



Research Article

SUPPLY CHAIN OF COFFEE IN RWANDA

SHRUTHI GADHE^{1*} AND KABAYIZA FIDELE²

¹Institute of Agri Business Management, Swami Keshwanand Rajasthan Agricultural University, Bichhwal, Bikaner, 334006, Rajasthan

²Market linkage and Agribusiness Officer, PHHAST, Ministry of Agriculture & Animal Resources- MINAGRI, Kigali, Rwanda

*Corresponding Author: Email-shruthi.iabm@gmail.com

Received: October 18, 2016; Revised: November 16, 2016; Accepted: November 17, 2016; Published: November 30, 2016

Abstract- Coffee production and marketing faced many challenges in Rwanda, where the most important problems faced by farmers were lack of choice in choosing a marketing channel, lack of extension activity, lack of roads and transportation and scattered living conditions of farmers. The major problems faced by coffee traders were the right of setting price, low quantity supplied by farmers, price fluctuation, and access to credit followed by absence of storage facility.

Keywords- Coffee, Marketing, Farmers, Production, Problems

Citation: Shruthi Gadhe and Kabayiza Fidele (2016) Supply Chain of Coffee in Rwanda. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 8, Issue 58, pp.-3189-3193.

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Introduction

Coffee production in Rwanda dates back to 1904 with its first export occurring in 1917 since its introduction into Rwanda, coffee has played an important role in the economic development of the country. For many years, coffee has been the major source of foreign currency in Rwanda. Historically, Rwanda had been the 9th largest producer of *arabica* in Africa, with 500,000 small farms averaging less than one hectare each. Farms are usually not measured in land area being so small, they are measured in number of trees. The average is 165 trees per farmer, miniscule compared to other nations.

Africa's share in world production has hence decreased from 25% to an average of 14%. Since 1990, production levels have generally stagnated, registering less than 20 million bags every year. During the regulated market period, many African countries benefited, both from an assured market in the European Union under the framework of EU-ACP agreements and from guaranteed prices for producers, recording a growth in production through the rapid expansion of the areas planted with coffee.

Rwandan coffee is predominantly an export-oriented commodity, with over 95% of the coffee produced in the country being exported, and the leftover is being locally consumed. Most of the Rwandan coffee is exported to European countries wherein 42% of the coffee exported goes to Switzerland, 10% to Belgium, 15% to the United Kingdom, 19% to America, 8% to Uganda, 1% to Kenya and the remaining 5% goes to Asian countries and other importers.

The study supply chain of coffee was carried in Karongi and Rutsiro districts in Western province of Rwanda. In a liberalized economy, globalization and privatization play a very important role in coffee production and exports. In the coffee industry, mainly the coffee growers are facing various problems. Low yield per acre, low quantity of coffee production, inadequate storage and transportation facilities and labour are the major problems being faced by these growers at the production stage. Fluctuating prices, lack of market information, lack of efficient management, malpractices at the market place are the other problems faced by these growers at the marketing stage.

Research Approach

The research paradigms adapted for this study is mixed approach. These are both qualitative and quantitative research approaches. Qualitative approach have been used while quantitative approach was used to collect and quantify data's such as coffee production, marketing and revenue generated.

Materials and Methods

The study used both primary and secondary sources to collect the relevant data. The primary data were collected from coffee farmers and coffee beans traders through a mailed questionnaire. Primary data with respect to coffee cultivating area, marketing and constraints faced by farmers was collected from farmers and marketing constraints aspects regarding traders were included in the questionnaire.

Secondary data relating to coffee production, export and prices from 2004 to 2014 was collected from National Agricultural Export Development Board- Rwanda, Ministry of Trade and Industry- Rwanda, and National Institute of statistics of Rwanda.

Methods of data analysis and interpretation

Analyzing the data

In analyzing, through the SPSS (Statistical Program for Social Sciences), the research has used tables, figures, mean and percentages where necessary, statistical method of correlation was used to examine the relationship between quality and price of coffee. Compound Growth Rates (CGR) was be used to examine the trend in area, production and productivity of coffee in Rwanda. In analyzing qualitative data textual description was used.

