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Effect of Farm Level Activities on Productivity of the Coffee Value Chain in Rwanda: A Case Study of Gatsibo District, Rwanda

John Nyamu Karuru
Student, Jomo Kenyatta University of Agriculture and Technology, Rwanda
Dr. Julius Warren Kule
Lecturer, Jomo Kenyatta University of Agriculture and Technology, Rwanda
Dr. Jaya Shukla
Lecturer, Jomo Kenyatta University of Agriculture and Technology, Rwanda

Abstract:
The coffee sector in Rwanda is vital to the country's economy by providing a source of foreign exchange and employment, especially for smallholder farmers in rural areas. Farm level activities in the coffee value chain affect the quantity and quality of coffee produced in Rwanda. Farmer level activities have been blamed for the continued drop in quality of Rwanda coffee in the recent past, leading to poor quality and low productivity. This study aimed at determining the effect of farmer level activities on productivity of the coffee value chain in Rwanda. The study adopted a descriptive survey design as the study design. The target population for this study was 178 coffee famers from Muhura sector. Purposive sampling was used to select the sector while simple random sampling was used to get the respondents who are near Muhura Coffee washing station. The station has operated for more than five years. Coffee farmers who have been growing coffee for the last five years were selected. A sample size of 120 was obtained using the formula by Yamaro (1960). The study relied on primary data that was collected using questionnaires that consisted of both open and close-ended questions. Data from the questionnaires was then coded and entered into the Statistical Package for Social Scientists (SPSS) for analysis. Descriptive analysis specifically frequency and percentage constituted descriptive statistics for the study. Correlation analysis generate inferential statistic, which helped in estimating association between the study variables. Study findings were presented using tables and bar graphs. The study findings revealed that there was a positive significant relationship between support services, cost of production, good agricultural practices and productivity of coffee value chain (r=.321 P<0.01, r=.267 P<0.01, r=.608 P<0.01) respectively.

1. Introduction

Value chains have emerged as an important place to embed environmental and socioeconomic sustainability because they recognize the interdependency of actors involved in a product value chain, from production to consumption. Value chain describes the full range of activities that are required to bring a product from its conception to its end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. These activities can take place within a firm or among different firms in one or several geographical locations. This characteristic of physically transforming products over time and their distribution over geographical locations is known as input-output relations (Dekens et al 2014).

Value chains are organized linkages between groups of producers, traders, processors, and service providers (including nongovernment organizations) that join together to improve productivity and the value added from their activities. Productivity depends both on the value of a nation's products and services, measured by the prices they can command in open markets, and the efficiency with which they can be produced. Productivity growth supports high wages, a strong currency, and attractive returns to capital — and with them a high standard of living. Productivity is the goal, not exports per se or whether firms operating in the country are domestic or foreign owned (Porter et al., 2007).

Rwanda has gradually established itself as a source of specialty coffee, sold internationally through fair trade (Mutwandwa*et al.*, 2009). The coffee market chain in Rwanda is segmented into three types of coffee namely cherries, parchments and green coffee. Selling cherries offers more benefits to farmers compared to selling parchments because of the relatively high prices (Murekezi, 2009). Parchment is mostly purchased by middlemen whereas the cherry is sold through either farmers' cooperatives or private processors (NAEB, 2010). After obtaining cherries, cooperatives and traders start transforming the product through a depulping and drying process. The subsequent transformation into green coffee via hulling (removing the parchment) is performed both by cooperatives (though a few own hulling machines) or by exporting companies A small proportion is roasted and domestically consumed and 99% of coffee is exported (OCIR-Café, 2008).

Individual smallholders in developing countries face numerous constraints in the marketing of their products resulting from high transaction costs in the market chain (Froukje et al., 2007). First, they have limited access to physical and financial resources. This

restricts their opportunities to increase their scale of production in order to reduce transaction costs and to invest in efficiency increasing and value adding technologies. Secondly, smallholders have limited technical skills, no access to training on production and processing, or to information on market requirements. Lastly, individual farmers lack bargaining power and as a result there is no equal distribution of the value added among the actors in the market chain. Farmers' cooperatives or associations are often described as an effective way to solve most of these problems (Froukje et al., 2007).

Like many other African Countries, cooperatives were first introduced in Rwanda by the Belgians in the colonial period as instruments for driving the agenda of the government's socio-economic goals (Mukarugwiza, 2010). In the agricultural sector, African cooperatives were strictly controlled by the colonial administration to the point of fixing the prices that cooperatives could pay their members for their produce, which was lower than what private European entrepreneurs paid (Wanyama et al., 2009). At the time of independence in 1962, these cooperatives were mainly involved in social activities (e.g. mutual assistance and conviviality, offering health and life insurance, etc.). After independence, the GoR used these cooperatives as mechanisms for implementing policies and development plans, thus becoming a tool for political control (MINICOM, 2006).

