MDP-IFAD PROJECT RESEARCH REPORT

VALUE CHAIN ANALYSIS OF COFFEE PRODUCTION IN RWANDA

A CASE STUDY OF HUYE DISTRICT

By:

RUKEME OLOMU (MDP Intern)

Professor Olanrewaju Olaniyan

Center for Sustainable Development (CESDEV), University of Ibadan, Ibadan, Nigeria

(Academic Supervisor)

Mr. William Niyitanga

Project for Rural Income through Exports/National Agricultural and Export Development Board

(Field Practicum Supervisor)

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ABSTRACT

This study analyses the value chain of coffee production in terms of functional and economic linkages among actors in the chain, it identifies marketing channels as well as constraints to coffee production in Huye district, Rwanda.

The Project for Rural Income through Exports (PRICE), established by the International Fund for Agricultural Development (IFAD) in partnership with the National Agricultural Export and Development Board (NAEB), has aided the development of the coffee sector and its value chain improvement in Rwanda through marketing and value chain upgrading strategies such as input provision and distribution, farmer field schools and the turnaround program.

Huye district was purposively selected and survey questionnaire, key informant interview and focus group discussion was administered to 267 coffee farmers, 2 CWS managers, 2 Agronomists, 1 coffee value chain specialist and 2 PRICE staff.

Findings revealed six key players in the chain: input suppliers, smallholder fresh cherry producer, primary processors, secondary processor, roasters and consumers. Two marketing channels were identified in the study area, Informal and Formal markets, comprising producer to consumer and producer to wholesaler to retailer to consumer. Regression analysis revealed major determinants of market channel choice to be Age, Education, Gender, Farm Size, Coffee yield, Cooperative status, Distance to market and Selling price of coffee cherry Economic analysis showed that cost of production per unit of fresh cherry, dry parchment and green coffee was estimated at 157.91 RWF, 425.09RWF, 312.09RWF respectively. Smallholder producers were discovered to have benefitted the least in terms of gains shared down the chain at 4.35% and 8.72% in the domestic and export markets, and secondary processors benefitted the most at 17.71% and 15.87% in the domestic and export markets. The study also revealed that constraints in coffee production and marketing were insufficient and late supply of inputs, high costs of production, poor infrastructure, market accessibility and price fluctuations. CWS were found not to be running at full capacity, poor traceability and transparency of dry mills, old mills, high operation costs, poor infrastructure and access to market, low domestic consumption of coffee, fluctuation of global prices, geographical zoning policy and loss of coffee to bad quality, high cost of packaging materials and access to export market.

It is recommended that farmers involved in the chain should form cooperative organizations to increase access to funds needed for operation, government should support technological advancement at the processing level, development of infrastructure prioritizing areas where there are coffee washing stations and extensive marketing of coffee both locally and internationally will aid in the improvement of the coffee value chain.

Keywords: Value Chain, Coffee, PRICE, NAEB

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LIST OF ABBREVIATIONS

CBI-Center for Promotion of Imports from Developing Countries

CEPAR- Coffee Exporters Processors Association of Rwanda

CWS- Coffee Washing Station

DP- Dry Parchment

FAO- Food and Agriculture Organization

FC- Fresh Cherry

FONERWA- The Green Fund

Gbe- Green Bean Equivalent

GOR- Government of Rwanda

Ha- Hectare

ICO- International Coffee Organization

IFAD- International Fund for Agricultural Development

JICA-Japan International Cooperation Agency

MINAGRI- Ministry of Agriculture and Animal Resources

MTR- Mid Term Review

NAEB- National Agricultural and Export Development Board

NISR- National Institute of Statistics of Rwanda

OEC- Observatory of Economic Complexity

PDR- Project Design Report

PDCRE

PRICE- Project for Rural Income Through Exports

RAB- Rwanda Agriculture Board

RDB- Rwanda Development Board

RWASHOSCCO- Rwanda Small Holder Specialty Coffee Company

RWF- Rwandan Francs

SMES- Small Medium Enterprises

SPSS- Statistical Package for Social Sciences

TAP- Turnaround Program

CHAPTER ONE

INTRODUCTION

1.1. BACKGROUND TO THE STUDY

As the demand for processed agricultural products expands in the global market, the opportunities for smallholder farmers in developing countries to benefit from such opportunities by value chain integration grows continuously (Vermeulen et al., 2008). Coffee is one of the major cash crops and export commodities in Rwanda second to tea, it contributes 45% of export value and 5% to the coffee sub-sector contributed about 2% of the Rwanda's GDP (NISR, 2018). It also represents about 7% of the total export value and 20% of the agricultural export value (OEC, 2016)

Coffee was introduced for the first time in Rwanda by German Missionaries in 1904, and in the beginning, it was mainly cultivated by the colonial administration. The production of coffee has increased through the years and reached its peak in the mid-1980s. From 2000, the Government of Rwanda (GoR) introduced a new coffee strategy that aimed at promoting the cultivation and production of new high-quality coffee varieties following the increasing interest from international companies on Rwandan specialty coffee.

Currently approximately 400,000 smallholder farmers earn their living from coffee and together with other coffee growers on 37,500 hectares across hilly areas and steep slopes, produce between 15,000 MT and 22,000 MT which has been relatively stable, but is slightly on the decline (ICO, 2017; NAEB, 2018). The volume represents about 0.2% of the global coffee production, of which 98% is Arabica, mainly of the "Bourbon" variety. Of this volume, about 98% is Arabica, mainly of the "Bourbon" variety, and the rest is Robusta, according to the National Agricultural Export Development Board (NAEB). Coffee represents about 2% of the total agricultural production area in Rwanda (OEC, 2016).

The Government of Rwanda understands that, strategically, the coffee sector should promote the cultivation and production of high-quality coffee, which is why since the year 2000, more attention has been focused on the strategic development of the industry. This has involved the development of land use plans, farmer cooperatives as well as programs to stimulate the market, e.g. the Rwanda Cup of Excellence.

As a result of the increased focus by the GoR, not only coffee production has increased, Rwandan coffee has also received increasing interest and recognition from international companies. Rwandan coffee was ranked among the top 30 leading coffees in the world by Coffee Review in 2018.

Despite the impressive progress, Rwanda's coffee productivity index is low by comparison to the potential productivity the livelihoods of the approximately 400,000 smallholder farmers remain marginal (Nyezimana, 2018). The domestic consumption of coffee is also quite low (NAEB/ICO, 2017) as majority of coffee produced is exported. This leaves revenue obtained from coffee completely at the mercy of export markets.

Rwanda has received international aid with regards to its development, especially in its agricultural sector. One of such international organizations is the International Fund for Agricultural Development (IFAD) whose aim is to reduce poverty and empower the rural poor by transforming agricultural sectors and reducing vulnerability to climate change (IFAD, 2013)

It has launched and implemented the Project for Rural Income through Exports (PRICE) in partnership with NAEB to establish pro-poor cash crop value chains involving smallholder production and early transformation in partnership with private sectors. The project focuses on the proven exports of tea and coffee, as well as the upcoming export of silk and horticultural crops intended for domestic and regional markets. PRICE has national coverage,

supporting interventions in selected areas across the country along with specific criteria for each value chain (PRICE PDR, 2011).

In developing the coffee sector IFAD-PRICE aims at securing better returns through higher marketed returns and coffee quality. They have tried to achieve this through farmer field schools and the turnaround program for cooperatives alongside promoting the marketing branding and strengthening of Rwandan coffee and farmers negotiating positions (PRICE PDR, 2011). NAEB-PRICE has addressed key production, processing, and marketing constraints, intending to improve farmers' ability to deliver the qualities and quantities required to respond to market opportunities, maximize their profit and strengthen their position in the value chain governance. (PRICE MTR, 2015). Since implementation, achievements include an increase in the average yield of coffee from 1.35kg to 3kg, helped in the establishment of new coffee washing stations, increased smallholder access to advisory services, increase the adoption of improved production technologies and increased the average price of coffee cherries. (IFAD,2018)

Despite this, the value chain of coffee production in Rwanda still suffers from a myriad of issues which will be addressed in this study using a value chain analysis.

1.2.   RESEARCH PROBLEM

Coffee plays a crucial role in the livelihoods of millions of households in developing countries. In Rwanda, coffee remains one of the major export products, contributing more than 45% of the value of export crops (NISR, 2015)
A value chain analysis helps in providing information related to competitive advantage in terms of cost, value addition, product segment, and upgrading critical success factors for better markets. One of the several problems that exist in a value chain from production to distribution is the sharing of profit along the value chain. The value chain of coffee in Rwanda consists of key actors, chain supporters, and influencers. The key actors include coffee farmers, traders, processors, exporters, unions, and consumers. Rwanda's coffee industry is dominated by a few channels to large traders and exporters. Together they control 64% of the theoretical capacity, but they are responsible for at least 85% of the exported volume of coffee in the country. Their vertical integration into the value chain has reduced the bargaining power of suppliers and considerably increased competition for the raw material (cherries). The smaller processors and exporters are seen struggling in such an environment. (CBI, 2018).

Despite the recent positive developments in the coffee sector in Rwanda due to government and international aid such as the IFAD-PRICE project, small-coffee producers are still straddling in the poverty line as they are one of the weakest actors along the coffee value chain. Smallholder coffee farmers are not as happy as other actors because they are getting the lowest share of revenues along the value chain despite being involved in the production process. This presents a serious problem to the sector if left unchecked as coffee farmers play a huge role in coffee production and exports, which contributes to Rwanda's GDP every year. Even though some studies have captured the relationship between inter-value chain actors input and output in the coffee value chain and the roles coffee value chain analysis play in governance and economic value, there is still little attention on how profits are shared along the coffee value chain, especially to its core producers and smallholder farmers. Since Rwanda has experienced a recent increase in exports, it is expected that the increase in production would lead to an increase in value share down the chain. On average, the price of coffee at the international market is between $2 and $5 depending on quality, but farmers get only about a third of a dollar for a kilogramme of their coffee cherries, according to market estimates. Farmers' efforts are not rewarded accordingly, even when they produce the best coffee or organic coffee (Lukenge, 2019). Among other issues include low productivity, which has multiple causes, such as low soil fertility and increased pest and disease pressure, and which is also due to changing weather patterns. Farmers are tempted to invest in other subsidized crops that fetch higher prices in the market, including horticultural crops and irrigated

crops, such as maize and rice. Furthermore, smallholder farmers in the coffee value chain have difficulty obtaining and accessing financial services and knowledge required to be able to compete successfully. (CBI, 2018).

The processors (coffee washing stations), which consists of both primary and secondary processors are perceived to be the weakest link along the value chain. Coffee washing stations face several challenges like strong competitions to purchase high-quality cherries and are forced to buy low quality, immature, or damaged cherries from farmers as coffee producers only sell high-quality cherries to the highest bidder. Several other challenges the processors face include high processing costs, lack of access to finance, weak bargaining power and lack of collaboration and coordination (CBI, 2018).

Given the above, the following questions are raised.

1. What are the different links in the value chain from production to consumption?
2. What are the marketing channels of coffee production in the study area?
3. What are the major challenges to coffee production in the study area?
4. What are the opportunities to upgrade the coffee value chain?
5. Which actor in the coffee value chain benefits the least?
6. What are the prices, costs and value shared per actor in the coffee value chain in the study area?
7. Which factors determine the market channel choice for farmers?

1.3. OBJECTIVES OF THE STUDY
The objectives of the study include;

1. To describe the different links in the coffee value chain including actors and their interrelationships in the study area,

2. To identify the marketing channels of coffee production and determinants of market channel choice for farmers in the study area.

3. To ascertain the prices, costs, and value gained at the different stages in the coffee value chain in the study area

4. To explore the challenges and opportunities for actors in the coffee value chain.

1.4. RESEARCH HYPOTHESIS
Ho: Socio-economic factors have no significant effect on market channel choice of coffee farmers

1.5. SIGNIFICANCE OF THE STUDY
Coffee is an important high-value commodity in Rwanda. According to NAEB (2016), 355,000 farmers earn their living from coffee. Since it can be cultivated on marginal land, smallholders can achieve greater returns from coffee than from other traditional crops (Kattel, 2009). One of the approaches that can help address the issue of income generation for small coffee farmers is to carry out a coffee value chain analysis. This analysis is essential to an understanding of markets, their relationships, and the participation of different actors and the critical challenges that limit the coffee production and, consequently, the competitiveness of smallholder farmers (Rota, 2006).

Also, the analysis of the coffee value chain can offer more insight on how to connect small and medium-sized enterprises (SMEs) in developing countries like Rwanda with the European market and thereby contribute to sustainable and inclusive economic growth.

A study on the coffee value chain analysis in Rwanda helps to find out whether there is a fair gains distribution or if there are disparities in gains distribution along the value chain and provide solutions to solve discovered disparities, thereby improving the income and livelihoods of the farmers. This study will be of significant value to the government agencies, policymakers, international organizations, and farmers to ensure cooperation, integration, and coordination for effectively improving gains distribution along the coffee value chain in Huye, Rwanda.

