

FACTORS AFFECTING THE QUALITY OF COFFEE PROCESSING IN RWANDA: A CASE STUDY OF TUZAMURE KAWA COOPERATIVE

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By

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DEDICATION

To my lovely wife, Liliane Uwizeyimana, for her unconditional encouragement I benefit from her and to my daughter Bracha Bethia Furaha.

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ABBREVIATIONS

EFTA	: European Fair Trade Association
FAQ	: Fair Average Quality
FLO	: Fair Trade Labeling Organization International
Frw	: Franc Rwandais (Rwandan Franc)
GCA	: Green Classification Association
GDP	: Gross Domestic Product
ICO	: International Coffee Organization
IFAT	: International Federation for Alternative Trade
ISAR	: Institut Supérieur des Sciences Agronomiques du Rwanda
ITC	: International Trade Center
MINAGRI	: Ministry of Agriculture and Animal Resources
MINECOFIN	: Ministry of Finance and Economic Planning
OCIR (Café)	: Office des Cultures Industrielles du Rwanda (National Coffee Board)
PEARL	: The Partnership for Enhancing Agriculture in Rwanda through Linkages-Michigan State University
PSTA	: Plan Stratégique pour la Transformation de l'Agriculture (Strategic Plan for Agricultural transformation)
SCAA	: Specialty Coffee Association of America
USA	: United States of America

ABSTRACT

Coffee farming in Rwanda is an important sector that highly contributes to the economy in terms of employment and income especially for the small farmers in rural areas. In order to improve coffee production in terms of quantity and quality, farmers are encouraged to form and join cooperatives so that they can increase their bargaining power and earn higher prices for their produce. This is achieved through the establishment of washing stations for the purpose of producing high-quality coffee that is competitive at the international markets.

The research paper assessed the quality in producing for the speciality coffee market, using the TUZAMURE KAWA cooperative as a case study. The objectives of this study are therefore to analyze the factors affecting the quality of coffee produced by the cooperative and to define the economic profits of coffee processing by the Cooperative.

The study finds out the processing factors affecting quality of coffee and their potential problems, which can influence Arabica quality. In addition, the study finds that investing in coffee processing by coffee growers' cooperative such as the TUZAMURE KAWA Cooperative is profitable.

The policy implication of the research paper is that putting in place coffee washing stations, which are necessary to produce high quality coffee, can contribute positively to improving coffee productivity at the farm level. Price premiums associated with high quality coffee will provide economic incentives for farmers to maintain coffee trees and increase their productivity.

CHAPTER 1: INTRODUCTION

Agriculture is the main activity of Rwandan rural population. It contributes highly in terms of (1) employment: the 2002 Household Living Standards Survey (MINECOFIN, 2002) found that 87 percent of the active population is engaged in the agricultural sector and (2) GDP: the share of agriculture in the GDP varied from 43.4 to 40.5 percent in the period 1999 to 2004 respectively (MINAGRI, 2006). The revenues in agriculture are raised mainly from exports of cash crops such as coffee, tea, pyrethrum (*Chrysanthemum cinerariifolium* and *coccineum*: its flowers are used to make insecticides), etc. These amounted on average to 71 percent of the country's total export revenues in the period 1999-2004 (MINECOFIN 2002; MINAGRI, 2004).

Coffee is one of the important traditional cash crops in the Rwandan economy. It has been grown in the country since its introduction by German Missionaries as early as 1904. Coffee growing is often a smallholders' activity. These are mainly poor people who work small, fragmented plots. Coffee is produced to supplement staple production and thus achieve basic food security. In 2004, there were some 400,000 producers of coffee in Rwanda in 60 districts (OCIR 2005). Other actors in the sector include private traders, hulling and exporting companies, government institutions and in the recent decade, many cooperatives have emerged.

Cooperatives are established for multiple purposes. They are involved in the (1) provision of services to growers including accessing and managing inputs and monitoring their use; (2) production of high-quality coffee through washing stations and (3) improvement of farmers' participation in the coffee sector. The goal is to increase farmers' bargaining power in order to earn higher prices for their produce and ultimately, improve their incomes and livelihoods (OCIR, 2005).

The Cooperative, "Tuzamure Kawa" was created in 2005. In Kinyarwanda, the national language of Rwanda, the cooperative's name means "promoting coffee". The main objective of the cooperative is to produce and market a high quality coffee in order to increase revenues for its members.

1.1. Problem statement

Most Rwandan coffee is currently grown and processed the same way it was a decade ago. Consequently, Rwanda's coffee production and marketing system has not been able to keep up with changes in the global market for high quality coffee. Given world market gluts of relatively poor quality coffee, Rwanda is now exporting a product that fetches low prices. Despite the challenges in coffee marketing and production, coffee remains one of Rwanda's most important official sources of foreign exchange and the drop in production is of major concern to both the public and private sectors. The fact that the coffee sector survives at all in the face of numerous unfavorable conditions is a weighty testament to its potential. Numbers of farmers have moved away from coffee with more seemingly on the cusp of removing more trees, or "decaffeinating" their fields.

International coffee prices are at their lowest levels due mostly to a supply surplus. In order to respond to this coffee crisis, Rwandan coffee stakeholders are trying to target coffee niche markets that provide price premiums (Arabica coffee).

In order to improve coffee production in terms of quantity and quality, farmers are encouraged to form and join cooperatives so that they can increase their bargaining power and earn higher prices for their produce. This is achieved through the establishment of washing stations for the purpose of producing high-quality coffee that is competitive at the international markets.

It is in that way that the Tuzamure Kawa cooperative was created. Tuzamure Kawa cooperative has not targeted the specialty coffee market (has not delivered the best quality needed in the market). There is lack of experience and knowledge concerning the production of high quality coffee product Arabica that is grown in Rwanda. In order to produce consistently high quality coffee, the producer and processor must understand the factors that affect coffee quality. Given the oversupply of average quality coffee coupled with low prices, and in increasingly competitive coffee world, both productivity and quality of coffee from Rwanda should be increased in order to enable small growers to maintain their plantations in a sustainable basis (Schluter, J.E., and A. Finney., 2001).

1.2. Research Objectives

The objectives of this study are:

- 1 To analyze the factors affecting the quality of coffee produced by Tuzamure Kawa Cooperative;
- 2 To define the economic profits of coffee processing by Tuzamure Kawa Cooperative.

1.3. Research questions

In order to reach the above research objectives, this study addresses the following research questions:

1.3.1. Main questions:

1. What are the factors affecting the quality of coffee processing of Tuzamure Kawa cooperative?
2. Is coffee processing economically profitable to Tuzamure Kawa cooperative?

1.3.2. Sub-questions:

1. What are the technical factors for improved quality of coffee processing?
2. What are the resources the cooperative used for improved quality of coffee processing?

CHAPTER 2: LITERATURE REVIEW

2.1. Quality of Arabica coffee and coffee processing

2.1.1. Quality of Arabica coffee

Coffee quality depends on a combination of many factors, including the botanical characteristics of the variety grown, topographical conditions, weather conditions, and the care taken during growing, harvesting, processing, storage, export preparation and transport. Growing, harvesting, processing, storage and export preparation are the most variable factors that can influence the determination of quality since the varietal and topographical conditions are constant (ITC, 2002). These activities start with the reception of coffee cherries and sorting until the preparation of the green coffee, ready to be exported (figure 1). Coffee must be safe for human consumption and not contain harmful organisms such as moulds, pests, etc. In addition, the coffee exporter must comply to the contract description with the coffee buyer and the coffee quality must be uniform for the entire shipment. Furthermore, the coffee should have an excellent cup, which means that it should not present obnoxious flavors. Respect to the coffee quality and the contract description should be a marketing strategy for any exporter aiming to target the high quality coffee market. Moreover, solid business reputations of the exporter and the trust from the buyer are sustained by improving the quality or at least complying with coffee buyers' exportations.

2.1.2. Categories of coffee quality

From the highest to the lowest quality of coffee, four categories form different types sold in the coffee market (ITC, 2002).

1) Exemplary quality

The exemplary quality forms the true niche coffee market and has a high excellent unique cup. They include well-presented washed coffees, some superior washed Robusta, and some organic top coffees. The conditions of exemplary quality coffee encompass the following criteria (Howell, 2001): absolutely uniform attractive appearance, "whistle" clean cup, no traces of taints, exceptional sweet taste and after taste, absolute uniformity cup to cup, and a unique flavor and aroma reflecting a special terroir.

2) High quality

They are sold as straight estates or blends. The straight estate coffee is produced in a similar region or farm. They have also a good cup but are not more visually perfect than the exemplary quality. However, they constitute a large market share of the specialty coffee market. In this category fall Arabica good quality, well-prepared organic coffees, and washed and dried Robusta.

3) Mainstream quality

This category consists of the fair average quality (FAQ) that does not provide an impressive cup. The nevertheless, the mainstream quality accounts between 85% and 90% of the world

coffee consumption (Ponte, 2002). The exemplary and the high quality coffee account for less than 15% of the world coffee market.

4) Under-grades or low grades coffees

They include everything that does not fit in the three other categories. In the US coffee market, an under-grade coffee is any coffee that grades below GCA type (120 defects per 370 grams) (ITC, 2002). In order to reduce the glut of coffee exports in the short run and increase the overall coffee quality in the long run, the International Coffee Organization has put in place Resolution of February 2002. The resolution lays out the coffee quality improvement program. Under that resolution, minimum grading standards and maximum moisture content for coffee exports are explained (ICO, 2002).

