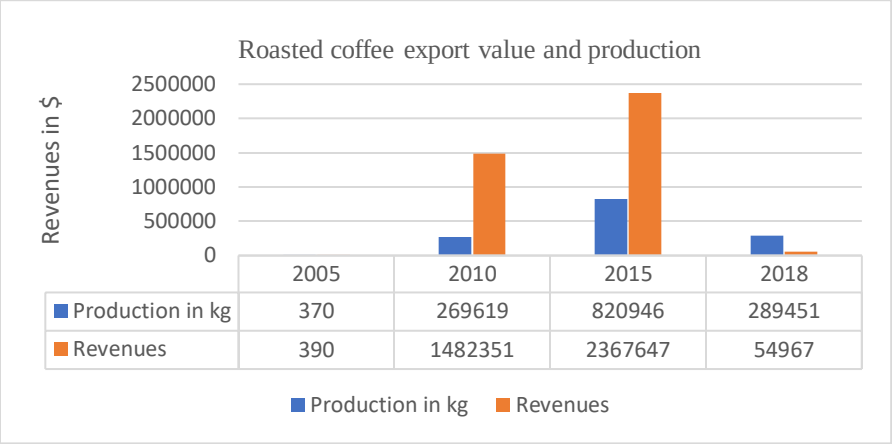


	2005	2010	2015	2018
Production in kg	2714	47134	29273	6343
Revenues	15419	399504	53973	27998

(Source: own calculation based on United Nations 2020)

In Uganda, the situation was worsening except in the year of in 2010, where the country performed very well but after 2010 it has fallen and has never recovered

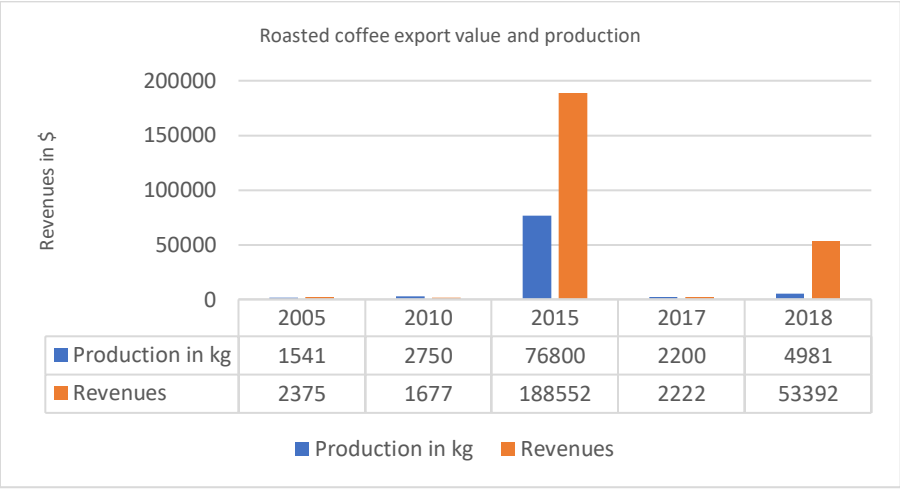
Figure 10 : Tanzania coffee exports production and coffee exports revenues



(Source: own calculation based on United Nations 2020)

In Tanzania, the country gained a lot of revenues and produce more coffee from 2010 to 2015 and in 2018 the country had a low performance.

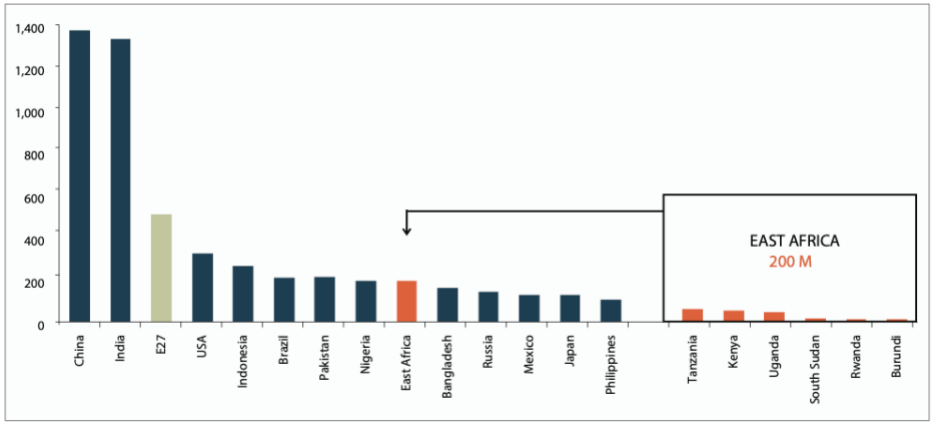
Figure 11 : Burundi coffee exports production and coffee exports revenues



(Source: own calculation based on United Nations 2020)

In 2005, 2010 and 2017 Burundi had experienced a low coffee production and its revenues, however in the year of 2015, the country grew more coffee and earned more revenues than other periods. Global Coffee Platform (2016) stated that the contribution of coffee production in Burundi to gross domestic product (GDP) amounts to $40 millions.

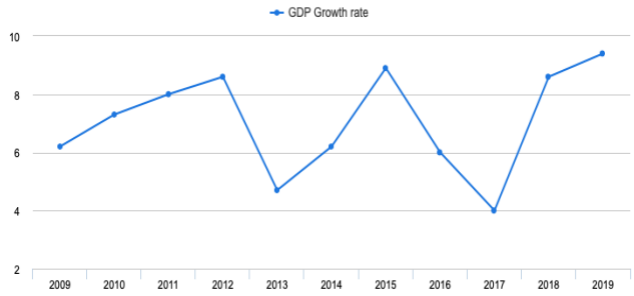
Figure 12: Largest global market by population (EAC is on the 9th place)



Source: World Bank 2020

The graph above indicates that EAC was ranked 9th in the world's largest consumption market by population, which means that Rwanda has a great opportunity to be part of this community as, EAC is a big coffee export market for Rwanda. World Bank (2020) mentioned that East Africa Community would enter the 9th largest digital market by world's population and will earn 200millions and once this community will perform a single digital market, the GDP will boost by an additional of $1.6 billion and they will generate between 1.6 and 4.5millions more jobs. The organisation has 180million of population; Rwanda has a huge potential and a capacity to develop and become competitive to the market. In order to retain and attract more investors, Rwanda needs to participate in a large e-commerce market.

Figure 13: GDP growth rate 2009 - 2019



Source: NISR 2020

This figure shows the Rwandan GDP growth rate which increased from time to time, except in 2013 and 2017 where it decreased at the highest rate.

EXPORT COMMODITY

Guariso et al. (2012) added that since Rwanda has completed the transition from traditional to modernization and has become a path to development, they have to put much efforts to support the production of staple crops to be eaten and sold outside the market and enable farmers to have a better standard of living and earn more salary.

Guariso et al. (2012) & NAEB (2019) due to the support, materials and funds received including the demand for specialty coffee, the farmers have been able to grow more specialty coffee that has helped them trade and export more coffee abroad which gave them more money. However, Coffee washing stations are not well managed, and some do not work very well, which can reduce the quality of coffee products in Rwanda on the international market so that they need to work on it and enhance the washing stations so that they can continue to produce good coffee and maintain a good reputation as a country. In 2010, the Rwandan government began controlling and directing most of unprofitable washing stations' coffee areas and providing more funding to reinforce them. The efforts of farmers should be recognized and appreciated, and they should be rewarded and given some incentives for producing good quality which will motivate them to grow more and work very hard.

Guariso et al. (2012) since Rwanda is a landlocked country, it will become more costly for them if their competitors who have access to the sea join the market, but they have started to think about promoting the coffee to get to know everywhere, and to see how well roads can be rebuilt. Finding a way to make more advertisements and to have a well-known brand all over the place, they found a good way to get the labels that justify that the coffee is good and use a friendly environment they were planning to see how well the roads could be built to shorten the distance between the coffee production land to the industry in the case of lowering the transport cost.

3. OBJECTIVES

The Rwandan coffee has been one of the major exports for a long time and it has incredibly benefited the country's economy. The agriculture production and exports of coffee have featured on international markets and contributed to the countries' GDP. However, without coffee farmers that wouldn't be possible. The Rwandan coffee production and value chain mainly focus on international trade and market share. As a result, it is rare to get first hand experience from the farmers themselves. Many researchers underlook the importance of coffee farmers and how coffee itself has impacted their every day lives. I believe that it is crucial to also focus on the low income farmers, those with limited land resources and means of production. The Objective of this thesis is to analyze the impact of coffee production on small scale farmers, to examine the contribution of government to the farmers and lastly to assess the factors that affect the coffee production.

3.1 The main objectives

Coffee is known to be one of Rwanda's main exports and a key factor to the country's economic growth. Most Researchers of the coffee production in Rwanda focus on the overall journey of coffee being exported to the final international markets and the revenues it generates to the country. It was necessary to go deeper in the research to learn about where coffee plantations start from, coffee value chain and the benefits it provides to the farmers. My objective was to assess the impacts of coffee production in Rutsiro district not only on the Rwandan economic level but also on the small-scale farmers.