The research can also be used to complement other studies conducted in line with the value chain analysis of coffee production in developing countries.

1.6. RESEARCH SCOPE

This study was undertaken in the Huye District of Rwanda with a focus on the profitability in the coffee value chain from production to consumption. In this context, the research attempted to examine each step of the coffee value chain. More importantly, this study will analyze the distribution among value actors. The challenges affecting each segment of the coffee value chain, as well as the opportunities to improve the coffee value chain was discussed. Huye District consists of fourteen major sectors with many surrounding villages. In this study, the five major sectors in Huye District will be covered, and the genders (male and female) involved coffee production will be addressed. The time frame for this research is from 2015-2018.

CHAPTER TWO

MATERIALS AND METHODS

2.1 INTRODUCTION

This chapter highlights the specific methodologies and procedures that were used in the study. The methodologies include the description of the study area, sampling criteria and study instruments used. Data collection methods, data analysis and data interpretations for the study are also described.

2.2 STUDY AREA

The study was conducted in Huye district which is one of the eight districts that make up Rwanda's Southern Province. It has a total surface area of 581.5 square kilometers and a population of 314,022 inhabitants with an average of 540 inhabitants per square kilometer. It is well known for its high quality

Figure 1. Map of Huye district, Rwanda
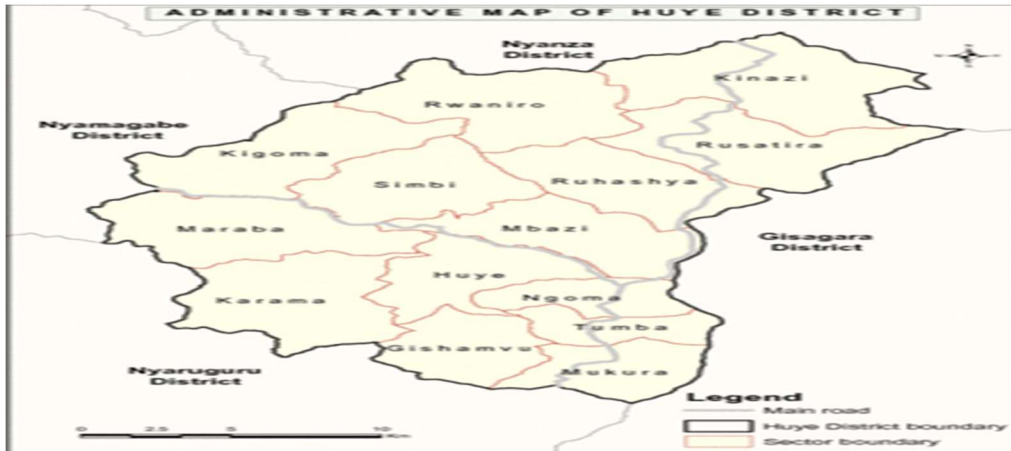
Source: huye.gov.rw (2019)

specialty Maraba coffee that has attracted a big market locally and internationally. There are over 18,000 coffee farmers. Rainfall distribution pattern is 1.200mm and the average climate is 19ºC.

2.3 RESEARCH DESIGN
Data Collection

Primary data collection comprised surveys and interviews. Expert opinions and informal group discussions from the National Agricultural Export Development Board, Project for Rural Income through Exports, Ministry of Agriculture and Animal Resources in Rwanda were obtained. Semi-structured questionnaires for the interviews and surveys were developed, pretested, adjusted and used to collect data face to face from stakeholders in Huye District to enable the collection of in-depth quantitative and qualitative information i.e. views and personal experiences from farmers, farmer's association, extension support providers, processors and experts from PRICE and NAEB. Informal sessions with stakeholders were randomly selected and interviewed according to the set

questionnaires, site visits were also conducted. Secondary data were obtained from reports, journals, newsletters, published research works and books as well as baseline surveys

Sampling procedure for respondents

Multistage sampling techniques was used in this study. The sampling was carried out in stages and smaller sampling units were used at each stage. In this study, sampling was done by district and sector. At the sector level, sectors were selected based on high and low populations of coffee farmers. Two groups of farmers were interviewed. Cooperative and non-cooperative members. Random sampling technique was used to select respondents. The survey was carried out in 6 sectors in Huye district (Huye, Mbazi, Rusatira, Maraba, Simbi and Kinazi) 8 Cells (Shyembe,Nyakagezi, Tare, Buhimba, Kaboma, Cyendajuru, Rugonoma, Birembo) and 14 Villages (Kagoma, Kamutima, Nyarunazi, Kigarana, Gashikiri, Gasaka, Munyu, Bucumbi, Kigwene, Cyizi, Mupobone, Rugarana, Munara,Cyasoka).

Sample size for respondents and informants

Sample size for this study was calculated using Cochran's sample size formula with a confidence level of 95% and confidence interval of (1.96). Data for this study was collected from 290 households and 23 were discarded for poor quality and irrelevance, one focus group discussion with members of farmer's association, 8 key informant interviews were also conducted. In order for the data to represent all relevant groups, purposive sampling techniques were used in selecting the respondents for FGD and KII. A structured questionnaire was administered to smallholder farmers to collect information on agricultural practices, land holding, income generation, productivity, challenges and opportunities during production. The key informant interviews also covered similar questions in order to acquire more information on the subject matter. Field observations were also used in the acquisition of additional data and for verification purposes.

Table 1 shows the distribution of respondents and informants per section. The pool of respondents and informants comprised farmers, district officers, extension workers, managers of CWS both private and cooperative owned and government agency officers.

Table 1. Distribution of respondents

Section	Number of respondents and informants
Government agency officials	3
Extension workers	2
District officer	1
CWS Managers	2
Farmers	267
Total	274

Authors computation

2.4 DATA ANALYSIS

Table 2. Method of data analysis by objective

S/N	Objectives	Method of Collection	Method of Analysis
1.	To describe the different links in the coffee value chain including actors and their interrelationships in the study area	Survey Questionnaire, Key Informant Interview, Focus Group Discussion	Descriptive Statistics (Frequencies, percentages) Inferential statistics (Chi-square test)
2.	To identify the marketing channels of coffee production and determinants of market channel choice for farmers in the study area	Survey Questionnaire, Key Informant Interview, Focus group Discussion	Descriptive Statistics (Means, Frequencies and Percentages) Inferential Statistics (Binary Logistic Regression)
3.	To ascertain the prices, costs, and value gained at the different stages in the coffee value chain in the study area	Survey Questionnaire, Key Informant interview.	Descriptive Statistics (Means, Frequencies and Percentages)
4.	To explore the challenges and opportunities for actors in the coffee value chain in the study area	Survey Questionnaire, Key Informant Interview, Focus group discussion	Descriptive Statistics (Means, Frequencies and Percentages)

Data management, Analysis and Presentation

Data collected from respondents were collated, verified, a coding template was drawn up for variables, and data was entered, cleaned and merged in the data sheet.

Tools utilized for coding and analysis were Microsoft Excel Spreadsheet and Statistical Package for Social Sciences (IBM SPSS statistics 20 and 22).

Description of Relevant Variables

This is shown in the table below

Dependent Variable		
Variable	Description	Measurement of Variable
Marketing Channels for Coffee	Selling on the Roadside or to neighbours and relatives, selling to traders and coffee washing stations (private and cooperative)	Formal Market channel (1), Informal market channel (0)
Independent Variables		

Variables	Description	Measurement of Variable	Expected sign
Coffee Yield	Quantity of coffee cherries harvested	Kilograms	+
Age	Age of household head in years	Years	-
Distance to market	Distance from farm to nearest market	1= <3km 2=>3km	+
Education	Level of education for household head	1=Formal education 0=Other	+
Farm Size	Size of farm in hectares	1=<1ha 2=>1ha	-
Farmer-Buyer relationship	Contractual relationship between farmer and buyer	1=Contract 0=No Contract	+
Cooperative status	Membership of farmer to coffee cooperative	1=In cooperative 0=Not in cooperative	+
Selling Price	Price per kilogram of fresh cherry sold	1=Less than 190Rwf 0=More than190Rwf	+
Gender	Gender of household head	1=Male 0=Female	-/+

Table 3: Description of dependent and independent variables

Analytical Framework

Decision to participate in either formal or informal markets signifies the individual's direction to maximizes utility (Xaga et al, 2012). To analyze the farmer's choice of participating in formal or informal market channels, Binary logistic regression was utilized.

The Bogale and Shimelis (2009) probit model used is below:

Logit $(P_i) = f(Z_i) = 1/1 + e^{-(\alpha + \Sigma \beta_i + X_i)}$ ………………………(1)

Where :

P_i = the probability that a farmer participates in the formal market

X_i = a cumulative of all the independent variables

α & β = parameters to be estimated

e = base of the natural logarithm

To make the interpretation of coefficients easier, a logistic model could be written in terms of odds i.e. the odds ratio is the probability that a farmer would select the formal market channel(P_i) to the probability of a household participating in the informal market (1-P_i)

That is:

$P_i/1-P_i = e^{zi}$ …………………………..(2)

Taking the natural logarithm of the equation yields:

$L_n (P_i/1-P_i) = z_i = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_3X_3{}^2 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9$ …………….(3)

If the error term Σi is taken into consideration, the equation becomes:

$Zi = \alpha + \Sigma_i^m = O\beta_1X_1 + \varepsilon_i$ …………………………..(3)

In the model, the choice of market channel represents the dependent variable where participating in the formal market channel is set as the reference category. The choice of market channel describes the decision to sell coffee cherries to the formal market channel or non-formal market channel. Thus, Pi represents the probability of participating in the formal market channel.

CHAPTER THREE

RESULTS AND DISCUSSION

3.1. INTRODUCTION

The study was undertaken to analyze the value chain of coffee production in the Southern Province of Rwanda in order to understand the interrelationships of actors within the chain, their challenges and opportunities for improvement. The purpose of this chapter to present the general findings based on careful analysis of survey information and discuss the results.

3.2. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

The survey carried out on 267 coffee farmers revealed majority were male (64%), while 36% were female. This implied that women were less involved in coffee production than men. On the other hand, it was discovered that more women were involved in the processing aspect of coffee especially in jobs such as hand sorting and drying.

Averagely, each of the coffee farmer was aged 51 years, with 25.1% falling within the age range of youth in Rwanda which is 14-35 years. Therefore, youth integration is required for the coffee value chain as they are more susceptible to change and more likely to adopt new practices or improve old ones.

All respondents were household heads. The average household size was 4 to 6 persons which indicates more hands to be used for family labour. Similar findings were made by Yusuf *et al.,* (2016). There were dual-headed households which comprised married couples (72%) who both made the decisions and single headed households for those who were unmarried (7%), had divorced or separated (7%) or were widowed (14%)

Results from the survey show that 62.9% of respondents had no formal education while 34.1% passed through primary education. This indicates that farmers with higher education will be more productive as they are more likely to adopt innovative technologies, similar findings were made by Shultz, (1964). More than half of the farmers indicated they had over 20 years of experience in coffee farming (56%) this implies that they have acquired enough farming experience that enables them employ new farming techniques and be more susceptible to improving on old ones.

Mostly, farmers had a farm size below 1 hectare (174 out of 267) and the average farm size was 1-3 hectares per household. This confirmed that the respondents were indeed smallholder farmers with land less than 2 hectares for cultivation (Sarah et al, 2016). 65.2% of respondents had less than 100 trees per hectare, about 32% had coffee trees of about 101 – 200 per hectare, 15% had coffee trees of about 200 – 300 per hectare, 18% reported having 301 – 400 trees per hectare, while 17% reported having more than 400 trees per hectare. The average number of trees per farm were 151.49 trees/ha in the study area.

On farm ownership, Majority of farmers (61%) inherited the farms they currently cultivate on, while 32.2% purchased their farms. In addition, results showed that three-quarter of respondents (73.4%) engaged in coffee farming and other businesses simultaneously, while only 26.6% engaged in coffee farming only. This shows that currently, coffee farming as an exclusive source of income is not enough and many farmers have resorted to growing and selling other crops such as bananas, rearing of animals such as cows and off-farm employment in order to make a living.