2.1.3. Preparing high quality coffee

Before deciding which quality grade of coffee to produce, an exporter should have some information on markets that provide price incentives for quality; otherwise the exporter may not afford to invest the cost required to produce such quality. In addition, since the coffee buyer, who can be the importer, the roaster or the retailer, is the final judge of the quality, the seller needs to know what the buyer is considering when purchasing his or her coffee. Such information would help the coffee exporter to know what actions should be taken care of in the production of the export coffee. The quality requirements for the green Arabica are the following:

1) The aspect or style and the color must be even

Uneven greens tend to produce low liquor quality and pose problems during roasting. Moreover, uneven color highlights the mixing of immature and ripe coffee cherries during the harvesting stage, which negatively affects the quality of the cup. Furthermore, greens of uneven color can be caused by poor processing, incorrect moisture content during the fermentation, premature aging of the coffee, poor drying techniques, harvesting of overripe cherries, keeping cherries a long time before pulping and/or insufficient washing after natural fermentation (ITC, 2002).

The process of producing the green coffee of high quality needs the best management expertise. If this skill is lacking, potential coffee candidates can fail to meet the requirements of the high quality coffee. For instance, coffee cherries start fermenting immediately after being harvested. A maximum of 12 hours between picking coffee cherries from the trees and the primary (wet) processing is allowed (Walker, 2001). If that is not respected, the start of the fermentation within the skin will reduce the flavor of the cup. The success to the quality of Arabica coffee bean lies mostly in the wet processing operations (Ngaruiya, 1994).

2) Moisture content and drying

The level of moisture content varies from country to country. However, 11% is a general target for most coffee and the International Coffee Organization recommends the prohibition of moisture content below 8%. Furthermore, un-dried beans lead to a loss of cup quality but can also produce fungi and moulds. On the other hand, over-dried beans not only are a loss of weight but are also accompanied by a decrease in acidity and flavor. Over-dried beans also translate in increasing milling costs because as the beans break up easily, so there is an increase of waste beans.

3) Avoid obvious defects

Coatedness is the phenomenon where the silver skin has adhered to more than half of the bean's surface. Coatedness can be caused by drought, trees overbearing and under-fermentation of unripe cherries. All these shortcomings will not produce an excellent cup of coffee. Moreover, light and heavy greens should be separated; if this not performed, they will offer an uneven style. Furthermore, good green beans should not contain foreign matter that makes the coffee appearance undesirable.

4) Insects and pests damage

The damage from insects and pests should be controlled on the field. However, they can also be eliminated during the floatation of coffee cherries before pulping in the case of the wet processing. The danger of such beans is that they can produce fermented cups.

5) Bean size

Coffee exporters should consider also the buyer requirements of the coffee bean size. A mix of different sizes of the bean does not produce adequate appearance. The roasting of such beans is also not homogenous.

6) Bean density

The mixing of light and broken beans with heavy beans can reduce not only the appearance but can also reduce the flavor and acidity of coffee. This leads to the importance of adequate density separation of different types of coffee beans.

7) Sorting

Bean size determination and density grading techniques cannot replace the importance of sorting. Sorting takes care of other pitfalls such as bleached, mottled and discolored beans that cannot be removed by previous methods. Sorting can be undertaken manually or electronically depending on the quantity to be sorted and the labor wage rate. Small-scale specialty coffee producers will sort the coffee by hand when the cost of labor is cheap.

Regardless of the factors affecting the quality of coffee discussed previously, exporters need to comprehend the requirements of their target coffee market. The knowledge of price premiums is also important. In addition, the exporter should consider the motivations that are essential for consumers in order to trust his or her product (Ponte, 2002). If all recommended measures of cleanliness are taken into account during all the stages of the wet processing, one should expect at least an ordinary or acceptable cup since there is no naturally bad coffee (ITC, 2002).

2.1.4. Coffee processing

There exist two main processing methods: dry process or unwashed and wet or washed processing methods. In the dry process, the ripe coffee beans (coffee cherries) are dried in the skin after which the skin is removed to produce the green beans. In the wet process, coffee cherries are pulped and fermented to get rid of the mucilage that adheres to the beans. After the fermentation, beans are washed and dried. There is another processing technique called semi-washed coffee where the ripe coffee cherries are pulped and dried but with the mucilage still attached to the bean. This semi-washed technique is the most popular in Rwanda with the use of hand-pulpers.

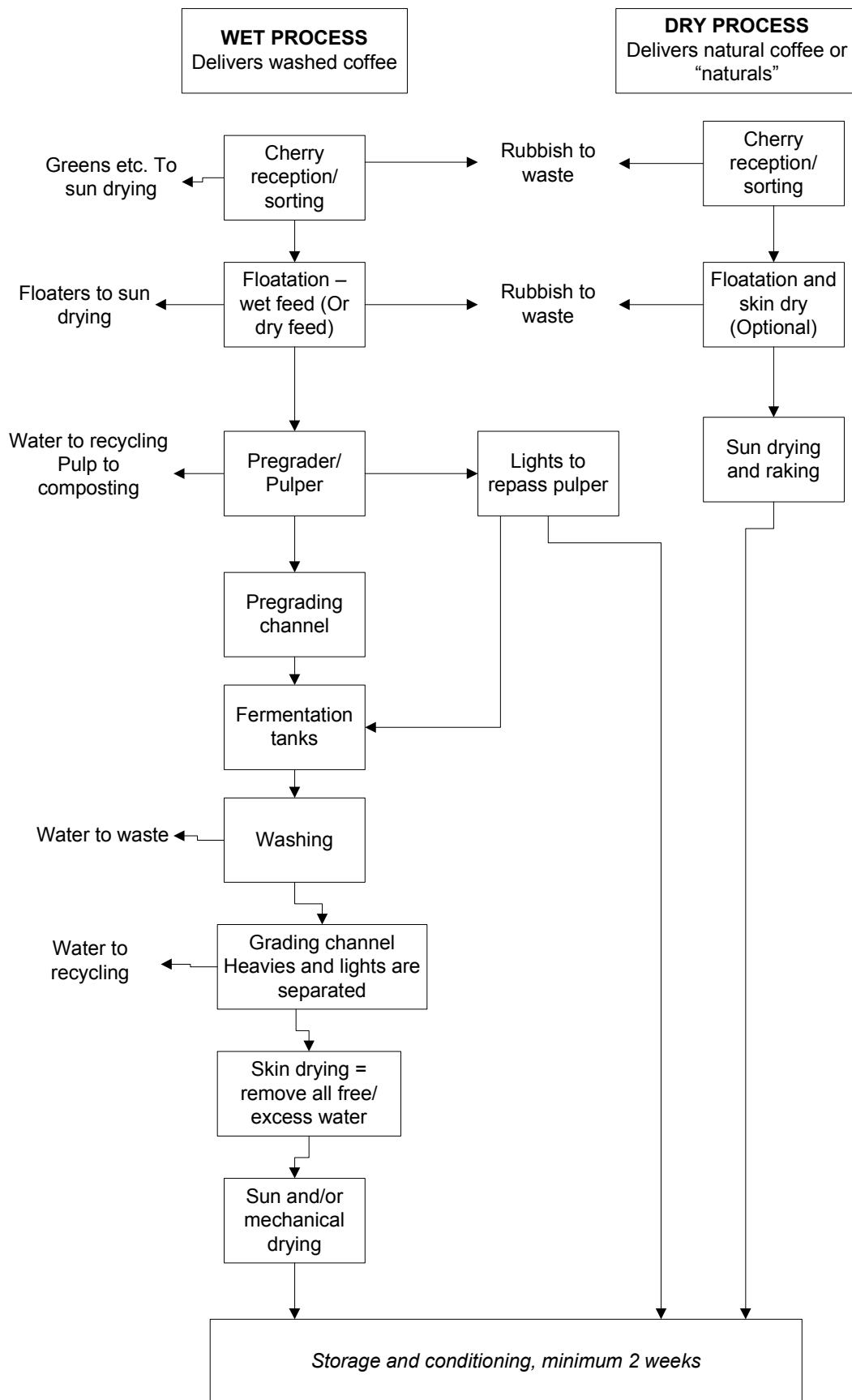


Figure 1 continues on the next page.