Furthermore, the Rwandan government's strategies to improve its coffee production was evaluated. If a contributor to a country's economy is not well maintained, there are risks therefore, the measures and policies must be set in place to ensure a high coffee productivity. The study mentions the benefits the farmers get from coffee and goes into further depth on what the country of Rwanda does to ensure that its coffee production continues to gain international recognition.

3.2Research Questions

I. What policies and major strategies were adopted by the Rwandan government to support coffee production?
II. How did coffee production positively impact the lives of Rwandan farmers and what opportunities has it created?
III. What are the existing relationship between farmers' coffee production and the size of land, age group and income of farmers?

4. METHODOLOGY

This chapter seeks to answer research questions and the objectives of my study of coffee production. To gain a deeper understanding a quantitative and qualitative survey was conducted among farmers and an interview to an agronomist of Cyimbiri Factory to acquire first hand informations. The survey and the interview questions were based on the content already mentioned in the literature review.

The literature review demonstrated the growth of coffee production in Rwanda, the positive effects on international trade and the impact on the overall economy. Nevertheless, multiple research questions remain to be answered. These include examining and analysing if the farmers are getting welfare to sustain their costs of living and if the coffee production is improving their livelihood.

4.1 Description of Research area (Cyimbiri Coffee Factory)

Cyimbiri Coffee Factory was established in 2010, it is a factory that produces coffee in Rwanda, it is located in Rutsiro district in Kigeyo Sector. The factory has approximately 70 employees and 60 of them are farmers. The Factory has a sandy loam with a size of 19 ha and 4ha is the size of land used in coffee production with 472,258 planted coffee trees. The average coffee produced is between 150,000kg and 250,000 kg annually.

Based on key information interview conducted by an agronomist of Cyimbiri Coffee Factory, the factory not only sells coffee inside the country but also exports it to international markets; the National Agriculture Export Development Board (NAEB) is the channel distribution of their

coffee production to foreign markets, but the Cyimbiri Factory distributes directly to the domestic consumers, and the means of transportation used are the trucks. The agronomist mentioned also that NAEB inform the price situation of the market to the factory and set the minimum wage of the farmers. NAEB also sets the price of coffee but they are different criteria that are being considered before setting price which include the price on the international market, the costs of production used, the challenges that farmers faced, the weather situation if the weather was good the output increase and led to low price but if the weather was bad, this led to low quantity of coffee output which causes the prices to go up.

The stakeholders that are involved in Cyimbiri Coffee Factory include the Government of Rwanda, National Agricultural Export Development Board and the Ministry of Agriculture. These stakeholders provide pesticide, fertilizers and the access to loans to the factory. There are other key players in the coffee production industry considered as the competitors of Cyimbiri Factory that include RWACOF EXPORTS SARL, COOPAC LTD, CAFERWA LTD, KOPOKAMA COFFEE COOPERATIVE AND MARABA Coffee. Cyimbiri coffee is mainly planted in the rainy seasons; either in April or September and harvested within the following three years. Harvest season starts from February until May and from September until December.

4.2 Study Area: Rutsiro District Overview

World Bank (2018) Rutsiro is a district located in the western province of Rwanda where coffee is the major cultivated crop. It is made up of 7districts and 13sectors with a total of 483villages. Rutsiro has an area of 1,159 km^2 with 324,654 inhabitants. The major cultivated crops in the area are coffee, tea, maize, beans and Irish potatoes. Coffee and tea are classified in the cash crops and are traded internationally. The majority of the population are rural, and the area is known to have poor transport routes. The Government of Rwanda (2021) mentioned that between 2016 and 2017, the western province of Rwanda had 11,774 ha of coffee land, built 127 washing stations, planted 29,433,765 coffee trees, and produced 8,930 tons of coffee. As a result, the Western Province of Rwanda accounted for half of Rwanda's agricultural exports which included tea, coffee, vegetables, and pyrethrum. Rutsiro District had 19 coffee washing stations and 5,558,759 planted coffee trees with 2224 ha of land. The coffee production that was grown in the Rutsiro district between 2016 and 2017 was 2,343 tons of coffee. In comparison to other district, Nyamasheke is the largest district, producing 3959 tons of coffee followed by Rutsiro.

Image 3 Rutsiro district map

Source: world Bank 2018

World Bank (2018) along with other development agencies such as World Bank and International Development Association, the Ministry of agriculture and animal resources have financed various districts including Rutsiro to combat the loss of agricultural production after harvesting and to support transport routes. The government of Rwanda has therefore implemented a project called Rwanda indicative feeder Development to assist in that plan of infrastructure development.

World Bank (2018) mentioned that the project has positively made a huge impact in Rutsiro district. These are the following benefits that it offers such as:

- Transfer of knowledge
- Job opportunities
- Strengthening the rural economy
- Facilitate the transportation facilities.

<u>Environment factors</u>

World Bank (2018) & Fromm (2015) mentioned that Rutsiro district is characterized by a hillside mountains, high-elevation and solid volcanic fields with good weather conditions such as rainy season that are suitable for the production of coffee and Tea. Rwandan weather is suitable for coffee production which is why it is produced in the country

4.3 Main target and sample size

The main target group was small-scale farmers working in the Cyimbiri Coffee Factory in Rutsiro district. A simple random sampling was used to determine the population size and by the use of the formula taken from the Raosoft calculation.

$x = z(c/100)^2 r(100 - r)$, $n = Nx/((N-1)E^2 + x$, $E = Sqrt\ [(N-n)x/n(N-1)]$

N is the population number, r is the fraction of the respondents that we are interested in, and Z(c/100) is the critical value for confidence level c.

The sample size calculation had a margin error of 5 percent and a confidence level of 95 percent with a population size of 70 and gives results to 60 respondents who were able to complete the survey. A structured and semi-structured questionnaire was developed to collect data on field surveys from 60 respondents and the Statistical Package for the Social Sciences (SPSS) software was used for the statistical data analysis, in addition to that an interview was conducted to an agronomist of Cyimbiri Coffee Factory. The survey and interview questions were based on the results of various case studies done through scientific studies.

4.4 Data source and types

4.4.1 Farmers survey

The research methodology of the thesis was gathered from primary data sources.

Data were collected through questionnaires in Rutsiro district and were filled by the farmers of Cyimbiri Coffee Factory. The questionnaire consisted of 26 questions (the open-ended questions, the closed-ended questions and the rating scale question). The questions are enclosed in the (Appendix 9.1). The kind of questions that are in the survey are based into different category and include: the quantity of coffee produced, the size of land used in the production, the support and assistance received, the tools used for coffee production, the price of coffee, the income earned through coffee production, other main source of income and other technical and knowledge skills they have.

Prior to data collection, the permission of collecting data to Cyimbiri Coffee Factory in Rutsiro district was sent to the company's manager, later on, the pivot study was conducted by 4people and checked if the questions are well asked and understandable. Then survey was distributed to

coffee farmers who are working in Cyimbiri for completion. Respondents were given one week to complete the questionnaire and it was translated into the Kinyarwanda language for farmers to understand it. The surveys were distributed in January 2021 to the farmers. The data was collected through questionnaires, the key focus group are coffee farming families. The main finding and results obtained were evaluated using the statistical approach method via a regression analysis which will help to identify the relationship that is between dependent and independent variables. The results are shown in tables and figures.

4.4.2 Interview with an agronomist of Cyimbiri Coffee Factory

The interview was conducted through a phone interview with an agronomist of Cyimbiri Coffee Factory, the purpose of the interview was to get more description information of Cyimbiri Factory, to get more clarifications from a managerial position and more insight on the coffee production trends and welfare of the farmers. The aim was to align from both the interview with an agronomist and the questionnaire from the farmers. The interview questions were sent to the interviewee before the scheduled phone interview. The interview questions were conducted in March 2021 and consisted of 14 structured questions (appendix 9.2) and all of them were open ended questions. The types of questions asked include: the incentives given to farmers in the factory, the strategies used to boost the production, the coffee distribution channel, the challenges faced, the stakeholders involved and how the price of coffee is set; the answers given were used for more description of research area as well as in the discussion of this study.

4.5 Data analysis

One of the main aims of the study was to evaluate the effect of coffee production in the Rutsiro district on small-scale farmers and this objective was achieved through descriptive statistical approach and regression analysis model which was tested the variables that leads to high production of coffee.

I. **Descriptive statistics:**

This model was used to interpret the data analysis through charts, figures and tables
The remaining objectives were achieved through:

II. **Linear regression model:**

Under strong set of assumptions, an ordinary multiple linear regression was used to demonstrate the relationship between dependent and independent variables.
Ordinary least square (OLS) methods were done through 3 phases:

1st step: The preliminary test

To check the quality of data and the distribution of data, therefore the Normality test and correlation test were used. According to Durbin Watson test, it has indicated that there is no autocorrelation in the model.