Table 4. Demographic characteristics of respondents

	Frequency (n = 267)	Percentage
Gender		
Male	171	64.0
Female	96	36.0
Age group [51.1 $\pm$ 14.9]		
Below 30 years	20	7.5
30 – 39 years	47	17.6
40 – 49 years	45	16.9
50 – 59 years	67	16.9
60 – 69 years	59	22.1
70 or more years	29	10.9
Household size		
1 – 3 persons	65	24.3
4 – 6 persons	145	54.3
More than 7 persons	22	21.4
Marital status		
Single	19	7.1
Married	191	71.5
Divorced	4	1.5
Separated	17	6.4
Widowed	36	13.5
Level of Education		
Non-formal	168	62.9
Primary	91	34.1
Secondary	6	2.3
Vocational training	2	0.7
Years of coffee farming experience		
Less than 5 years	30	11.2
6 – 10 years	42	15.7
11 – 15 years	22	8.2
16 – 20 years	24	9.0

More than 20 years	149	55.8
Size of coffee farm		
Less than 1 hectare	174	65.2
1 – 3 hectares	83	31.1
4 – 6 hectares	7	2.6
7 – 9 hectares	2	0.7
10 – 20 hectares	1	0.4
Farm ownership status		
Bought	86	32.2
Inheritance	163	61.0
Leased	11	4.1
Government owned	3	1.1
Gift	4	1.5
Source of Income		
Coffee farming only	71	26.6
Coffee farming and others	196	73.4

Field Survey (2019)

3.3   Links in the coffee value chain including actors and their interrelationships in the study area

This is revealed in the value chain map presented below

Figure 2. Value chain map of coffee production in Huye district, Rwanda
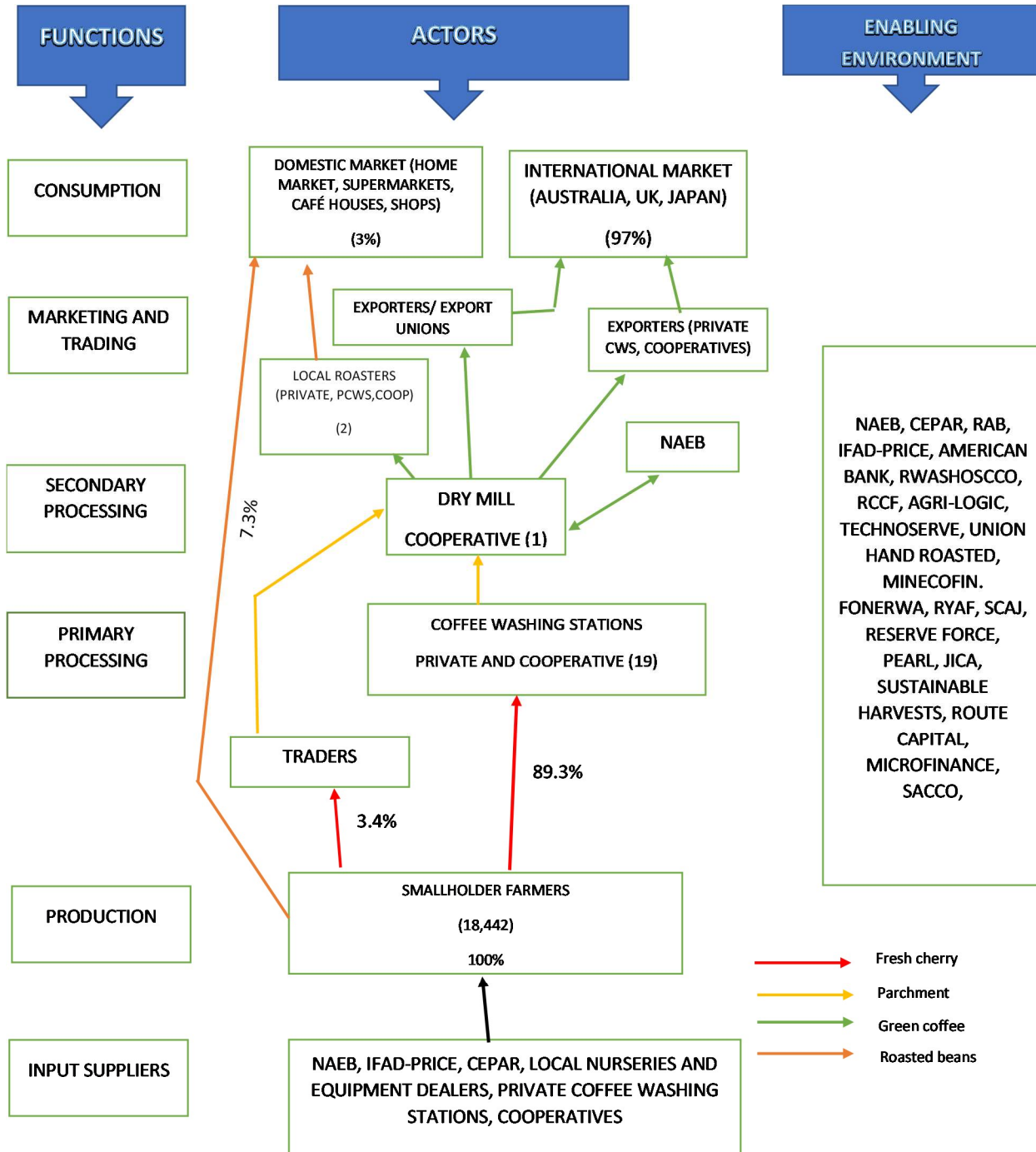
Source: Own Illustration (adapted from various images and personal observations, 2019)

Source: Own Illustration (adapted from various images and personal observations)(2019)

Figure 2 illustrates the Coffee Value chain in Huye District, Rwanda. There are two main qualities of coffee recognized for consumption and export in Rwanda : Fully Washed and Semi-Washed/Ordinary.

Input suppliers

Agricultural value chains begin at input supply level. Inputs such as disease resistant seeds, fertilizers, pesticides are supplied by cooperatives or private coffee washing stations through government agencies such as NAEB, CEPAR and international organizations such as IFAD/PRICE. Figure 3 shows the inputs used and their suppliers.

Figure 3. Sources of production and processing inputs
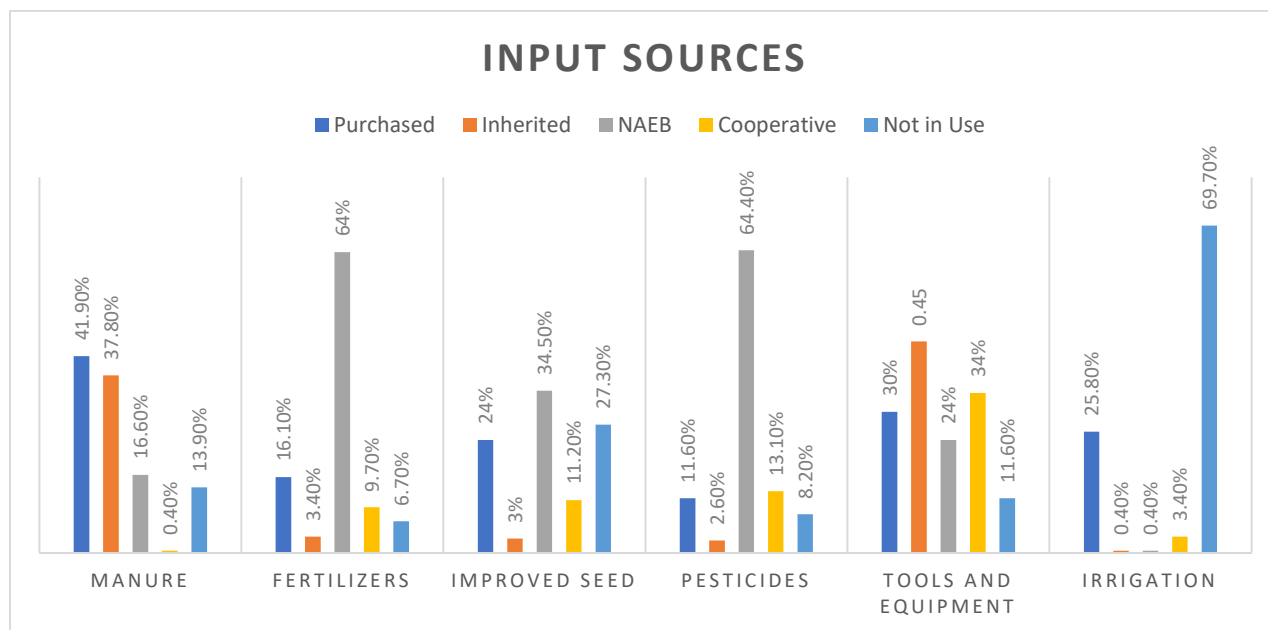
The major inputs used in coffee production were manure and fertilizers, improved seeds, pesticides, tools & equipment and irrigation

Majority of the respondents purchased manure from local markets or fellow farmers (41.9%) while 37.8% utilized farmyard manure. More than half of the respondents (64%) were supplied with fertilizers from NAEB while 9% obtained fertilizers from their cooperatives. According to NAEB, 2,148,500kg of fertilizer were distributed and applied to 31,939,789 trees in the Southern province where the study area is located (NAEB Annual Report 2018/19). This makes an average of 1kg fertilizers per 14.8 trees.

64% of respondents acknowledged that they benefitted from pesticide sprays from NAEB, 13.1% from their cooperatives and 11.6% indicated they purchased pesticides for their farms. Average pesticides applied was 10,286trees/1L of fertilizer to combat pests and diseases. (NAEB 2018/19).

Many of those who planted improved seeds got them from NAEB (34%) or purchased themselves from local nurseries (24%) another 27% use local seeds instead. In 2018, 590,438 seedlings were planted on 118ha in Huye district (NAEB, 2018)

Most of the farmers had received tools and equipment from cooperatives (34%), or purchased themselves (30%) or through NAEB (24%)

For inputs supplied to the Processors: NAEB provides water pumps which are used in the wet process, as well as capacity building programs such as cupping trainings for staff.

In addition, Labour, which is a key factor of production, is employed from land preparation to harvest. As depicted in Table 5, about 54.30% of the respondents used family labor 31.8% used hired labour for the production and harvest of coffee cherries. From observations, family labour was mostly used in land preparation and coffee cultivation, labour is usually hired during harvest periods in order to deliver harvested cherries timely and reduce loss.

Table 5. Labour distribution of respondents

Labour	Frequency	Percentage
Hired	85	31.80%
Family	145	54.30%

Field Survey (2019)

Coffee producers

Coffee producers refers to those actors who have coffee trees and harvest fresh cherry. Smallholder farmers were identified as the coffee producers in the study area. There are 18,442 smallholder coffee farmers (NAEB, 2018) who grow coffee on an average of 1 – 3 hectares of land with an average of 151 trees per hectare. The average yield per farmer in the study area was 768.18kg.

As shown in figure 4, of 267 farmers, 157 belonged to cooperatives, 110 sold to private coffee washings stations, middlemen or on the roadside. Although, of 18,442 farmers, only 4058 farmers belong to cooperatives (NAEB, Coffee Census, 2016).

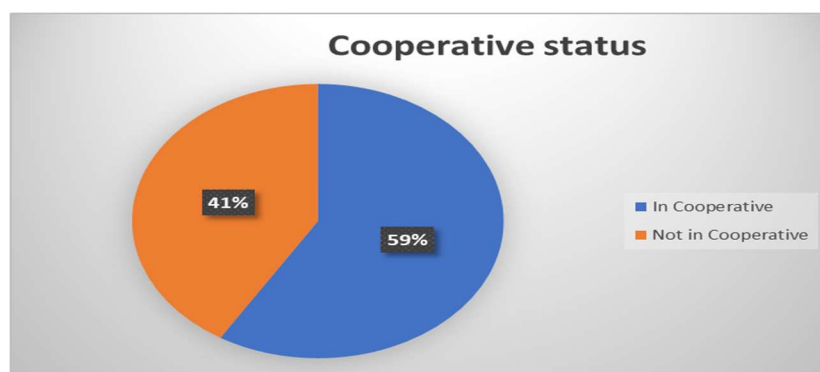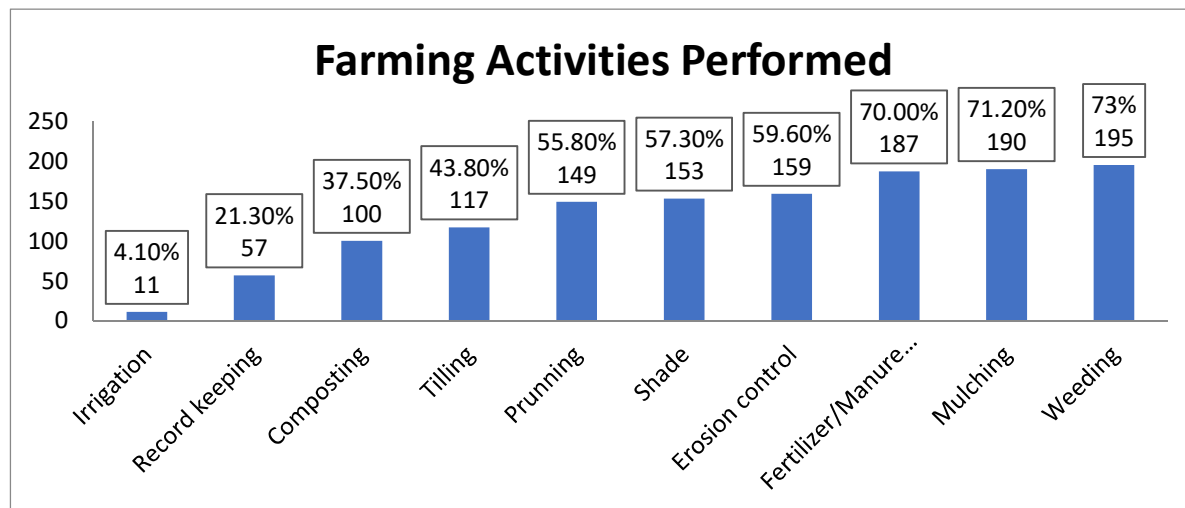*Figure 4. Cooperative membership status of respondents*