Procedure for Computing Compound Growth Rate

The compound growth rate is estimated by Eq

$$\hat{r} = \exp(\hat{B})$$

Rank Based Quotient (RBQ)

The sources of price information for farmers in coffee marketing channel were identified. The quantification of data was done by first ranking the sources based on the responses obtained and then calculating the Rank Based Quotient (RBQ) (Sabarathanam, 1988) which is as follows:

$$RBQ = \frac{\sum(f_i)(n + 1 - i)}{N \times n}$$

Where,

f_i = number of respondents reporting a particular sources under i^{th} rank

N = number of respondents

n = number of sources of price information identified

Interpretation of results

Whatever the type of study the objective of every research is to generate knowledge and come up with new findings, so that data collection is not an end by itself rather data analysis, interpretation and presentation are the final duties of every research under study. Thus, to attain the major objective of this study, the data collected from the study area are analyzed and interpreted. In interpreting the data major attention was given to quantitative analysis although it is supported by qualitative analysis.

Results and Discussions

Growth rates in area, production and productivity of coffee in Rwanda.

Trend in area

The area under coffee cultivation in 2004 was twenty five thousand nine hundred

hectares (25,900 ha). In 2005 the area increased to twenty six thousand hectares i.e., 0.39 per cent increase over the previous year. In 2006 the area increased to twenty six thousand and nine hundred sixty hectares i.e., 3.69 per cent growth over the previous year. It again increased to 27,240 hectare (1.04 per cent) in the year 2007, 27,950 hectare (2.61 per cent) in the year 2008, 28,826 hectare (3.13 per cent) in the year 2009, 33,000 hectare (14.48 per cent) in the year 2010, 33,600 hectare (1.82 per cent) in the year 2011, 34,000 hectare (1.19 per cent) in year 2012, 34,800 hectare (2.35 per cent) in the year 2013 and further in 2014, the area extended to 35,680 hectare i.e., an increase of 2.35 per cent over the previous year. Compound Annual Growth Rate in area was 3.7 with level of significance at 1 per cent. This implies that the positive trend in area was significant. Percentage change in 2014 over 2004 was 37.76 per cent.

Trends in production

Coffee production in 2004 was 28,858 T. In 2005, the production was 18,609 T with percent change of -35.52 over previous year. In 2006 the production increased to 26,291 T (41.28 per cent increase), in 2007 the production was 14,800 T (-43.71 per cent decrease), 2008 the production was 21,000 T (41.89 per cent increase), 2009 production was 16,000 T (-23.81 per cent decrease), in 2010 the production was 20,000 T (25 per cent increase), 2011 the production was 16,371 T (-18.15 per cent decrease), 2012 the production was 19,955 T (21.89 per cent increase), the production in 2013 was 18,346 T (-8.06 per cent decrease) and in 2014 the production was 16,572 with per cent change of -9.67 over previous year.

Table-1 Growth rate in area, production and productivity of coffee beans in Rwanda

S.No	Year	Area (Ha)	Per cent change over previous year	Total Production (T)	Per cent change over previous year	Productivity (kg/ coffee tree)	Per cent change over previous year
1	2004	25900		28858		2.8	
2	2005	26000	0.39	18609	-35.52	2.7	-3.57
3	2006	26960	3.69	26291	41.28	3.1	14.81
4	2007	27240	1.04	14800	-43.71	2.3	-25.81
5	2008	27950	2.61	21000	41.89	3.15	36.96
6	2009	28826	3.13	16000	-23.81	3.16	0.32
7	2010	33000	14.48	20000	25.00	3.2	1.27
8	2011	33600	1.82	16371	-18.15	3.22	0.63
9	2012	34000	1.19	19955	21.89	3.1	-3.73
10	2013	34800	2.35	18346	-8.06	2.4	-22.58
11	2014	35680	2.53	16572	-9.67	2.9	20.83
	Per cent change in 2014 over 2004		37.76		-42.57		3.57
	CAGR(%)	3.7*		-3.2 ^{NS}		0.4 ^{NS}	

* Significant at 1% level NS Non-significant Source: Secondary data, NAEB

The production shows negative trend over time i.e. CAGR (-3.2) was not significant and per cent change in 2014 over 2004 in production was -42.57. This was because of the biggest challenge in the coffee value chain, which was the low productivity in terms of the yield of cherries per tree. This could be explained by a lack or low usage of fertilizer, both mineral and organic, insufficient agronomic practices, replacement of trees and inappropriate diseases/ pests controls. (NAEB, 2014).