2nd step: Ordinary Least Square (OLS)

Under Ordinary Least Square assumption, the multiple linear regression model was estimated to assess the relationship that are between the dependent variables such as coffee production and independent variables such as income, land size and age group
OLS was used to check if the reliability of the model is reliable, or if it is BLUE (Best Linear Unbiased Estimator);
and ANOVA: was used to assess the relationship between variables

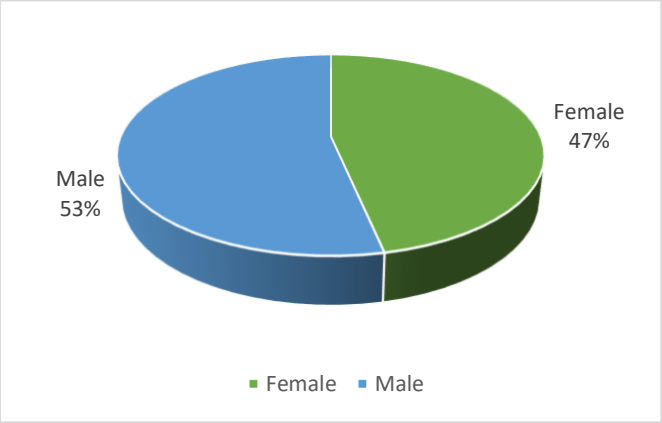
3rd Step: Diagnostic test

The reliability and the accuracy of the model was assessed by testing the autocorrelation between the residuals, Heteroscedasticity, R square and F-test.

4.5.1. Data Analysis: Field Results Survey

This part consists of research findings of our primary data analyzed through a series of questionnaire to 60 farmers of Cyimbiri Coffee Factory in Rutsiro district. The research found and categorized into two parts: The first part of this chapter consists of descriptive statistics and analysis of respondents such as age, gender, marital status, crops cultivated, income earned and describes size of land. The data was analyzed by the use of basic descriptive statistics and interpreted using tables and figures through Microsoft Excel and the last part of our results was described through regression analysis and statistical analysis, analyzed using Statistical Package for the Social Sciences (SPSS).

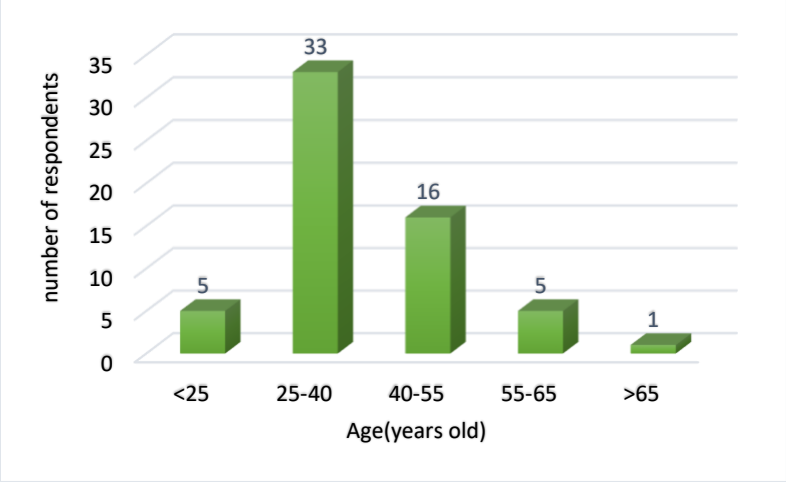
Figure *14*: distribution of gender among the respondents



Source: (Author's calculation based on own survey 2021)

The results show that women have been given equal opportunities as men. Women's involvement in coffee production has increased at the highest level and the results show that women's participation is 47%, while men are 53%. In Rwanda before Genocide against the Tutsi in 1994, men had access to resources, capital, finances and know-how and women were neglected as subsistence farmers, however the situation has changed in post Genocide due to the good governance which demonstrated a strong commitment to gender equality and Rwanda has made progress in boosting agricultural productivity as well as empowering women's involvement in parliament, its good leadership empower the women to govern with the highest % of 70 (Nader 2016).

Figure 15: Age distribution among the respondents

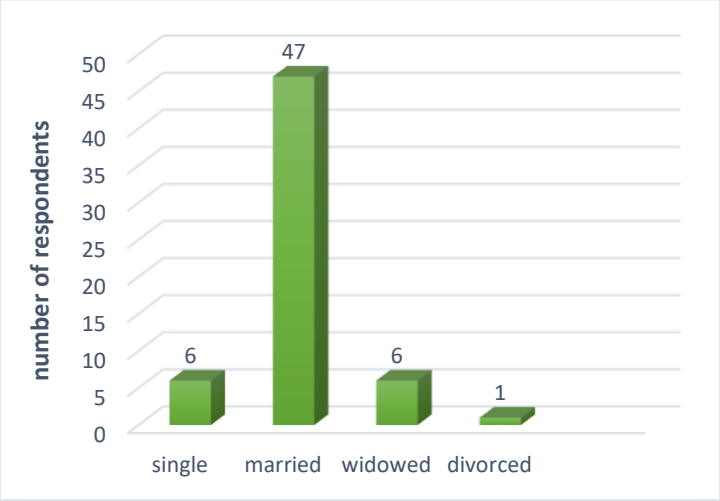


Source: (Author's calculation based on own survey 2021)

And the age group in figure 15 which falls from category that are between 25- 40years of age continues to dominate other aging groups.

According to the results, the respondents under 25 with 5total number of respodents representing 8 percent, and the age range between 25-40 years the highest one with 33 total number of respondents representing 55 percent, followed by the range level category that are between 40-55 years with 16total number of respodents representing 27percent, and the range group that are between 55 and 65with 5total number of respodents representing 8percent, and the remaining one falls from the category of age that are higher than 65years has 1 total number of repondent representing 2 percent, this range group is being the lowest among the other groups, because people in that category are in retirement.

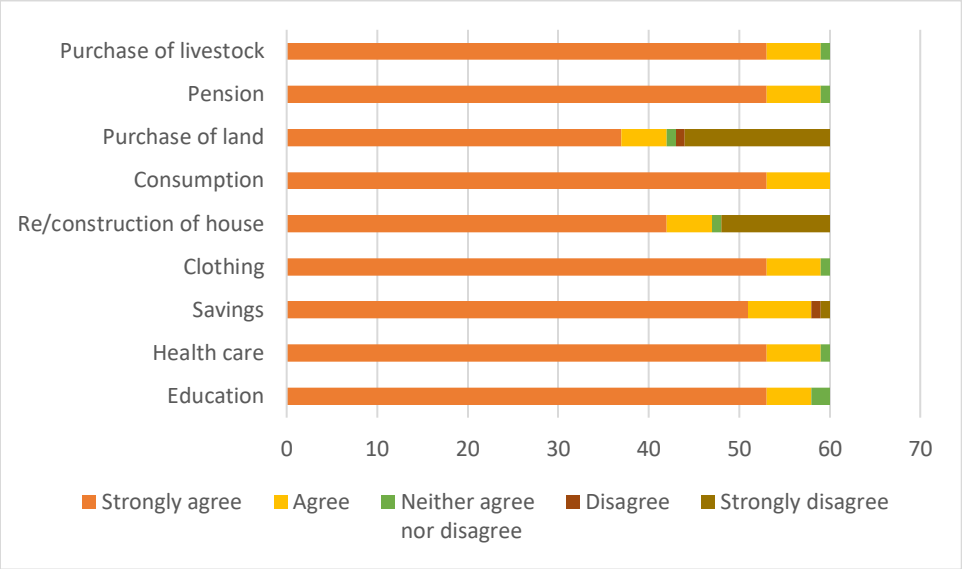
Figure 16: Marital status for the respondents



Source: (Author's calculation based on survey 2021)

According to the results, the number of respondents who are married tends to be higher compared to other numbers with 47 total number of respondents, followed by single and widowed people with a total number of 6 and the lowest category is divorced, with only 1 respondent.

Figure 17: coffee production income contributes to the following factors

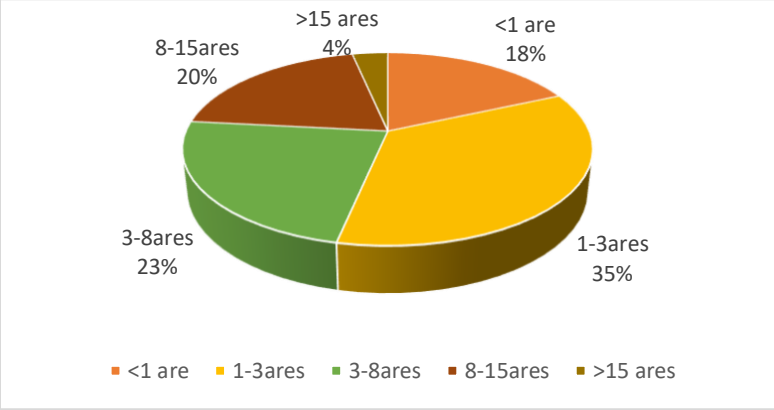


Source: (Author's calculation based on survey 2021)

The study assessed the extent to which coffee production contributes to farmers' households by a rating scale from 1 to 5. The first number (1) is supported the terms strongly agree, while the last number (5) is strongly disagree (5). Based on the findings of the survey in Figure 17, coffee production plays a key role in the lives of farmers. A total of 53 respondents strongly agree that the revenue or income from coffee production is used for the purchase of livestock, the pension contribution, the consumption, the clothing use, the health care and education of their children, and a number of 51 respondents strongly agree that the revenue from coffee is used for savings.