Figure 5 illustrates activities performed in the cultivation of coffee; most performed were weeding (73%), mulching (72%), fertilizers or manure application (70%); slightly more than half performed other activities such erosion control (60%), construction of shades (57%), and pruning (56%); less than half of the farmers engaged in activities such as tilling (44%) and composting (37%); poor record keeping (21%) and irrigation (4%) were identified. These activities contribute to the overall quality of coffee cherries when they are harvested. Harvesting was done when cherries were red-ripe (98.9%) and by selective-picking to avoid damaging the cherries (98.9). It is imperative that

producers deliver fresh cherry within 12 hours of harvest in order to maintain optimum quality and prevent rotting

Figure 5. Farming activities performed by respondents

Farming Activities Performed

Activity	Value
Irrigation	4.10% / 11
Record keeping	21.30% / 57
Composting	37.50% / 100
Tilling	43.80% / 117
Prunning	55.80% / 149
Shade	57.30% / 153
Erosion control	59.60% / 159
Fertilizer/Manure…	70.00% / 187
Mulching	71.20% / 190
Weeding	73% / 195

of cherries

In the fully washed coffee value chain, Farmers have two options to choose from after harvesting; selling the cherries private coffee washing stations, or to their cooperatives where the cherries undergo the wet process. For semi washed/ordinary coffee, In the event that they have rejected cherries due to low quality or they do not wish to sell to any of the above, they hand pulp the rejected cherries, dry and sell them to middlemen who sell to traders or they sell on the roadside at a higher price or to their relatives and neighbors.

Primary Processors

In the study area, primary processors are private coffee washing stations and Cooperatives which have washing stations; As stated before, there are currently 19 coffee washing stations in the study area. They are the second link in the value chain for fully washed coffee. Table 6 shows the proportion of harvested coffee that was sold to cooperatives and private buyers.

Table 6: Proportion of coffee sold to cooperatives and private washing stations

	Min.	Max.	Average (per farmers)	Total	Proportion
Quantity Sold to Cooperative (*in kg*)	60	2,490	780.37	81,974	40.1%
Quantity Sold to Private Buyers (*in kg*)	30	1,880	745.22	122,518	59.9%

Delivery of fresh cherry is within 12 hours of harvest by pick up from collection points set up by the washing stations or the cooperative or directly from the farmers who live close the washing stations. This coffee goes through wet processing, after which parchment is produced and either stored or sent off to dry mills for further processing. Sorting is done at every step of processing in order to filter poor quality coffee and improve competitiveness in the market as well as overall quality.

Secondary Processors and Exporters

Secondary processors are the actors who buy dry parchment from the coffee washing stations and cooperatives. One dry mill was identified as the only secondary processor within the study area and it was cooperative owned. The parchment undergoes dry milling to produce green coffee. The green coffee undergoes one last quality control check before samples are sent to NAEB for quality certification. Most CWS and Cooperatives export their coffee themselves or they go through export agents that possess export licenses. The washing stations sort the green coffee into sizes. Size 15mm and above are exported to the international market.

Roasters

In Rwanda, the consumption of coffee locally is being encouraged, so the green beans sized under 15mm undergo further processing in the form of roasting. The roasted beans are then packaged and sold in the domestic market. In some cases, roasted coffee is also exported, but this is rare as the buyers prefer to roast the green coffee themselves to control quality and taste. Smallholder farmers also process the coffee cherries that do not meet quality checks and are returned by CWS and Cooperatives at home, by drying on mats or plastic beds and roasting with household utensils which they then consume at home or sell locally. It was found that 97% of the green bean produced in the study area by secondary processors was exported and 3% was further processed to produce roasted beans or powder coffee for domestic market or roasted locally for home and local consumption

Marketing and Trading

In marketing Rwanda coffee, various coffee exhibitions, conferences are held to penetrate a variety of markets on both national and international levels. Some of them are the 17th African fine coffee conference and exhibition, Cup of excellence, BARISTA training, etc. these are organized in collaboration with NAEB and supported by IFAD- There are two identified markets in the study area;

1. Domestic market; this constitutes the lower graded green beans(A3) under 15mm, that farmers process at home using household utensils and sell at discounted prices to neighbors or relatives and the medium grade green coffee (A2) roasted and ground by the washing stations and sold within Rwanda in supermarkets and coffee shops.

2. International market; high grade green coffee (A3) 15mm and above, are not further processed but packaged into bags and exported as green coffee and sold at the Mombasa auction in

Consumers

Rwandans drink more tea than coffee as it the major national beverage. It is also much cheaper. According to NAEB, 3% of coffee produced is consumed in Rwanda while 97% is exported. However, coffee shops, supermarkets and offices are slowly aiding the marketing of coffee as a great beverage. Majority of coffee produced in Rwanda is exported and sold to consumers in recipient countries such as Australia, US, UK and Japan.

Enabling environment

Government, private and international development agencies have been promoting coffee by policy formulation, extension, research and development. The institutions involved in governing the coffee value chain of Rwanda, providing enabling environment are analyzed along with their functional relationship as follows.

1. National Agricultural Export Development Board: this government actor is involved in all links in the value chain, from input supply to export. It is registered under the Ministry of Agriculture and Animal Resources

(MINAGRI) and participates in the development of governing policies and strategies in the sector and ensures implementation of policies that affect production, processing, marketing research and training the main actors in the sector. It is also responsible for setting the farm gate price. NAEB supports the production of coffee in Rwanda in the following ways:

- Provision of planting materials such as improved seeds/seedling and fertilizers as well as pesticide sprays. Results from the survey in the study area show that (64%) acknowledged they got their fertilizers and pesticides from NAEB; many of those who planted improved seeds obtained them from NAEB (34%).

- Markets and promotes the export of coffee through exhibitions and conferences

- Provision of export licenses and quality certification to ensure access to the international market and better prices.

- NAEB provides cupping training to CWS and Cooperative staff as well as trainings for agronomists who in turn train farmers on good agricultural practices.
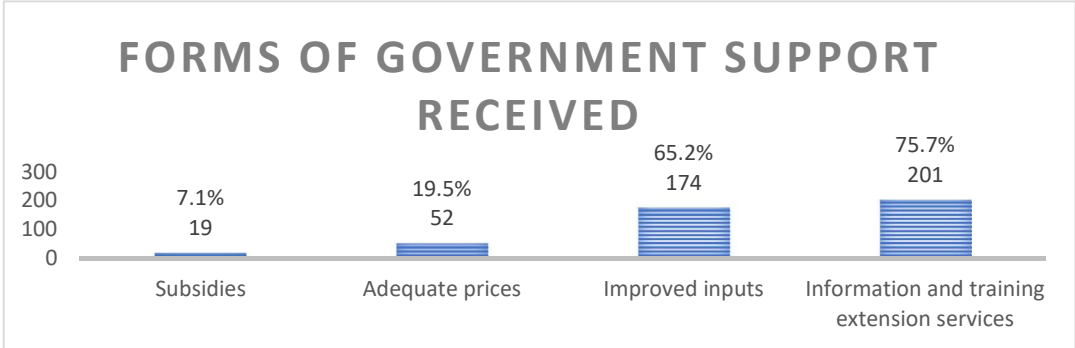
Figure 6; Support from NAEB

Most of the farmers remarked they had received some support from the government, this includes receipt of information and training extension services (76%), provision of improved inputs (65%), provision of adequate prices for coffee sales (19%) and subsidies (7%).

2. Project for Rural Income through Exports; this is an international project set up by the International Fund for Agricultural development whose aim is to raise smallholder farmers' incomes through establishment of pro-poor cash crop value chains. They provide improved seedlings as well as fertilizers to washing stations (private and cooperative) through NAEB, they also provide water pumps for the wet process. In addition, technical trainings are given to agronomists who in turn train the producers on agricultural practices. Cupping trainings are conducted for staff of washing stations and support is provided for exhibitions and conferences in order to improve Rwanda's competitive advantage in the international coffee market. as well as the staff of washing stations

3. Cooperatives, Private Coffee Washing Stations, Agronomists were identified as support providers in the value chain, starting from production where they would supply fertilizer for free, spray pesticides and provide market information as well as training. They also shared profit to the farmers which they referred to as 'second payment" and gave them cows for manure. Huye Mountain Coffee, which is a private owned coffee washing station, pays for health insurance for the farmers they are in business with. Maraba cooperative in addition to the above forms of support, has set up a credit and savings fund for its farmers which is currently at 6,000,000RWF ($6440), it also sponsors educational scholarships for member farmers' children.

4. RAB: The Rwanda Agriculture Board has a mission to make agriculture and livestock sector more productive. RAB supplies improved seedling to NAEB, who propagates and distributes to PCWS and Cooperatives, local nurseries and farmer organizations that do not have CWS.

5. Coffee Exporters and Processors Association of Rwanda: CEPAR aim is to increase coffee sector productivity. Its responsibilities are to buy and deliver inputs in a timely manner and manage the local administration offices that distribute the inputs.

6. Rwanda Small Holder Specialty Coffee Company (RWASHOSCCO): is a farmer owned marketing, exporting and roasting company that provides key services such as farm and managerial training to its member smallholder coffee cooperatives, it also sends back 100% profit for the development of the farms

7. Japan International Cooperation Agency (JICA): this agency is in partnership with NAEB and its goal is to increase Rwanda's coffee competitiveness through the creation of well-coordinated value chains and strong monitoring systems and to increase Rwanda coffee's visibility on the Japanese market.

8. The Rwanda Green Fund (FONERWA): an environment and climate change investment fund, it invests in the best public and private projects that have the potential for transformative change and that align with Rwanda's commitment to building a strong green economy. The Green Fund also provides expert technical assistance to ensure the success of its investments.

9. Financial service providers: 18% of the respondents obtained interest free loans from their cooperatives, 12% reported they had received credit from a neighbor or family member; other sources of finance are government subsidy (7%), and bank loans (1%). Other Finance providers are American Bank, Root Capital, Savings and Credit Cooperatives, Microfinance banks.

10. Transport and Logistics; The transport of cherries and parchment is organized with local small-scale transporters or washing station owned lorries. Only 1% of the respondents delivered the cherries directly to the washing stations (private and cooperative), 69.7% carried the harvested cherries by head to the collection points of the washing stations or directly to them. Green and Roasted coffee are transported by land using shipping containers.

3.4 Marketing channels of coffee and determinants of market channel choices for farmers in the study area
Respondents were discovered to have participated in two market channels; Formal market channel, which comprised selling of fresh cherry coffee to private and cooperative coffee washing stations processor middlemen to undergo the fully-washed process and Informal market channel which comprised selling of parchment or roasted coffee on the roadside or to neighbours and relatives. It is revealed in the figure below;
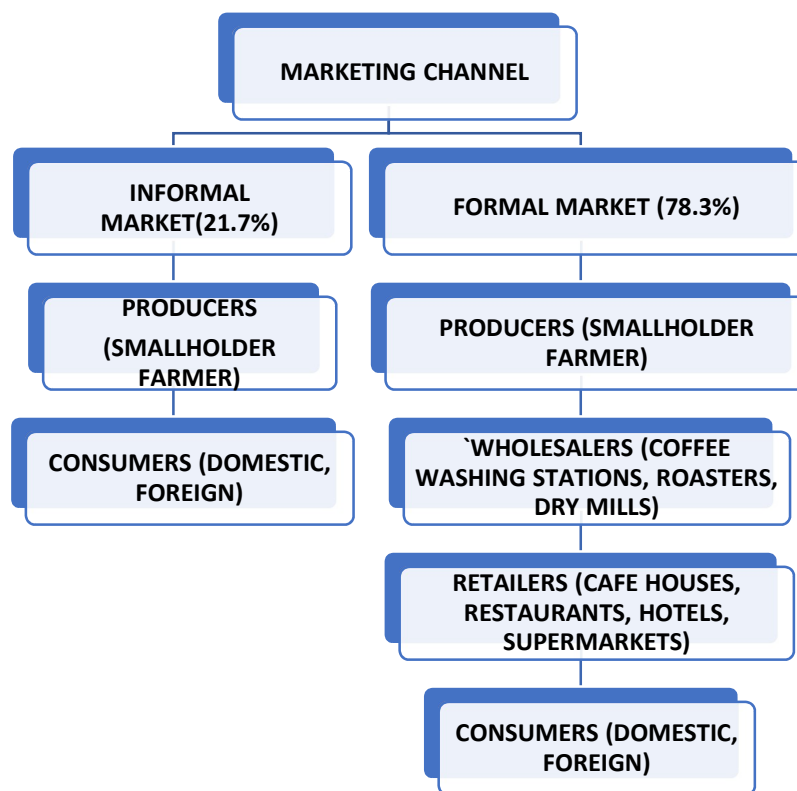
Figure 7: Marketing channels of coffee production

Producer-Consumer (Informal Market): Smallholder producers process cherries rejected by the CWS (Cooperative and Private) through dry processing and sell Semi-washed/ordinary coffee by the roadside or to relatives and neighbors. It was discovered that on average, 9.1% of harvested cherries were rejected by CWS for not meeting quality standard. In addition, farmers believe that they do not get adequate income from going through coffee washing stations or their cooperatives and sell ordinary coffee directly to exporters. Figure 7 shows that 21.7% of farmers participate in the informal market.