Trends in productivity

In 2004, coffee productivity in Rwanda was 2.8 kg per tree. In 2005 the productivity was 2.7 kg per tree (-3.57 per cent decrease), in 2006 the productivity was 3.1 kg per tree (14.81 per cent increase), in 2007 the productivity was 2.3 kg per tree (-25.81 per cent decrease), in 2008 the productivity was 3.15 kg per tree (36.96 per cent increase), in 2009 the productivity was 3.16 kg per tree (0.32 per cent), in 2010 the productivity was 3.2 kg per tree (1.27 per cent), in 2011 the productivity was 3.22 kg per tree (0.63 per cent), in 2012 the productivity was 3.1 kg per tree (-3.73 per cent), in 2013 the productivity was 2.4 kg per tree (-22.58 per cent) and the productivity in 2014 was 2.9 kg per tree (20.83 per cent). CAGR calculated value (0.4) was not significant. Per cent change in 2014 over 2004 was

3.57.

Marketing pattern, marketing channels and marketing cost of coffee in Rwanda

In marketing research, analysis of marketing cost is the most important aspect. Producer's profit largely depends on the various costs associated with the marketing of the produce. From the very entry in the market, farmers incur various kinds of costs, which had a large impact on the gross returns. In the present study marketing costs incurred by the farmers and traders in coffee marketing channel were identified. [Table-2] indicates various costs incurred by the farmers and traders in one single marketing channel adopted by farmers:

Farmers → traders → Exporters

In the study area, it was noticed that only, one channel of marketing was prevalent for marketing of coffee beans.

Marketing cost incurred by coffee farmers and traders in 2012

In 2012, the farmers received low prices from traders in comparison with next

three years. Gross price received by the coffee farmers in coffee marketing channel was 702.5 rwf/kg. The total marketing cost of coffee traders was 21.65 rwf/kg and gross price received by trader from exporter was 796.15 rwf/kg. It can be noticed that total cost incurred in marketing was 33.47 rwf/kg, which is 4.76 percent of the price received by the farmer. The traders' margin is 72 rwf/kg.

Marketing cost incurred by coffee farmers and traders in 2013

[Table-2] revealed that coffee farmers realized price of 756.67 rwf/kg, which was higher than the coffee price of previous year, where farmers received 702.5 rwf/kg. Total costs of marketing by farmers in 2013 was 13.61 rwf (1.8% of gross price received) per kg. In this year, also the transportation cost was most important cost contributing 78.18 per cent to the total cost. The farmers also incurred 1.18 per cent of total cost on wastage, 14.70 per cent of total cost for packaging, 3.67 per cent for loading and unloading and 3.23 per cent of total cost for market commission.

Traders got a gross price of 1,041.67 rwf/kg and incurred a total marketing cost of 21.79 rwf/kg. Like previous year the storage cost has highest share of 41.26 per cent in the total cost. They paid 14.32 per cent of total cost for transportation, 7.25 per cent

Marketing cost incurred by coffee farmers and traders in 2014

A price of 820.69 rwf/kg of coffee beans was received by the farmers in the year of 2014 and the total marketing costs incurred by the farmers was 55.69 rwf/kg (6.78% of gross price received). Market commission cost was found to be largest cost accounting for 59.97 per cent out of total marketing cost. For coffee traders the gross price received from exporters was 1470 rwf/kg with total marketing cost of 21.75 rwf/kg. The storage cost was most important with 46.48 per cent of the total marketing cost. The margin to the traders was 627.56 rwf/kg.

Marketing cost incurred by coffee farmers and traders in 2015

Among four years (from 2012 to 2015) analyzed, in the year 2015 farmers and traders received highest gross price/kg. Farmers selling in the coffee marketing channel received gross price of 842.5 rwf/kg. Gross price was quite high due to the pricing policy to provide farmers a better price and also because of high international coffee prices.

[Table-2] indicates total marketing costs incurred by the farmers in 2015 was 97.8 rwf/kg (11.6% of gross price received). Total marketing cost also was highest among other costs in last four years. Cost of commission to the commission agents was again the main cost component. Traders selling to the exporters received gross price of 1495 rwf/kg and spent a total marketing cost of 22.17 rwf/kg.