1.1. Problem Statement

Coffee production in Rwanda remains fairly low at around 10% potential (Karl, 2008) in spite of government efforts and the construction of coffee washing stations. The government of Rwanda has employed measures to strengthen cooperatives and give farmers access to extension services, farm inputs, credit, markets and other services (Nambi, 2008). In 2006, 2007 and 2008, OCIR Café imported fertilizers for distribution by Districts and later repayment by the farmers. Also, agronomists were employed by the government in line with Vision 2020 strategies and charged with monitoring the planting and development of seedlings, the distribution and application of fungicides, as well as the distribution and application of fertilizers, (OCIR-Café, 2009)

In response to the steady decline in production, quality and export earnings, and in view of the recognized potential contribution that the sector could make to increase economic growth, the government of Rwanda adopted the 1999-2003 Coffee and Action Plan (Ngabitsinze, 2012).

According to National Agricultural Export Board (NAEB) in 2009, Coffee washing stations are underutilized at only 43% of their capacity (NAEB, 2010). In OCIR-Café (2009) coffee census, Rwanda had 160 cooperatives in the coffee sector, and has introduced coffee sector reforms that aimed to transform the sector in a way that targets the high quality market and moves coffee farmers away from the bulk coffee market.

Demand for high quality Rwanda coffee market has shown consistent growth over time and exhibits price premiums in international market, like fair trade, (Mutwandwa*et al.*, 2009). Rwandan coffee is increasingly recognized as a high-quality product, one for which importers such as Solberg and Hansen and in turn, consumers, are willing to pay a premium. (USAID 2009)

Ngabisnze (2012) on his study on the Rwanda coffee Sector, notes that although there are fewer coffee producers, farmers grow Arabica coffee, primarily Bourbon variety, a particularly good quality coffee and the crop remains Rwanda's major export crop with close to 500,000 families being involved in the coffee sector (Ocir café, 2008).

Despite the existence of these opportunities, productivity at the farmer level remains low and farmers earning have not improved (Love ridge, 2003). This gap formed the basis of this research and from a strategic perspective, a study on the effect of farm level activities on productivity of the coffee value chain in Rwanda was conducted with a focus on Gatsibo district.

1.2. Objectives of the Study

i. To establish the effect of support services on productivity of the coffee value chain
ii. To ascertain the effect of cost of production on productivity of the coffee value chain
iii. To determine the effect of good agricultural practices on productivity of the coffee value chain
iv. To determine the relationship between farmer level activities and productivity of the coffee value chain

2. Literature Review

A value chain depicts set of businesses, activities and relationships engaged in creating a final product or service. It builds on the idea that a product is rarely consumed in its original form but becomes transformed, combined with other products, transported, packaged, marketed etc. until it reaches its final consumer (UNIDO, 2009). In this sense, the value chain describes how producers, processors, buyers, sellers, and consumers separated by time and space gradually add value to products as they pass from one link in the chain to the next (Lusby and Panlibuton, 2007).

The value chain approach is becoming intensively used both by private sector agents as well as government and development agencies to both identify options for industrial development and implement development programs. Its particular attractiveness draws from, among other things, its capacity to deal with a new business environment prevalent in industrial development in the context of today's globalized markets. In particular the value chain approach is capable of: Pointing to the process of value addition, meaning that through transformation as well as quality improvement and traceability, the value of the products and services increases; Mapping the various industry agents that participate in the process of value addition, from the initial primary production to its final shape in which it gets consumed and identify measures that can improve their capacities; Picturing the increasing interrelatedness of industry agents. Local producers need to link up to global buyers and brand-owners in order to market their products while suppliers need to produce to standards and factor in the requirements of the end-consumer and trade regimes. Close interaction generates efficiency in business transactions, builds capacities among industry agents and leads to overall chain efficiency; Bringing various public and private actors together and engage them in targeted activities of value chain development (UNIDO, 2009)

Value chain issues are very relevant in the developing country context: as traditional isolated production systems struggle to develop relationships with local and global markets, small-scale producers and processors in less developed countries miss out on opportunities to produce and market their products. Globalization and the opening-up of their domestic markets have made developing country industries further vulnerable to the interventions of global players and competition from abroad. Revolutionary developments in communication and information technology are driving the emergence of, and quest for; global knowledge and increased environmental and social awareness are pressing companies and producers to account for the provenance and quality of their products. Meanwhile many small-scale producers and processors lack capacities to comply with new business rules and quality standards and to make use of new technologies, all of which constitute obstacles to their integration into value chains. In this context, the value chain approach can be seen as a generic approach to industrial development going beyond the boundaries of the traditional industrial sector where the provenance and destination of products are usually not well considered (Lusby and Panlibuton, 2007).

2.1. Conceptual Framework

This study considered internal integration, customer integration and supplier integration upon some researches as aspects of supply chain integration. A conceptual framework for the study has been developed based on literature review with three independent variables (Internal Integration, Supplier Integration and Customer Integration) and one dependent variable (competitive capability). Indicators for competitive capability in this study were customer service, flexibility and product innovation. The arrow in the conceptual framework shows the flow of effect between the independent and dependent variables.