Producer-Wholesaler-Retailer-Consumer (Formal Market): Producers sell to CWS comprised of private owners and cooperatives. 90.9% of received fresh cherry is processed into parchment which is then hulled into green coffee. 97% of green coffee is exported to the international market, after which they are sold to retailers and consumers in the recipient countries. Major buyers of green coffee in the study area are the UK, Japan and Australia.

In the domestic market, the green coffee that are medium and low grade sized under 15mm usually make up 3% of coffee produced. These are roasted and ground by the CWS or by Roasters and sold in the domestic market. Mostly to cafe houses and supermarkets, who then sell to consumers in the ground or brewed form.

Determinants of market channel choice for farmers

Table 7: Results of Binary Logistic regression for market channel choice

Market Channel	OR (95% CI)	p-value
Age	1.09(0.97 – 1.24)	0.153
Age²	0.99(0.99 – 1.00)	0.131
Education		

No formal education	1	
Formal education	1.12 (0.57 – 2.19)	0.739
Gender		
Male	1	
Female	1.26(0.67 – 2.37)	0.482
Farm Size		
Less than 1 hectare	1	
More than 1 hectare	1.06(0.53 – 2.11)	0.866
Coffee Yield	1(0.99 – 1)	0.445
Cooperative status		
Not in cooperative	1	
In cooperative	0.80(0.43 – 1.50)	0.492
Distance to Market		
Less than 3km	1	
More than 3km	1.78(0.92 – 3.47)	0.089
Farmer and Buyer relationship		
No contract	1	
Contract	0.31(0.16 – 0.63)	0.001
Selling price of coffee cherry		
More than 190Rwf	1	
Less than 190Rwf	0.62(0.30 – 1.24)	0.176

Source: Field Survey (2019)

A binary logistic regression was conducted to assess whether socio-economic factors (Age, Education, Gender, Farm size, Coffee yield, Cooperative status, Farmer buyer relationship, Selling price of coffee cherry) had a significant effect on the choice of market channels for coffee farmers. Table 7 shows the results of the binary logistic regression

Age of the Household head: Results of the multinomial logit regression show that age and age squared both have a positive effect on market channel choice, this indicates that as the farmer grows older, the odd of participating in the formal market channel is increased by 9%. this may be attributed to the fact that much older farmers seek the orderliness and financial safety of participating in formal markets as opposed to leaving their sales to chance.

Education: Farmers with formal education were 1.12 times more likely to participate in formal markets unlike farmers who had no formal education. This may be attributed to the fact that more educated farmers had more access to market information and understood the benefits of the formal market channel as well as the value of their produce and thus selected that channel. Formal education was found to be statistically not significant with a p-value of 0.739 in the determination of factors that influenced market channel choice. This emphasizes the importance of increasing the literacy level of farmers in order to help them make more informed decisions

Gender: The results indicate that being a female farmer increases the probability of selling coffee to formal markets by 26%, i.e. private and cooperative owned washing stations as opposed to being male. This may be due to the fact that women are less economically empowered than women and are thus find income stability in selling to organized channels such as formal markets

Farm size: the odds of farmers who farmed on more than 1 hectare participating in formal markets was found to be 1.06 times the odds of those with less than 1 hectare. A large farm size indicates more yield which would be easier and more profitable to sell in formal market channels

Coffee yield: Results indicated that a unit increase in coffee produced increased the probability of a farmer selecting the formal market channel by 1 than those in the reference category, and results were found to be not statistically significant at 0.445. This indicates that the more coffee a farmer produces, the more likely the farmer's participation in the formal market.

Cooperative status: membership to a coffee cooperative was associated with 0.8 increased likelihood of participating in the formal market as opposed to selling on the roadside or to neighbours and relatives. This is due to the fact that those who belong to cooperatives are obliged to sell their harvest to the cooperatives in return for better prices and cooperative services. With a p-value of 0.001, membership of a cooperative was said to have a significant effect on the choice of marketing channels for farmers.

Distance to market: Distance to market positively influenced the likelihood that a farmer will choose formal market to informal market. Farmers who were more than 3km away from the markets places were 1.78 times more likely. This implies that as distance to market decreases, farmers prefer to sell in the informal market.

Farmer-Buyer relationship: Farmers who had a contractual relationship with their buyers were found to be 0.31times likely to participate in formal market as opposed to those with no contractual relationship. And results were found to be statistically significant at 0.001.

Selling price of coffee cherry: a selling price of less than 190Rwf was statistically not significant in determining the factors that influence channel choice decision with a p value of 0.176. Its coefficient reads a positive sign which indicates that an increase in price will make a farmer more 0.62times likely to participate in the formal market where profits would be higher.

3.5 Analysis of the prices, costs and value gained at the different stages in the coffee value chain

This section deals with the economic analysis at three major levels of the value chain: coffee producer, primary processor and secondary processor. It includes coffee type, actors, production cost per actor, selling price, value added and value share per actor.

Cost of fresh cherry production: Cost of fresh cherry production for this study takes into consideration costs such as improved seeds, labour, manure, fertilizer, mulching and irrigation. Fertilizers and pesticides are majorly provided by cooperatives or private CWS, however, the sum of 11RWF is deducted per kilogram of coffee cherries sold. In cases where farmers did not purchase manure but used cow waste, no cost was estimated

Therefore, in analyzing the cost of fresh cherry production, only variable costs were considered.

As shown in figure 8, the biggest cost during fresh cherry production is labour (63%) due to the simultaneous ripening of coffee. Farmers must harvest almost immediately to prevent rotting and post-harvest losses. So labour must be hired during harvest and during cultivation (planting, weeding, pruning). Although many farmers do not practice it, mulching is very expensive but vital to coffee production for soil preservation. Pesticides and fertilizers are provided by NAEB to cooperatives who sell to the farmers at a subsidized rate.

Figure 8. Distribution of fresh cherry production costs
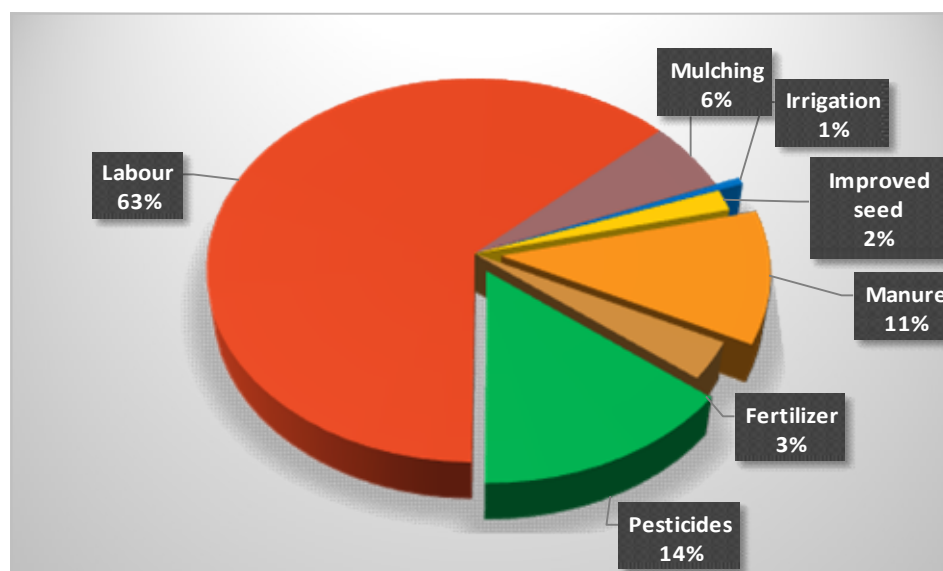
Source: Field survey (2019)

Table 8. Cost of production per kg of fresh cherry

Particulars (RWF)	Sum (RwF)	Mean(RwF)	Std. Deviation
Improved Seeds	201600	755.05	4712.23
Manure	1282810	12334.71	9070.93
Fertilizer	371377	1390.92	4495.54
Pesticides	1669483	6252.74	19261.65
Labour	7209000	27000	33678.93
Mulching	670000	51538.46	24185.45
Irrigation	65000	21666.67	32470.5
Cost of production/ha(RWF)	**11469270**	**120938.6**	**127875.2**
Cost of production/ha (USD)	**12,717.91**	**134.11**	**14.18**
Cost of production/kg (RWF)	**56.08**	**157.91**	**308.24**
Cost of production/kg(USD)	**0.06**	**0.18**	**0.3417**

Source; Field survey (2019)

Exchange rate according to exchange-rates.org as at May 2019 (1 USD= 901.82RWF)

Table 8 shows that total cost of fresh cherry production in the last season was 11,469,270RWF, while cost of fresh cherry production per hectare was 120938.60WF while cost per tree was estimated to be 798.33RWf (151.49 trees/ha). Similarly, as the average amount of coffee produced was 765.88kg per farmer, the cost of production of 1kg of fresh cherry was 157.91RWF. As farmers are paid an average of 186 RWF per kg of fresh cherry, this price is too low to cover the costs and burden of producing fresh cherry.

Cost of Dry Parchment Production

In the estimation of the cost of dry parchment, variable and fixed costs were analyzed. Table 9 shows the details of the cost of producing dry parchment. Costs of obtaining fresh cherry, transportation, electricity, washing, labour, equipment and other costs. The total variable cost and fixed cost of producing a kg of dry parchment at a coffee washing station was. Hence, studying 5 Coffee wet mills in the study area, the total cost of dry parchment production was estimated as 425.09 RWF/kg.

Table 9. Cost of production per kg of dry parchment

Particulars (RWF/Kg)	Mean	Std. Deviation
Labour	150.97	104.79
Packaging	12.77	3.874
Electricity	20.29	11.19
Washing	9.18	4.33
Fresh Cherry Input	197.29	11.69
Equip Maintenance	23.06	4.65
Fuel	11.51	7.92
Total Cost of Production per kg of DP (RWF)	**425.09**	**148.44**
Total Cost of Production per kg of DP (USD)	**0.47**	**0.16**

Source: Field Survey (2019)

Exchange rate according to exchange-rates.org as at May 2019 (1 USD= 901.82RWF) (1 EUR=1013.18)

Cost of green bean production

In estimating the cost of green bean production, fixed and variable costs were analyzed. Total cost of green bean production is presented in Table 10. It showed that total variable and fixed costs incurred in producing a kg of green bean was 312.09RWF/kg.

Table 10. Cost of production per kg of green bean

Cost of Green bean production (RWF/kg)	Mean	Std. Deviation
Total cost of GB production/kg	**312.09**	310.76
Total cost of GB production/kg(USD)	**0.35**	0.34

Source: Field Survey (2019)

Exchange rate according to exchange-rates.org as at May 2019 (1 USD= 901.82RWF) (1 EUR=1013.18)

Retail prices, Price spread and Actors' share on consumer price

The retail price of Rwanda filter coffee in supermarkets was 2500RWF per 250g which is equivalent to 10,000RWF/kg, it also goes for 15,500RWF on RWASHOSCCO website and is paid directly by domestic consumers, making the average price per kg of roasted coffee 12,750RWF on the domestic market. According to Union hand roasted, a packet of 1kg of roasted Rwanda Coffee is £28.50 Therefore, foreign consumers pay 25161.50RWF per kg of roasted coffee as per the exchange rate of EUR/RWF for May 2019.

The price of fresh cherry in green bean equivalent was estimated at 934.5RWF/kg as shown in table 13, therefore the retail price spread for domestic market was 9779.79RWF/kg while the price spread for the export market was 28,612.98RWF/kg which represents processing, marketing and shipment prices.

Also, producer's share on consumer price was 8.72% on the domestic market and 4.35% on the export market as illustrated in table 12, showing that producers benefit the least and secondary processors benefit the most in the coffee value chain.