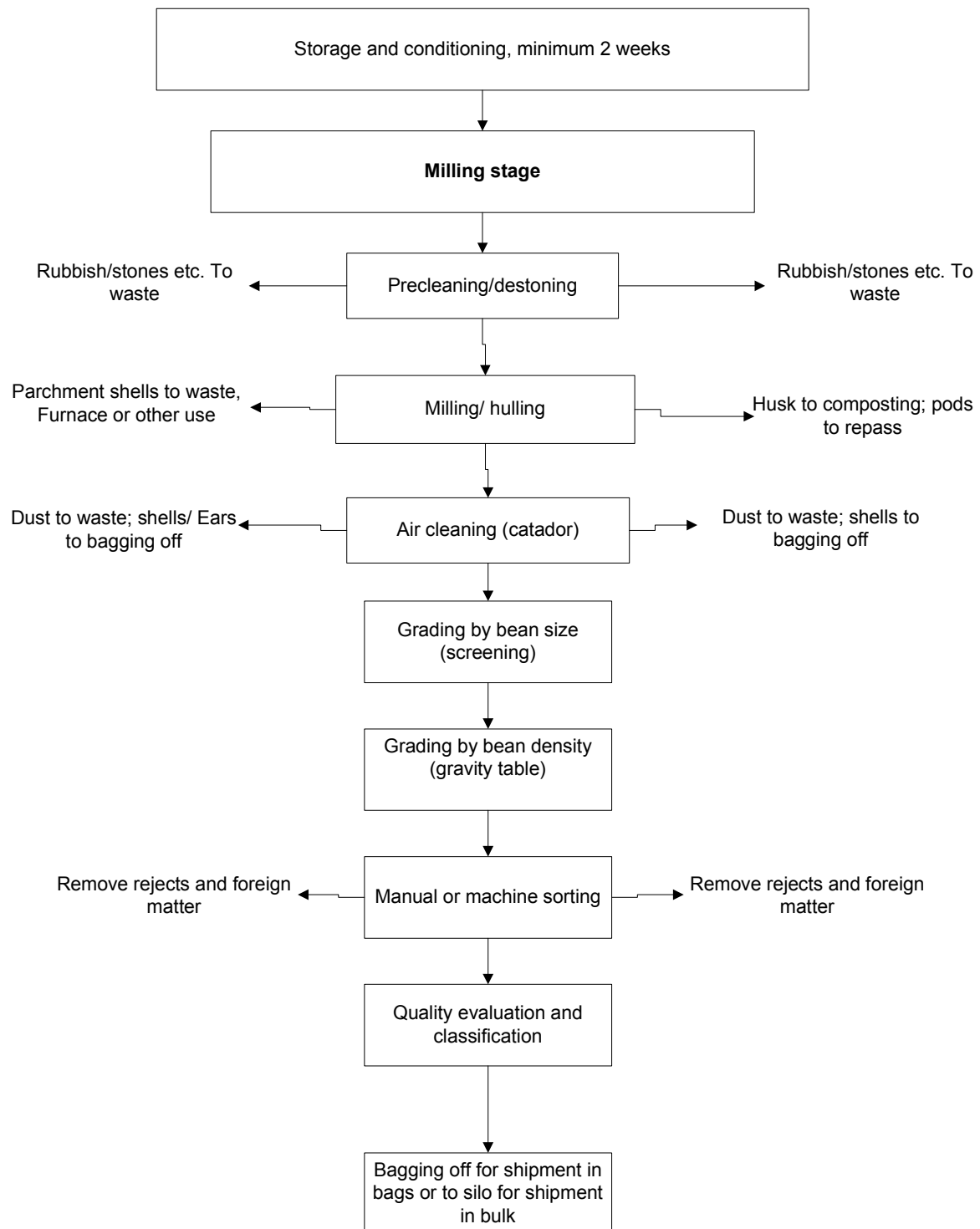


Figure 2. 1: General scheme of coffee processing and preparation of green beans

2.2. Fair trade coffee

Fair trade coffee relies on partnerships between fair trade organizations also called alternative trade organizations and producers' associations or cooperatives. Two important organizations are the International Federation for Alternative Trade (IFAT) and the European Fair Trade Association (EFTA). Their role is twofold: to facilitate the exchange of information on markets and sources for fair trade products and to lobby public institutions in order to raise public awareness of fair trade issues. The partnerships are mediated by independent certification organizations. The national certification agencies are under umbrella of Fair Trade Labeling Organization International (FLO).

Fair trade coffee is sold directly by small producers' associations or cooperatives to an importer or a fair trade organization, and the producer is guaranteed a minimum price for his or her coffee. The cooperative that forms the case study of this research is already registered by FLO.

CHAPTER 3: METHODOLOGY

3.0. Introduction

This chapter covers methodology used in this study and has eight (8) sections. The first section offers introduction to field work of Tuzamure Kawa Cooperative in Gakenke district. The second section also offers research design of the study. The third Section covers sources of data collection while Section four covers qualitative and quantitative research methods. Arriving at Tuzamure Kawa Cooperative and conduction of interviews takes section five and six respectively. Data processing and preliminary interview analysis covers section seven and the last section takes fieldwork challenges and lessons learnt.

3.1. Introduction to field work at Tuzamure Kawa Cooperative

Social science research uses the term 'Fieldwork' in two different ways. First, it can be used in a general sense to cover several kinds of qualitative methods. Burgess (1982) described it in that sense as "a style of investigation that is referred to as... qualitative method; interpretive research; case study method and ethnography" (quoted in Payne and Payne, 2004:94; see also Burgess, 1990: ix & Burgess, 2005). It is used in the second way by Payne and Payne (2004:94) to refer to an aspect in the qualitative research process where data are collected, over a period of time, in a naturally occurring setting. However, the term could also be used to refer to any data collection trip, be it in a specific social setting or not. Thus, fieldwork "can mean data collection stage of a project (particularly in the qualitative tradition); or researchers go about collecting data; or more narrowly, data collection in a social setting that tries to reflect the naturally occurring order of events and subjective meanings of those being studied" (Payne and Payne, 2004:94). In explaining what fieldwork entails, some scholars focused on the central role of the fieldworker and of primary data while others emphasized the kind of data or what methods or tools that should be used. For Pole (2005: xx): Fieldwork is a way of doing research where the emphasis is placed on the collection of data at first hand by a researcher. It relies on personal interaction between the researcher(s) and those been researched in the research setting, during which the researcher(s) will use one or a combination of particular methods to collect data over a prolonged period of time Chakravarti (1979: 38) also opined similar view. For him, fieldwork is a personal experience because it involves close interaction or "intimate long-term acquaintance" (Wolcott, 2005:45) between the researcher and the subjects of his research (see also Wolcott, 2005:44).

In this present study, fieldwork is seen and employed as a key method of both qualitative and quantitative research processes. Doing fieldwork under this study, unlike the classical fieldwork in social anthropological sense, I went to the cooperative and collected data through personal interaction with my respondents, open observation on the site and the cooperative's record keeping data was using. I met my respondents in working place. I met them to explain my mission as student doing research for academic purposes and would need their assistance in the form of availing themselves to be interviewed. Fieldwork under this study in contrast to the traditional fieldwork was not conducted over a prolonged period of time (Pole, 2005), neither did it involve "intimate long-term acquaintance" (Wolcott, 2005) though there was some level of close interaction. The fieldwork was carried out for barely four weeks.

3.2. Research Design

This chapter addresses the methodological framework within which the study was conceptualized and undertaken. The chapter focused on the chosen approach to fieldwork that was carried out at Tuzamure Kawa Cooperative in Gakenke district in order to collect data for the study. The study analyzed the factors affecting the quality of coffee processing in Rwanda, using TUZAMURE KAWA cooperative as case study. The chapter further explained the general research method that underlies the study. It was focused on explanation of research techniques and procedures used in the data collection. A face-to-face interview with the respondents was used for the data collection, an open observation on site was done, and the cooperative's record keeping data was gathered. Steps to follow in processing the data collected and the analysis was also presented. The chapter finally shared experiences and lessons learnt from the field.

3.3. Source of data collection

The research was conducted at Tuzamure Kawa Cooperative in Gakenke district. The study was based on both primary and secondary data sources. The primary data is constituted by interview data or what Silverman (2006) calls researcher-provoked data in contrast to natural occurring data. The researcher-provoked data is very crucial since it allows the collection of unexpected data and other information that could not easily be captured in the natural occurring situation. Interviews were used as the main method to generate data. A semi-structured interview guide was designed and used as a tool to carry out formal interviews to obtain information from the respondents. The use of interviews as a qualitative research technique was used to obtain in depth response from the informants. A flexible semi-structured interview guide would better help capture enough information than a structured questionnaire. I used the semi-structured interview guide instead of structured questionnaire because not all the respondents are literates.

The secondary data sources for this study included research from books, newspaper articles, journals, internet materials, individual writings, administrative archives, etc. The primary data was collected through focus group discussion and in-depth interview. The people who were involved in focus group discussion are the Director of the cooperative, two staff, one in-charge of quality and production and other one in-charge of personnel and the workers. And in-depth interview was also carried out with Director of the cooperative, the staff in-charge of quality and production at the cooperative and two staff of OCIR Café both in-charge of quality.

3.4. Qualitative and quantitative research methods

There is said to exist two main conventional ways of doing research; quantitative and qualitative. While some scholars see one as more important, others believe that they could be complementary. The two methods are distinguished from each other with regards to how each of them treats data and how data is collected (Brannen, 1992:4). In quantitative research, variables and variable categories are isolated and defined and brought together to generate hypotheses before the data are collected. But qualitative research often starts by defining very general concepts, and changes definitions as the research progresses (Brannen, 1992:4). However, also studies that are mainly qualitatively oriented may make use of hypothesis, which allowed reform to some degree. Those who see quantitative research as very important argue that quantitative research is about counting and it involves statistical techniques. This has to do with controlling of variables. Qualitative research, on the other hand, seeks to “describe actions within a specific setting and invites rather than

tries to control the possibility of a rich array of variables" (Holliday, 2002:2). In other words, qualitative research tends to investigate uncontrollable social variables directly instead of reducing them. In light of this, Denzin and Lincoln (2005) pointed out that qualitative research entails interpretive and naturalistic approach to the world. This according to them means, "quantitative researchers study things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (quoted in Creswell, 2007:36). Quantitative and qualitative methods, according to Holliday (2002:5), are two separate fields and "do represent very different ways of thinking about the world". Each of them is a field of enquiry on their own right (Denzin and Lincoln, 2000:2). Each or both may be appropriate depending on the research problem one is interested in. This is supported by Silverman (2005:6) who argued that "in choosing a method, everything depends upon what we are trying to find out. No method of research, quantitative or qualitative, is intrinsically better than any other" (See also Silverman, 2006:34; Hamersley, 1992:51).

The choice of a method for a particular study may also be influenced by other factors such, the available financial resources, skills of the researcher, political orientation of the research team, etc. (See for example Brannen, 1992). Thus the decision to use either of the methodologies is not to assert any distinction or down play the importance of the other. Therefore, the alleged dichotomy between quantitative and qualitative methodologies should be questioned. As Hamersley (1992:39) has argued, any distinction "obscures the breadth of issues and arguments involved in the methodology of social research". With regards to this study, the choice of fieldwork approach to data collection was based on my initial assessment of research questions and my assessment of what could be the appropriate methodology. The qualitative and quantitative methods of research were basically chosen for this study based on these assessments.

3.5. Arriving at Tuzamure Kawa Cooperative

As already mentioned, this study sought to analyse the factors affecting the quality of coffee processing in Rwanda using Tuzamure Kawa Cooperative as a case study. After choosing Tuzamure Kawa cooperative as a case study for this study, I immediately contacted the Director of the cooperative and one staff from OCIR Café who is in-charge of quality. I linked up with them before I arrived in Rwanda. As soon as I arrived, I arranged and met with the Director of the cooperative and informed him about details of the study. When I met with him, he also linked me up with some key persons from the cooperative who could be of immense help. After that, I met my contact person from OCIR Café and also informed him about details of the study. These facilitated easy access and entry into the work places of the cooperative and to meet the staff of OCIR Café and to a very large extent the success of the fieldwork.