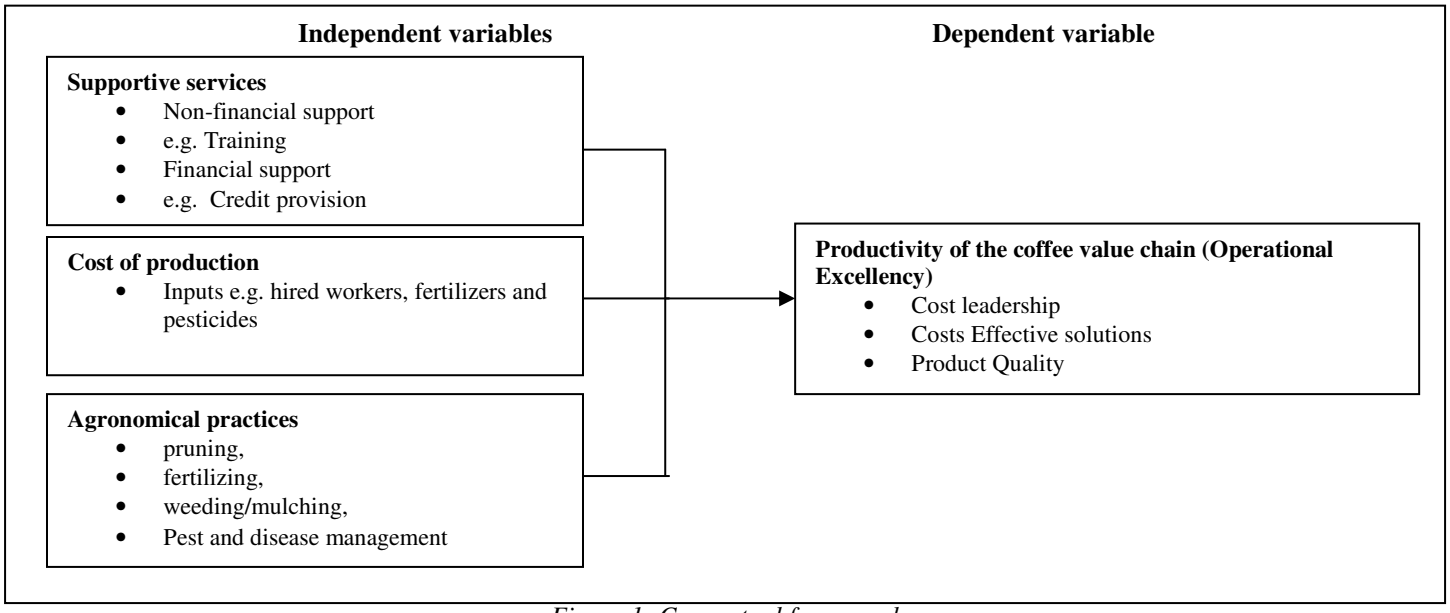

Figure 1: Conceptual framework

2.2. Supportive Services and Productivity of the Coffee Value Chain

Famers require supportive services from public and private institutions in order to improve on coffee production. Non-financial support such as training on relevant aspects of coffee production including cooperative organization and governance and technical assistance such as equipment selection, installation, is required to strengthen the capacity of famers. Financial support such as credit provision will assist in reducing the burden of cost of coffee production. Demand for technical assistance, training, and financial support, in Rwanda far exceeds supply, as is the case in all developing countries. The DPs (USAID and SNV) have had a big impact in the process of promoting the Rwandan specialty coffee industry. They assisted different coffee cooperatives by training them on specialty coffee production and processing. Before year 2000, Rwanda counted only two state-run washing stations and by 2007 there were about 100 washing stations (SPREAD, 2007) which increased to about 200 in 2012

The United States Agency for International Development (USAID) has been the principle provider of technical assistance, training, and targeted financial support to the nascent specialty coffee sector through primary program implementers: ACDI-VOCA; the ADAR Project, implemented by Chemonics International; and the PEARL Project, executed by Michigan State and Texas A&M Universities. Through agency investments in technical assistance, training, and direct financial support through grants and the Development Credit Authority (DCA) loan guarantee program, 46 coffee washing stations have been constructed and several hundred Rwandans have been trained in improved coffee production, coffee processing, washing station management and marketing. Rwanda has benefited from Kenyan and Burundian coffee processing technicians in providing training for Rwandan CWS staff was an important element in the success of the coffee program. ACDIVOCA and ADAR recruited seasoned coffee technicians and placed them on-site at each assisted CWS for the duration of the coffee production season. These technicians provided guidance in the organization of the workforce and instructed staff in all aspects of coffee processing including equipment installation, testing and maintenance, cherry reception, sorting, pulping, fermentation, washing, drying, lot identification, and storage (USAID, 2006).