Table 7. Share on retail price per actor

Actors	Share on Retail price	
	Export Market Channel (%)	Domestic market channel (%)
Producer	4.35	8.72
Primary Processor	5.43	10.9
Secondary Processor	17.71	15.87

Field Survey (2019)

Value Addition at Different Levels of the Coffee Value Chain

Table 13 represents the estimated value addition at different levels of the coffee value chain in the study area. It depicts the average market price of fresh cherry, dry parchment, green beans and roasted coffee and the green bean equivalent prices (GBE). Results showed that value addition of 233.625RWF occurred in the processing of fresh red cherry to dry parchment, while for the green bean of domestic market there was value addition of 531.875RWf from dry parchment and value addition of 2107.63RWf for green beans for the international market. At the domestic consumers' level, the value addition was 690.66RWF and it went even higher at 10781.09RWf on the international market.

Table 8. Value addition at different levels in the value chain

Level	Particulars	Price(RwF/kg)	Price (USD/Kg)	GBE conversion factor	GBE price(RwF/kg)	GBE Price (USD/Kg)	Value addition
Producer	Fresh cherry	186.9	0.2	0.2	934.50	0.98	0
Primary Processor	Dry parchment	934.5	0.98	0.8	1168.13	1.23	233.63
Secondary Processor	Green beans (Domestic market)	1700	1.79	1	1700.00	1.79	531.87
	Green beans (Export market)	4058.19	4.28	1	4058.19	4.01	2358.19
Consumers	Roasted coffee (Domestic market)	12750	13.43	1.19	10714.29	11.29	6656.10
	Roasted coffee (Export market)	35161.50	37.04	1.19	29547.48	31.13	18833.19

Source: Field Survey and Internet sources

Exchange rate according to exchange-rates.org as at May 2019 (1 USD= 901.82RWF) (1 EUR=1013.18)

3.5   Challenges and opportunities for actors in the coffee value chain

The challenges affecting farmers during coffee production are identified in figure 9 and discussed below

Figure 9. Constraints in coffee production

CHALLENGES FACED IN COFFEE PRODUCTION

Challenge	Value
Insufficient inputs	70%
Cost of labour	68.90%
Change in crop prices	64%
Pest & Diseases	58.80%
Old trees	37.80%
Rainfall	28.50%
High costs of inputs	26.60%
Poor soil fertility	21%
Credit availability	17.60%
Government policies	9.70%
Finding a market	7.90%
Inadequate labour	4.10%
Low quality of seedlings	1.50%
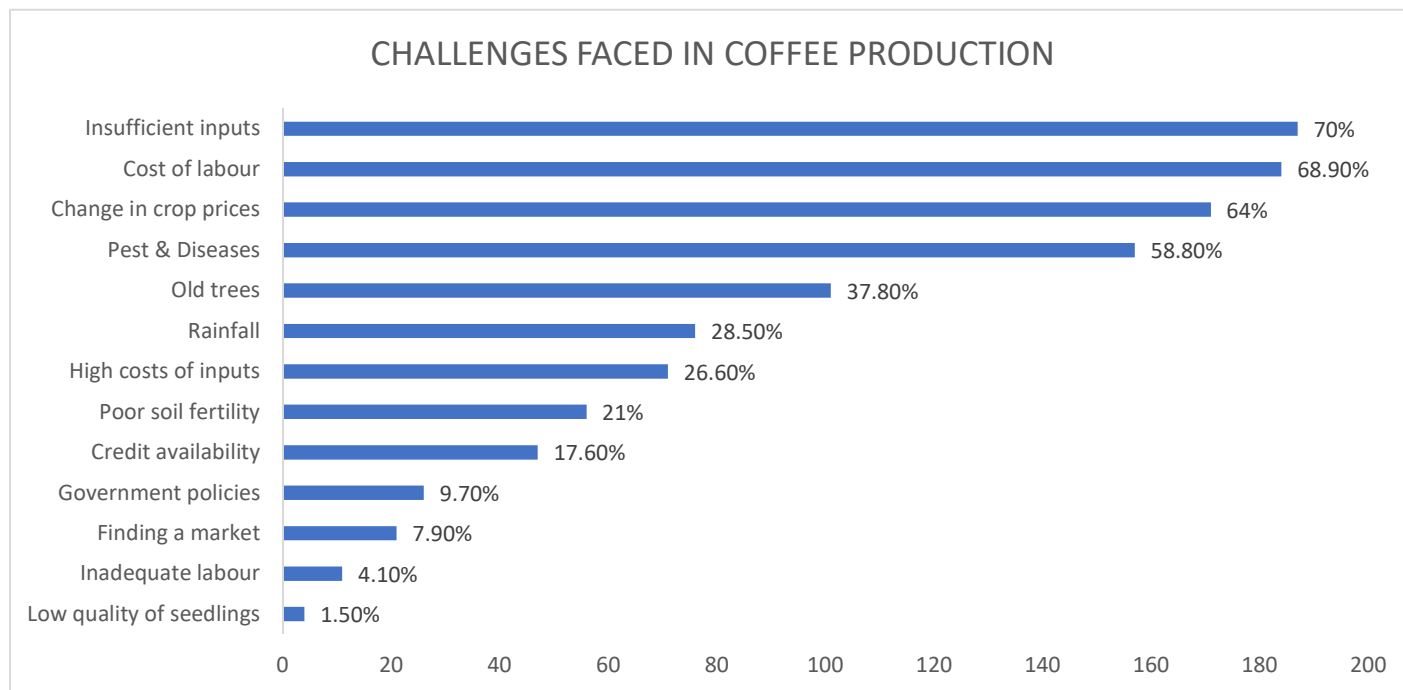
3.7.1 Major challenges to production

1. Insufficient Inputs: 70% of farmers reported insufficient inputs. Although NAEB, CEPAR, IFAD/PRICE have collectively tried to minimize costs by providing improved seeds for farmers, the seeds supplied are insufficient which leads to low yields. Manure and fertilizers are provided only once a year which is grossly inadequate causing the farmers to purchase out of their already minimal income.

2. Cost of Labour: of 267 farmers, an overwhelming majority of 184 indicated that labour costs were too high. Farmers pay an average of 700Frw per day to a range of 8-10 farmers for 20 days depending on farm size. This comes out of their savings or advance payments, leaving a little spending income leftover after all debts are paid off.

3. Pests and Diseases; more than half of the respondents (59%) acknowledged the problem of pests and diseases. Coffee Leaf Rust caused by *Hemilieia vastatrix,* Coffee bug caused by *Antestiopsis lineaticolis* and Coffee berry disease transmitted by *Colletotricum coffeanum* are posing a hindrance to high quality coffee yield. Although the seeds provided by NAEB/CEPAR are said to be disease resistant, the diseases are still prevalent.

4. Late and inadequate supply of pesticides; the NAEB routinely goes around the farms to spray pesticides to combat the infestation of pests and diseases. However, majority of the farmers indicated the untimely and insufficient supply of pesticides. This has made them cautious of extending their land or venturing into coffee production.

5. Old Trees; 43% of farmers indicated that they had unproductive trees and the average number of unproductive trees per hectare was estimated to be 50, for an average 250 trees per hectare, this means that one in five coffee trees are unproductive, thereby reducing yield by 20%. farmers acknowledged that it was unlikely they would plant new trees due to expenses and the fact that newly planted coffee trees yield cherry after three years of growth.

6. Rainfall; 28% of farmers indicated that rainfall posed a problem for them during production as it ruined the quality of coffee, made them harvest too early and made the roads difficult to navigate when they had to deliver harvested cherries.

7. High costs of Inputs; Although inputs were provided by various agents, farmers still purchased inputs due to insufficiency of supplied inputs. Major inputs used were seeds, manure, fertilizer and mulch. Farmers who obtained manure from their cows had no problem, but those who purchased organic manure spent an average of 16,706.89Frw. Organic manure has low levels of NPK, so chemical fertilizers were also purchased at an average rate of 600Frw per kg. Mulch is very important for soil preservation, but costs are high. The highest amount spent on mulching was 100,000Frw with the lowest being 25,000Frw.

8. Lack of irrigation: Regarding irrigation facilities, there are very scarce sources of water in the study area. Many respondents reported that they had to walk several kilometers to streams in order to procure water. Survey results show that 96% of farmers do not irrigate their coffee farms, leaving it to rainfall. They however agreed that poor irrigation was a contributor to the low quality and quantity of coffee produced

9. Old trees; in coffee farms old trees signify low productivity and farmers as well as primary processors indicated that old trees were a challenge to production. Currently one in four coffee trees are above productive age (30+ years) (NAEB, 2017).

Table 9. number of unproductive trees

	Min.	Max.	Average	25th Percentile	75th Percentile
Number of unproductive trees	1	1,200	50	20	100

NAEB with support from IFAD-PRICE has made efforts to plant new trees to combat the issue but more effort will have to made. Farmers are unwilling to plant new coffee trees due to costs and age of maturity as well as their own ages. A younger generation of farmers who are drawn to coffee through high returns and growth potential will aid in curbing this problem, but high costs and low returns will push them to other more profitable crops

11. Poor soil fertility: Although CEPAR and NAEB provide fertilizers through cooperatives and the CWS give cows for manure, there is often a delay in the delivery of the fertilizers. In addition, due to the inadequacies of the distributors, not all the supplied inputs reach the farmers.

12. Poor record keeping practices: When asked about record keeping of farm practices, only 21% of farmers acknowledged that they kept records. In one-on-one interviews as well as observations, majority of the farmers provided information from memory alone. This means that farmers will have poor planning and management skills required for income increase.

Marketing challenges for Farmers
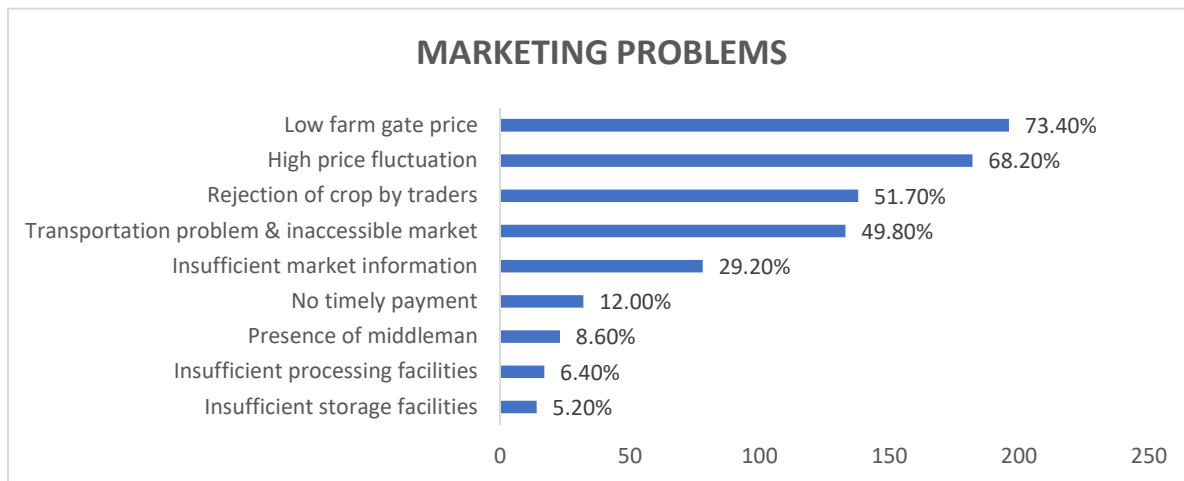
Figure 10. Marketing problems at producer level
Field survey (2019)
Figure 10 illustrates marketing problems experienced at the production level of the value chain.

1. Low farm gate price: Recently the price of coffee has dropped from 240FRw/kg to 190Frw/kg, due to competition on the international market. This price, although cushioned by second payments is too low to cover costs and burden of coffee production and not all farmers receive second payments.

2. High price fluctuation: due to the competitiveness of coffee on the international market, farmgate prices constantly fluctuate. This makes farmers reluctant to produce coffee and has them shifting to other crops with less volatile prices.

3. Rejection of crop by traders; CWS often reject bad quality cherries which are identified by the floatation system. Table 15 shows that an average of 6kg of cherries were rejected by Coffee Washing Station due to bad quality in the previous harvest.

Table 10. Coffee rejected by CWS

	Min.	**Max.**	**Average**	**25th Percentile**	**75th Percentile**
Quantity of coffee rejected at the cooperative or washing station (kg)	*0*	*80*	*6*	*2*	*12.5*

Field survey (2019)

Although these cherries are later processed at home by the farmers and sold to neighbors and relatives or consumed at home, they still considered it a loss.

4. Transportation problem and inaccessible market; Rwanda is also known as the land of a thousand hills, as well as being 90% rural. During the rains, it is nearly impossible for the farmers to carry the harvested cherries to the collection points or the washing stations. The hilly roads are also difficult to access for certain vehicles to pick up coffee cherries.

5. Insufficient market information; Although farmers were able to identify problems such as low prices, transportation issues, post-harvest losses, they do not have enough information to find solutions to these problems. When farmers are up to date on market prices, they can negotiate better prices for themselves and boost their incomes.