However, 42 and 37respondents strongly agree that income from coffee production used in re/construction of house and purchase of land respectively. These are the lowest in scale compared to others on the strongly agree range and the highest ones to strongly disagree with a total number of 12 and 16 respondents.

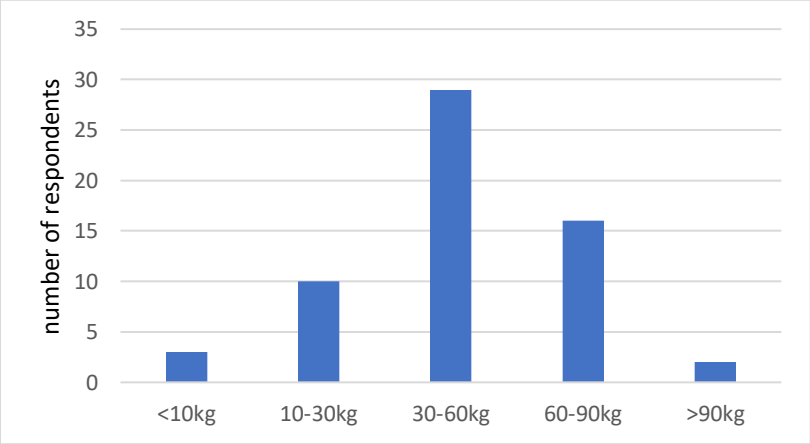
Figure 18: Ares of land used for coffee production



Source: (Author's calculation based on survey 2021)

According to the results of the survey, there are 57 farmers who used their own land for coffee production and 3 others who still rent land for coffee production. In Figure above, it can be seen that there is a high majority of farmers who have 1-3 ares of land representing 35 %, followed by farmers who have 3-8 ares of land representing 23 % and those with 8-15 ares representing 20% and those with less than 1 are representing 18% and the lowest of those with less than 15ares representing 4%.In accordance to what respondents said the survey, their land is divided into parts according to the crops they cultivate, and most of the respondents have 3 or more other crops they cultivate. Respondents produced different crops include: cassava, plantains, soybeans, tomatoes and yams, but the most commonly produced crops are beans, maize and sweet potatoes, while rice and potatoes are less produced.

Figure 19: Quantity of coffee produced per month



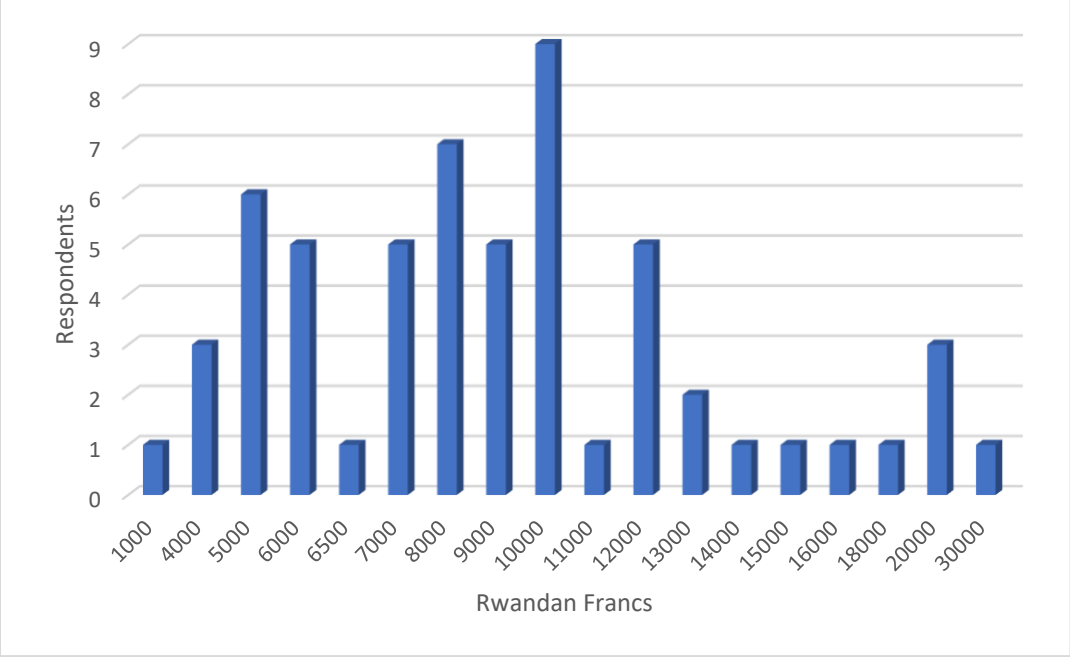
Source: (Author's calculation based on survey 2021)

Coffee in Rwanda is one of the top exports we have in the country, so producers enjoy producing coffee because there is a high demand on the market.

According to the findings, there are a total of 29respodents, representing 48 percent of farmers producing between 30 and 60 kg of coffee per month, and this is the highest rate compared to other farmers followed by 16 farmers producing between 60 and 90 kg, representing 27 percent, and there are 10 farmers producing between 10 and 30 kg, representing 17 percent, and 3 other farmers producing less than 10 kg, representing 5 percent and the smallest number of 2 farmers producing more than 90 kg of coffee, representing 3 percent.

The average price per kg of coffee production is slightly different, depending on the quality and quantity of coffee sold, 1respondents indicated that the average price per kg is 300Rwf, while 43 other respondents indicated that they received 250 or 300 Rwf/ kg and 1 respondent said that he received 240 or 300 Rwf/kg, 2 others said that they received 230 or 300 Rwf/kg, and 4 last respondents said that they received 220 or 300 Rwf/kg. According to the survey findings, 53 out of 60 respondents said that coffee prices did not change most often but changed every year.

Figure 20: monthly income earned from coffee production

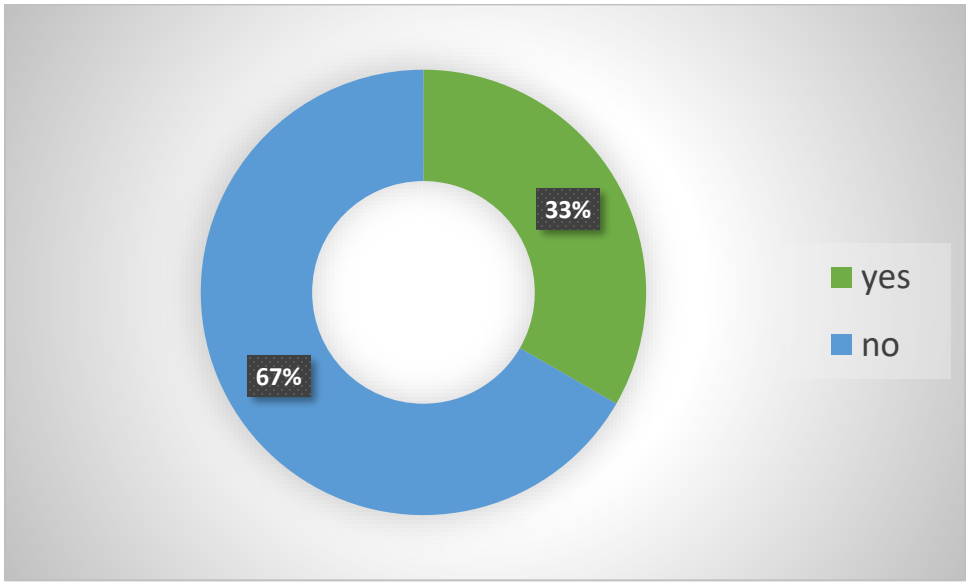


Source: (Author's calculation based on survey 2021)

According to Figure, we can see that there is a high-income inequality between farmers, due to a large difference between them, but with regard to the other question asked, it shows that the quantity of coffee produced is different, that there are different areas of land for production, therefore their income should also be different.

There is 1 farmer who earns 30,000 Rwf, the highest income compared to the rest, followed by a total of 10 farmers earning between 15,000 Rwf and 11,000 Rwf, followed by 32 farmers earning between 10,000 Rwf and 6,000 Rwf, and the last group of 10 farmers earning the lowest income between 5,000 Rwf and 1,000 Rwf. According to transferwise limited (2021) 1 EUR equal 1195.37Rwandan Francs (Rwf).Bike and wheelbarrow as well as coffee basket, hoes and pruning shears were the key tools that respondents could purchase to increase the amount of coffee produced. According to the survey findings, 53 out of 60 respondents said that coffee prices did not change most often but changed every year.