2.3. Cost of Production and Productivity of the Coffee Value Chain

The coffee industry like other industries has felt the impact of globalization, both directly and indirectly. One of the major effects of globalization on the coffee market is its impact on coffee prices since the 1970s. Of the world's coffee production, 15% takes place on coffee plantations of more than 50 hectares. The majority (70%) is grown on farms of less than 10 hectares (Fitter and Kaplinsky 2001). Production requires little machinery or other long term investment, but a great deal of labor, not only for the harvest but also for planting the trees, for the elimination of weeds and for fertilizing. Although average costs can be reduced by expanded land use and a combination of vehicles and laborers, there is generally less scope for economies of scale in coffee production than there is for products such as potatoes and wheat, where machines can take over much of the process. This may be an explanation as to why so many production units are still very small in size. It takes two years from the planting of a coffee tree until harvesting of the berries can start. The optimal yield of a tree is reached when it is five to six years old (Lewis, 2007)

Production of high quality beans can then continue for 20 years, followed by another 20 years of declining production. The only way to increase the produce in the short term is by using more inputs such as hired workers, fertilizers and pesticides. These costs however outweigh the price fetched in selling the harvested coffee. The price elasticity of demand is also low, with coffee demand dropping only when coffee prices increase significantly (Ponte, 2001). As a result, prices on the world coffee market are highly variable. Supply shortage then leads to high coffee prices without a significant reduction in consumption. The response on the supply side is usually higher than necessary, as more farmers than before will plant new coffee trees. Two years later, when the new trees have matured, there are oversupply and low prices. These in turn induce many coffee farmers to leave the business or start growing something else (Kaplinsky 2001).

2.4. Agronomical Practices and Productivity of the Coffee Value Chain

Agronomical practices for coffee farming include pruning, fertilizing, renovation via replanting or grafting, weeding/mulching, and pest & disease management. The biggest variable to coffee productivity is pruning and fertilization. Optimize these, and coffee productivity will improve rapidly (Simone, 2013). In order to maintain and protect the coffee beverage quality, aroma, thickness of the brew, taste and flavor as well as acidity in the cup, the right kind of coffee fruits have to be harvested in right time. Proper harvesting practices help in protecting the inherent quality as well as helps in getting premium prices. Under ripe or over ripe fruits should not be mixed or used for the preparation of parchment coffee as they can spoil the overall cup quality. Greens and under ripe fruits should be sorted out and dried separately. All the extraneous matters like twigs and leaves should be separated from the fruits and dried. The fruits should be spread uniformly in the drying yards at a thickness of 7 – 8 cm. Clean cement or clay lined drying yards should be used for drying the cherry coffee. Use of cow dung smeared or mud drying yards should be avoided (Fukunaga, 1999).

Coffee pruning as a good practice involve removal of the unproductive wood for encouraging the growth of new branches. Pruning facilitates the entry of adequate sun light and air to all parts of the bushes thereby reducing the incidence of pest and diseases and helps maintaining the frame work of the plants in desired shape. Pruning should be light involving removal of old unproductive wood, crisscross branches, branches touching ground, lean, lanky and whippy wood and pest and disease affected branches as well as branches growing towards main stem and ground (Fukunaga, 1999).

3. Research Methodology

3.1. Study Design

This study adopted a descriptive survey design. As it is the case with descriptive survey design, the researcher does not manipulate the variables (Burns and Grove, 2005). Descriptive research is description of the state of affairs as it exists and the research just reports the findings. According to Orodho (2003), the design assists the researcher to identify, observe, describe and analyze existing phenomenon on the basis of prevailing circumstances. It also enables the researcher to draw inferences from the existing phenomenon and trends. Descriptive survey study design involves collecting information by administering questionnaires to a sample of individuals. This study sought to administer questionnaires to study participants for data collection

3.2. Target Population

Target population is the specific population about which information is desired. According to Ngechu (2004), a population is a well-defined or set of people, services, elements, events, group of things or households that are being investigated. Mugenda and Mugenda, (2003), explain that the target population should have some observable characteristics, to which the researcher intends to generalize the results of the study. The target population for this study was 178 coffee famers from Muhura sector who are part of the coffee supply chain in the sector.

3.3. Sampling Frame

Ngechu (2004) underscores the importance of selecting a representative sample through making a sampling frame. From the population frame the required number of subjects, respondents, elements or firms was selected in order to make a sample. The sampling frame for any probability sample is a complete list of all the cases in the population from which a sample is drawn (Saunders et al., 2007). A sample is a smaller and more accessible sub set of the population that adequately represents the overall group, thus enabling one to give an accurate (within acceptable limits) picture of the population as a whole, with respect to the particular aspects of interests of the study. Sample of responding staffs were drawn from 178 possible respondents. Statistically, in order for

generalization to take place, a sample of at least 30 elements (respondents) must exist (Cooper and Schindler, 2003). Saunders et al (2007) argue that if well chosen, samples of about 10% of a population can often give good reliability.

3.4. Sample Size and Sampling Technique

Mugenda and Mugenda (2003) recommend that a sample size of 384 is ideal when a study population is more than 10,000 people. They add that when the population is less than 10,000, the required sample size is smaller and the formula that follows is applied. The study population for this study is 178coffee farmers. The sample size was calculated using the formula by Yamaro (1960)

nf = n/(1+n/N).

Where;

nf= desired sample size in a population of less than 10,000 individuals,

n= desired sample when the population is more than 10,000,

N= estimate of the population size.

