



**EFFECT OF QUALITY OF RICE PRODUCED ON CONSUMER SATISFACTION IN COPRORIZ-COOPERATIVE
GATSIBO DISTRICT, RWANDA**



Research project submitted to Van Hall Larenstein University of Applied Sciences in partial fulfillment of
the requirements for the Master Degree in Agricultural Production Chain Management - Horticulture
Chains.

BY

GAUDENCE MUKAMURENZI



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September 2018

The Netherlands

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Acknowledgements

Special thanks go to my supervisor Koen Janssen who agreed to supervise this research thesis and his valuable guidance and advice that have helped me to deliver this quality work. I am also grateful to the intellectual contribution of all my lectures at Van Hall Larenstein University who provided me with a required skilled package which helped me to conduct this research work.

I would like also to extend my deepest appreciations to the Netherlands Government who granted me a fellowship, through their NFP Program, due to your sponsorship at Masters Level.

I would like to appreciate my beloved sisters and brothers no words to express my deepest appreciation and feeling over your moral support right from primary level up today as I say this you might not clearly remember your contribution but you have been ever behind my education pushing me, providing guidance, your encouragement, advices and follow up at least today have provided the product that is visible, touchable and presentable today.

Last but not least my appreciation and thank to my fellow students for their moral support and encouragement.

Dedication

This thesis is dedicated to all who supported me during the period of the study

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LIST OF ABBREVIATIONS

COPRORIZ: Cooperative des Producteurs de Riz

EAC: East African Community

GOR: Government of Rwanda

Kg: Kilogram

MINAGRI: Ministry of Agriculture and Animal Resources

MINICOM: Ministry of Trade and Industry

MT: Metric tons

NGOs: Non-Government Organization

NISR: National Institute of Statistics of Rwanda

NRDS: National Rice Development Strategy

RAB: Rwanda Agriculture Board

RCA: Rwanda Cooperative Agency

RSB: Rwanda Standard Bureau

RSSP: Rural Sector Support Project

Rwf: Rwandan Francs

SPSS: Statistical Package for the Social Sciences (Tool for analysis)

ABSTRACT

Rice quality is one key factor affecting consumption of rice not only in Rwanda but also in Africa, however the consumption of local rice remains low. This study aims to investigate the effect of rice quality produced on customer satisfaction in Rwanda. A total sample size of 77 respondents, was sampled. Multi stage sampling techniques was used to select respondents using structured questionnaire. Cross section survey that collected qualitative and quantitative data was employed in this study. Both Primary data and secondary data was collected. The structured questionnaires was designed to extract information on production, post- harvest, quality, processing factors and levels of satisfaction on rice quality in the study area. The data was estimated using descriptive statistics and correlations in SPSS software. The results of the study revealed that the production factors affecting rice quality were extension services (85%) and infrastructure (74%), pests and diseases (72%) and fertility of the soil (70%).The post-harvest factors that affected quality of rice were threshing (97%), drying methods (80%), winnowing and cleaning (50%), were the major factors that affected quality of rice. The varietal purity (100%), moisture content, yellowing and cracked (80%), damaged grains (65%) were major factors processing factors that affected quality of rice. Findings from this study also found that rate of breakage (84 %), absence of foreign matter (80%) and whiteness (72%), shape of grain (67 %), were the major consumer factors affecting quality of rice. The consumer satisfaction with Rwandan rice on the cooking characteristics, results of the study proved that aroma (37%, appearance and color (25%) were the major factors that affected satisfaction of respondents. The largest dissatisfaction came from the labelling (45%), followed by the packaging (25%) and finally availability with 22% as marketing characteristics that affected dissatisfaction. The study concluded that production, post-harvest, quality and processing stages affect the quality of Rwandan rice. Thus ,the study recommends that in order to improve the quality of Rwandan rice, Ministry of Agriculture in Rwanda, trade and commerce and RSB and related stakeholders need to increase in the numbers of extension worker providers to reduce the farmers' extension worker ratio to increase extension contacts for the purposes of technology transfer through trainings, information dissemination about rice farming production, sensitize and mobilize farmers on use of pesticides and also emphasize on the current policy of input subsidy to be easily accessible to farmers this can reduce the challenge pests and diseases and decentralize modern milling facilities and increase regular inspection of factories to check the quality and harmonization of rice standards, through this quality of rice can be improved.The horizontal and vertical integration between all stakeholders involved in Rice production should strengthened by creating a structured cluster of all stakeholders and the role of each player should be well performed in order to increase the quality of locally produced rice.

Key words: *Rice, paddy rice, quality rice, customer satisfaction*

CHAPTER ONE: INTRODUCTION

1.1 The background

Rice is the staple food for over half the world's population. Approximately 480 million metric tons of milled rice is produced annually. China and India alone account for 50% of the rice grown and consumed. Rice provides up to 50% of the dietary caloric supply for millions living in poverty in Asia and is, therefore, critical for food security. The staple food of an estimated 3.5 billion people worldwide, Rice production and consumption are among the highest in Asian populations (Muthayya *et al* 2014). "Rice, therefore, is of special importance for the nutrition of large reaches of the population in the Asia Pacific region, parts of Latin America and the Caribbean and, increasingly so, in Africa. Nonetheless, the market competitiveness of locally produced rice has never improved in the recent years, as judged from the constant demand in the past three years while the demand for imported rice increases significantly (Kathireshan, 2012). It is well recognized that rice produced locally in Sub-Saharan Africa suffers a significant price discount in comparison with imported rice (Lançon & David-Benz, 2007). This appears to be at least partly due to perceived differences in quality. Local African rice generally has more impurities mixed with it and is not of uniform grain size and color. Lack of product uniformity leads to longer cooking times and unpredictable preparation, Cleaning and sorting this rice prior to cooking is time-consuming and laborious (Stryker, 2013).

1.1. 1.Rice production in Rwanda

Rice, one of the major food crops grown in Rwanda was introduced in the 1960s by missionaries from South Korea, Taiwan and China. Thanks to geographic conditions, rice is grown mostly in inland valley swamps referred to as marshlands. For decades, Rice has been considered as a crop that brings much profit to smallholder farmers in the marshlands and inland valleys. Compared to any other traditional crop, Rice is the only crop which produces better yields, especially during the rainy season (Kathireshan, 2011). Rice is grown in 16 districts of Rwanda. It is characterized by the mono-cropping system with two seasons per year with difference between seasons mainly due to irrigation water availability. In 2016 rice was seasonally produced on 17,000 irrigated hectares by 71,799 rice farmers (MINAGRI, 2016) cited in (Habyarimana & Dushimayezu, 2018). Rice in Rwanda is cultivated in two seasons, wet (A; March-August) and dry seasons (B; September–January), but most of the rice is produced during the wet seasons. The demographic pressure has led to land fragmentation into smaller plots of rice cultivation. Rice farms in Rwanda are very small with an average plot of land of less than 0.1ha. As a result, mechanization is not easy and production cost of rice in Rwanda is relatively high. According to RSSP survey 2012, the average cost of production is estimated to be some 170 Rwf/kg. All the districts of Eastern province produce rice while 6 districts out of 8 in Southern province produce also rice. In the north, only one district produces rice (Gakenke) and three in Western province. However, the good rice production varies according to the size of land cultivated and the agro-climatic condition of the area/district. Rusizi district is highly ranked in production, yield and area under cultivation of rice for the entire period considered. The Government of Rwanda has planned to increase rice production by increasing area under cultivation and improving the productivity. The actual average productivity of 5.8 tons / Ha will reach 7tons /Ha and 28,500ha will be covered by 2018. According to Ghins and Pauw (2017), there has been a rapid rise in rice production in the past decade with a 5.8 t/ Ha of on-farm productivity, rice yields in Rwanda exceed the average level of productivity of several other traditional rice growing countries.

However, the local production in Rwanda lags behind the consumption needs of the national market. As a result, the locally produced grains suffer from poor marketability in mainstream markets. The domestic production is able to provide only 70.5% of the national annual requirement of 60,825 T (Kathireshan, 2013). MINAGRI plans to develop new marshlands (=7,000ha) across the country for rice cultivation and additional 23,000 Ha developed for the hillside. The annual production expanded rapidly reaching 95 000 MT by 2015 (Ghins & Pauw, 2017). In 2015, the number of people engaged in rice cultivation was 11,903. In Rwanda, rice farmers belong to a total of 106 cooperatives, distributed within 29 rice schemes country-wide, Western (2),

Southern (12), Eastern (13), and Kigali City (2). Each cooperative covers rice farmers in a watershed. As shown in Figure 3, annual production expanded rapidly, reaching 95,000T by 2015, thanks largely to land expansion. Yields however oscillated around 5.5T/ha from 2011 on, contrasting with the surge in productivity which occurred during 2007-2010.