Figure 21: Other business own apart from coffee production

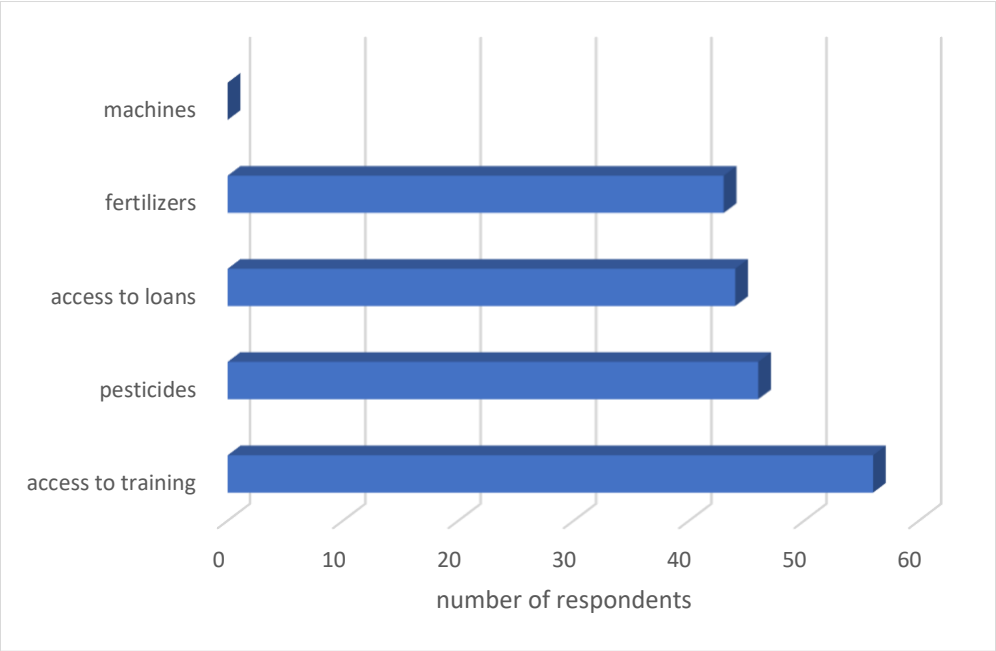


Source: (Author's calculation based on survey 2021)

The survey asked whether the respondents had any other business, and 20 respondents said that they had another business representing 33%, while the other 40 responded that they did not own any other business representing 67%.

The findings show that other main sources of income come mainly from livestock and agriculture, and since the respondents are farmers, they are specialized more on agriculture sector.

Figure 22: Support received from government, NGOs & other development projects

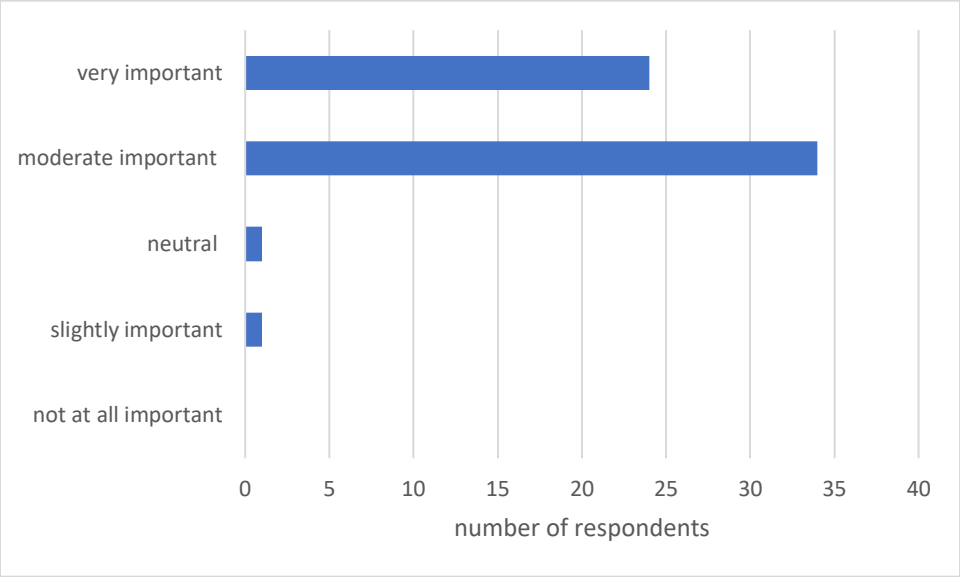


Source: (Author's calculation based on survey 2021)

Coffee farmers have received different assistance from the Government of Rwanda, the Non-Government Organization and other development projects, which have led them to improve their standard of living and encourage them to become active in the agriculture sector, particularly in coffee production.

The number of respondents who receive training is 56, followed by 46 who receive the pesticide used in coffee production. There are an even more 44 respondents who mentioned that they have access to loans which always help some farmers who do not have enough resources and 43 other respondents who mentioned that they are getting fertilizers

Figure 23: importance of coffee production to the farmers'household



Source: (Author's calculation based on survey 2021)

According to the findings, 24 respondents said that coffee production is very important in their household, and 34 total respondents and the highest one said that coffee production is moderately important in their family, followed by 1 respondent who said that coffee production is neutral important, and 1 other respondent who said that coffee production is slightly important, so the results show the value of coffee in the life of farmers.

The respodents have mentioned some other benefits and how coffee production contributed to their high standard of living, 46 of them said that they have electricity through income from coffee, other 9respodents said that they were able to get a running water in their home and other 3respondents said that they have toilets in their house due to coffee income, they are other benefits specified such as creation of a small shop, buying a tailing machine, paying the health insurance, buying livestock for rearing and paying school fees for children,

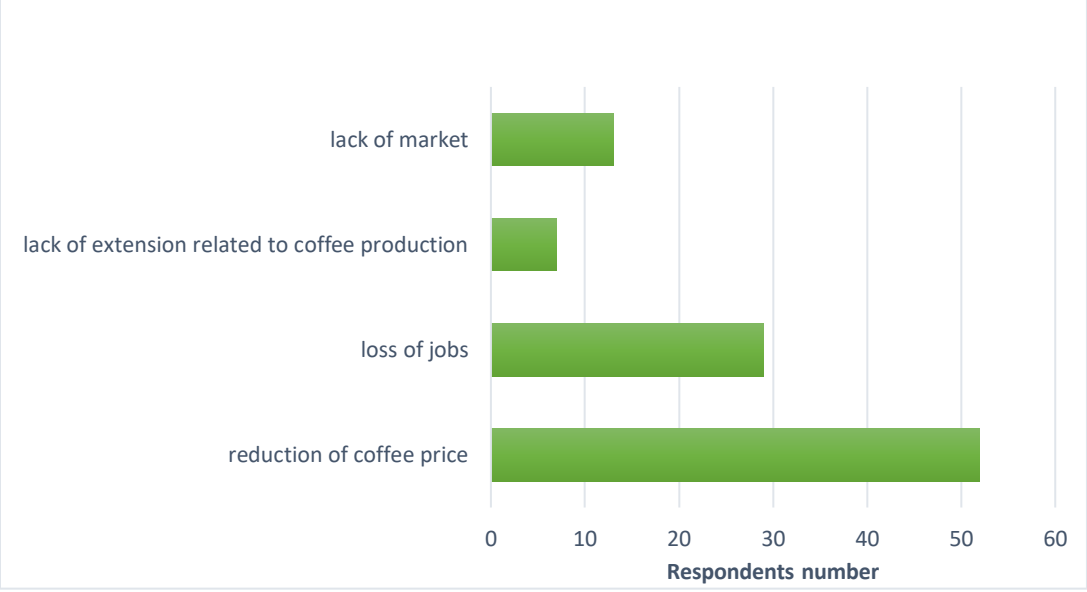
Table *2*: Technical & Vocational training of respondents

Technical &Vocational Training	Respondents
Farming	58
carpentry	2
tailing	3
mechanics	1
hospitality	1
business	1

Source: (Author's calculation based on survey 2021)

The results show that the majority of farmers had technical and vocational training in agriculture with a total of 58, followed by 3 respondents who had training in tailings and 2 others who had training in carpentry, followed by other 1respondents who had been trained in mechanism and hospitality, we can see that the majority had knowledge in agriculture but were unable to acquire further different knowledge.

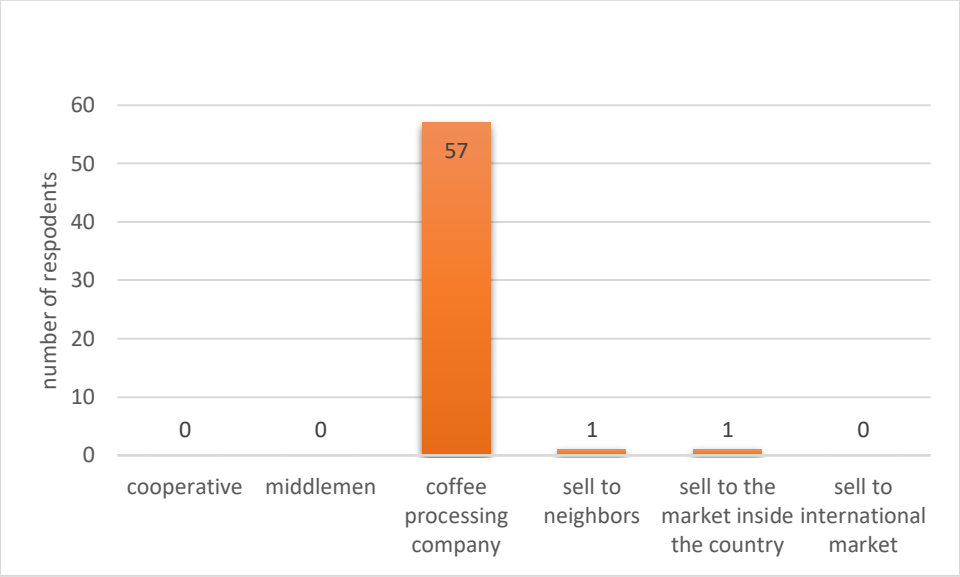
Figure 24: the consequences of Covid-19 to the production of coffee for farmers



Source: (Author's calculation based on survey 2021)

The respondents indicated that Covid-19 would have an impact on coffee production and would have a negative impact on their lives. 52 respondents said that the price of coffee would fall, 29 others responded that they would lose jobs, followed by 13 other respondents who replied that there would be a market shortage, and 7 other respondents who said that there would be no extension to coffee production.