Study sample size by applying the formula, (nf) sample size is:

384/(1+384/178) = 120

Purposive sampling was used to select the area under study while simple random sampling was used to select the respondents. Coffee farmers who have been growing coffee for the last five years were selected. This duration of five years ensures that the farmers are familiar with the best cultivation practices they have witnessed the change in coffee price specifically the cost of inputs and they can relate that with change of coffee price over time.

3.5. Data Collection Instrument

The study relied on primary data that was collected using close-ended questionnaires. Questionnaires were used to collect data for this study because they are more efficient for they require less time to collect data; they are less expensive and permits collection of data from a wide population (Nachmias and Nachmias, 2008). Close-ended questions were used and this made it easier and quicker for respondents to answer as well as ensuring that there are no irrelevant answers to questions.

3.6. Data Collection Procedure

Primary data for the study was collected through questionnaires. The questionnaires were distributed to all the respondents by the researcher and collect them immediately after they are filed. This prevented loss of the questionnaires as well as ensuring high response rate. According to Nachmias and Nachmias (2008), Questionnaires are simpler in administration, responding to items and analysis.

3.7. Data Analysis

The questionnaires were first examined to ensure they are complete and have been consistently completed. Data from the questionnaires was then be coded to enhance analysis. Both descriptive and inferential statistics were generated. Descriptive analysis was carried out to generate descriptive statistics for the study which consisted of frequency distribution and percentages. Inferential statistics was generated through Pearson Correlation analysis. Correlation analysis was carried out to help in estimating the relationship between the study variables. Statistical Package for Social Scientists (SPSS) version 20 was deemed the appropriate statistical tool for data analysis in this study. The findings were presented using tables and bar graphs as were found appropriate

4. Research Findings and Discussion

4.1. Demographic Information

The study sought to determine the gender, age and education level of coffee farmers who participated in the study

	Frequency	**Percentage (%)**
Gender		
Male	45	42
Female	62	58
Total	107	100
Age		
31-40	8	7
41-50	64	60
51-60	21	20
Above 61	14	13
Total	107	100
Education level		
None	46	43
Primary level	49	46
Secondary	7	6
University	5	5
Total	107	100

Table 1: Background information of respondents

Table 1 indicates that majority (58%) of the respondents were female while male respondents constituted 42%. Further the study shows that majority (60%) of the members aged between 41-50 years, 7% aged between 31-40, 20% aged between 51-60 years while only 13% of the respondent aged above 61 years. The table also indicates that 43% of the respondents had no education, 46% has primary level education, 6% has secondary education while only 5% of the respondents had attained university education level. This means that the coffee farmers did not have sufficient knowledge and skills necessary for improved coffee farming

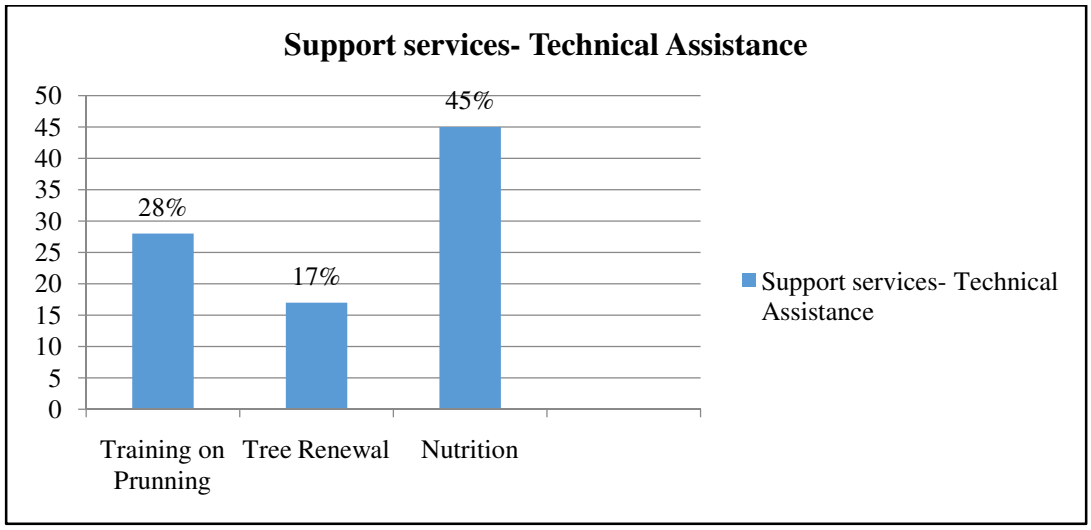

Figure 2: Technical assistance- Training

Figure 2 indicates that 28% of the respondents stated that training on pruning was the technical assistance they received, 17% indicated technical assistance on tree renewal (Rejenuvation) and while 45% stated that they have received training on crop nutrition.