6. No timely payment; Table 16 indicates mode of payments for farmers. In most cases, Payment was made immediately to farmers who brought the cherries to the Coffee Washing Stations. Out of 267 farmers, just 32 farmers indicated that untimely payments were a problem in production. Although it is a little amount, it is still a problem to be considered

Table 11. Mode of payments for fresh cherry

Mode of payments	Frequency (n=267)	Percentage
In advance	7	2.6
Immediately	117	43.8
Partially	52	19.5
At the time of my choosing	91	34.1

8. Presence of middlemen; Middlemen often try to invade the market by offering higher prices to the producers then reselling at a much higher price to the processors. Although it benefits the farmers immediately, it distorts the market in the long run.

Constraints in Processing and exports

1. CWS not running up to full capacity; The washing stations only function at 66.7% capacity due to inadequate equipment and insufficient or poor-quality cherries supplied to the stations.

2. Poor Infrastructure: Although the capital enjoys constant supply of electricity, the case is different in rural areas. Electricity supply is quite erratic which results in loss of production time, lowers productivity and increases costs. Rwanda is a landlocked area so has limited streams of water for processing, this means that washing stations which do not have their own water sources, must purchase tanks of water further driving up processing costs.

3. Loss of bad quality cherries obtained from farmers; Although there have been trainings for farmers on post-harvest handling, coffee washing stations lose at least 20% of cherries brought by farmers due to bad quality.

4. Traceability of dry mills; In the study area, there is only one dry mill. This makes traceability and tracking of coffee quality difficult as most dry mills are concentrated in the capital, Kigali and small coffee washing stations are unable to produce green coffee

5. High operating costs and Old Mill: this is insufficient for processing as the mill is old and takes a whole week to process just one container

6. Access to market for exporters: CWSs set quite high prices on the international market to cover costs and make profit however, this makes it difficult to find buyers due to competition from bigger producers. There is also a lack of experience and skills required to successfully market coffee on the global market.

7. Lack of financing; the financial capacity of coffee washing stations varies and this leads to loan requests which are only granted with high interest rates.

Marketing constraints in processing and exports

In the study area, most times the processors all export the coffee they process in order to minimize costs and increase profits or outsource through exporters. They also do this to track and maintain the coffee quality until it reaches the buyers.

1. Packaging and Insufficient equipment; Since the ban on plastic bags, the packaging industries have still not caught up with the demand for quality packaging of certain products. This includes packaging for the coffee industry. Respondents reported that packaging materials for coffee are imported and thus, quite expensive to procure and ship. Quality packaging is not produced locally as well as roasting equipment. They possess sample roasters and grinders and often must outsource the roasting to Private roasters.

2. Low consumption of coffee locally; 97% of coffee produced is exported due to low consumption of coffee locally. According to respondents, Rwandans have not cultivated the habit of drinking coffee. They are more likely to drink tea. Some reasons for this preference include, price, taste and culture.

Figure 11. Coffee consumption 2018/2019
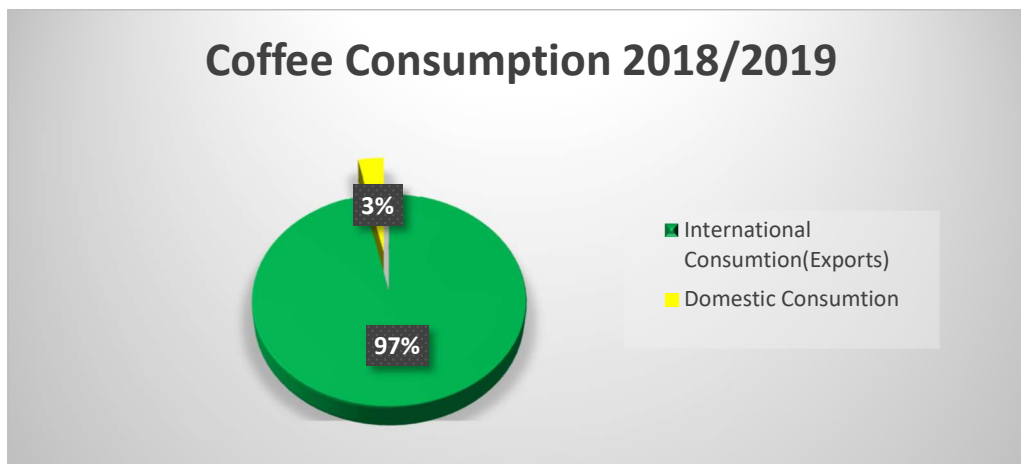
Source: NAEB Annual Report (2018/2019)

3. Geographical Zoning Policy; the 2016 policy which states that farmers in a 'zone' must sell to a designated CWS (both private and Cooperative), and CWSs must only buy from farmers within its zone is posing a problem to the CWS. Although it has reduced the presence of middlemen and increased amount of cherries going to the coffee washing stations, it reduced the amount some CWS usually received and they are unable to expand beyond their zone. Also, some CWS cannot handle the amount of cherries delivered to them, so they must reject some, this means that the farmers do not have an alternative buyer for their harvested cherries.

4. Low exports of roasted coffee: International buyers of coffee do not buy roasted coffee due to low trust in Rwanda's roasting capacity or the fact that they are already roasters of coffee. This causes underutilization of roasting companies and loss of potential revenue.

5. High certification costs; coffee certification costs can go up to 80,000USD which is very expensive. However, certified coffee attracts more buyers, therefore, coffee exporters who have not invested in coffee certification find it difficult to attract international clients for their coffee.

6. Poor coffee marketing strategies leading to low domestic and international consumption despite high quality of coffee.

SWOT Analysis of the Coffee value chain.

STRENGTHS	WEAKNESSES
- Time frame of planting and harvesting (October-June) does not coincide with other food crops allowing farmers time to focus on their other crops (February-September) - Strong relationship between farmers and processors - Quick and organized collection of fresh and processed cherry to prevent deterioration of quality. - Availability of farm labour which helps to increase area cultivated and farm yield. - Ability to choose between coffee buyers and negotiate above farm gate price based on coffee quality - Increasing awareness on wet processing methods for producing high quality dry parchment. - Emergence of coffee washing stations as micro enterprises - High traceability of Fully washed coffee - CWSs engaging in processing and marketing resulting in a shorter link between the value chain actors - Adoption of coffee as a major source of income and large-scale production by new and existing farmers - Growth of new coffee plantations	- Scattered and small scale of production. - Reluctance of farmers to adopt coffee production due to gestation period of three years - Low productivity caused by old trees - Late delivery of fresh cherry by farmers to coffee washing station resulting in loss of quality - Late supply of inputs such as fertilizers and pesticides by NAEB, IFAD-PRICE - Competition among CWS among the processing units for dry parchment collection, due to geographical zoning policy. - Irregular geographical zoning policy assessment - Prevalent technology producing more wastages. - Preference of tea over coffee in domestic market - Old mills resulting in low productivity and time wastage - Insufficient number of dry mills leading to distrust among primary and secondary processors - Potato and fermentation taste reducing demand in export market
OPPORTUNITIES	THREATS
- Access to inputs, extension services and capacity building from NAEB and IFAD-PRICE - The NAEB subsidizes fertilizers at 11 RwF/kg and pesticides at 97RwF/kg, reducing cost of production. - Increased income potential through diversification and alternative uses of coffee	- Inconsistent quantity and quality of coffee production due to climate change - High perishability of coffee cherries, low storage capacity unless processed. - Coffee price volatility on international market - Ageing producer population - Competitive crop i.e. Tea

by-products such as coffee flour, Cascara and fertilizer • Integration of youth into coffee production • Coffee Tourism to raise revenue and awareness • Several public and non-governmental institutions working for the capacity building of coffee producers and processors • Continued support of government and external agencies in installation of new coffee washing stations • Increasing demand for Rwanda coffee in the international markets • Trending coffee culture and growth of café houses • Rwanda coffee has the potential to fetch premium price through Fairtrade and organic certifications • Duty free access for coffee beans under trade preferences for LDCs in all the major coffee importing countries	• Infestation of pests and diseases • Low productivity caused by high costs of production and processing, poor roads, lack of electricity, water scarcity and insufficient inputs • Intrusion of middlemen in the vertical linkage between farmers and primary processors • Lack of research in processing technology • Dependence on already established buyers

Results from the SWOT analysis show that the coffee value chain benefits from solid vertical and horizontal integration which enables them to penetrate markets and compete against other coffee brands, It possesses high traceability and tells a story which is crucial to its image in the international market.

However, threats such as insufficient and late availability of inputs, poor infrastructure, low productivity and competitive crops like tea pose a hindrance to its growth and expansion. The coffee value chain is weak because of poor market communication among actors especially to its primary producers who are the major determinants of its quantity and quality.

The coffee industry has the opportunity to diversify its products as well as integrate youth into production as they are more resilient and open to new ideas.

Fairtrade and organic certification provides the leverage to fetch premium prices on the international market which will then lead to a trickle down in profits the major actors in the chain and increase overall productivity.

CHAPTER FOUR

SUMMARY, CONCLUSION AND RECOMMENDATION

4.1 Summary

The main objective of this study was to carry out a value chain analysis for coffee in Huye District, Rwanda. This includes mapping of the value chains, detailed description of the main actors involved in the value chains (from production to consumption), identification of constraints to coffee production as well as knowledge on the costs, prices and share of value distributed among actors.

The first objective was to identify the different links in the coffee value chain, including actors and their interrelationships in the study area; Links identified in the chain were input supply, production, primary processing, secondary processing, Roasting, Marketing and Trading and Consumption. Actors involved were Input suppliers, smallholder farmers, middlemen, coffee washing stations owned privately and by cooperatives, dry mill owned by cooperative, roasters, marketers and exporters, consumer (international and domestic). Farmers were involved in production, harvest and post-harvest handling activities. Coffee washing stations purchase fresh coffee cherries from farmers and put the cherries through wet processing to produce dry parchment. Middlemen buy dry parchment from farmers and sell to dry mills. At the dry mills, parchment coffee is hulled and polished to produce green coffee which is then sent back to coffee washing stations who do their own roasting and export to their buyers or sell to export agents who find buyers on the international market. Private Roasters buy the green coffee and roast after which they sell on the domestic market to retailers such as café houses, restaurants or supermarkets who sell directly to consumers. Enablers of the coffee value chain in Rwanda include extension service providers and input suppliers such as NAEB, IFAD-PRICE, CEPAR, Cooperatives and Private coffee washing stations. Other enablers include trading partners, finance service providers, development and certification agencies.

Findings revealed that IFAD-PRICE played a role in the distribution of seedlings, pesticides and fertilizers to smallholder farmers, employment and training of agronomists to support farmers with smallholder farmers, provision of equipment and trainings on coffee cupping and capacity building for cooperative staff and financial support to the government of Rwanda in improving coffee production. Farmers who belonged to cooperatives and contracted with coffee washing stations received support in the form of manure and fertilizers as well as GAP trainings.

The second objective was to identify the marketing channels of coffee production and determinants of market channel choice in the study area; Two marketing channels were identified in the study area. The first channel was the Informal market channel and ran from Producer to consumers. 21.7% of farmers participated in this channel and this entailed 9.1% of production catering to local demand by processing with locally available tools and selling to neighbors, on the roadside or to relatives. The second channel was the Formal market and comprised producers, wholesalers, retailers and consumers. 78.3% of farmers participated in this channel and It consisted of 91.9% of production, where producers sold fresh cherry to wet mills who processed and sold dry parchment to dry mills after which green coffee was roasted and sold to consumers both domestic and international. Major determinants of market channel choice included Age, Education, Gender, Farm Size, Coffee yield, Cooperative status, Distance to market and Selling price of coffee cherry.

The third objective was to ascertain the prices, costs and value shared among actors in the coffee value chain in the study area: Cost of production per unit of fresh cherry, dry parchment and green coffee was estimated at 157.91RWF, 425.09RWF, 312.09RWF respectively. Also, value addition of 233.63RWf was added in processing fresh cherry to dry parchment, 531.88RWf and 2358.19RWf in processing dry parchment to green bean in the domestic and international markets respectively. There was also value addition of 6656.10RWf and 18833.19RWf from green bean to roasted coffee in the domestic and international markets respectively. Producers share on consumer's price was 4.35 % and 8.72% in the domestic and international markets, Primary processors share on consumer's price was 5.43% and 10.9% on the domestic and international markets and finally, Secondary

processors share on retail price was 17.71% and 15.89% on domestic and international markets respectively. This shows that secondary processors benefited the most in the coffee value chain compared to primary processors and smallholder producers.

The final objective was to identify the constraints in the coffee value chain in the study area; findings revealed that constraints at production level in coffee production were insufficient and late supply of inputs, high labour costs, old trees, poor irrigation, inadequate training and lack of book-keeping. Marketing constraints in production were found to be low farm gate price, high price fluctuation, rejection of crops by traders, Inaccessible markets and transportation issues. Processing and marketing constraints included CWS not running at full capacity, traceability and transparency, old mills, high operation costs, poor infrastructure and access to market, low domestic consumption of coffee, fluctuation of global prices, geographical zoning policy and loss of coffee to bad quality, high cost of packaging materials and access to export market.