3.6. Conducting of interviews

The interview process actually began with meeting with the Director of the cooperative after he had already been informed about this study in his Cooperative. Interviews with the respondents from the cooperative were conducted and open observation was done. Obviously, the cooperative's record keeping data was gathered and other relevant 'background materials' on the cooperative was also collected within the period. After collecting data from the cooperative, I went in OCIR Café, conducted interviews with 2 staff of OCIR, both in-charge of quality and collected relevant information about the cooperative and the coffee in general.

3.7. Data processing and preliminary interview analysis

Processing and analysis of data for this study began on the field with the verification of the interviews. The transcripts and other documents collected were later read through. The next step was therefore to do early interview analysis, start interpreting and verifying claims from the respondents. In this regard, all the in-depth interviews were thoroughly read through one after the other and I identified and wrote down key events explanation by the informants. I also made early analytical comments. This exercise, though time consuming, was very helpful in interpreting the data and in organizing the data presentation chapters and also to ensure consistency in the writing process.

3.8. Fieldwork challenges and lessons learnt

It is difficult if not impossible to imagine doing fieldwork in an unfamiliar environment without encountering challenges. The four weeks fieldwork at Tuzamure Kawa cooperative in Gakenke district and at OCIR Café in Capital city to collect data for this study meets with certain challenges. These include methodological, ethical and moral challenges. This section presents the challenges and lessons learned from the field.

The period of research was very short. The study was conducted during July to August 2009 which is the end of the season for coffee. Therefore the case study was done on a recall basis by the respondents. This could have affected the answers of some of the respondents especially those who had difficulty in recalling past information and the open observation on site was not satisfactory because of the small amount of coffee at the washing station. In some cases respondents were too busy and overloaded by their daily assignments and therefore failed to respond to interview, this is mainly the case of the staff of OCIR Café.

CHAPTER 4: OVERVIEW OF THE AGRICULTURAL SECTOR AND COFFEE INDUSTRY IN RWANDA

Rwanda is a small, densely populated, landlocked country in Central-Eastern Africa. The country has 26, 338 sq. km of total area, of which 24, 950 sq. km (94.7 percent) is made up of land; of this, only 8, 600 sq. km (32.7 percent) are suitable for agriculture. The population is estimated at 8.4 million with an annual growth of 2.4 percent; its density is of 311 inhabitants per sq. km. When taking into account the arable area only, this density increases to 955 inhabitants per sq. km making Rwanda one of the most densely populated countries in Africa (Rwanda Development Gateway, 2005).

The Rwandan economy is predominantly based on agriculture. This is reinforced by the quasi absence of minerals and other natural resources, the landlockedness, the current low level of industrialization and the low purchasing power of the population.

4.1. Overview of the agricultural sector

Agriculture is practiced on all land types, including land of marginal quality and steep slopes. Agricultural systems in Rwanda are characterized by small family farms with an average size of 0.76 hectare which integrate polyculture and animal production systems. They are highly labour intensive since the cultivation techniques are purely manual. However, the household's arable land is becoming smaller due to the high population density combined with soil erosion. According to Agricultural, Livestock and Land Use Survey -Saison B/2005, the soil fertility is reducing due to a decline in the number of livestock causing scarcity of manure and compost. This increases the poor people's vulnerability and only a few agricultural households have the opportunity to raise their incomes by being engaged in off-farm activities. The practices of land renting and share cropping exist: on average 10.7 percent of farmland is rented in form of cash or kind (Nkezabahizi D., Shingiro E. and Rwamasirabo S., 2005,). However, the consequence is that people would not make long-term investments where land is being rented.

About 97 percent Rwandan agriculture depends on rainfall. According to FAO (2005), only 8.9 percent of the arable area is irrigated. The suitability of most land in Rwanda for irrigation, given her terrain, is a major constraint, but there could be some good pockets where irrigation could be practiced.

Beans and sweet potatoes are the staples of the Rwandan diet, and are cultivated everywhere in the country. Irish potatoes, sorghum, bananas and maize are grown in the majority of the rural communities, with regional patterns being apparent in some cases.

Majority of the total food production (66 percent) is for family consumption, but surpluses are marketed. However, not all households are able to sell any of their agricultural produce (only 60.3 percent). Crops marketed by smallholders include bananas, potatoes, sorghum, beans, peas and maize which constitute the major sources of cash income for rural households (Nkezabahizi et al., 2005).

Other crops most likely to be sold are coffee, tea and pyrethrum. These perennial export crops are cultivated on 13 percent of the arable land. Recently, there is an emerging diversification with products such as maracuja (passion fruit) and plums developed by

private enterprises that process the fruit into juices and horticultural products (tomatoes and other vegetables) that supply an increasing urban demand.

With regard to agricultural infrastructure, 91 percent of rural communities have a road leading to the community, but in more than a third of cases this is inaccessible for parts of the year (3.4 months on average). Only 14.8 percent of the communities have a weekly or daily market, and the average distance to the market is 4.6 km. Lack of access to markets acts as a serious constraint on developing more commercialized agriculture (Nkezabahizi et al., 2005).

Despite the above constraints, agriculture remains the main source of income in rural areas. The agricultural contribution to the total GDP in 2004 was 40.5 percent while that of industry and services were 21.5 percent and 38.1 percent respectively (Rwanda Development Gateway, 2005).

4.2. Coffee production in Rwanda

Coffee has been grown in Rwanda since its introduction by German Missionaries in 1904. The crop was mainly kept by the colonial administration to respond to the need for coffee that they cherished but also to support the economy of the country. Coffee growing was then made compulsory and the number of coffee producers grew progressively and consequently, the number of coffee trees and the plantation area considerably increased. The National Coffee Board (OCIR) was created in 1945, with the mandate of fixing the qualitative norms and classification systems, generating and diffusing information pertaining to the coffee sector and establishing an environment of cooperation between different stakeholders that are engaged in the coffee sector. In 1998, coffee production occupied around 6.3 percent of the total cultivated land (OCIR, 1998). Meanwhile as production increased, private operators started setting up coffee processing factories.

Rwanda produces Arabica coffee of bourbon and typical species. In general, the coffee tree grows well and gives a sufficient production in regions with altitude between 1400 and 1900 meters, rainfall between 1500 and 1600 mm, temperature between 18 ° C and 22° C and soils with acidity levels (pH) between 4.5 and 6, which are fertile, fragile and quite permeable (MINAGRI, 2004). Even though it is interspersed in all parts of the country, regions of suitability to coffee cultivation were identified relative to the above characteristics (OCIR 1998). For instance the shores of Lake Kivu in the Western province of the country are suitable for coffee growing with very good productivity. The rich volcanic soils, rainfall distribution and clement yearlong temperatures favor the slow maturation of the coffee bean which is good for the coffee taste. The productivity per hectare varies between 1100 and 1600 kg of dry coffee.

In general, the central and southern areas are moderately suitable for coffee growing with the yield varying from 200 to 900 kg of dry coffee per hectare. The highland region in the Northern Province is unsuitable for coffee because of very low temperatures. The lowland region of the eastern province is also not suitable for coffee growing due to insufficient rainfall and longer dry season; the soil fertility is too low for the coffee crop (OCIR 1998, MINAGRI, 2004). Mulch and manure are mainly used to maintain soil fertility and sometimes, depending on their availability, few chemical fertilizers are also used. Coffee is harvested between the months of March and July (MINAGRI, 2004).

Almost all produced coffee is exported as its domestic consumption is quite low. The high volume importers include European countries France, Switzerland, United Kingdom and Belgium and the USA. Figure 2 shows the trends in production along with the exports.

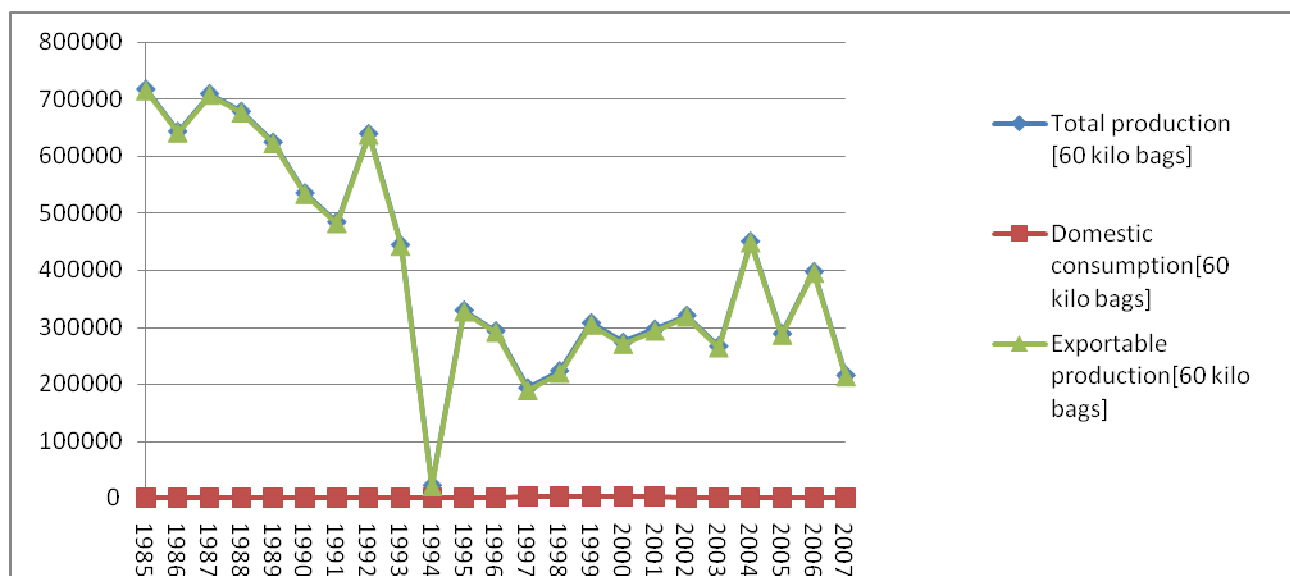


Figure 4. 1: Coffee's production and exports evolution since 1985

Source: ICO, Statistics on Coffee

Apart from productions recorded during the period in the 1980's and some scattered peak years (1992, 1999, 2002 and 2004 and 2006) the country's coffee production was declining with the more pronounced impact in 1994. However, even from 1993 farmers had started neglecting coffee. Throughout the period, exports have been following the same trends.