4.2. Effect of Support Services on Productivity of the Coffee Value Chain

Statements	**Strongly Agree**	**Agree**	**Disagree**
Support agronomy services have influence on productivity of the coffee value chain.	32(30%)	73(62%)	2(1%)
Coffee farmers have been trained in improved coffee production	56(52%)	36(34%)	15(14%)
Coffee farmers have access to technical assistance onsoil nutrition	38(36%)	52(48%)	17(16%)
Farmers receive training on how to access credit provision which can affect cost of coffee production	42(39%)	65(61%)	0%
Coffee Farmers receive training on tree renewal	51(48%)	56(52	0%

Table 2: Respondent Perception on Effect of support services on productivity of the coffee value chain

Table 2 indicate that 30 % of the respondents strongly agreed with the statement that support agronomy services have influence on productivity of the coffee value chain, 62% just agreed while 1% disagreed with the statement. Majority (52%) of the respondents strongly agreed with the statement that coffee farmers have been trained in improved coffee production 34% just agreed while 14% disagreed. The table also shows that 36% of the respondents strongly agreed with the statement that coffee farmers have access to technical assistance, 48% just agreed with the statement while 16% disagreed. Majority (61%) of the respondents agreed with the statement that training on access to financial support (credit provision) will assist in reducing the burden of cost of coffee production while 39% strongly agreed. Forty-eight percent of the respondents strongly agreed with the statement that coffee farmers received sufficient technical training on tree renewal support while 52% just agreed.

		Productivity of coffee value chain	**Support services**
Productivity of coffee value chain	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	107	
Support services	Pearson Correlation	.321**	1
	Sig. (2-tailed)	.001	
	N	107	107
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 3: Correlation between support services and productivity of the coffee value chain

Table 3 indicates that there was a significant relationship between support services and productivity of coffee value chain (R= .321, P< 0.01). This implies that availing adequate support services to coffee farmers would result to increased productivity of the coffee value chain. The Pearson correlation coefficient is low (.321) implying that although there is a significant relationship between support services and productivity of coffee value chain, the relationship is not very strong. Findings of this study are consistent with those of a study conducted by Ingrid and Juan (2006) which showed a positive significant relationship between support services offered to farmers and productivity of coffee value chain.

4.3. Effect of Cost of Production on Productivity of the Coffee Value Chain

Statement	Strongly Agree	Agree	Disagree
Cost of fertilizer has influence on productivity of the coffee value chain.	34(32%)	59(55%)	14(13%)
Coffee farmers receive inputs such as fertilizers and pesticides on credit.	55(51%)	35(33%)	17(16%)
High cost of production has made some coffee farmers to abandon coffee farming.	81(76%)	10(9%)	16(15%)
Cost of production is important in coffee farming	64(60%)	36(34%)	7(6%)
Availability of input like pesticides, and fertilizers Can improve quality.	64(60%)	43(40%)	

Table 4: Respondent perception on the Effect of Cost of Production on Productivity of the coffee value chain

Table 4 indicate that 32 % of the respondents strongly agreed with the statement that cost of fertilizer has influence on productivity of the coffee value chain, 55% just agreed while 13% disagreed with the statement. Majority (51%) of the respondents strongly agreed with the statement that coffee farmers receive inputs such as fertilizers and pesticides on credit, 33% just agreed while 16% disagreed. The table also shows that 76% of the respondents strongly agreed with the statement that high cost of production has made some coffee farmers to abandon coffee farming, 9% just agreed with the statement while 15% disagreed. Majority (60%) of the respondents strongly agreed with the statement that cost of production is important in coffee farming, 34% just agreed while 6% disagreed. sixty percent of the respondents strongly agreed with the statement that availability of inputs like pesticides, and fertilizers can improve quality while 40% just agreed

		Productivity of coffee value chain	Cost of production
Productivity ofcoffee value chain	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	107	
Cost of production	Pearson Correlation	.267**	1
	Sig. (2-tailed)	.005	
	N	107	107
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 5: Correlation between costs of Production on the Productivity of the coffee value chain

Table 5 indicates that there was a significant relationship between cost of production and productivity of the coffee valuechain (R=.267, P<0.01). This means that lowering the cost of coffee production would result to increased productivity of the coffee valuechain. This can be ensured through providing the farmers with inputs such as fertilizers and chemicals at low prices. The correlation coefficient is relatively low (.267) this means that the relationship realized between cost of production and productivity of the coffee valuechain is weak and therefore cost of production alone might not affect productivity of the coffee valuechain greatly. The findings of this study are in agreement with Jacob (2012)who argued that the cost of coffee production is significantly related to productivity of the coffee value chain

4.4. Effect of Agronomical Practices on Productivity of the Coffee Value Chain

Statement	Strongly agree	Agree	Disagree
Agronomical practices like pruning practices has influence on productivity of the coffee value chain.	70(65%)	37(35%)	
Majority of coffee-trees cultivated by most coffee farmers are too old.	52(48%)	36(33%)	19(18%)
Most of the coffee farmers are not implementing right agronomical practices.	79(74%)	28(26%)	
Most of coffee farmers apply fertilizer after hoeing and pruning their coffee trees.	63(59%)	44(41%)	
Majority of coffee famers cut back old trees at the beginning of the rainy season.	47(44%)	22(21%)	38(35%)