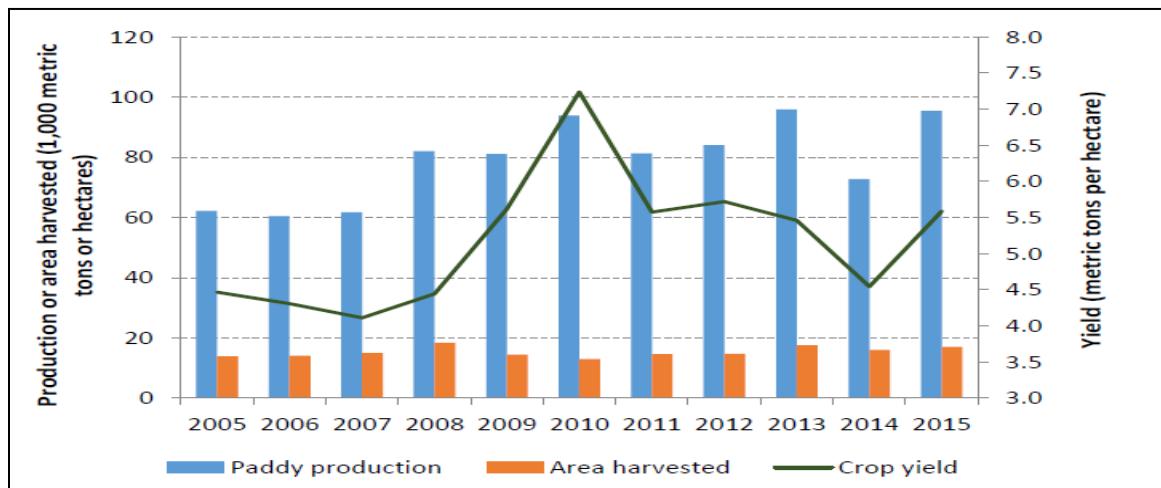


Figure 1: Yearly paddy rice production in Rwanda, 2005-2015, Source: MINAGRI 2016 B

1.1.2. Rice Marketing in Rwanda

Since the 1980s, Rwanda has been unable to meet its domestic food needs from national production. Especially important has been the growth of rice imports to satisfy demand for this convenience food the consumption of which has grown rapidly. In Rwanda, rice is a major food crop and yet the crop is grown as a cash crop (Norbert, 2015). This is mainly because the farmers who produce rice, owing to higher yield levels, keep only a small proportion (about 15%) of their total production for consumption purposes and sell the rest in the markets. Rice has become a major commodity in the food baskets of rural- and urban households in Rwanda. In the recent years, the local production of rice has increased substantially owing to huge investments in the expansion and rehabilitation of marshland areas under rice cultivation. The current national average on-farm rice yield level of 5.7t/ Ha is significantly higher than the global average productivity level of 4.3t/ Ha (Fermont & Benson, 2011). The recent surge in national demand for consumption of rice on the other hand however has far exceeded the local production. Local markets have hence been aggressively importing rice from other rice producing countries in order to meet the demands of consumers. In the past 4 years, the importation has accounted for 48.2% of all the available rice in the markets. Rwanda has currently tariff-free rice imports from EAC countries and imposes an ad-valorem common external tariff (45%) for rice imported from outside EAC (Kathiresan, 2013).

Through the implementation of several progressive policy measures, the government has facilitated significant improvements in the processing of locally produced rice in the recent years. The Rwanda rice is mainly sold in price-sensitive sections of rural and urban markets. However, in urban areas, people still sell imported rice. This is mainly due to lack of competitive quality features of the locally produced rice over that of the imported rice (MINAGRI, 2013) cited in Habyarimana & Dushimayezu(2018). The price of local rice on the domestic market is generally less than that of the imported rice.

It is not totally evident whether this is due to the lower quality of the local rice. Some local rice, processed in modern mills and flowing into similar market channels, would seem to compete very well with the imported rice. However, in Rwanda at least, local rice of very similar appearance in terms of lack of impurities, the

percentage of broken grains, uniformity of grain size and color, etc., sells at a substantial discount over imported rice. Either this is because of other characteristics that cannot so easily be observed or the results from prejudice in favor of imported rice is not known (ICCO, 2016) cited in Natawidjaja, Harahap, & Perkasa (2015). The qualitative competitiveness of local rice production and processing in Rwanda is increasingly being recognized as a major constraint to increased self-sufficiency and reduced dependence on rice imports. The duality of the market for rice is a major factor. On the one hand, the market for the imported rice is heavily concentrated in urban areas and requests a relatively high standard of quality in terms of lack of impurities and relatively uniform appearance. On the other hand, rice in rural areas is more likely to come from local sources, to have more impurities and to be less uniform with respect to grain size and colour, though it may have certain taste characteristics that are appreciated by local consumers (Stryker, 2013). Consumers in mainstream markets generally prefer long and medium/slender type rice grain imported white rice from Pakistan, Vietnam and Tanzania. They have the opinion that the locally processed rice is of lower quality. The industrial mills put a lot of effort into processing and marketing a good quality of locally processed white rice. Unfortunately, there is a negative influence from traders, some small millers, and wholesalers who don't care about putting quality rice in the market. The evidence is there that sometimes grade III was sold as Grade I, qualities were mixed, and inferior rice was put in second-hand bags of the well-respected industrial mills(Kathiiresan, 2013) adapted by Binagwaho et al, (2013). According to Ghins and Pauw (2017), the prioritization of rice as a strategic food and cash crop in Rwanda has paid dividends, with production increasing by one-third during 2010–2015, However, production expansion driven mainly by land expansion as opposed to yield growth has failed to keep pace with growing consumption demand, especially in urban areas. In 2015, around 30 percent of national consumption was met by imported long grain rice, which is preferred over locally produced rice perceived to be of a lower quality (Ghins & Pauw, 2017).

1.1.3. Rice Quality in Rwanda

Rice grain quality is determined by a combination of varietal properties and environmental conditions which occur during crop production, harvesting, processing and handling (Mapiemfu et al., 2017 and Gummert et al., 2010). Varietal properties include: chemical characteristics (gelatinization temperature, apparent amylose content, gel consistency, alkali spreading value and aroma); physical characteristics are shape and size, colour of grain, chalkiness, bulk density, thermal conductivity, equilibrium moisture content and grain flow ability (IRRI, 2010 adapted by Neoh, 2011). Environmental properties are either additional to the normal varietal qualities or are the consequence of certain varietal qualities being lost or modified during processing (Gummert et al, 2010).

Important environmental reduced properties are: moisture content, grain purity, physical and pest damage, cracked grains, presence of immature grains (IRRI, 2009b adapted by Neoh, 2011). The milling related characteristics (head rice recoveries, grain dimensions, whiteness, milling degree and chalkiness) are likely to be affected by environmental changes (Chen et al, 2012) and (Mir et al, 2015). Milling related characteristics are relevant measures of value because these are of major concern to consumers (IRRI, 2009) adapted by Calingacion et al, 2014) . Rice quality therefore, can be divided into five broad descriptive categories; these interrelated categories are milling quality, cooking and eating quality, processing quality, nutritive quality and purity/cleanliness standards (Mir et al, 2015). Each category is described by a specific set of criteria that collectively determine the suitability of rice for a specific end user.

1.1.4. Rice consumption patterns in Rwandan market

The MINAGRI-RSSP survey (2013) adapted by (Dam, Rwamagana, & District, 2013) revealed that the biggest percentage of traders (59%) sell imported rice while 18% sell both imported and local rice. The reasons given by traders on why they prefer to sell imported rice were that Rwandan rice is poorly milled and short grain variety which is not liked on the market.

Most Rwandans are not aware that there is Rwandan rice on the market because previously it never used to be on the market. It was milled and sold illegally. Some millers packaged poor second-grade rice in bags labeled first grade so consumers are reluctant to buy Rwandan rice. Given to these reasons, only 43% of traders believe that Rwandan rice can compete with imported rice on the market because it is cheaper than imported and taste fresher. The major source of imports is Pakistani and Tanzania. Pakistan rice is much cheaper and of a good quality, while Tanzanian rice is of a good quality and expensive. It is mainly consumed in hotels rather than individual households (Flynn, 2005). The quality of grain is best when it reaches physiological maturity (Pan et al, 2007). Poor management from that point forward determines the rate of decline in quality but is unable to stop some decline in quality from occurring. For the last 15 years, MINAGRI has increased irrigated areas while MINICOM has supported the professionalization of the domestic rice market. The two ministries have developed conducive rice policies that have led to increasing the standards of white rice. The quality of rice grain is influenced by physical and chemical characteristics which determine the milling, cooking, nutritional and eating qualities. The acceptance of rice quality is generally determined by the consumers based on physical and cooking characteristics. Consumers in mainstream markets in Rwanda generally prefer the long and medium/slender types of rice grains. This is mainly due to a perceived consensus amongst traders and consumers that the locally produced rice grains are milled poorly (Muhinda & Dusengemungu, 2011). Recently the trend has changed to incorporate preferred quality characteristics that increase the total economic value of rice. Grain quality is not just dependent on the variety of rice, but quality also depends on the crop production environment, harvesting, processing and milling systems (Ahmed et al, 2016).