Some of the causes which led to the fall of production are poor fertility of coffee plantations and poor performance of coffee extension activities. This degradation is also associated with massacres and genocide: many coffee producers were killed while others went into a prolonged exile; coffee extension workers were very few, which resulted in a lack of follow-up and supervision for coffee producers to care for the crop. Research on coffee was also disrupted following the shortage of necessary means (OCIR, 1998). It is in the present decade that the crop is again taking off.

Although the above-mentioned factors are undoubtedly important, external factors also need to be mentioned. These include the big reduction in coffee prices on the international market maintained on a low level due to overproduction of coffee in countries like Brazil and Vietnam. Since the competitiveness of Rwanda coffee is being based solely on the price, the consequences of the fall in the market price have had a huge impact on Rwandan coffee sector. As the evolution of price paid to the producer in comparison with prices at the international market shows in Figure 3, Rwandan coffee producers continue to receive very low prices (OCIR, 2005).

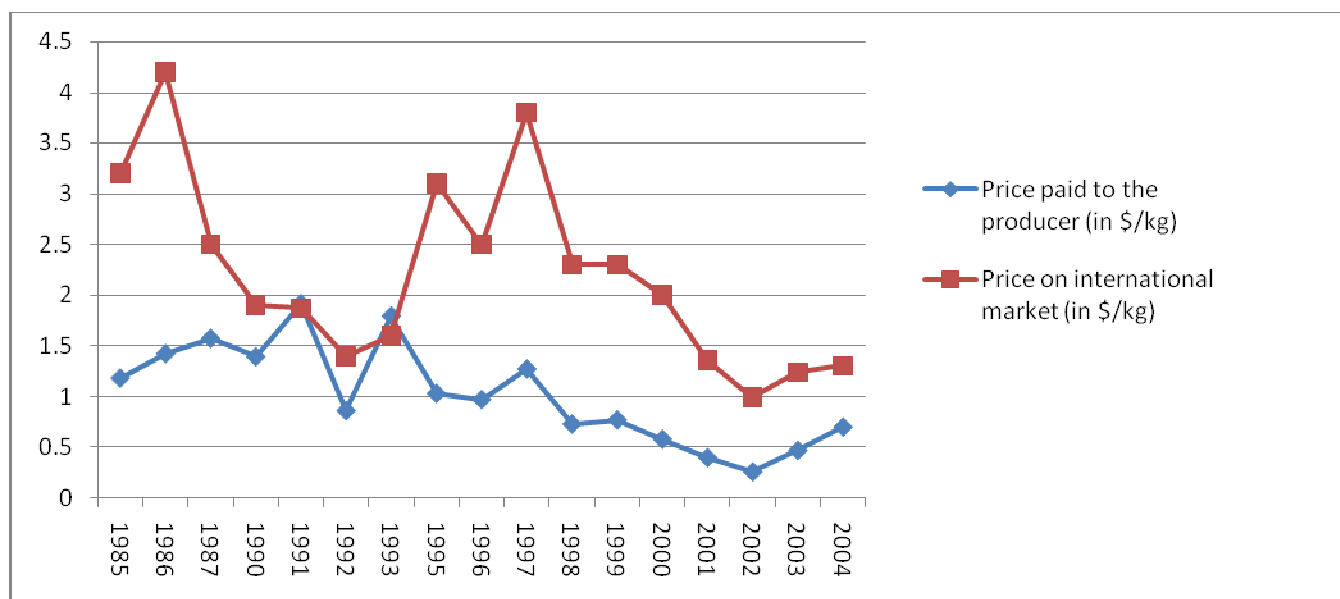


Figure 4. 2: Evolution of price paid to the producer from 1985 to 2004

Source: OCIR, 2005

In general, similar trends can be observed in fluctuations in world prices and the price paid to the producer. However, the gap is quite big: the price paid to the Rwandan growers was higher than 1.5\$ per kg only in 1987, 1991 and 1993 while international prices went even up to almost 4.5\$/kg. Moreover, at specific times, the changes at world level are not reflected to the producers' level. For instance, while in 1997 the world prices shoot up, there was only a small increase in the price to the growers. This means that producers are not largely the beneficiaries of the earnings from coffee (OCIR, 2005).

The result of the declining production and relatively lower returns from coffee resulted in farmers' lack of motivation. The coffee-covered area decreased gradually as some coffee fields were left untended, which led to their deterioration. During 1995, the number of neglected coffee-trees was estimated at 60 percent and some of the coffee-trees continued to be neglected (OCIR, 1998). For all these reasons, coffee production and quality have been seriously reduced, propelling the sector in a vicious cycle of «low quantity-low quality» loop. This is illustrated in Figure 4.



Figure 4. 3: Evolution of Rwanda Coffee Quality

Source: OCIR, 2005

The quality of coffee depends on the maintenance of coffee trees in the cultivation stage. Other problems include inefficient systems of quality control in processing, insufficient price differentiation in relation to quality and excessive competition among factories and exporters (PSTA, 2004). The methods used by farmers in processing are traditional (depulping by stone) and were quite adequate when the quantity was low. However, with increasing quantity the traditional system failed and quality deteriorated. There were only a few washing stations, also lacked the appropriate equipment.

To meet the above challenges, since 1998 the Government, through OCIR Café, has undertaken a promotional programme of investing in coffee production. The changing trends include the replacement of old varieties by more performing varieties, improving the general plantations' condition (weeding, mulching, pruning), using inputs (fertilizers, pesticides against diseases and pests), as well as the restructuring of the producers' environment (establishment and support given to producers' associations) in order to progressively take care of all the activities pertaining to output's increase (MINAGRI, 2006).

The coffee quality is also being improved through making growers sensitive to producing high-quality coffee, strengthening the cooperative spirit within coffee producers' associations for the establishment of washing stations and encouraging private operators to invest in washing stations (MINAGRI, 2006). Results have started to show as the overall coffee production is now being revitalized in the different coffee producing regions of the country. Coffee production increased from 14,268 tonnes of green coffee in 1998 to 29,000 tonnes in 2004 (PSTA, 2004; MINAGRI, 2006); and the overall quality of coffee production has improved with high-quality coffee rising from 19.2 percent in 2000 to 45 percent in 2005 (OCIR, 2005).

The remaining issue is to fairly distribute the increased incomes generated by the industry so that these reach the producer in relation to the effort, money and time spent in growing coffee. This is realized through the active participation of coffee growers to coffee marketing, mainly through their cooperatives.

4.3. Coffee supply chain in Rwanda

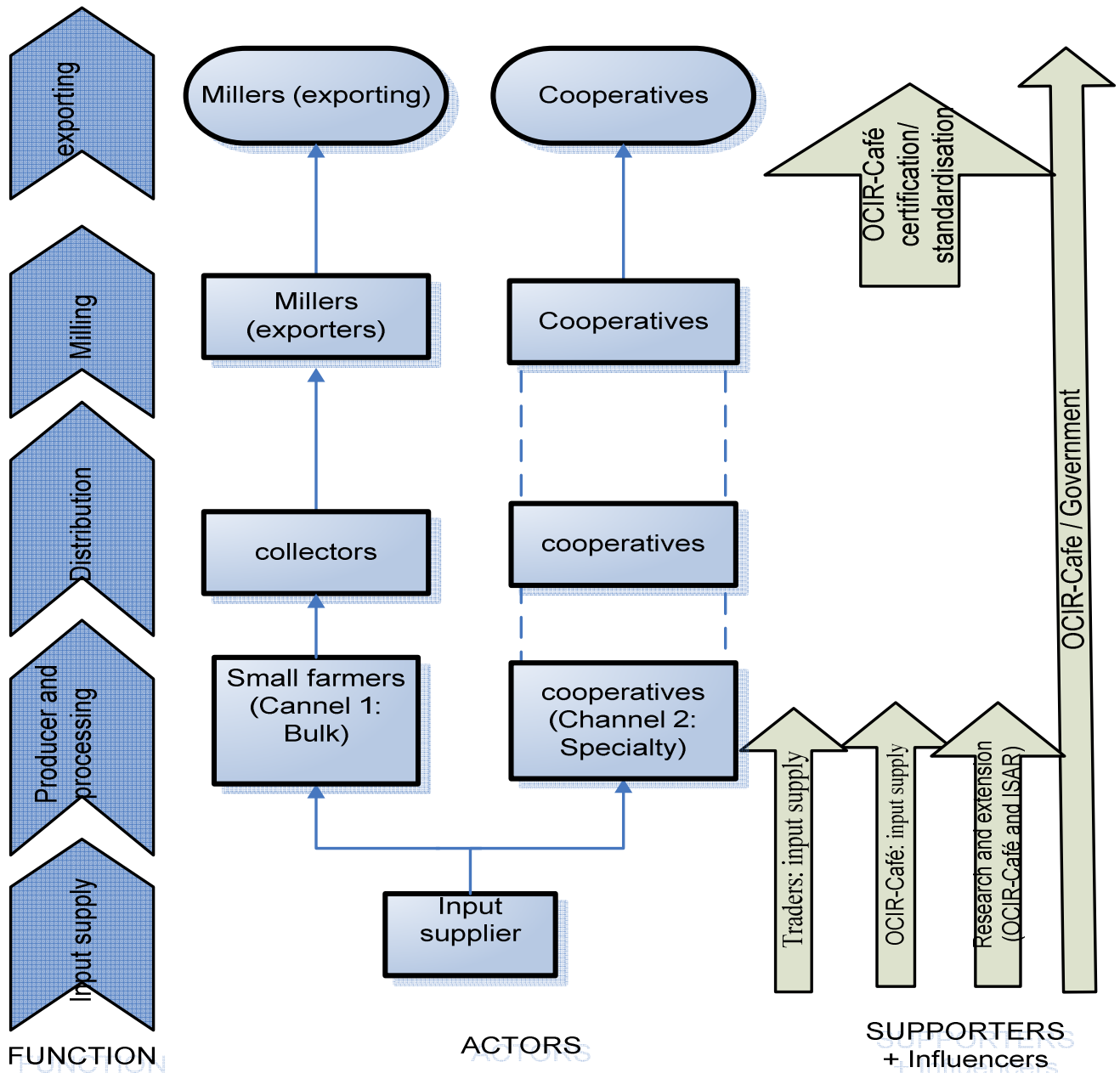


Figure 4. 4: Coffee supply chain in Rwanda

Cooperatives buy berries from farmers, either members or neighboring non-members. These berries will be processed into parchment coffee at the cooperatives' washing stations. The operational area of the cooperatives is also an arena for other buyers such as private