Table 6: Respondent Perception on the Effect of Agronomical Practices on the coffee value chain

Table 6 indicates that 65% of the study respondents strongly agreed with the statement that agronomical practices like pruning practices has influence on productivity of the coffee value chain while 35% just agreed. Also 48% of the respondents strongly

agreed with the statement that majority of coffee-trees cultivated by most coffee farmers are too old, 33% just agreed while 18% disagreed with the statement. Majority (74%) of the respondents strongly agreed with the statement that most of the coffee farmers were not implementing right agronomical practices while 26% just agreed. Majority (59%) of the respondents strongly agreed with the statement that most of coffee farmers apply fertilizer after hoeing and pruning their coffee trees while 41% just agreed. Also 44% of the respondents strongly agreed with the statement that majority of coffee famers cut back old trees at the beginning of the rainy season, 21% just agreed while 35% disagreed with the statement.

		Productivity of coffee value chain	**Agronomical practices**
Productivity of coffee value chain	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	107	
Agronomical practices	Pearson Correlation	.608**	1
	Sig. (2-tailed)	.000	
	N	107	107
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 7: Correlation between Agronomical Practices and productivity of the Coffee value chain

Table 7 indicates that there was a significant relationship between agronomical practices and productivity of coffee value chain (R=.608, P<0.01). This implied that the more the farmers adhere to agronomical practices including timely application of fertilizers and chemicals the higher the productivity of coffee value chain. These findings are in agreement with those of a study Bart *et al*., (2015) conducted by that revealed a significant relationship between good agricultural practices and productivity of coffee value chain.

4.5. Effect of Farm Level Activities on Productivity of Coffee Value Chain

Statement	**Strongly agree**	**Agree**	**Disagree**
Farmer level activities are important in the efficiency of the coffee value chain	84(78%)	23(22%)	
Farmer level activities example level of support services affect productivity	43(40%)	64(60%)	
Productivity in terms of quality and quantity is affected by support services like credit	46(43%)	49(46%)	12(11%)
Productivity of the value chain is affected by cost of production e.g. inputs, pesticides	67(62%)	36(34%)	4(4%)
Coffee farmers can produce more with less if they implement right agronomical practices	60(56%)	36(34%)	11(10%)

Table 8: Respondent Perception on the Effect of farmer level activities on Productivity of the coffee vale chain

Table 8 indicates that 78% of the study respondents strongly agreed with the statement that farmer level activities are important in the efficiency of the coffee value chain while 22% just agreed. Also 40% of the respondents strongly agreed with the statement that Farmer level activities example level of support services affect productivity while 60% just agreed with the statement. Majority (46%) of the respondents agreed with the statement that productivity in terms of quality and quantity is affected by support services like credit, 43% strongly agreed while 11% disagreed. Majority (62%) of the respondents strongly agreed with the statement that productivity of the value chain is affected by cost of production e.g. inputs, pesticides 34% just agreed while 4% disagreed. Majority (56%) of the respondents strongly agreed with the statement that coffee farmers can produce more with less if they implement right agronomical practices 34% just agreed while 10% disagreed with the statement.

		Productivity of coffee value chain	**Farm level activities**
Productivity of coffee value chain	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	107	
Farm level activities	Pearson Correlation	.501**	1
	Sig. (2-tailed)	.000	
	N	107	107
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 9: Correlation between Farm level activities and Productivity of the coffee value chain

Table 9 indicates that there is a positive significant relationship between farm level activities and productivity of coffee value chain (r=.501 P<0.01. This implies that the more coffee farmers get adequate support services, low cost of coffee production and adhere to good agronomical practices the more productivity of value chain would improve.

According to the reviewed literature farm level activities determines the productivity of value chain to a greater extent. The quality of coffee produced and there for the price fetched by the coffee could be explained by the activities undertaken by the farmers in the course of coffee growing. Bart *et al*., (2015) argued that significant increase in the adoption of improved coffee production practices by coffee famers in Ethiopia with compost use, mulching, pruning, and weeding had contributed to the improvement of productivity of value chain in Ethiopia. They associated improved farm level activities with higher productivity levels and improvement in coffee quality.

5. Summary, Conclusions and Recommendations

5.1. Summary of the Findings

The purpose of this study was to determining the effect of farmer level activities on productivity of the coffee value chain in Rwanda. The study adopted a descriptive survey design as the study design. The target population for this study was 178 coffee famers from Muhura sector. Purposive sampling was used to obtain the samples. Sample size of 120 respondents was determined using the formula by Yamaro (1960). The study relied on primary data that was collected using questionnaires. Data from the questionnaires was coded and entered into the Statistical Package for Social Scientists (SPSS) version 20 for analysis. Descriptive analysis specifically frequency and percentages constituted descriptive statistics for the study. Correlation analysis generated inferential statistic, which helped in estimating association between the study variables. Out of the 120 questionnaires issued 107 were correctly filled and submitted to the researcher. This gave a response rate of 89% which according to Punch (2003) was considered excellent for use in drawing conclusion in a study. The study findings indicated that majority (58%) of the respondents were female while male respondents constituted 42%. Further the findings showed that majority (60%) of the members aged between 41-50 years, 7% aged between 31-40, 20% aged between 51-60 years while only 13% of the respondent aged above 61 years. The results also indicated that 43% of the respondents had no education, 46% has primary level education, 6% has secondary education while only 5% of the respondents had attained university education level.