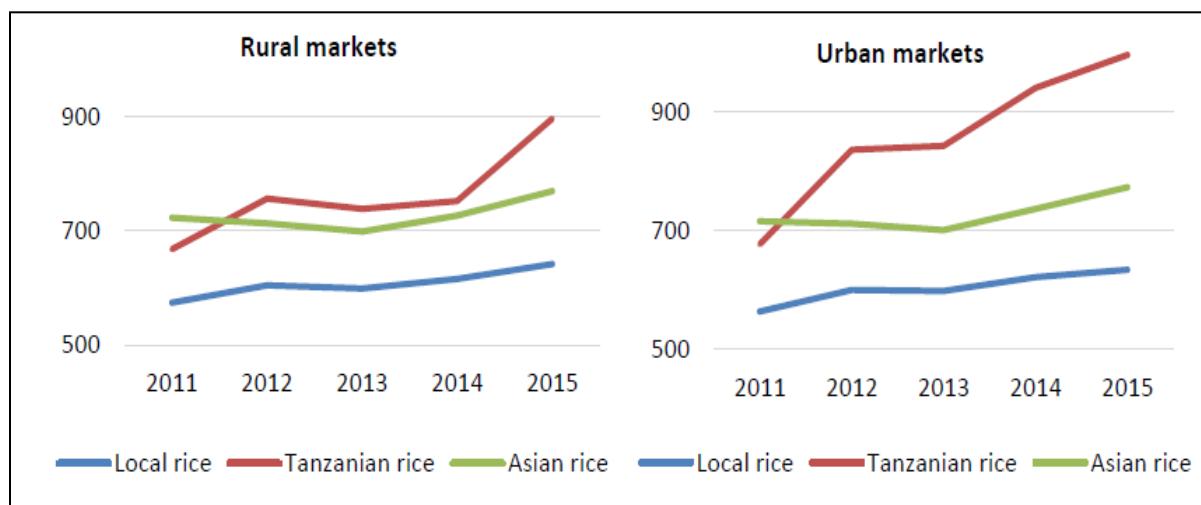


Figure 2: Rice retail price in the rural and urban market in Rwanda

1.2. Justification of the study

This study will be useful to the policymakers in designing and implementing the policies and strategies that can help in producing the desired quality of rice. Moreover, the findings from this study will benefit researchers and extension service providers as well as different NGOs in indicating the area of advantage for what should be done to improve the quality of locally produced rice. Finally, this study will serve as a source for further studies for the development of rice subsector in Rwanda. The information generated from this study will mainly help actors in the value chains especially the producers, processors and traders. The value chains actors will use this information in improving their way of operating and linking to reach the customer satisfaction.

1.3. Statement of the Problem

The government of Rwanda has encouraged rice production through national rice policy strategy with the national target levels to increase production by three folds by 2018. Despite the efforts to promote the local rice consumption through protection measures like increasing the Common external tariff at 45% of rice imported outside the East African Community Countries still, consumption of local rice remains low compared to the imported rice. This study investigates factors affecting the quality of Rwandan rice and effect of quality on consumption of local rice in Rwanda which has been lacking in Rwanda context. The empirical knowledge that will be generated will be as policy instrument in increasing consumption of local rice in the study area and in Rwanda in general.

Problem owner: The Ministry of Trade and Industry (MINICOM)

The Ministry of Trade and Industry is the responsible institution for products quality management including rice. The inspection of the quality rice and strengthening the rice value chain is monitored through MINICOM internal Trade Department and Rwanda standard Bureau (RSB) for increased market access.

1.4. Research objective

To determine the factors affecting the quality of Rwandan rice and assess the extent at which quality of rice produced influences consumer satisfaction in Rwanda and suggest possible solution to improve the quality of rice produced in Rwanda.

1.5. Main questions

1. What are factors that influence the quality of rice produced in Rwanda?
2. To what extent are the consumers of Rwandan rice satisfied?

1.5.1. Sub-questions:

1. What are the factors that influence the quality of Rwandan rice at production level?
2. What are the factors that influence the quality of Rwandan rice at post-harvest handling level?
3. What are the factors that influence the quality of Rwandan rice at processing level?

To what extent does quality of rice produced influences consumer satisfaction in Rwanda?

1.5.2. Sub-questions:

1. To what extent are consumers satisfied with physical characteristics of Rwandan rice?
2. To what extent are consumers satisfied with cooking characteristics of Rwandan rice?
3. What is other factors influencing consumer' choice?

1.6. Conceptual framework

A "literature review" should cover all of the scientific literature in a field that is defined by the author. Much of this is usually achieved by reference to previous reviews. By doing this, it is not necessary to review all of the past literature, but all studies that have been published since the most recent thorough review should be included.

EFFECT OF QUALITY OF RICE PRODUCED ON CONSUMER SATISFACTION

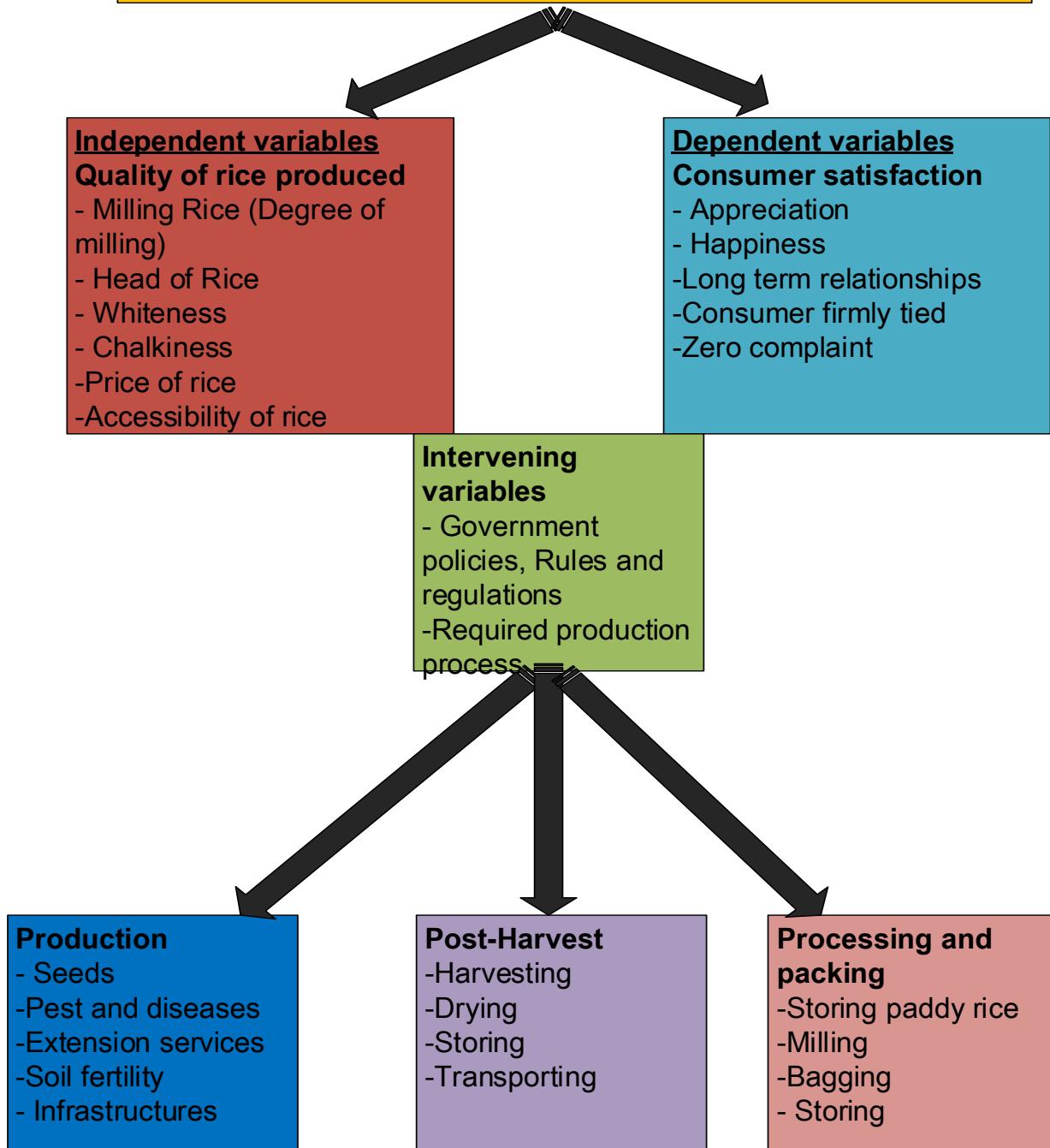


Figure 3: Conceptual framework of the study

Source: Author, 2018

1.7. Definition of Key Concepts

Quality of rice

The quality of rice can generally be defined as the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs (Badi & Osamu, 2013).