operators who might own mini-washing stations. These also buy the berries, but mainly from the non-members and undertake the same processing into parchment coffee. The bad quality berries or the produce of the non-members who do not trade at all with cooperatives are processed by farmers themselves who sell them as dry coffee to the traders.

The exportable coffee from Rwanda is green coffee. The transformation of berries into parchment coffee takes place through the process of depulping and drying. The subsequent transformation into green coffee by hulling (to remove the parchment) is performed either by cooperatives (few own the hulling machines) or 'hulling and exporting' companies. These are Rwacof, Rwandex, Sicafe, Coffee Business Center, Agrocoffee and Caferwa. A small proportion of green coffee is roasted and domestically consumed, and the major share is exported.

After obtaining the exporting certificate from OCIR, coffee is exported either to Europe (France, Belgium, Switzerland, etc.), USA or new niches in Asia (eg. China). Cooperatives sometimes operate through Fair Trade markets (where they are guaranteed a minimum price) and/or other international markets depending on the markets they have access to through their marketing unions.

4.4. Description of the case study

The TUZAMURE KAWA cooperative is located in Gakenke district with the altitude between 1500-2000m, the rainfall is between 1200-1600mm per year. This region is suitable for coffee growing with good productivity. Gakenke district is located in Northern Province. It borders with Rulindo district in the East, Nyabihu district in the West, Burera and Musanze districts in the North, and Kamonyi and Muhanga districts in the South.

The District covers a surface area of 772.4 km² with a population of 349,094 inhabitants and a population density of 463/km². The administrative structure of Gakenke district is made up of 19 sectors, 97 cells and 617 villages. The principle crops grown in Gakenke District include coffee which is grown on 1,028ha with a production capacity of 4,127.781 tones, pineapple grown on 745ha with 38,756 tones worth of harvest annually, maracuja which is practiced on 442.6ha producing 4,585 tones, and silk grown on 21ha producing 649kg of silk. The District grows also hybrid maize on 642ha producing 3,210 tones, beans grown on 2,850ha producing 5,700 tones, and cassava cultivated on 75ha producing 1,875 tones (<http://www.gakenke.gov.rw/>).

The TUZAMURE KAWA cooperative was created in 2005. In Kinyarwanda, the national language of Rwanda, the cooperative's name means "promoting coffee". The main objective of the cooperative is to produce and market a high quality coffee in order to increase revenues for its 2500 members. The cooperative is governed by an elected Board of the Cooperative for two years term. The Director reports to the Board of the Cooperative. The Bureau of the Board of the Cooperative is composed of the Chairman, Vice Chairman, the Organizing Secretary and three Advisors.

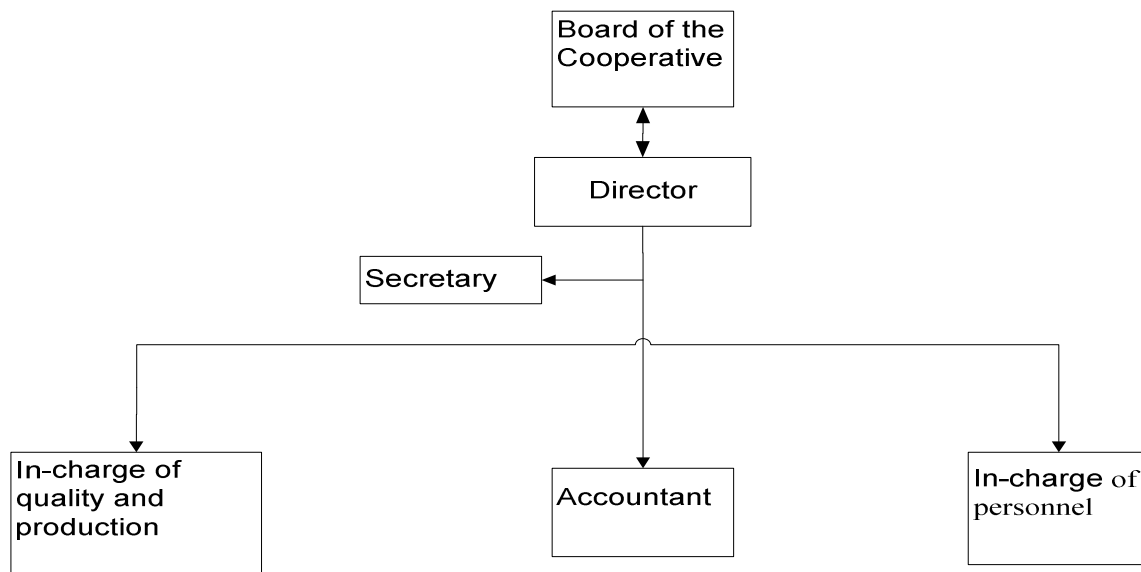


Figure 4. 5: Organizational structure of the Tuzamure Kawa cooperative

The main duties of the Director of the Cooperative are to supervise the Cooperative staff in its activities, coordinate, prepare directive and control activities at Cooperative level on the basis of the decisions taken by the Board of the Cooperative and administrative matters. He also supervises the technical activities executed at Cooperative level; controls the use of Cooperative assets and prepares reports for the Board of the Cooperative. He is also responsible for improvement of the skills and experience of the staff of the Cooperative by providing training opportunities to reinforce their capacities. The tasks are assigned to the staffs according to the objectives of the Cooperative.

In 2006, the cooperative constructed a washing station. The cooperative buys coffee cherries from member growers. The cherries pass through the wet and dry processing. This system is fully integrated so that the quality of the product is monitored along the chain. The focus is put in producing a high quality coffee that is able to compete in the coffee international market. Rwandan coffee farmers usually pulp or peel the husks off their coffee at home but do not wash due to the lack of clean water. The coffee washing station gets its water from a spring in a nearby mountain.

CHAPTER 5: FINDINGS AND DISCUSSION

5.1. Processing fresh cherry

Coffee processing transforms fresh coffee cherries into clean, green bean of 9-12.5% moisture ready for export or for roasting (OCIR, 2008). This process involves harvesting, pulping, fermenting, washing, drying, hulling, cleaning, grading, sorting, storing and transporting green beans. The process can be broadly divided into two main components - Wet Processing (cherry to dry parchment) and Dry Processing (dry parchment to exportable green bean). The cooperative studied buy coffee cherries from member growers.

It is important to understand that each of these steps has an influence on the final quality of coffee produced. Processing is a chain of activities aimed at achieving a coffee of high quality. If any link in the chain is broken (such as over-fermentation, mould contamination, taints or odours or physical damage to the bean) then that loss in quality can never be regained.

In every step, therefore, there are certain factors which influence the quality of the product.

5.1.1. Wet Processing

The research findings show that there are certain factors which are influencing the processing of coffee at Tuzamure Kawa cooperative:

- The coffee-processing season coincides with the rainy season (March-August). The rural access roads in the coffee growing areas are not accessible during the rains. This affects the coffee yields and quality because some farmers are forced to wait for the rains to subside in order to harvest and by then most of the coffee will be overripe or dry.
- During the coffee peak season, coffee is harvested in large quantities and therefore hand sorting before pulping becomes difficult and as a result, many coffees are pulped straight as it comes from the farms. Most of it reaches the factory well after sunset and darkness has set in. The pulping continues even at night because the coffee must be processed the same day. Many damaged or defective beans are pulped together with the good coffee and this leads to quality loss.
- Pulping must be accomplished within 12 hours of harvesting in order to maintain the quality. The peak-processing season is characterized by some machine breakdowns and congestion at the pulping station which causes delays in pulping of the coffee. This reduces the quality of the coffee. Poor adjustment of the pulping machine may cause broken/nipped beans, which are considered as defects and lowers the quality.
- Fermentation is very critical in terms of final coffee quality. During the periods of bad weather coupled with the peak season, coffee takes longer time to dry. Continuous inflow of coffee from the farms causes serious congestion in all the stages and mainly in fermentation and drying. Coffee has to be held in the fermentation tanks for longer periods than necessary, which causes over-fermentation. Over-fermentation affects the final taste and flavour.

- Final washing of the coffee requires a lot of water. Lack of enough water results in incomplete washing and the coffee will start the drying process when it has some residues of the mucilage. This renders the coffee susceptible to attack by microorganisms and formation of mycotoxins, thus lowering the quality.

The skin of the fresh cherry is physically removed using a pulper machine with addition of water (pulping). The sugar coating (mucilage) is allowed to ferment for 2 days and then the parchment is washed thoroughly to remove all traces of fermented mucilage (PEARL, 2005). The parchment is dried until the bean inside reaches 11% moisture. This process produce high quality coffee, but requires large quantities of water and requires very good management of the fermentation and washing process to ensure the coffee flavour is not damaged in the process.