Table-2 Marketing cost incurred by the farmers and traders in the study area

S.No	Particulars	2012		2013		2014		2015	
		Rwf/Kg	Percentage of total cost	Rwf/Kg	Percentage of total cost	Rwf/Kg	Percentage of total cost	Rwf/Kg	Percentage of total cost
1	Gross price received by the farmer	702.5		756.67		820.69		842.5	
2	Marketing cost incurred by the farmer								
A	Storage	0	0.00	0	0.00	0	0.00	11.57	11.83
B	Transportation	7.13	60.32	10.64	78.18	20.19	36.25	38.09	38.95
C	Wastage	0.23	1.95	0.16	1.18	0.34	0.61	0.17	0.17
D	Packaging materials	2.27	19.20	2	14.70	1.76	3.16	1.29	1.32
E	Loading& unloading	0.48	4.06	0.5	3.67	0	0.00	1.75	1.79
F	Commission	1.7	14.38	0.44	3.23	33.4	59.97	44.95	45.96
G	Other	0	0.00	0	0.00	0	0.00	0	0.00
3	Total marketing cost	11.82	100.00	13.61	100.00	55.69	100.00	97.8	100.00
4	Net price received by farmer	690.68		743.06		765		744.7	
5	Farmer's sale price to traders	702.5		756.67		820.69		842.5	
6	Marketing cost incurred by traders								
A	Storage	9.9	45.73	8.99	41.26	10.11	46.48	10.35	46.68
B	Transportation	3.11	14.36	3.12	14.32	3.03	13.93	3.15	14.21
C	Packaging	1.51	6.97	1.58	7.25	1.56	7.17	1.56	7.04
D	Storage loss	2.81	12.98	2.83	12.99	2.8	12.87	2.84	12.81
E	Loading & unloading	2.29	10.58	2.23	10.23	2.22	10.21	2.23	10.06
F	Fill the bag& stitch	2.04	9.42	2.05	9.41	2.03	9.33	2.05	9.25
7	Total cost incurred by traders	21.65	100.00	21.79	100.00	21.75	100.00	22.17	100.00
8	Trader selling price to exporter	796.15		1041.67		1470		1495	

Source: Primary data

The trader's margin was 630.33 rwf/kg. Like in the case of farmers total marketing cost incurred by traders also was highest in this year in comparison to previous years. It can be noticed as the price received by farmers and traders increased over the years i.e from 2012 to 2015, the marketing costs have also increased. The price received by the farmer increased by 19.93 percent, where as the price received by traders increased by 87.78 percent from 2012 to 2015. The margin of traders increased by 8.75 times during the period. It can be noticed that the price received by the farmers increased at very less rate compare to the price received by traders from exporters.

Mode of transportation used and distance travelled by the farmers to sell coffee

In Karongi and Rutsiro districts 100 per cent of respondents use head load as means of transport, 25 per cent of them use bicycle, 6.7 per cent of total respondents use bike as a means of transport and those who use auto trolley in coffee transportation were 6.7 per cent of respondents.

From the [Table-3], it can be seen that most of the farmers are travelling less than 5 km to sell their produce. These farmers carry the load on their heads and walk the distance most of the time. However few farmers have mentioned that few times they use bicycle, bike and auto trolley to transport the produce. Since, the quantity produced is less; most of the farmers are able to carry the produce on their head.

Table-3 Means of transport by farmers to sell coffee

Means of transport							
Head load		Bicycle		Bike		Auto trolley	
Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
60	100	15	25	4	6.7	4	6.7

Source: Primary data

Table-4 Distance travelled by farmers to sell coffee

S.No	Distance	Frequency	Percent
1	1 to 5 Km	58	96.7
2	> 20 km	2	3.3
3	Total	60	100

Source: Primary data

Factors affecting the price of coffee beans according to traders

As shown in [Table-4], majority of traders (75%) said that the high influencing factor on coffee price was high moisture content and 25 per cent of traders believed this factor had moderate influence on price of coffee beans. Quality difference was the second factor with high influence on price (70%) and 30 per cent of traders said that this factor influenced price moderately. In case of color differences factor, 50 per cent of traders said that it is a highly influencing factor with regard to price of coffee, 40 per cent said that this factor had a moderate influence.