4.2 Conclusion
Coffee is the second most consumed beverage after tea, is a significant source of revenue for the Rwandan economy. It is also a source of livelihood for farmers alongside other crops. It has potential to be an exclusive source of income if farmers have the assurance that income from coffee will cover their costs and burden. This will enable them to focus on enhancing the quality of the crop and improving the value chain. The future of the Rwandan coffee industry rests on how well the issues found within the value chain are solved. Extensive research, increased and timely input, better infrastructure, added capacity building for actors in the chain, a wider access to market and increased domestic consumption are some of the ways to improve the value chain of coffee. Although farmers are the major actors in the chain, they receive the least share of profits in the chain. Collective action of all actors in the value chain will help to increase bargaining power and fair share of value.

4.3 Recommendations
In light of the findings of this study, the following upgrading strategies are recommended for the improvement of coffee value chain performance in Rwanda.

At production level

1. Increased extension services throughout the year as well as number of extension workers per district

2. Timely supply of inputs to reduce loss and poor quality of coffee

3. Increased inputs such as fertilizer and pesticides in order to boost yield

4. Reduced requirement for joining cooperatives to allow more inclusion and greater access to farmers for training and monitoring of coffee plantations

5. Provision of enough market information on prices and consumer demand to raise awareness on the importance of good quality coffee

6. Rejuvenation of old trees and planting of new ones to increase productivity

7. Increased competitiveness of coffee on the international market

8. Incorporation of more farmers into cooperatives and integration of youth into the coffee sector.

At processing level

Minimize losses in processing by customizing processing machineries suitable in Rwandan context.

1. Extensive research should be done at the processing level to improve quantity and quality of coffee processed.

2. Presently, sorting at each stage of processing is majorly done by hand. Mechanical sorting technologies should be acquired in order to reduce the cost and time spent on processing.

3. Development of infrastructure of coffee washing stations privately managed as well as cooperative owned, prioritizing those with poor roads, poor electricity supply and water supply issues

4. Replacement of old mills and installation of new ones to boost production and exports.

At marketing level

The recommended upgrade strategies at marketing level are listed below:

1. Promote domestic consumption of Rwanda filter and espresso coffee with the use of media outlets. Ethiopia can prevent fallout from price fluctuation because they consume up to 50% of coffee produced. Domestic consumption would boost incomes from coffee production.

2. Reducing costs of production and processing would make coffee prices competitive on the international market and reduce prices domestically, leading to an increase in demand.

3. Exploration of consumer preferences and identification of areas of value chain addition to meet consumer favorites

4. Expansion of buyers of organic and Fair-Trade markets.

5. Provision of support to Coffee washing stations and cooperatives for marketing and trading as they also in order to decrease the number of actors between producers and consumers

6. Installation of more dry mills in order to enable tracking and traceability of coffee and ensure optimum quality maintenance throughout the chain

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APPENDIX

QUESTIONNAIRE

A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS	E. GOVERNMENT SUPPORT AND MARKET INFORMATION
1. Gender of respondent □Male □Female	36. What form of support do you receive from the government □Adequate prices □Improved inputs □Subsidies □Information and training(Extension services)
2. Age of respondent in years:………………………years old	
3. Education level of respondents (include on-going) □No formal education □Primary □Secondary □Vocational □Diploma □Degree □Postgraduate (Masters/PhD) Other, specify………….	37. Are you updated with coffee prices? □Yes □No
	38. How do you get the price information? □Radio □Television □Online □Word of mouth □Public meeting □Cooperatives □Other
4. Marital Status: □Single □Married □Divorced □Separated □Widow/Widower	39. Are the current prices to your satisfaction? □Yes □No
5. Household Size: (Number of members in family□1-3 □4-6 □7-9 □More than 10	40. In what way has the current market price for coffee affected your income? □Increased□Reduced
B: FARM CHARACTERISTICS, PRODUCTION PRACTICES	41. What price do you believe would be sufficient to cover your costs and burden??..........................Frw
6. Do you have any other source of income besides coffee farming? □coffee farming only □Off-farm employment □I grow and sell other crops □animal farming	42. Does access to market information assist in increasing quantity and quality of cherries delivered to your cooperative? □Yes □No
7. How long have you been a smallholder coffee farmer? □Less than 5 years □6-10 years □11-15 years □16-20 years □More than 20 years	43. Are you updated with market information on consumer demand? □Not at all □A little □I frequently get information
8. What is the size of your coffee farm? □Less than 1 hectare □1-3 hectares □4-6 hectares □7-9 □16-20 hectares	44. Do you know about coffee quality requirements? □Not at all □A little □I frequently get information
9. The coffee farm is □Bought □Inheritance □Leased □Government owned □Gift	45. What marketing problems are you currently experiencing?□Low farm gate price□ High price fluctuation □No timely payment □Insufficient processing facilities □Insufficient storage facilities □Transportation problem and inaccessible market □ Insufficient market information (about price and quality) □Rejection of crop by traders reasoning low quality □Presence of middleman
10. How many trees per hectare? □Less than 100 □101-200 □201-300 □301-400 □Morethan 400	
11. How many unproductive trees?...	
12. Variety of coffee grown □Arabica only □Robusta only □Arabica and Robusta	**F. COOPERATIVE MEMBERS**
	46. What is the name of your cooperative?
13. Do you know about coffee certification? □Yes □No	47. How long have you been a member of the cooperative?............................years
14. Which scheme do you think is most beneficial to you? □Organic □Fair trade□Shade grown □All of the above	48. Please state price of coffee sold per kg and kgs sold before and after joining a cooperative
15. Which of the farm inputs do you use? PLEASE TICK	

Input	Purchased	Inherited/Gifted	NAEB	Cooperative
Hired labour				
Family labour				
Manure				
Fertilizers				
Improved seed				
Pesticides				
Tools & Equip				
Irrigation				

16. What are the types of activities you normally do? Please tick as appropriate. □Mulching □Weeding □Fertilizer/Manure Application □Composting □Tilling □Pruning □Erosion control □Shade □Irrigation □Record keeping

17 What are the major challenges that your coffee production is facing? Tick as many as possible □Insufficient inputs □High cost of inputs □Cost of labour □Inadequate labour □Low quality of seedlings □Changes in crop prices □Finding a market □Government policies □Pest and Diseases □Rainfall □Poor soil fertility □Credit availability □Old Trees

C. COFFEE HARVEST, POST HARVEST, POST HARVEST LOSSES AND SALES

18. When do you harvest coffee □Mixed yellow □green □red ripe

19. How do you harvest the coffee? □Selective Hand picking□Striping and collecting both red and green cherries □Collecting dropped cherries on the ground

20. After harvesting, what do you do next? □Cleaning and drying □Sell to Cooperative □Sell to Private Coffee washing station □Auction off to buyers □Sell on the roadside

21. How much coffee did you harvest last year?........kgs of fresh cherry

22. If you dry, how do you dry the cherries? □On the ground □On a mat/ plastic bed □Other

23.On average, how much coffee do you lose as bad quality............%

24. If you take directly to cooperative/coffee washing station, how much is rejected?...........%

25. Are you able to sell the rejected cherries? □All of them □Some of them □None of them

26. How do you transport cherries to your buyers?□Bike□Head□Pick up □Others, please specify

27. How is the relationship between you and your buyer? □Contracts □Informal: only verbal □Informal: trust based

28. How long have you traded with them? □Less than 1 year □1-3 years □3-5 years □More than 5 years

29. How much do you trust your buyer?□1-no trust□2-low trust□3-middle trust□4- high trust

30. How are payments made?□In advance□Immediately□Partially □At the time of my choosing

31. How far is the distance from your farm to your buyer? □Less than 3 km□3-5km□More than 5km

D. FINANCIAL INFORMATION

32. How do you finance your coffee farming? □Own finances □Government subsidy □Grant from project (PRICE) □Loan from bank □Credit from Neighbours/Family □Farmer's group/Cooperatives

33. Cost of production last year. If free, leave blank.

Cost of production	Total Cost(Frw)
Improved seeds	
Manure	
Fertilizer	
Pesticides	
Hired Labour	
Transportation	
Rent	
Irrigation	

Before Cooperative (Frw/kg) Qty sold	After Cooperative (Frw/kg) Qty sold

49. What was quality of your coffee before and after joining a cooperative? Please tick one each.

Quality	Before joining cooperative	After joining cooperative
Poor		
Fair		
Good		
Very good		

47. What types of services do you get from the cooperative? Tick as many as possible

□Farming advice □Product Market information □Access to farm inputs(seedlings, labour, manure, fertilizer,etc) □Access to farming equipment □Storage facilities □Access to loans □Share of profits □Bargaining higher prices □Processing facilities

48. To what extent do you trust your cooperative? □1-no trust □2-low trust □3-middle trust □4- high trust

49. Does your cooperative have a Coffee Washing Station? □Yes □No

50. How far is the distance from your cooperative to your farm? □Less than 3 km □3-5km □More than 5km

51. What challenges are you currently facing as a member of your cooperative?

52. What suggestions do you have for improvement?

NON-COOPERATIVE MEMBERS

53. What is the name of the Coffee Washing station you sell to? 54. Why have not joined a cooperative? □High membership fees □Other buyers offer higher prices □Poor cooperative services □Long distance to cooperative 55. What would encourage you to join a cooperative?

□Lower membership fees □Closer collection point □Better cooperative services □Higher prices

H. FARMER'S PERCEPTIONS OF THE PROJECT FOR RURAL INCOME THROUGH EXPORTS through NAEB?

56. Are you aware of the Project for Rural Income through Exports (PRICE) Turnaround Programme(TAP)? □Yes □No

57. Since you attended PRICE' training school conducted at your cooperative and adopted some of the good agronomy practices have you and your household seen a change in the volume of coffee harvest produced compared to before the agronomy training started?

□ Yes, large volume increase □Yes, small volume increase □No volume change □Yes, small volume decrease □Yes, large volume decrease □ I don't know 58. Has your income level improved in the past 5 years? □ Yes, large income increase □Yes, small income increase □No income change □Yes, small income decrease □Yes, large income decrease □ I don't know

59. Have you extended your land in the past 5 years? □No land extension □Land Extension

60. What suggestions do you have for improvement of your coffee production?

INTERVIEW GUIDE FOR PROCESSORS

1. What is your position in this organisation?
2. Give a brief history of this organization
3. How many members of staff work here during production, harvest, processing and export season?(how many male and how many female)
4. Please describe the activities regarding coffee production and processing
5. How much can this establishment process?
6. How much does it process per year?

COFFEE PRODUCTION AND PURCHASES

7. Which other sources do you get coffee for processing?
8. How many kgs/tonnes did you purchase from them last year?
9. At what price did you purchase the coffee
10. How do you get the coffee from your suppliers?(Collection centers/drop off)
11. What percent did you reject from suppliers last year?
12. Please describe the processing activities, from delivery to export
13. What quantity of parchment did you process last year?

14. For every kilogram of green coffee, how much dry parchment is processed?
15. Do you have a Dry Mill?
16. If No, Where do you process the parchment during the dry milling process?
17. How much did you process in the dry mill last year?
18. How many percent did you lose as bad quality?
19. At what price/kg did you mill the parchment last year?
20. How many kgs of cherry did you roast last year
21. What equipment do you currently have and which ones do you need?
22. Are your processing facilities certified? Which certification? Cost and Payment burden.
23. Are your processing equipment fully functional?

COFFEE PACKAGING AND SALES
24. Do you package your products?
25. Do you weigh them?
26. How many kgs/tonnes of parchment coffee did you sell last year
27. How many kgs/tonnes of green coffee did you sell last year?
28. Who do you sell the parchment, green and roasted coffee to?(market and organization)
29. At what price did you sell the parchment, green and roasted

30. coffee?(International and local)
31. How do you transport the coffee to your buyers?
32. What are the marketing and quality requirements?
33. Do you satisfy the requirements?
34. When you are unable to satisfy them what do you do with the subpar coffee?
35. What is your marketing strategy?

FINANCIAL INFORMATION
1. How do you finance this business?
2. What was your total cost of production last year?
3. What other costs did you incur last year and how much?
4. What was your total income for last year?
5. What was your profit for last year?
6. If you made a loss, how much?

GOVERNANCE AND MARKETING
1. Are you aware of the market prices and who sets them?
2. Are they to your satisfaction?
3. What amount would be sufficient to cover your organizations costs and burden?
4. What government support are you currently receiving? (PRICE AND NAEB)
5. What additional support do you require?

CHALLENGES AND OPPORTUNITIES
1. **What production and organizational challenges are you currently facing?**
2. What marketing challenges are you currently facing?
3. What government policies are currently hindering production?
4. Are there any requirements that are giving you problems?
5. What problems are you experiencing from competitors?
6. What problems are you currently facing regarding farmers?
7. What are your suggestions for improvement?

FARMER SUPPORT
1. What form of support are you currently providing to the farmers?