5.1.2. The drying process

In Tuzamure Kawa cooperative, drying is done in full sun on raised tables or trays with a mesh base (Figure 6). Drying should remove moisture from the coffee bean in a slow continuous process until the bean is at 11% moisture. Drying coffee directly dirty surfaces can lead to dirty or earthy flavours in the finished coffee. Re-wetting of the coffee or storage of partially dried coffee due to rain is a major problem facing sun-dried coffee. Drying coffee too slowly by spreading it too thickly on drying areas is also a major problem. Each of these situations can lead to fermented or fruity flavours in the coffee along with mould growth producing mouldy or musty flavours.



Figure 5. 1: The parchment is dried on a clean, flat surface in full sun

Controlling the drying process to ensure that coffee is not over-dried is important. Over-dried coffee is easily damaged during hulling and may also result in a bland flavour in the final cup. Parchment coffee dries in about 10 to 14 days (PEARL, 2005). During the process, coffee must be covered with polythene or plastic sheets if rain occurs and every night to stop re-wetting those results in mould development. Coffee is fully dry when green bean is a translucent, jade green color and 9-12.5% moisture content.

5.1.3. Storage of dry parchment

Storage of coffee after drying is also a stage, which can affect coffee quality. During wet and dump weather conditions, the coffee can reabsorb moisture, which will lead to loss of quality. Once parchment has been dried so that the green bean has reached 11% moisture, it can be stored while the cooperative decides when it will be hulled. Mould can grow on stored coffee if it has not been dried sufficiently before storage or if the stored coffee absorbs moisture from the atmosphere due to humid conditions. This can lead to mouldy or musty flavours. Storage areas must be kept isolated from strong smelling liquid such as petrol or diesel, or agricultural fertilisers and chemicals, as stored coffee can take on these odours that will continue to the final cup.



Figure 5. 2: Jute bags for storing parchment coffee

Parchment coffee or dry cherry is stored on-farm in either jute bags (Figure 7) sometimes covered with polyethylene covers, or in woven polyethylene sacks covered with a polyethylene sheet, or in special polyethylene bags or silos. If not carefully managed, parchment or green bean stored in uncovered jute sacks in a moist climate will absorb moisture and go mouldy. Poorly ventilated warehouses and relative humidity situations over 65% will create mould problems (Nguyen Van Thuong, Tran Kim Loang, Phan Thanh Binh, Ha Thi Mao, Ho Thi Phuoc, and staff of WASI, Le Anh Tuan, Bach Than Tuan, Go Nuc Bin, Pham Van Tam and staff of CAFECONTROL, 2006).

5.1.4. Hulling and sorting dry parchment

Hulling dry parchment is a mechanical process to remove the dry parchment skin and silver skin from the green bean. If the huller is set incorrectly or the coffee is over-dry and brittle, coffee beans can be damaged. If the coffee is too wet the beans can be crushed. There are a range of machines that are able to clean and sort hulled coffee by colour, size, density and aerodynamic shape. Ultimately the human eye is used as the final process to 'hand-sort' coffee ready for export. However, even with the wide range of machinery available, coffee that has picked up off-flavours but otherwise looks normal, cannot be sorted, and is only identified in the cup when it is too late.

5.1.5. Storage of green bean

Stored, green bean is very susceptible to contamination from nearby chemicals or fuels. Storage and shipment of green bean in jute sacks that have been made on machinery lubricated with petroleum oils, can lead to a 'baggy' or 'oily' taste in the coffee. Use clean, jute sacks specially made for coffee.

Green bean that is stored for long periods in hot and humid conditions is liable to absorb moisture from the atmosphere with resultant mould producing musty flavours. To ensure minimum spoilage, beans in jute sacks or woven poly bags should be evenly stacked in a well-ventilated area that remains at less than 65% relative humidity (Figure 7). After some time in storage, the bean surface begins to oxidise leading to 'woody' taints. Coffee beans should not be stored for longer than 12 months as the beans fade and mottle (Josephs S. and Kanampiu J., 2008).

5.1.6. Transport

The cooperative studied, sells his coffees with buyers that ensure themselves transport. However, transportation of the green coffee from Rwanda to the main consuming countries is the first by the road (Kigali-Dar-salaam) then by sea, which exposes the coffee to warm and humid conditions. Reabsorption of moisture from the air may occur which will encourage mould growth.

Storage and transport pose similar risks to coffee quality. Re-wetting of beans due to leaky tarpaulins or high humidity inside hot containers standing for long periods in tropical ports, can result in the coffee developing mouldy or musty flavours.

5.2. Quality evaluation process

The product (green coffee) of the cooperative will be then tested by the OCIR Café (Coffee Board) for certification/standardization before exportation. In an effort to standardize the process of evaluating the cup quality of coffee samples, the OCIR-Café chose to use the quality evaluation process described in the *Coffee Cuppers Handbook* by Ted Lingle (Third edition, 2001) and published by the Specialty Coffee Association of America (SCAA) which is different with what we say in the literature given in chapter 2.

The SCAA approach is a systematic, sensory evaluation process of a coffee. The process is divided into five evaluation steps with each step scoring from 1 to 10 points. A sixth step is added to give the coffee a Cupper's Point or Balance score from -5 to +5. For convenience, 50 points is then added to the resulting score to give a score out of 100.

Table 5. 1: Six step SCAA evaluation process

	Step	Ranking on	Rating	Scale range
1	Fragrance of the ground coffee + Aroma of the coffee liquor	Preference	1 to 10	very poor to outstanding
2	Acidity of the liquor	Intensity	1 to 10	very flat to very bright
3	Flavour of the liquor	Preference	1 to 10	very poor to very bright
4	Body of liquor	Intensity	1 to 10	thin to heavy
5	Aftertaste of the liquor	Preference	1 to 10	very poor to outstanding
6	Cuppers Points or Balance	Taster's overall preference	-5 to +5	very poor to outstanding

The fully-washed Arabica coffee is classified in 5 grades (Grade 1 to grade 5):

- a) **Class 1 Specialty Grade:** should receive 90 to 100 points. Not more than 5 full defects in 300 grams of coffee. No primary defects allowed. A maximum of 5 % above or below screen size indicated is tolerated. Must possess at least one distinctive attribute in the body, flavour, aroma, or acidity. Must be free of cup faults and taints. No Quakers are permitted. Moisture content is between 9-12.5%
- b) **Class 2 Premium Grade:** should receive 80 to 89 points. Not more than 8 full defects in 300grams of coffee. Primary defects are permitted. A maximum of 5 % above or below screen size indicated is tolerated. Must possess at least one distinctive attribute in the body, flavour, aroma, or acidity. Must be free of faults and may contain only 3 Quakers. Moisture content is between 9-12.5%.
- c) **Class 3 Exchange Grade:** should receive 70 to 79 points. 9-23 full defects in 300 grams. Primary defects are permitted. A maximum of 5% above or below screen size indicated is tolerated. Must possess at least one distinctive attribute in the body, flavour, aroma, or acidity. No cup faults are permitted and a maximum of 5 Quakers are allowed. Moisture content is between 9-12.5%.
- d) **Class 4 Below Standard Grade:** should receive 60 to 69 points, 24-86 full defects in 300 grams.
- e) **Class 5 Off Grade:** should receive 50 to 59 points, more than 86 defects in 300 grams.

The highest score obtained by the cooperative studied was 89 points (**Premium Grade**) nearby **Specialty Grade** and the lowest was 73 points (**Exchange Grade**) in 2008. Care must be taken during the coffee production and processing stage to produce the highest level of quality at the cup. With the highest level of quality, the price will be more and will provide potential profit level that can provide the economic motor needed in the area of the cooperative that will contribute to national economic growth.

5.3. Economical Analysis

The washing station is a necessary investment to produce a fully washed coffee, which is sold in the specialty coffee market at high prices. The purpose of this section is to find what has been the profitability of the Tuzamure Kawa cooperative for last year.

1) Coffee cherry purchasing costs

The cooperative buys coffee cherries from coffee growers, members of the cooperative. In 2008, the price was Frw 150 per kilogram of coffee cherries, roughly equal to Frw 750 per kilogram of parchment coffee. Other coffee growers were paid Frw 600 per kilogram of parchment coffee in the bulk channel. Table 5.2 shows the quantity of coffee cherries produced in 2008 by the growers' member of the cooperative and the costs of purchasing the raw coffee.

Table 5. 2: Costs of purchasing coffee cherries

Year	2008	Total
Production of coffee cherries (kg)	561,314.00	
Price per kilogram	150.00	
Cost of coffee cherries		84,197,100.00

Source: Report of the TUZAMURE KAWA cooperative, 2008

2) Wet processing costs

They include overhead staff and temporary labor costs to carry out the wet processing activities. Temporary labor costs consist of costs of de-pulping, washing and drying, grading and sacking the parchment coffee. The table 5.3 shows the labor costs of the wet processing function.

Table 5. 3: Labor costs related to wet processing

Year	2008	Total
a. Quantity of coffee cherries (kg)	561,314.00	
b. Average variable cost/kg of wet processing (Frw)	11.00	
c. Variable labor costs of wet processing (Frw)		6,174,454.00
d. Average fixed cost/kg of wet processing (Frw)	14.00	
e. Fixed labor costs of wet processing (Frw) / = (a*d)		7,858,396.00
Total labor costs of wet processing (Frw)		14,032,850.00

Source: Report of the TUZAMURE KAWA cooperative, 2008

3) Dry processing costs

These costs include overhead staff and temporary labor costs to carry out the dry processing activities. The table 5.4 shows the labor cost related to dry processing

Table 5. 4: Labor costs related to coffee dry processing

Year	2008	Total
a. Quantity of parchment coffee (kg): 5kg of coffee cherries give 1kg of coffee parchment	112,262.80	
b. Average variable costs of dry processing (Frw)	12.38	
c. Variable labor costs of dry processing (Frw)		1,389,813.464
d. Average fixed costs of dry processing (Frw)	14.00	
e. Fixed costs of dry processing (Frw)/ $= (a \times d)$		1,571,679.20
Total labor costs of dry processing (Frw)		2,961,492.664

Source: Report of the TUZAMURE KAWA cooperative, 2008

4) Transport costs

Coffee cherries need to be processed within 12 hours of picking; otherwise can start fermenting, consequently reducing the quality of the coffee and its monetary value. Transport costs were computed for coffee collected at more than 7 km from washing station. Transport costs also encompass costs of moving the parchment coffee to a milling factory located about 80 km from the washing station. Transport costs include also costs of moving green coffee from milling factory to OCIR Café for certification and standardization. The table 5.5 establishes the types of transport costs.