Consumer satisfaction

The customer satisfaction is a way in which the level of client's happiness on the product, service or experience can be drown (Badi & Osamu, 2013).

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

This chapter intends to review the empirical literature on quality of rice produced in Rwanda and market demand. This chapter focused on reviewing the literature related to the current practices from farmers to processors, which can impact negatively the quality of Rwandan rice and also on rice quality attributes. The primary aim of this literature review is to analyze what has been researched in relation to the topic under study. This provided profound insight into the topic and facilitated the interpretation of the findings. The source of this literature was academic journals, the internet, newspapers and magazines, newsletters and reports of specific institutions.

2.1. Review of empirical findings

2.1.1. Production level factors affecting quality of rice

2.1.1.1. Seeds

Seed production system in Rwanda lacks quality assurance, timely delivery and adequate volumes. The major part of rice farmers in most parts of the country has a problem to access sufficient amounts of good quality rice seeds in time for the season. In old marshlands where rice has been grown over the past few years, the quality of seeds limits the productivity (Rice National Strategy, 2013). Major concerns revolve around purity and viability of the available seed lots in old marshlands. This is mainly due to the absence of an efficient public seed production and distribution network in the country. Furthermore, the characteristic features of already released rice varieties are not made available to the farmers and other stakeholders to verify the description of the varieties. Progressive farmers also feel that the varietal options need to be broadened through research and development. In new marshlands, however, the quantity and the type (variety) of seeds cause greater concerns. Due to a rapid expansion of area under cultivation and the limited capacity of seed production and distribution system in the country, seeds of improved varieties could not be supplied to new marshlands on time (Rice National Strategy, 2013).

2.1.1.2. Pests and diseases

Pests and diseases destroy an average of 37% of the crop rice annually (IRRI, 2009b).The intensive mono-cropping of rice has gradually built up the pressure of pests and diseases to alarming levels in several marshlands. The lack of knowledge on appropriate control measures against pests and diseases amongst farmers is a major impediment in raising the productivity levels and affect the quality of paddy rice. The limited choices of tolerant/resistant rice cultivars and access to pesticides also affect the preparedness of farmers against the most common epidemics of blast and Diopsis in the marshland (MINAGRI, 2013). The safety measures and standards of the availability and the use of pesticides are not properly regulated leading to pollution of drinking water and raising health risks of farmers and farm families in marshlands.

2.1.1.3. Soil fertility management

Use of inorganic fertilizer is one of the major factors that catalyzed the green revolution in Asia. The low input and yet intensive mono-cropping pattern in the marshlands are constantly depleting the soil and water reserves. The lack of suitable fertilizer recommendations and the high fertilizer costs are the two major reasons for the poor nutrient management in rice fields. (UNDP, 2015).

Farmers generally dispose of the crop residues such as straws by burning them in their fields instead of effectively recycling the nutrients stored in the residues through decomposition. Such practices further aggravate the soil nutrient imbalances (Carbon: Nitrogen ratio, for example) in their fields (Kathiresan, 2010). Erosion of topsoil from the hills and the associated slopes into marshlands cause accumulation of silt. The lack

of availability and the slow rate of decomposition of organic residues lead to low usage of organic manures in marshlands. Hence the texture and nutrient profile of the topsoil in marshlands are constantly changing in marshlands.

The soil fertility is highly variable amongst marshlands, and in some cases between nearby sites within a given marshland. Soil fertility thus remains a constant threat to the sustainability of rice cultivation in marshlands (Rice strategy, 2013).

2.1.1.4. Extension services

In general, farmers in Rwanda learn rice cultivation from each other from within their marshlands and/or from across other marshlands. The lack of human capacity and the organized formal extension network has weakened the extension services in the country. The system is currently struggling to raise its technical capacity on effective and timely dissemination of improved soil, water and crop management practices that have been shown elsewhere to increase the productivity of rice production. (Kathiresan, 2010).

2.1.1.5. Infrastructure

Rice cultivation is a resource-intensive enterprise. Synchronized planting of rice in a given marshland often requires planning of resources such as labor, water, inputs, threshing and drying yards, and storage. Timely availability of these resources also inherently influences the quality of rice produced in marshlands. Smallholder farmers often find organizing these resources difficult and perceive it as a constraint in raising the productivity and profitability. Rice farmer cooperatives are established in most of the marshlands to organize communal resources. However, several operational difficulties exist in investing in establishing/organizing the required infrastructure and maintaining the infrastructures such as water canals, drying yards, storage warehouses. (MINICOM, 2016)

2.1.2. Post-harvest factors affecting quality of rice

Rice harvesting, post-harvest handling activities and storage are key operations within the rice value chain. The poor performance of these operations normally results in tremendous losses in terms of rice quality and quantity. According to Kilimo trust (2017) poor post-harvest handling practices at farmer level and rudimentary milling technology causes loss up to 50% of rice and contribute to poor grain quality. Rice post-harvest operations are categorized into different stepwise operations that have to be performed very well so as to end up with a quality product that is competitive at the market.

2.1.2.1. Harvesting, transporting and storage

At harvesting time, farmers use traditional materials called “sickle”. Then follows the activity of threshing which is done by using a piece of tree. Paddy is beaten onto a log or stone and collected on a plastic sheet. Harvesting is done by men and threshing by women. Transportation of paddy rice from field to drying yards is individually organized (on heads, bicycle or wheelbarrow) while from drying yards/stores to processing plant, transport is organized by the cooperative or the plant. Paddy rice is stored in sacks in the living space of the house or at a cooperative level where the rice grain is greatly susceptible to postharvest damage by rainfall at harvest time or in storage (Ohn, 2012).

2.1.2.2. Drying and Storage facilities

The drying and storage facilities at the cooperative level are similarly insufficient in terms of quantity and quality, yet the means of accessing credit to address these constraints are not available to cooperatives (Dries et all, 2009).

Rice plants require proper drainage of fields to allow for uniform maturity. Due to the prolonged maturation of the varieties, non-synchronized planting, lack of awareness, and labor availability, farmers in marshlands often harvest the rice under wet conditions and/or during rainy days. Since threshing is done manually by

beating against drums/wood, the high moisture content of grains and straw at harvesting stage reduces the output (yield). Rwandan farmers generally sun-dry the grains, but these are not turned properly while drying. Since the harvest is carried out under wet conditions and often before grains reach physiological maturity, the uneven moisture content of grains poses an additional challenge at this stage. As a result, the grains are not dried to the prescribed moisture content of <14%. The higher moisture content affects storage life and how millable the rice grains are.

Some stages in the rice post-harvest system are more critical than others. Among these critical stages, drying and storage are especially important. Between 10 and 40 per cent of the food that is grown never reaches the market or consumer's plate because of inadequate harvesting, drying and winnowing materials, insects and rodents that get into storage containers. It's more difficult to assess qualitative losses, such as loss of edibility, nutritional quality, caloric value, and consumer acceptability of the products than assessing quantitative losses (Pankaj, & Aloka, 2015).

2.1.3. Processing and packaging factors affecting quality of rice

2.1.3.1. Milling, bagging and storage

Rice processing is a combination of several operations to convert paddy rice into well milled silky-white rice, which has superior cooking quality attributes (Roberts, 2012).

African rice fails to compete with imports because large-scale commercial rice processing is poorly developed or limited, and urban consumers have become used to the look and feel of imported rice. Locally milled rice is generally of poor quality and mainly consumed in rural areas. It often tends to be contaminated with stones and dust. Even when it is of acceptable quality, it does not sell well in cities, where consumers are acquainted with imported rice. For some people, eating imported rice has even become a status symbol. One of the major challenges for Africa is therefore to produce a sufficient and affordable price that meets the preferences of its fast-growing and increasingly urbanized population; and which can compete with imported rice both in terms of price and quality (EUCOR, 2012). The mills are strategically located around the rice production areas. While farmers in some rice production areas are not able to easily access mills; farmers in some other production areas easily find two or more milling facilities in their vicinity. The figure 4 presents the geographical location of active rice mills in Rwanda.