5.2. Effect of Support Services on Productivity of the Coffee Value Chain

The findings indicated that 30 % of the respondents strongly agreed with the statement that support agronomy services have influence on productivity of the coffee value chain, 62% just agreed while 1% disagreed with the statement. Majority (52%) of the respondents strongly agreed with the statement that coffee farmers have been trained in improved coffee, 34% just agreed while 14% disagreed. The findings also showed that 36% of the respondents strongly agreed with the statement that coffee farmers have access to technical assistance, 48% just agreed with the statement while 16% disagreed. Majority (61%) of the respondents agreed with the statement that financial support such as credit provision will assist in reducing the burden of cost of coffee production while 39% strongly agreed. Forty-eight percent of the respondents strongly agreed with the statement that coffee farmers received sufficient financial support while 52% just agreed

5.3. Effect of Cost of Production on Productivity of the Coffee Value Chain

The findings indicated that 32 % of the respondents strongly agreed with the statement that cost of fertilizer has influence on productivity of the coffee value chain, 55% just agreed while 13% disagreed with the statement. Majority (51%) of the respondents strongly agreed with the statement that coffee farmers receive inputs such as fertilizers and pesticides on credit, 33% just agreed while 16% disagreed. Findings also showed that 76% of the respondents strongly agreed with the statement that high cost of production has made some coffee farmers to abandon coffee farming, 9% just agreed with the statement while 15% disagreed. Majority (60%) of the respondents strongly agreed with the statement that cost of production is important in coffee farming, 34% just agreed while 6% disagreed. sixty percent of the respondents strongly agreed with the statement that availability of inputs like pesticides, and fertilizers can improve quality while 40% just agreed

5.4. Effect of Agronomical Practices on Productivity of the Coffee Value Chain

The results indicated that 65% of the study respondents strongly agreed with the statement that agronomical like pruning practices has influence on productivity of the coffee value chain while 35% just agreed. Also 48% of the respondents strongly agreed with the statement that majority of coffee-trees cultivated by most coffee farmers are too old, 33% just agreed while 18% disagreed with the statement. Majority (74%) of the respondents strongly agreed with the statement that most of the coffee farmers were not implementing right agronomical practices while 26% just agreed. Majority (59%) of the respondents strongly agreed with the statement that most of coffee farmers apply fertilizer after hoeing and pruning their coffee trees while 41% just agreed. Also 44% of the respondents strongly agreed with the statement that majority of coffee famers cut back old trees at the beginning of the rainy season, 21% just agreed while 35% disagreed with the statement.

5.5. Relationship between Farm Level Activities and Productivity of the Coffee Value Chain

The study revealed that there was a positive significant relationship between support services, cost of production, good agricultural practices and productivity of coffee value chain ($r=.321$ $P<0.01$, $r=.267$ $P<0.01$, $r=.608$ $P<0.01$) respectively

5.6. Conclusion

The study concluded that offering support services to coffee farmers has the potential to improve the productivity of the coffee value chain. This is supported by the positive and significant relationship between support services and productivity of the coffee value chain that was realized in the study.

The study also concluded that cost of production influences the productivity of the coffee value chain. When coffee farmers incur a lot of expenses during coffee production they are likely to forego some of the necessary aspect of farming like fertilizer application and spraying. This then leads to low production and production of poor quality coffee. Low cost of production as a result of cheap labor of due to accessibility of microcredit would ensure that farmers produce more quality coffee.

Additionally, the study concluded that observing good agricultural practices during coffee farming especially at farm level has the capability of improving productivity of the coffee value chain. The study concluded that mulching timely and correct pruning, weeding and application of fertilizers and chemicals results into quality coffee production

5.7. Recommendations

The study made the following recommendations;

1. Coffee farmer should have access to support services for improved coffee production. Extension services including trainings on good agricultural practices should be availed to the coffee farmers at the right time.
2. With the evidence that high cost of production affects the quality and quantity of coffee and thus is main contributor to low and poor productivity of the coffee value chain. The Coffee value chain can be effective is the farmers is low cost producer. This way, farmers would produce high volumes of good quality, thus creating customer intimacy as the supply will be reliable. Improved access to financial support in form of micro credit will enable coffee farmers have a competitive advantage in the market as it will reduce the cost of doing business.
3. In addition, inputs provided to the farmers should be at lower price, should be sufficient and timely.

5.8. Areas for Further Research

This study focused on coffee farmers in only one sector this study therefore recommend that a similar study that will focus on a larger population to be conducted.

The study also suggests a future study that would seek to determine the effect of legislative framework on the farmer level and its effects on the productivity of coffee value chain in Rwanda.

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