Table 5. 5: Transport costs

Year	2008	Total
Bringing coffee cherries to washing station (Frw)		950.000
Quantity of parchment coffee (kg)	112,262.80	
Average cost/kg of moving parchment coffee to hulling factory (Frw)	20.00	
Moving parchment coffee to hulling factory (Frw)		2,245,256.00
Quantity of green coffee (kg)	76,369.25	
Average cost/kg of moving green coffee to OCIR Café for certification (Frw)	6	
Moving green coffee to OCIR Café		458,215.5
Total transport		3,653,471.5

Source: Report of the TUZAMURE KAWA cooperative, 2008

5) Costs of supplies of the cooperative

There are costs of supplies for maintaining fields for farmers, fuel oil, hiring machines for hulling, repair and maintenance. Packaging materials to the parchment and green coffee were also added to the cost of supplies. Table 5.6 shows the types of supplies.

Table 5. 6: Costs of the cooperative's supplies

Year	2008	Total
a. Quantity of parchment coffee (kg)	112,262.80	
b. Quantity of coffee/bag (kg)	60.00	
c. Number of bags / $= (a/b)$	1,871	
d. Cost of one bag (Frw)	1000.00	
e. Cost of bags for parchment coffee (Frw)/ $= (c*d)$		1,871,000.00
f. Cost of hiring machines for hulling (Frw/kg)	25.00	
g. Total cost of hiring machines for hulling $= (a*f)$		2,806,570.00
h. Quantity of fuel oil (l)	750	
i. Cost of one litter of fuel oil (Frw)	825	
j. Total cost of fuel oil (Frw) $= (h*i)$		618,750
k. Quantity of green coffee (kg)	76,369.25	
l. Quantity of coffee/bag (kg)	60.00	
m. Number of bags / $= (k/l)$	1,273	
n. Cost of one bag (Frw)	1000.00	
o. Cost of bags for green coffee (Frw)/ $= (m*n)$		1,273,000.00
p. Repair and maintenance cost (Frw)		250,000.00
q. Number of farmers	2,500	
r. Cost of materials to maintain fields for one farmer (Frw)	2,795.23	
s. Total cost for maintaining fields $= (q*r)$		6,988,075.00
Total costs of supplies (Frw)		13,807,395.00

Source: Report of the TUZAMURE KAWA cooperative, 2008

6) Fees charged by OCIR Café

This table below shows the fees charged by OCIR Café for the cooperative

Table 5. 7: Fees charged by OCIR Café

Year	2008
a. Quantity of green coffee (kg)	76,369.25
b. Cost of one kg (Frw)	11
c. Fees charged by OCIR Café	840,061.75

Source: Report of the TUZAMURE KAWA cooperative, 2008 and OCIR Café

7) Processing and marketing costs

This table below summarizes the costs of processing and marketing for the cooperative.

Table 5. 8: Total costs of processing and marketing

Year	2008
a. Cost of coffee cherries (Frw)	84,197,100.00
b. Labor costs of wet processing (Frw)	14,032,850.00
c. Labor costs of dry processing (Frw)	2,961,492.664
d. Transport costs (Frw)	3,653,471.5
e. Supplies costs (Frw)	13,807,395.00
f. Fees charged by OCIR Café	840,061.75
Total processing and marketing costs (Frw)	119,492,370.9

Source: Report of the TUZAMURE KAWA cooperative, 2008

8) Sales and prices

This table below shows coffee sales in kilograms and total benefits in Rwandan currency

Table 5. 9: Sales and revenue by the cooperative

Year	2008	Revenue (Frw)
Quantity of green coffee (Kg)	76,369.25	
Quantity of green coffee (Premium Grade) sold to 2,788.5Frw/kg	2,640	7,361,640
Quantity of green coffee (Premium Grade) sold to 2,646.5Frw/kg	34,705	91,846,782.5
Quantity of green coffee (Exchange Grade) sold to 1,787.5Frw/kg	39,024.25	69,755,846.88
Total revenues in Frwa		168,964,269.4

Source: Report of the TUZAMURE KAWA cooperative, 2008

Profit of the cooperative = 168,964,269.4 - 119,492,370.9= Frw 49,471,898.5

This economic analysis shows that farmers were paid 150 Frw/kg of coffee cherries. Using the conversion factor of 5 from coffee cherries to parchment coffee, this price is equivalent to 750Frw/kg of parchment coffee. Results on the economic analysis have implications for farm-level profitability. The 150Frw/kg of coffee cherries paid to coffee growers offers economic incentives to coffee growers members of the cooperative compared with the no members of the cooperatives who received 600Frw/kg of parchment coffee. Farmers will be expected to respond positively to the coffee price paid by the cooperative by replacing old trees and maintaining coffee fields, resulting in an increase in coffee productivity. Furthermore, interviews conducted with non-coffee growers and non-members of the cooperative in Gakenke district found that they are willing to invest in the coffee enterprise in response to greater revenue received by farmers delivering coffee cherries to the cooperative.

In 2008, the green coffee of the cooperative was sold in Japan and United Kingdom. With the current government policy, there is no tax applied for the cooperatives in Rwanda in order to promote small farmers. The economic analysis shows a positive net value of **Frw 49,471,898.5**. This result indicates that investing in coffee processing is profitable for the cooperative. These findings are encouraging and can be used as guidelines for other similar cooperatives and private investors planning to produce for high quality coffee markets.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

The research paper assessed the quality in producing for the speciality coffee market, using the TUZAMURE KAWA cooperative as a case study. Objectives of the study were to analyze the factors affecting the quality of coffee produced by the cooperative and to define the economic profits of coffee processing by the Cooperative. Primary and secondary data were collected in July-August 2009 from the cooperative and other coffee stakeholders working closely with them.

Coffee processing is done with insufficient inputs. Limitations in transport due to less accessibility, bad road conditions in rain season or few vehicles, unexpected breakdown of processing equipment and transport vehicles result in the delay in processing freshly harvested cherries leading to defects and lower quality of the product. Re-wetting of the coffee or storage of partially dried coffee due to rain and drying coffee too slowly by spreading it too thickly on drying areas are problems that cause also a lower quality. Improper use of packaging materials and sorting coffee without proper care is also affecting the quality of the final product.

The results of the economic analysis can serve as a guide for a private investor planning to build a washing station. The task for private investors will be to find what mechanisms will link them to the coffee growers so that they can deliver coffee cherries to the station. Since large-scale coffee plantations that can produce sufficient volume for export are nonexistent in Rwanda, private investors could implement a large-scale farming model.

Investing in coffee processing is also away to eliminate some of the intermediaries, leading to a reduction in high transactions costs of the bulk channel, permitting an increase in the farm gate price. The specialty coffee channel provides some cost savings compared to the bulk coffee channel.

Recommendations:

1. Acquiring management and marketing skills: The training of the management team of the cooperative about the quality, coffee cupping, market access and business management will hopefully to enhance the performance of the cooperative. The key factor for the cooperative's success is to have a strong committee team with strong management and marketing skills then the management team will give the training to the workers about the quality.
2. Coffee milling factory: the cooperative need to build a coffee milling factory that will reduce the cost of hiring machines for hulling.
3. Offering incentives to coffee growers: Since there is a growing number of washing stations in neighbouring areas of the Tuzamure Kawa Cooperative, we recommend the cooperative to provide market incentives to coffee growers so that they are committed to supply the high quality raw coffee to the washing station. The price and premiums paid to farmers will need to be competitive in the region, which can guarantee the cooperative to continuously process sufficient and high quality coffee cherries.

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APPENDICES

Appendix 1: Pictures showing the summary of coffee processing

1



Pre-sorting of cherries. Quality control is critical for obtaining a high quality coffee.

2



Washing and sorting

3



Sorting before drying

4



The parchment is dried on a clean, flat surface in full sun

Appendix 2: Coffee's production and exports evolution since 1985

[60 kilo bags]
(000 bags)

Year	Total Production	Exportable production	Domestic consumption
1985	717	716	1
1986	643	642	1
1987	709	708	1
1988	678	677	1
1989	624	623	1
1990	535	534	1
1991	484	483	1
1992	639	638	1
1993	444	443	1
1994	22	21	1
1995	329	328	1
1996	293	292	1
1997	193	190	3
1998	223	220	3
1999	307	305	2
2000	273	271	2
2001	296	294	2
2002	320	319	0
2003	266	265	0
2004	450	449	1
2005	288	287	1
2006	397	396	1
2007	215	214	1

Source: ICO, Statistics on Coffee

Appendix 3: Evolution of the price paid to the producer from 1985 to 2004

Year	1985	1986	1987	1990	1991	1992	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Price paid to the producer (in \$/kg)	1.18	1.42	1.57	1.39	1.91	0.86	1.79	1.03	0.97	1.27	0.73	0.77	0.58	0.4	0.26	0.47	0.7
Price paid to the producer (in Rwf/kg)	120	125	125	115	115	115	115	300	300	385	260	260	250	200	150	250	400
Price on international market (in \$/kg)	3.2	4.2	2.5	1.9	1.87	1.4	1.6	3.1	2.5	3.8	2.3	2.3	2.00	1.36	0.99	1.24	1.3

Source: OCIR, 2005