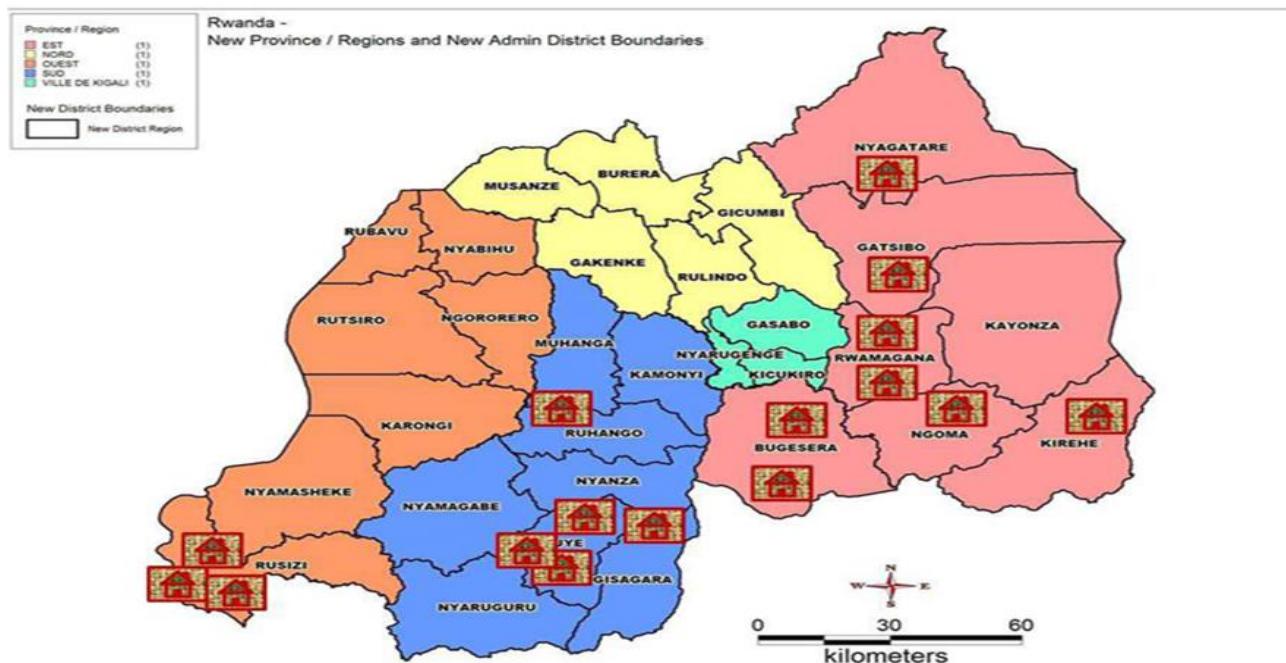


Figure 4: The map of Rice processing plant Source: MINICOM, (2013)

All the available milling capacities seem to be facing inadequate supply of paddy (raw material). These findings show that at the current local paddy supply levels, the available milling capacities in the country are generally insufficient. The existing mills operate every day by working 8 hours per day, the paddy received can be finished within two months. As there are two seasons per year, approximately the mills need to operate only for 4 months per year (MINICOM, 2013). Also, some rice mills are closed or temporarily closed due to mismanagement, lack of minimum quality requirements and quality standard issues. The processing factories in Rwanda are mixed, from very basic to well-designed modern rice mills able to produce good quality end-products and almost all the mills are well equipped. In addition to the dehuskers, the mills have de-stoners, polishers, separators (head rice and broken rice), and blending and bagging facilities. Inconsistency with East African Community (EAC)'s regulations, the rice mills in Rwanda generate three different grades viz., Grade 1 (up to 10% broken), Grade 2 (10-25% broken) and Grade 3 (25-50% broken).

2.1.3.2. Moisture content

"Moisture content has a marked influence on all aspects of paddy and rice quality and it is essential that paddy is milled at the proper moisture content to obtain the highest head rice yield. Paddy is at its optimum milling potential at a moisture content of 14% wet weight basis. Grains with high moisture content are too soft to withstand the hulling pressure which results in grain breakage and possibly pulverization of the grain. Grain that is too dry becomes brittle and has greater breakage. Moisture content and temperature during the drying process is also critical as it determines whether small fissures and/or full cracks are introduced into the grain structure" (Badi & Osamu, 2013).

2.1.3.3. Varietal Purity

"A mixture of varieties causes difficulties at milling and usually results in a reduced capacity, excessive breakage, lower milled rice recovery and reduced head rice. Different sizes and shaped grains make it more difficult to adjust hullers, whiteners and polishers to produce whole grains. This results in low initial husking efficiencies, a higher percentage of re-circulated paddy, non-uniform whitening, and lower grade of milled rice" (Badi & Osamu, 2013).

2.1.3.2 Cracked grains

"Overexposure of mature paddy to fluctuating temperature and moisture conditions leads to the development of fissures and cracks in the individual kernel. Cracks in the kernel are the most important factor contributing to rice breakage during milling. This results in reduces milled rice recovery and head rice yields (Badi & Osamu, 2013).

2.1.3.3. Immature grains

"The amount of immature paddy grains in a sample has a major effect on head rice yield and quality. The immature rice kernels are very slender and chalky and this results in excessive production of bran, broken grains and brewer's rice. The optimal stage to harvest grain in many countries is at about 20-24% grain moisture or about 30 days after flowering. If the harvest is too late, many grains are lost through shattering or dry out and are cracked during threshing, which causes grain breakage during milling (Badi & Osamu, 2013).

2.1.3.4. Damaged grains

Paddy deteriorates through a biochemical change in the grain, the development of off-odours and changes in physical appearance. These types of damage are caused by water, insects, and heat exposure.

2.1.3.5. Yellowing

"Yellowing is caused by over-exposure of paddy to wet environmental conditions before it is dried. This results in a combination of microbiological and chemical activity that overheats the grain. These fermented

grains frequently possess partly gelatinized starch cells and generally resist the pressures applied during grain milling. While the presence of fermented grain does not affect milling yields it does downgrade the quality of the milled rice because of the unattractive appearance. Insect- or mould- damaged grains can be distinguished by the presence of black spots around the germ end of the brown rice kernel which are caused by the microorganisms, insects, or a combination. Mould damage, in particular, is increased by unfavorable weather conditions. In the process of milling, these black spots are only partly removed which consequently increases the presence of damaged grains" (Badi & Osamu, 2013).

2.1. 4.Rice Quality factors

A number of interrelated features determine the quality of paddy. These are moisture content of paddy, purity degree, varietal purity, cracked grains, immature grains, discolored /fermented grains and damaged grains. These characteristics are determined by the environmental weather conditions during production, crop production practices, soil conditions, harvesting, and post-harvest practices (Badi & Osamu, 2013).

2.1.4.1. Degree of purity

"Purity is related to the presence of dockage in the grain. Dockage refers to material other than paddy and includes chaff, stones, weed seeds, soil, rice straw, stalks, etc. These impurities generally come from the field or from the drying floor. Unclean paddy increases the time taken to clean and process the grain. Foreign matter in the grain reduces milling recoveries and the quality of rice and increases the wear and tear on milling machinery" (Badi & Osamu, 2013).

2.1.4.2. Milling degree

"The degree of milling is a measure of the per cent bran removed from the brown rice kernel. Milling degree affects milling recovery and influences consumer acceptance. Apart from the amount of white rice recovered, milling degree influences the colour and also the cooking behavior of rice. Un-milled brown rice absorbs water poorly and does not cook as quickly as milled rice. The water absorption rate improves progressively up to about 25% milling degree after which, there is a very little effect (Badi & Osamu, 2013).

2.1.4.3. Head rice

"Head rice" or head rice percentage is the weight of head grain or whole kernels in the rice lot. Head rice normally includes broken kernels that are 75-80% of the whole kernel. High head rice yield is one of the most important criteria for measuring milled rice quality. Broken grain has normally only half of the value of head rice. The actual head rice percentage in a sample of milled rice will depend on both varietal characteristics (i.e. the potential head rice yield), production factors, and harvesting, drying and milling process. In general, harvesting, drying, and milling can be responsible for some losses and damage to the grain" (Badi & Osamu, 2013).

2.1.4.4. Whiteness

"Whiteness is a combination of varietal physical characteristics and the degree of milling. In milling, the whitening and polishing greatly affect the whiteness of the grain. During whitening, the silver skin and the bran layer of the brown rice are removed. Polishing after whitening is carried out to improve the appearance of the white rice. During polishing, some of the bran particles stick to the surface of the rice which polishes and gives a shinier appearance" (Badi & Osamu, 2013).

2.1.4.5. Chalkiness

"If part of the milled rice kernel is opaque rather than translucent, it is often characterized as "chalky". Chalkiness disappears upon cooking and has no effect on taste or aroma, however, it downgrades milled rice. Excessive chalkiness is caused by interruption during the final stages of grain filling". (Badi & Osamu, 2013).

2.2. Consumer satisfaction

The customer satisfaction is a way in which the level of client's happiness on the product, service or experience can be drowned; customer satisfaction is an indicator of customer appreciation. When the organization decides to keep customers satisfied and having a long term relationship with customers, it needs to know its strengths and weaknesses. How to deliver value and setting up for happy customer, there is different reasons to why happy customers are important in the business organizations: Satisfied customers are more firmly tied in to the company, They are not so easily tempted away by competitors, They recommend it to others, They are positive ambassadors for the business, They improve your customer acquisition rates, they are happy with their purchase decision and unlikely to question it. They tend not to raise complaints or issues, they strengthen and enhance the company's image, they help the company to reach the market, with their personal testimonials, and they can make your business appear approachable and extraordinary (Sonja, 2017).