Figure 25: Coffee production distribution channels



Source: (Author's calculation based on survey 2021)

The figure shows that 57 respodents representing 96% of farmers sell their coffee directly to the coffee processing company, The main distribution channel is the coffee processing company, this situation is called monopsony where there is only 1 buyer with many sellers.

1 respodent sell coffee to neighbors and another 1 respondent sell coffee directly to the market inside the country, both have 1-3 ares of coffee production land, and received the same average price as others (250 or 300 Rwf/kg) and both earn 8,000Rwf from coffee which are less amount compared to others.

Respondents mentioned some of the advantages obtained in Cyimbiri Coffee Processing Factory, including revenues gaining, the acquisition of farming experience and expertise, the acquisition of inputs for coffee cultivation and the sale of coffee to the coffee factory.

The farmers mentioned the incentives they get from the coffee factory for selling directly to them, such as better prices, and other farmers said that the coffee processing factory assists them in gaining market access by supporting them in cofffee distribution Channel to reach the market.

4.6 Assumptions of the model

Among the factors that affect the production of coffee Y, the basic determinants were assumed to be size of land (ares), income (Rwf), age group.

$y = f(x_1, x_2, x_3)$

Where y= coffee production

X1=size of land

X2=income

X3=age

Model OLS using 60 observation for a year of 2021 (T=60)

4.6.1. Preliminary Test: Normality testing

Table 3 : Test of Normality of the model

Tests of Normality[b]

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	size of the land	Statistic	df	Sig.	Statistic	df	Sig.
coffee production	less than 1 are	.219	11	.146	.889	11	.134
	1-3	.365	19	<.001	.727	19	<.001
	3-8	.281	13	.006	.811	13	.009
	8-15	.262	13	.015	.875	13	.062

a. Lilliefors Significance Correction

b. coffee production is constant when size of the land = greater than 15. It has been omitted.

Source: (Author's calculation based on survey 2021)

H_0: there is normal distribution of residuals

The size of land between 8-15ares and the size of land less than 1are, are greater than 0.05, therefore the residuals are normally distributed, However, the size of land between 1 and 8 ares are less than 0.05 which means that the residuals are not normally distributed.

4.6.2 Coefficient of determination R^2

Table 4: OLS Model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin–Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.489[a]	.239	.225	.771	.239	17.271	1	55	<.001	2.054

a. Predictors: (Constant), size of the land

b. Dependent Variable: coffee production

Source: (Author's calculation based on survey 2021)

In table 4, the value of coefficient of determination for the model (R^2) = 0.239 and that means that one factor (size of land) is explaining 23.9% of the variation.

R^2 of 23.9 shows that variability in coffee production is explained by the size of the land.

4.6.3 Testing for correlation among residuals

H_0 means the absence of autocorrelation

H_1 means the presence of autocorrelation

Durbin Watson testing detect if the model is autocorrelated in residuals or not, in table 4, Durbin Watson test has 2.054, which indicates that there is no autocorrelation among residuals in the model because the value is between 2 and 4.

Table 5 : ANOVA test of the model

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.272	1	10.272	17.271	<.001[b]
	Residual	32.711	55	.595		
	Total	42.982	56			

a. Dependent Variable: coffee production

b. Predictors: (Constant), size of the land

Source: (Author's calculation based on survey 2021)

$\beta_0 = 0$ which means that parameter is 0

$\beta_1 \neq 0$ which means that parameter is different from 0

In a multiple regression, the alternative mentioned that at least one parameter is significantly different from zero. The ANOVA in table 5, shows that F value equal to 10.272/0.595= 17.271. the distribution is F (1, 32.711), with the probability that has a value greater or equal to 17.271 is less than 0.01 therefore, beta is different from 0.

Here our P value is small, therefore we reject the null hypothesis. This implies that the size of the land statistically influences the production significantly. In this case the size of land is the only variable that affect the dependent variables statistically and significantly among other variables in the group. The P value for the F test statistic is less than 0.01, providing a strong evidence against the null hypothesis.

Table 6: Coefficients of the Model

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.030	.259		7.847	<.001
	size of the land	.388	.093	.489	4.156	<.001

a. Dependent Variable: coffee production

Source: (Author's calculation based on survey 2021)

The econometric model equal to:

$y = 2.030 + 0.388x_1 + u$

By the verification of the significance of fitted parameters the results from SPSS, our P value is 0.001 which is less than 0.05, this shows that the estimated parameter (size of land), has a statistical significant impact on the outcome variable (coffee production), it is an individual factor in the model that influence the coffee production.

Table 7: Excluded Variables of the model

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	income from coffee	.216[b]	1.393	.169	.186	.565
	age of respondents	.077[b]	.618	.539	.084	.909

a. Dependent Variable: coffee production

b. Predictors in the Model: (Constant), size of the land

Source: (Author's calculation based on survey 2021)

The results show that the income from coffee and age of respondents don't influence coffee production and have been excluded in the model.

Diagnostic Test

Table 8: Residuals Statistics

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.46	4.00	3.05	.418	59
Residual	-1.611	2.158	.000	.774	59
Std. Predicted Value	-1.418	2.259	.000	1.000	59
Std. Residual	-2.064	2.765	.000	.991	59

a. Dependent Variable: coffee production

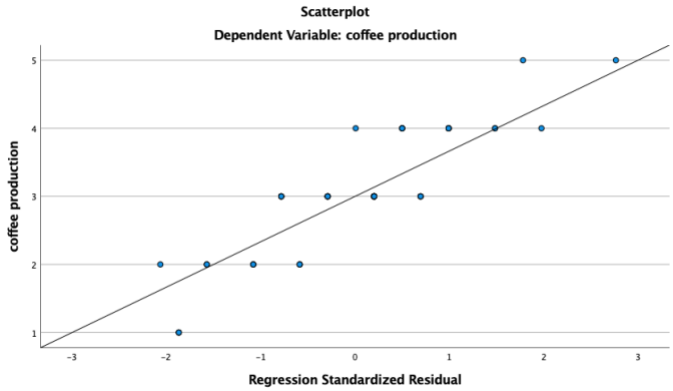
Source: (Author's calculation based on survey 2021)

The model is fit and reliable because the variability of error doesn't change.

The mean of residual equal to 0 therefore the model is reliable

5.2.4 Homoscedasticity testing

Figure 26 : Homoscedasticity scatter plot



Source: (Author's calculation based on survey 2021)

The graph above shows the scatter plot of homoscedasticity- implies to have the same dispersion and to remain in a data set, the points are about the same distance from the line. The alternative is heteroscedasticity, which is different scattering, where points are at greatly differing distances from the regression line.

5. RESULTS AND DISCUSSION

5.1 Discussion of the field study survey

The purpose of the survey was to identify the benefits of coffee production in the lives of small-scale farmers and the factors that lead to high coffee production. The survey findings show the positive relationship between coffee production and the standards of living of farmers, which means that coffee production has a positive impact on the welfare of farmers as a result of the income earned from coffee production.

In relation to the results analyzed in the survey, coffee production is important in the lives of farmers in (Figure 23) where the majority of respondents indicated that coffee plays a key role in their livelihoods, as shown in Figure17**,** where it clearly shows what farmers have been able to purchase such as health insurance for their family members, food, livestock purchases, school tuitions. The findings confirm the statement of Fromm (2015) in his study that coffee generated more income and helped farmers pay different expenses and feed their families with the profits generated, and that this was also in line with the study of Koss (2016) in which he indicated that through income from coffee production, farmers were able to send their children to school.

The results found in (Figure17**)** that coffee production helped farmers re/construct their homes and purchase land to produce more crops, which improves the living conditions of farmers, and this was demonstrated by Doucleff (2012) in his case study where a farmer named Uwimana Immaculee, who gained more benefits in coffee production after failing to grow other crops and started with 100 coffee trees, and her business was 3 times bigger, taking her 2 kids to school, building a new home, and buying a new land to plant more seeds.

According to (Figure 14) women participate in coffee production at a rate of 47%, which is close to the male rate of 53%. The study of (Koss 2016) found that women have been given equal opportunities as men even though they were left behind before and did not have the same rights as men, but this has changed after Genocide in 1994.