Table-5 Factors affecting coffee beans price according to traders

S. No	Factors	High influencing	Moderately influencing	Neutral	Less influencing	Not at all influencing
1	Color differences	10(50)	8(40)	0(0)	2(10)	0(0)
2	High moisture content (quality difference)	15(75)	5(25)	0(0)	0(0)	0(0)
3	Size	4(20)	14(70)	0(0)	2(10)	0(0)
4	Negotiating Capacity	3(15)	12(60)	0(0)	4(20)	1(5)
5	Quality difference	14(70)	6(30)	0(0)	0(0)	0(0)

Source: Primary data

With regard to the factor size of coffee beans, 20 per cent of traders felt that the coffee beans price was highly influenced by this factor. 70 per cent believed size was moderately influencing factor and 10 per cent said that the size had less influence on price. 15 per cent said negotiating capacity was the factor influencing price highly whereas, 60 per cent of respondents had different view on this, and they said negotiation was moderately influencing coffee price. 20 per cent said there was less influence of negotiating capacity on price and 5 per cent said that it is not at all an influencing factor. The result shows that high moisture content, color difference and quality difference were the important factors, which influence the price of coffee.

Source of price information

The analysis of source of market price information for farmers would help in knowing who provide information to the farmers and to what extent they access the information. In the present study, [Table-6] shows the list of sources of information for farmers. After getting different views on which is the most important source of information for respondents, Rank Based Quotient (RBQ) was used and as a result extension worker was ranked as the most important source of information. Second source of price information was radio, third was farmer field school; fourth was family or friends of farmers, fifth was newspaper and sixth was television.

Table-6 Source of price information for farmers

S.No	List of sources of information	RBQ	Rank
1	Radio	86.66667	II
2	Extension worker	91.11111	I
3	Family/friends	61.94444	IV
4	TV	9.722222	VI
5	Newspaper	37.77778	V
6	Farmer field school	67.5	III

Source: Primary data

From the [Table-6], it can be seen that farmers get price information from different

sources. Almost 80 per cent of farmers are staying in rural area where they don't have access to internet, power supply and also many of them are illiterate. Hence, they depend on information provided by extension workers and radio network.

Suppliers of coffee beans to traders' in the season of 2014-2015

Farmers and consolidating agents supply varying quantity of the coffee beans to traders. Traders were interviewed to know the quantity they purchased in season 2014-2015 from different suppliers and the results are presented in [Table-7]

Table-7 Supplier of coffee beans to traders 2014-2015

S. No	Supplier	Average quantity (Kg)	Average price/Kg
1	Farmers	213,751.00	785.50
2	Consolidating agents	78,620.00	804.00

Source: Primary data

The results showed that, an average quantity of 213,751 kg of coffee beans was supplied by farmers to traders at an average price of 785.5 rwf/ kg, and by consolidating agents supplied an average quantity of 78,620 kg at a price of 804 rwf/ kg.

Conclusions and Recommendations

In the study area, the primary income for farmers comes from agriculture. Most of the farmers use part of their land for cultivation of coffee. The area under coffee cultivation is increasing, however the trends in production and productivity are showing lot of fluctuations, and overall the trend is a decreasing trend. The moisture content and quality of coffee beans are the factors, which are mostly considered by traders to fix price of coffee beans when they are procuring from coffee cultivating farmers. But farmers are not aware about these factors and the literacy levels are also very low among the farmers. The price and margins received by traders are increasing manifold, where as the price received by farmers is increasing only by a small percentage. Lack of proper infrastructure in the form of roads and transport facilities is forcing farmers to carry the produce as head load and walk long distances.

It was found that there is only one coffee marketing channel in the country which is barrier to the farmers and traders to decide the price because of lack of competition. Government should facilitate new investors to start new processing units that will provide final coffee products to consumers. This will raise number of coffee marketing channels. Government should promote policies aimed at assisting the coffee farmers who live far from the coffee washing stations and market, such as by providing roads and transport to facilitate access to these stations and markets. Coffee farmers are more likely to join the cooperative if access is provided to cheap credit which helps them to meet costs related to coffee processing.

Acknowledgement

We are grateful to the Ministry of Agriculture and Animal Resources (MINAGRI) and School of Agribusiness Management for funding a portion of this study. We are also thankful to the reviewers of International Journal of Agricultural Sciences who corrected the mistakes in this paper.

Author Contributions

1. ShruthiGadhe, Ph.D Scholar, Institute of Agri Business management, SKRAU, Bikaner, Rajasthan- 334006, Email: shruthi.iabm@gmail.com, Ph:08688854658
2. Kabayiza Fidele, Market linkage and agribusiness officer, PHHAST, MINAGRI, Rwanda, Email:kafideli@gmail.com., Ph:+250788579321

Abbreviations

- % : Per cent
CGR : Compound Growth Rate
SPSS : Statistical Program for Social Sciences
RBQ : Rank Based Quotient
USAID : The United States Agency for International Development

Conflict of Interest: None declared

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