2.2.1. Consumer appreciation

Consumer appreciation is a measure of a company's efforts toward its Consumers and showing how grateful you are to a Consumer for their business is the foundation of a Consumer appreciation, if they feel valuable to you and are treated with care and attention; they are more likely to become loyal (Sonja, 2017).

2.2.2. Consumer happiness

Consumer happiness is a measure of how products and services supplied by a company meet or surpass Consumer expectation (Ghins & Pauw, 2017).

2.2.3. Consumer long-term relationships

Proven strategies to create long-term customer relationships loyalty: Successful companies spend time with their customers beyond the initial purchasing transaction, providing value and building engagement and alignment, they continue to learn what their customers need after closing the initial sale. (Sonja, 2017).

2.2.4 .Consumer complaint

A consumer complaint or customer complaint is "an expression of dissatisfaction on a consumer's behalf to a responsible party" (Landon, 1980). It can also be described in a positive sense as a report from a consumer providing documentation about a problem with a product or service (Ghins & Pauw, 2017).

2.2.5. Marketing characteristics on consumption of Rice

According to Rutsaert et al, (2013), attributes are product characteristics that are either intrinsic, like taste, texture or colour, or extrinsic to the product, like packaging, brand or label. Another attribute classification distinguishes between search, experience and credence attributes. Search attributes are available for product evaluation before purchase. Typical examples are price, appearance, brand and packaging. Experience attributes can only be evaluated upon product experience, thus after purchase or product use examples are taste and texture. Credence attributes are attributes that consumers cannot evaluate or verify themselves. Instead, they have to put trust in people or institutions, like government controls or industry claims. Attributes relating to production, processing and product contents are typical examples of the credence-type attributes.

2.2.6. Consumer preferences

Generally, in EAC region consumers prefer aromatic, long grain (not more than 20-30% broken), clean (no foreign matter especially stone), no sticky, well packed and brand (Wilson & Lewis, 2015). Rice is mainly consumed by individual households and to small extent institutions such as schools and hospitals.

However, with the exception of Tanzania, urban consumers of rice prefer imported rice over the locally produced due to the real or perceived better culinary qualities (Palmatier et al, 2009).

In fact, consumers in urban areas are willing to pay more for branded clean and well-packaged rice, unlike rural consumers. In Rwanda rice is replacing traditional staples such as cassava, maize and plantain, especially in the urban areas. Consumer preference is generally based on a physical characteristic (Rate of breakage, Shape of grain, Absence of foreign matter, whiteness, the shape of grain, the moisture content of the grain) and cooking characteristics (Stickiness after cooking, Taste, good aroma) of rice grains.

CHAPTER THREE: METHODOLOGY

3.0. Introduction

Methodology is a set of methods. Singh (2006) define methodology as the principles and procedures used in the systematic pursuit of knowledge; involving necessary steps as the recognition and formulation of a problem, the collection of data through observation possible, experiments and formulation of model. This chapter presents the methodologies that were used for assessing factors affecting the quality of Rwandan rice, and the extent at which quality of rice produced influences consumer satisfaction in Rwanda and suggest possible solution to improve the quality of rice produced in Rwanda; a case study of COPRORIZ- NTENDE.

This study mainly relied on both primary and secondary data collection, analysis and presentation of the findings. This chapter also includes a detailed description of the research design, techniques that were used throughout the research.

The figure below shows the sectors where COPRORIZ NTENDE operates.

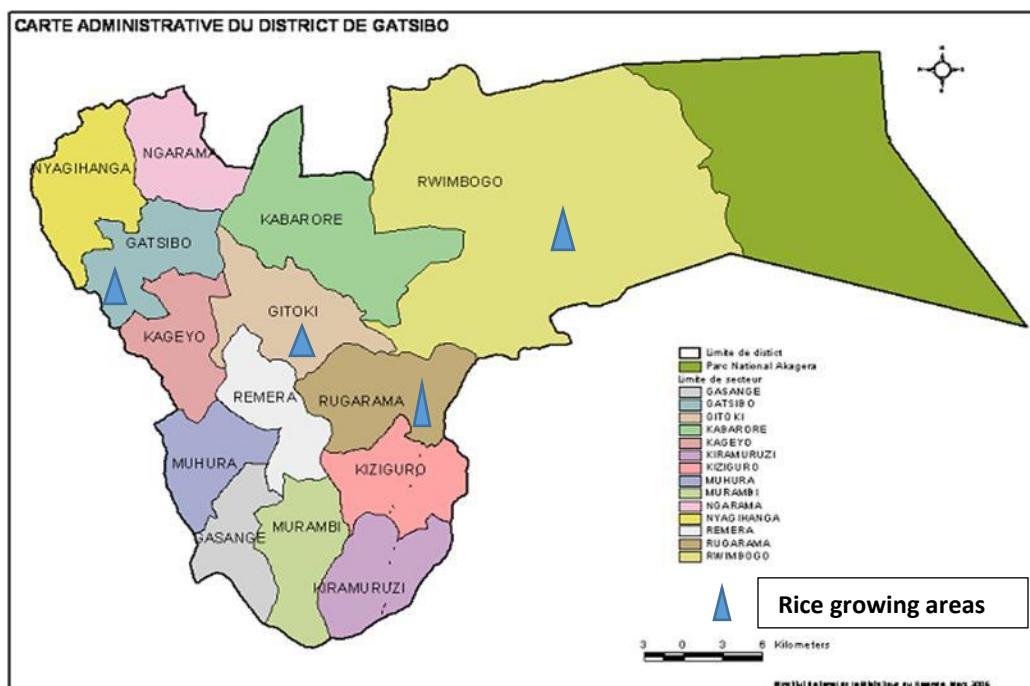


Figure 5: The map of Gatsibo District Source: Rwandapedia.rw

3.1. Research design

The research started with a desk study by collecting relevant secondary data and then field activities which aimed to collect primary data.

Both qualitative and quantitative data have been collected through interviews and survey. The interviews focused on key supporters Ministry of Trade and Industry, Ministry of Agriculture and Animals resources and Rwanda Standard Bureau. The information has been gathered using a checklist. The survey focused on Farmers, staff of CPRORIZ-NTENDE, staff of Gatsibo Rice the milling plant which process the paddy rice from COPRORIZ-NTENDE, traders and consumers. The information has been gathered using a questionnaire.

I used both survey and interviews to collect maximum of information to have sufficient answers responding to my research questions.

The figure 6 illustrates how the steps of research followed each other.

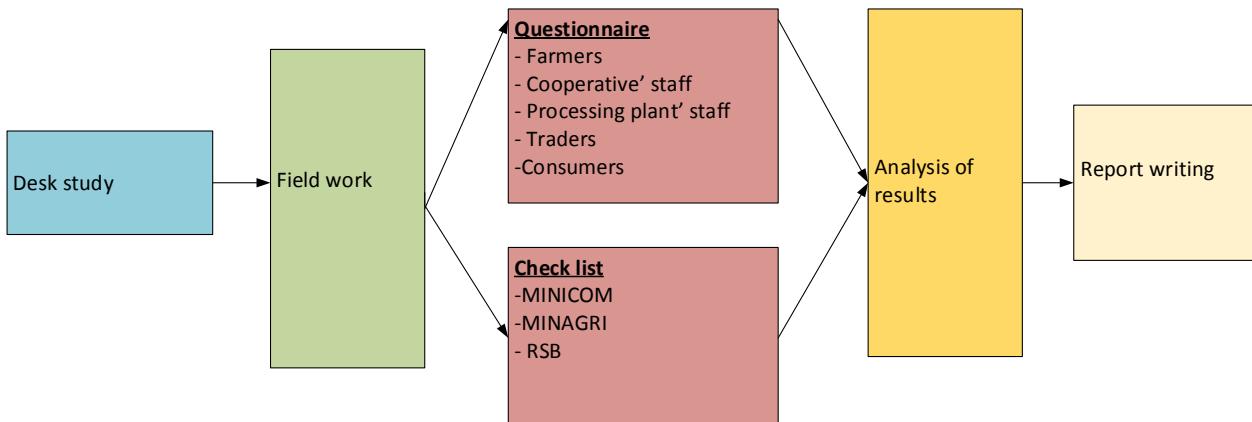


Figure 6: Research framework

Source: Author 2018

3.2. Target Population

The population is a totality of persons or items from which samples are taken for measurement (Khan, 2011). The population refer to as a target and also a set of elements that the research focused upon and to which the results obtained by testing the sample which should be generalized. During this research study, the researcher intends to assess the extent at which quality of rice produced influences consumer satisfaction in Rwanda and suggest possible solution to improve the quality of rice produced in Rwanda, examine total population in order to draw relevant and reliable information for the success of this study. The total sample of this study is 77 persons that included farmers, employers of COPRORIZ NTENDE, employers of GATSIBO rice, traders, Civil servants and consumers.