They now have equal rights and same opportunities and there is no inequality between them, because either a woman or a man can both support their families. In his study, Koss (2016) said that the Rwandan government promotes gender balance and supports all the participants of coffee production regardless their gender, as a result they have equal access to wages and could provide for their households therefore, both can become successful.

The results found what farmers were able to purchase for their day-to-day lives or for other investments they made, including the creation of shops, the purchase of tools to increase coffee output, this aligns to what Koss (2016) stated in his findings that coffee production has helped a farmer Called Epihanie Mukashyaka to set up her own business, which resulted in the employment of some other 4,600 women supporting their families, which shows the investment she made from coffee that turned out to be a solution for other employees.

According to the (figure 19) the majority of farmers produce between 30-60kg and 60-90kg, as mentioned by the Government of Rwanda (2021), in 2016 and 2017 Rutsiro district was the second district among 7 district in western province that produced a lot of quantity that gave more potential opportunities to farmers to grow alot and generate more profits among other districts.

In terms of all the support received by farmers, the machines are not included in (Figure 23) which contradicts what Karuretwa (2002) said about the different measures that have been imposed to increase the coffee productivity, such as a new agricultural machine that will improve production efficiency and effectively. The study found in (Figure 22) that farmers receive loans from government, NGOs or other development projects that help them produce more coffee and be able to rely on themselves and sustain their family, this support is very significant for those who do not have any resources at all. Getting access to loans can help the farmers to invest more in the coffee production which can lead to high quality of life and thus change their livelihood and resulted to high standard of living; this was supported by Ngango et al. (2019) in his study carried out in the north of Rwanda, refers to the beneficial effects of coffee production in Rwanda as well as the access of loans and different other support granted to farmers which positively influence their lives, these align also to what Minecofin & BRD (2012) mentioned that Rwanda Development Bank and Opportunity Bank have implemented a strategy to help farmers increase their coffee yields by providing loans that will increase the productivity of coffee.

As farmers are more engaged in coffee production, they acquire knowledge and skills from farming system (table 2), and this becomes one the reasons they are in agriculture field because they know more about agriculture practices and also in (figure 22), training is provided by international organizations and government which is the key in making them more productivity and this correlates with the findings of Ngabitsinze (2012) and (MINECOFIN 2012) where they mentioned that corporation with different donor organizations providing funding, materials and training to farmers in order to improve the quality of coffee and this is considered as an improvement based upon the statement made by Nzeyimana et al.(2013) and Doucleff (2012) stated that the farmers lack the sufficient knowledge of coffee processing steps.

Rwanda depends mostly on coffee compared to other crops, so because of grants and support to farmers, the country produces more and avoids coffee shortage that could occur due to high market demand. MINECOFIN (2012) added that government has provided also the seeds and other inputs needed, this has been considered as a good strategy to increase the production of coffee and has become beneficial to farmers especially those who are poor, and this line up with the results from the survey on (Figure 22) which indicate that fertilizers and pesticide have been given to farmers in order to increase the productivity. According to the findings in (Figure 24) the farmers said that the Coronavirus impacted the coffee production in Rwanda, lowering the price of coffee and preventing them from accessing the market which aligns what NAEB (2020) mentioned in their study that Covid-19 led to the closure of borders and the export revenues declined.

In the study of Karuretwa (2002) & Minecofin (2012), it was observed that the volume of coffee decreased due to lack of sufficient capital, inputs, labor and knowledge, with regard to Figure 22, the farmers demonstrated that their conditions have changed because they have received government support, such as proper training in the coffee process , access to loans or credits which indicated that those who did not have adequate means of production have acquired start-up capital, and more farmers have joined the coffee industry. Nzeyimana et al. (2013) and Doucleff (2012) stated that pests and diseases had infected coffee beans; and the (figure 22) also shows how the government provided pesticides to farmers after realizing this challenge the farmers faced and this support has resulted to an increase of coffee productivity.

5.2 Discussion of the model

The model shows that the age group doesn't impact the size of land, this means that the output received from production doesn't merely depends on who produced it, similarly to the income factor, when the farmers are gaining more income it doesn't determine that this will increase the coffee productivity, however the study shows that the increase of coffee output depends on the size of land- influence coffee production and there is a positive relationship between the two, this is in accordance with what Edgar (2014) mentioned that growing on a new land resulted to high coffee production.

5.3 Discussion of interview

During the interview with an agronomist from Cyimbiri Coffee Factory, it was concluded that National Agricultural Export Development Board (NAEB) is the factory's main channel distribution of the coffee to the international market. NAEB also determines and sets the coffee price. This aligns with what Doucleff (2012) stated in his study that the government set the price of coffee. By comparing the 5years ago and now, Cyimbiri Coffee Factory has increased the size capacity, the washing station, the storage of coffee, the drying tables and the factory has provided trainings to many farmers on how to process coffee.

The major benefit of Cyimbiri Factory in the coffee production is the revenues they earn from either domestic or international market that pay the wages of the employees and other expenses costs used in the factory, they also pay the country's tax which is used to build and develop the country.

The incentives that Cyimbiri Factory provides to the farmers include the provision of wages, trainings, health insurance, access to loans, pesticide, fertilizers which allow them to boost the production this in accordance with what Guariso et al. (2012) stated that the farmers get better off through the salary earned from coffee production.

The stakeholders of Cyimbiri factory include Rwandan government, National Agricultural Export Development Board, and Ministry of Agriculture they provide them with the nutrients for the seeds, fertilizers and the access to credits, this corresponds to the statement of MINECOFIN (2012)

that the government’s strategy is to encourage investors and stakeholders to support the farmers to increase the output of coffee.

However, there are some challenges that the factory faces, such as a sunny or rainy season that destroys the seeds, as well as some pests and diseases that damage coffee but Cyimbiri factory has put in place the strategy to avoid the risks that may occur. In order to combat the pests and diseases the factory apply the integrated pest management and the erosion control measure similar to what Nzeyimana et al. (2013) and Doucleff (2012) found in their study that pesticide used to combat the pests and diseases that destroy coffee.

Another strategy used by Cyimbiri Coffee Factory to improve production is the zoning system, which is a way to monitor farmers' practices and to assist them, resulting in high coffee output.

The factory's marketing techniques for acquiring coffee buyers include offering them a high-quality product, shipping the exact amount demanded by the consumers, and supplying the exact product sent as a sample. The factory often aims to be transparent with customers in order to win their trust.

5.4 Limitation

The biggest limitation faced in collecting data, was to ask a permission from a manager of one of the coffee factories in Rwanda to collect data from the farmers in the factory he manages and not getting any feedback from him, the aim was to get 100 farmers in the coffee factory he leads, but this couldn't happen, and the Cyimbiri Coffee Factory was the second option and from there I got the approval from the manager and was able to collect a survey from 60 farmers.

The other limitation of the research was the sensitive question that farmers were asked about, this includes the question of the monthly income they received from coffee, which 2 farmers skipped without answering. There was another question required to select all the answers that were relevant to the questions but still some chose one answer and others remained undecided which influence the accuracy of the results. Few of the farmers repeated or gave similar answers to open-ended questions, which had an impact on the quantity and quality of the answers.

Another limitation was the limited sample of farmers, the research represents the situation in the coffee industry, but the results cannot generalize the situation of coffee production as a whole in Rwanda meaning that the results cannot be applied to the whole coffee sectors in the country.

The study was limited due to Covid-19, which affected the price of coffee production compared to previous years.

Another limitation of the study is that Cyimbiri Coffee Processing Factory where the research was conducted does not have a website or any information on the internet, this prevented me to obtain additional information about the factory.

Other factors that can influence the coffee production may be: environmental, technological, capital and knowledge factors) but those factors were not considered.

6. RECOMMENDATIONS

Rwanda has access to many global markets and has boosted coffee revenues; since there seems to be a high demand, the country should support more producers to satisfy those needs, and they should invest more in the infrastructure to attract more investors and to export coffee more conveniently in international markets.

Farmers should be more involved in agriculture, which would happen if the government develops rural areas and this will minimize urbanization.

The government of Rwanda should spend more resources in the agriculture sector to fund and improve coffee farmers in order to ensure the continued growth of coffee production. The government should also continue to support women in coffee industries in order to earn the same income as men and to both have high standard of living and welfare. Some women are the heads of their families and take care of their households and their income can fully cover the expenses they have spent without depending on their husbands, so the support of government is always needed.

The Government of Rwanda should strengthen more the coffee cooperatives. This is because the cooperatives have provided various benefits and opportunities to the cooperative members and increased their social well-being. Cooperatives in Rwanda have had a tremendous impact on the lives of many Rwandans, particularly the low-income population, who were unable to find jobs or set up their own businesses due to lack of resources. Cooperatives ought to improve sustainable agricultural production and a modern coffee processing system that will improve the quality and quantity of coffee. The coffee cooperatives have had a positive impact on Rwandan society, and I would strongly recommend their continued existence.

7. CONCLUSION

Coffee plays a key role in the development of the country of Rwanda, and it is one of the major export cash crops. Through coffee production, Rwanda's economic growth has expanded tremendously due to the revenues generated and has boosted agricultural yields.