3.3. Sampling techniques

The techniques used in this study were purposive sampling, simple random sampling and stratified sampling. Purposive sampling is a method of sampling whereby the researcher used her own judgment about which respondents to choose and to pick only those who best meet the purpose of the study depending on the group of respondent. Purposive sampling was used for the staff of COPRORIZ-NTENDE the study chose the population assumed to give reliable information to the study. The stratified sampling is a probability sampling technique which divides the entire population into different subgroups or strata, then randomly selects the final subjects proportionally from the different strata, this technique does not embody the elements of randomness, the study decided to sample from a population which seems to have a global knowledge about the study. Simple random sampling is a procedure of selecting a sample out of a population in such a way that every member of the population has an equal chance of being selected to form the sample (Kothari, 2004). The simple random sampling was used to select the respondent who would be the respondents for this study. Each respondent has got an equal chance to be selected depending to the group of respondent and the study randomly chose 77 personnel to be the respondents.

3.4 Data Collection Methods

A source is one of the materials that the study has to use for collecting information during the investigation. The two major sources of data are primary and secondary source of information. Primary data enabled to measure the relevance of qualitative information towards the main objective of the study.

Secondary data enabled to draw reliable quantitative data towards the factors affecting the quality of Rwandan rice and the extent at which quality of rice produced influences consumer satisfaction in Rwanda and suggest possible solution to improve the quality of rice produced in Rwanda.

Crawshaw and Chambers (2001) stated that, Primary data is considered to be the first hand data the researcher gathered herself as result of her investigation. According to Suhov and Kelbert (2008), secondary data is that already exists in boxes or files in organization's basements or hidden in the core of computers. Under this study, the staff of COPRORIZ-NTENDE, famers, traders, civil servant and consumers was chosen to provide primary data, reports and internet sources was used for gathering secondary data.

3.4.1 Data Collection Instruments

In the process of data collection, the main methods used were library search, questionnaire and interview guide. The questionnaire was developed in the sense of finding factors affecting the quality of Rwandan rice and also measuring the extent at which quality of rice produced influences consumer satisfaction in Rwanda. The questions were formulated according to the objective of the study, the survey and the interviews were conducted consistently.

3.4.2 Questionnaire (Refer to appendix 1 I)

This is a type of data collection where by prepared set of questions was given to respondents and composed in the same nature. In this study self-administered questionnaires were distributed to the farmers, the staff of COPRORIZ-NTENDE, staff of the processing plant (Gatsibo Rice), traders and consumers in order to permit free and fair responses from the respondents by taking into considerations their positions, knowledge and working experience. The questionnaire was distributed to 74 sampled populations (30 farmers, 25 consumers, 12 traders, 3 Gatsibo Rice Plant' staff, 4 Cooperative' staff).

3.4.3 Interview guide (Refer to appendix 1 II)

This is another method of data collection that was used in this research by the conversation between the researcher and interviewee. This technique was used to get the information from the respondents with more required data and with no time to answer the questionnaire. The interview was conducted especially with Specialist in charge of rice value chain in MINAGRI, Specialist in charge of rice value chain in MINICOM, professional in charge of crops standard in RSB, since they know much more about the rice sub-sector.

3.5. Data analysis Procedure

As said by Crawshaw and Chambers (2001) data processing concerns with classifying responses into meaningful categories called codes. It consists of editing, coding and tabulation. After processing the data, the study starts the process of analyzing them. The responses obtained from the questionnaires were processed and edited using SPSS and Ms. excel for an easy interpretation. Editing was done to ensure completeness, accuracy, uniformity and legitimacy in questionnaire. After data collection, the exercise inspection followed in order to discover items that should be misunderstood by the respondents to detect gaps and other weakness in data collection methods.

In this study, coding was used to summarize data by classifying the different responses given into categories for easy manipulation. After eliminating errors, codes were assigned to each answer. This stage helped the manual construction of statistical tables showing the frequency distribution of answers to the respondents. The researcher used both quantitative and qualitative analysis. For the quantitative analysis, data collected was expressed in different tables and the analysis focused on frequencies and percentages. The

qualitative data were analyzed using casual diagram to identifying factors affecting the quality of Rwandan rice.

3.6. Reliability and validity of the research

According to Mugenda and Mugenda (2003) reliability refers to the consistence of the research instruments. It is a measure of the degree to which a research instrument yields consistent results or data after repeated trial. Validity is defined as the accuracy and meaningfulness of inferences which are based on the research results (Mugenda & Mugenda, 2003). In other words, Validity is the degree to which results obtained from the analysis of data actually represents the phenomenon under study to ensure that the questionnaires were reliable and valid, the researcher used a simple and clear language and terms that could be understood by the respondents. Closed ended questions were used as they have been proven in most researches to be most reliable for analysis. To ensure validity, the researcher makes sure that questions used relate to or cover all the variables of the study.

3.7. Ethical consideration

This regards seeking permission by the researcher from the officials of COPRORIZ-NTENDE and use the information for only research purposes. The researcher was given an acceptance letter with respect to the respondent's views; this was an important protection of respondent from harm or harassment and the confidentiality of the respondents and their supervisor's sensitive information. It was very important for the researcher to use professional and ethical standards to plan, collect and process data, the researcher ensured that data are interpreted according to general methodological standard and make sure that element that are irrelevant to data interpretation are excluded from the report. The researcher kept all information given to her very confidential and used them for only academic purposes. The researcher made sure that the study fulfills moral considerations of research by ensuring utmost confidentiality of information provided by the respondents. To meet research ethics the following activities were implemented by the researcher ,name of respondents never appears in this study ,respondent signature for consent, permission or acceptance letter was given by the management of COPRORIZ-NTENDE, authors cited appears in the references to avoid plagiarism and the findings was presented in generalized manner.

3.8. Limitations of the study

Different limitations were encountered but the researcher tried to suggest solutions to overcome them so as to conduct the research as planned. The first limitation was the reluctance of some respondent for answering questionnaires and the fact of not showing required cooperation in responding to the questionnaire. To overcome this, the researcher distributed questionnaire with an introductory letter, Identify who she is, her University and the purpose of the research. The second limitation was the drawbacks. for example in case where the appointment with the farmers was postponed to the date where less harvesting activities; this caused an inconvenience in scheduling especially when they gave the same appointment with traders. However the researcher opted to work on public holidays.

CHAPTER FOUR: RESULTS

4.0. Introduction

This chapter presents the findings of this study. It does so by first presenting the demographic data, and then under each objective the findings answer the research questions.

4.1. Descriptive statistics

The descriptive statistics comprised of gender of the respondents, educational level, experience and their age.

4.1.1 Gender of respondent

Table 1 shows that 38.8% of the traders were male, 6.1% of the male were cooperative staff, 18.4% male farmers, 4.1% male processing staff, 30.6% consumers and 2% a government staff. The overall number and percentage of male were 63.6%. On the other hand 39.3% of traders were female, 3.6% were cooperative and processing staff each, 10.7% female farmers, 35.7% female consumers and 7.1% female government staff. Overall there were 36.4% female respondents in the study.

Table 1: Gender of respondents (n=77)

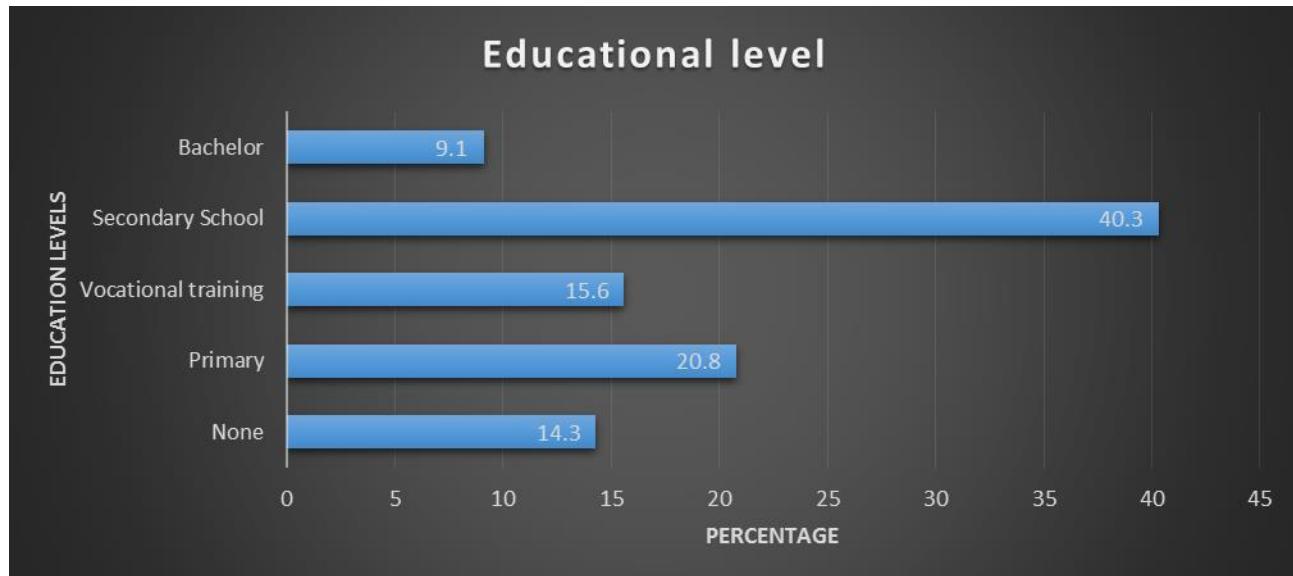
		Occupation					Total	
		Traders		Cooperative	Farmers	Processing	Consumers	Government
		Count	staff		staff		staff	
Gender	Male	Count	19	3	9	2	15	1
	Male	%	38.8	6.1	18.4	4.1	30.6	2.0
	Female	Count	11	1	3	1	10	2
	Female	%	39.3	3.6	10.7	3.6	35.7	7.1
Total		Count	30	4	12	3	25	3
		%	39.0	5.2	15.6	3.9	32.5	3.9%