Coffee farming has provided multiple job opportunities to farmers especially those in rural areas and this has led to the country's economic development and poverty reduction.

The main aim of the study is to assess the impacts of coffee production in Rutsiro district on small-scale farmers and on the Rwandan economic level and to evaluate the role of government strategies to improve the production of coffee in Rwanda. The research questions focused in Rutsiro district in Cyimbiri Coffee Factory.

A simple random sampling was used to determine the population size, a structured and semi-structured questionnaire was developed to collect data on field surveys. 60 farmers were randomly selected in the factory and a structured interview with Cyimbiri Factory agronomist was conducted. Coffee production has had a positive impact on the lives of farmers and they were able to pay school fees for their children, to buy health insurance, to purchase food, some farmers managed to re/construct their homes, others used the income from coffee to purchase livestock and land, basically coffee production has helped farmers to earn more income which were used to cover the necessary expenses as mentioned in the survey 46 out of 60 farmers got the electricity and other 9 farmers managed to get the running water in their houses. The farmers mentioned that the coffee production is very important in their households. As indicated in the primary data, the coffee has been seeing as a major product the farmers produce compared to other crops followed by beans and maize, and also 57 out 60 farmers have received the farming technical training and use their own land in production of coffee except 3farmers that rent the land to produce coffee. The farmers have indicated that the main source of income they get comes from agriculture business and livestock.

Despite the challenges faced by farmers which are poor infrastructure, lack of skilled labor, lack of technology, pests and diseases, the government of Rwanda has implementing various policies and strategies to support farmers and to make coffee production industry growing these include: the provision of loans, trainings, inputs such as fertilizers and pesticides, modern agriculture

machine and they are improving the infrastructure to attract the investors, stakeholder and increase the collaboration with different donors ‘organizations throughout the process.
The government also provided the financial support to coffee industry and individual businesses, in order to boost the output and to expand coffee processing regions. The government emphasize the competition for the best coffee quality and grants awards and certificates to those with high standards requirement, and they established the coffee cooperatives to assist the coffee growers.

As mentioned in the interview with an agronomist of Cyimbiri Factory, the National Agricultural Export Development Board (NAEB) is the distribution channel of coffee from the factory to the international markets, NAEB also set the minimum wages so that farmers will get the fair income and set also the price of coffee to continue support the agricultural sector and this led to high coffee production and provide better price to farmers.
The incentives the farmers receive from Cyimbiri Factory include wages, trainings, health insurance, fertilizers, pesticides, loans and better price.

The research question in the beginning of the study, analyzed the factors that help boost the coffee production, as shown in the results of the survey, the size of the land was the only variable that significantly influences coffee production and, among other independent variables identified, such as income and age group, do not impact coffee production, which indicates that having more income does not result in improving coffee output. Similarly, with the age range group, coffee production is not impacted whether it was produced by young or elderly people.

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9. APPENDIX

9.1 Questionnaire

The aim of this survey is to identify the benefits of coffee production on the livelihood of coffee farmers families as well as different assistance received from government, development projects and Cyimbiri Factory. The survey will also determine some factors that contribute to a high productivity of coffee production. The target group will be coffee farmers and research questions will be answered through the responses from this questionnaire.

The data collected will be kept confidential and will be used for the research study purpose only.

1. What is your gender?
    - Female
    - Male
    - Prefer not to answer
    - Others, specify…….

2. What is your age?
    - Under 25
    - 25 - 40
    - 40 - 55
    - 55- 65
    - Above 65

3. What is your technical and vocational training? Please select all that apply

    - Farming
    - carpentry
    - Tailing
    - Mechanics
    - Handcrafts
    - hospitality
    - Others, specify ……

4. What is your marital status?
    - Single
    - Married
    - Widowed
    - Divorced
    - Others, specify.....

5. Does a land you used for production your own or you rent it?
    - It is mine
    - I rent it
    - Others, specify….

What are the ares of that land?

- Less than 2 ares
- Between 2 and 6 ares
- Between 6 and 10 ares
- Between 10–20 ares
- More than 20 ares
- Others, specify …….

6. How many ares of land do you use for production of coffee?
    - Less than 1 are
    - Between 1 and 3 ares
    - Between 3 and 8 ares
    - Between 8 and 15 ares
    - More than 15 ares
    - Others, specify …….

7. What are other crops you do cultivate other than coffee? Please select all that apply

- Rice
- Beans
- Maize
- Potatoes
- Sweet potatoes
- others, specify…….

8. do you have other businesses apart from coffee?
    - Yes
    - No
    - others, specify……

9. What are the 3 main sources of your income?
- Income from a business
- Income from livestock
- Income from agriculture business
- Sales of farming products and services
- Remittances

- Pensions
- Grants
- Rental income
- No income
- Others, specify…

10. What is roughly the monthly income group do you earn?

    - Less than Rwf 30,000
    - Rwf 30,000 – Rwf 60,000
    - Rwf 60,000 – Rwf 100,000
    - More than Rwf 100,000
    - Others, specify…

11. How much money do you earn from coffee production per month (Rwf)?
…….

What is the contribution of coffee to the income earnings?

- None
- Less than 10%
- Between 10% and 25%
- Between 25% and 45%
- Between 45% and 80%
- More than 80%
- Coffee is partial
- Others, specify …..

12. How important is coffee production in your household?

- Very Important
- moderately important
- neutral
- slightly important
- not at all important
- others, specify ……

13. Using a scale of 1 to 5 where 1 means strongly agree and 5 means strongly disagree, how much do you agree or disagree with the following statements:

    In my household, my income from coffee production contributes to:

○ to the education of my children	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the health care	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to my savings	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the clothing	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the construction or reconstruction of house	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the food consumption	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the purchase of land	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the pension	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree
○ to the purchase of livestock	1 Strongly agree	2 Agree	3 Neither agree nor disagree	4 Disagree	5 Strongly disagree

14. What are the tools that you managed to buy to increase coffee production and other types of investment in the value chain?

- ○ Coffee Huller
- ○ Coffee roasting machine
- ○ coffee drying sheets
- ○ expand storing facilities
- ○ Coffee Pulping Machine
- ○ bicycle
- ○ wheelbarrow

- others, specify …….

15. How often does coffee price change?

- Yearly
- Monthly
- weekly
- Never
- others, specify …….

16. What is the average price in Rwf you receive from coffee in Kgs?
……

17. How much quantity of coffee do you produce per month?

- Less than 10kg
- Between 10kg – 30kg
- Between 30kg – 60kg
- Between 60kg – 90kg
- More than 90kg
- Others, specify ….

18. How does coffee contribute to your standards of living? Please select all that apply

- I have electricity
- I have running water at home
- I have toilette in my house
- Others, specify……

19. What tools or means of production do you use?
- Inputs (coffee beans in kg)
- Machinery (Rwf)
- Pesticide (Rwf)
- Fertilizers (Rwf)
- Others, specify……..

20. What kind of support do you receive from Cyimbiri Coffee Factory? Select all that apply

- Income
- Trainings

- Inputs
- Events (exhibition, exposition)
- Sell coffee
- marketing channels
- No support
- Others, specify…..

21. How does your coffee reach the market?
    - Cooperative
    - Middlemen
    - Coffee processing company
    - Sell to neighbors
    - Sell to the markets inside the country
    - Sell to international markets
    - Others, specify……..

22. What are the incentives Cyimbiri Coffee Factory give to sell to the factory directly.

    - Better price
    - Goverment regulations (Land reform and consolidation policies)
    - Distance to the market
    - Information market share
    - Access to the market
    - Others, specify ……..

23. Is there any knowledge obtained in Cyimbiri Coffee factory?

    - Yes
    - No
    - I don't work there
    - Others, specify ……

24. Do you receive support from government, NGOs other development projects?
    - Yes
    - No
    - Others, specify

25. If yes, what kind of support offered from the government or different projects? Please select all that apply
    - Access to training
    - Access to loans

- Machines
- pesticides
- fertilizers
- Others, specify……

26. How did the Covid-19 pandemic influence the coffee production? Please select all that apply
    - Reduction of coffee price
    - Loss of Jobs
    - Lack of extension related to coffee production
    - Lack of market
    - Others, specify …….

9.2 Interview questions

1. What are the major benefits of coffee production to the factory?
2. What are some of the strategies used at the factory to avoid any possible risks?
3. What are the distribution channels of coffee from the factory to the final consumers?
4. What are the means of transport used to supply coffee?
5. When are the planting and harvesting season of coffee and what challenges do you face in both seasons?
6. What would you say has been a major shift in the factory between now and five years ago?
7. What are your main competitors?
8. What benefits does the factory provide to the farmers?
9. What are the factory's marketing strategies and what tools does it use to acquire coffee buyers?
10. What are the trends of coffee production and the way it is exported? (new introduced ways that boost the production)
11. What are the stakeholders involved in the coffee production?
12. What incentives do farmers receive to boost production?
13. How are you using technology to leverage productions and maximize output?
14. How are you setting the base price per kilo, what are the elements that change your prices?

9.3 images of farmers in the field