Source: data from survey

4.1.2 Education level (n=77)

According to Figure 7, 9.1% have Bachelor's degree, 40.3 % have Secondary school diploma, 15.6 have Vocational training, 20.8% have primary school level, and 14.3% are not educated at all.

4.1.2. Educational Level



Source: data from survey

Figure 7: Educational level of different group

4.1.3. Experience in Rice sub-sector (n=77)

According to figure 8 all government staff had 7-10 years of experience, about consumers the majority had 1-3 years' of experience, processing staff the majority had 4-6 years of experience , farmers the majority had above 10 years of experience, cooperative staff majority had above 10 years of experience , and traders' the majority had 7-10 years of experience.

The general picture is that the respondents had experience ranging from 4 to over 10 years with Rwandan rice. This high experience provided them with sufficient grounds to provide relevant information for quality of rice as well as evaluate their level of satisfaction given the prolonged interaction with it.

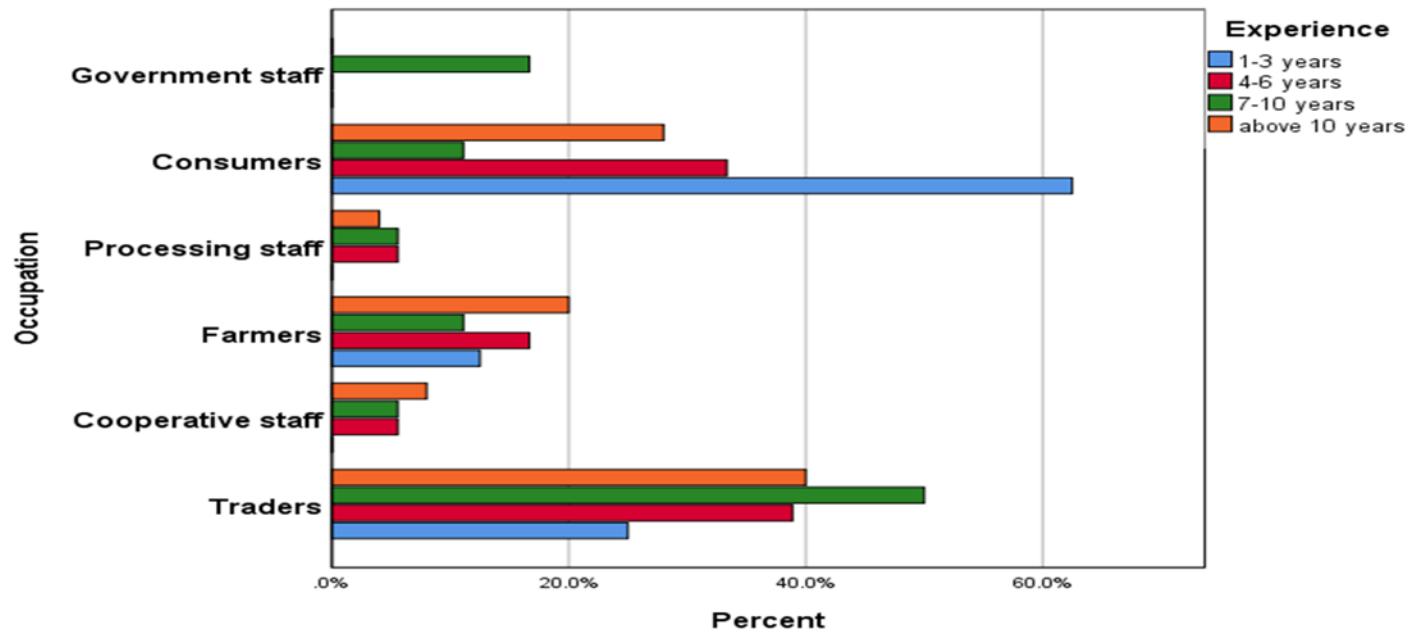


Figure 8: Experience in different groups

Source: Data from survey

4.1.4. Age of respondents

According to figure 9 majority of traders were in age group 36-40 years and consumers were in 20-25 years. The majority of farmers were in the age group above 40 years while government staff were in 31-35 years. In general the respondents were mainly in the age group 25 to above 40 years implying they were old enough to respond and also could have enough experience with Rwandan rice.

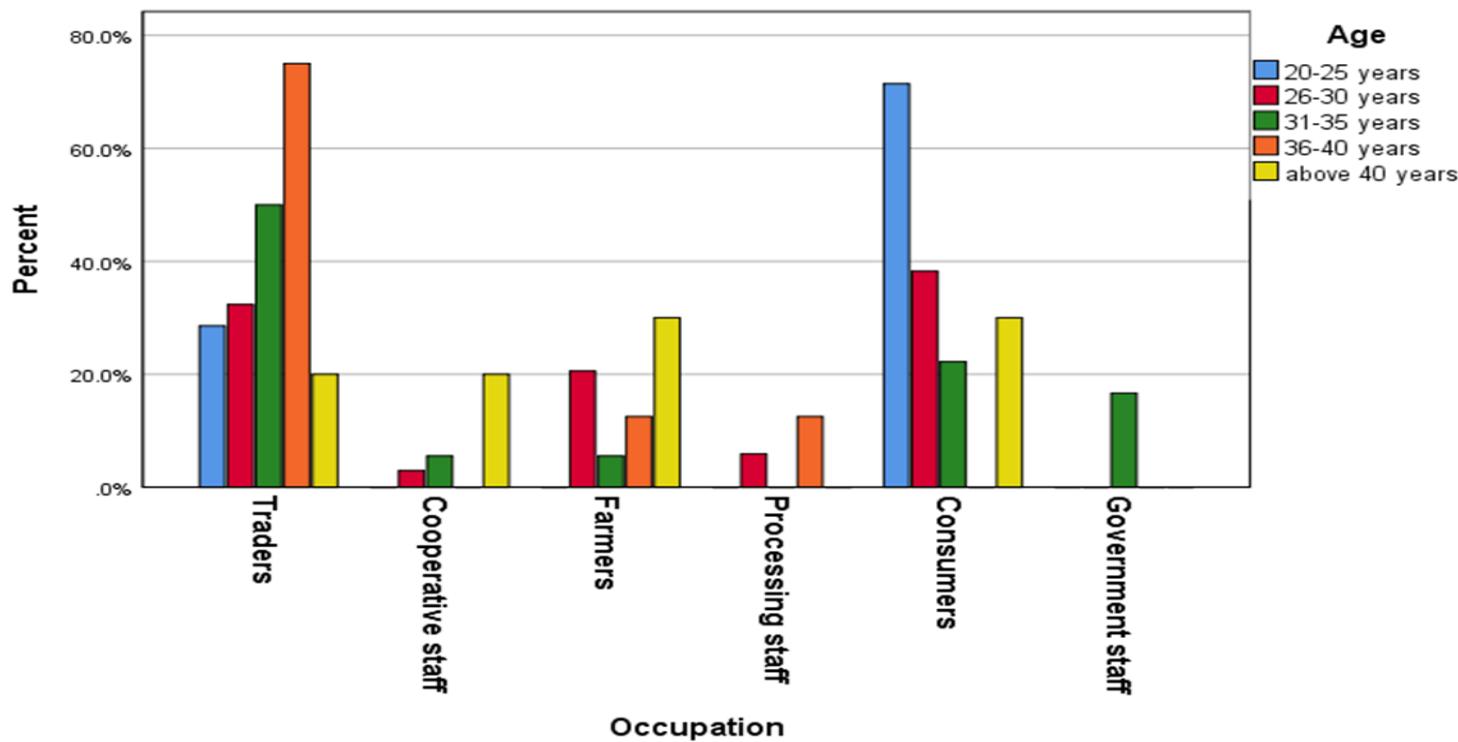


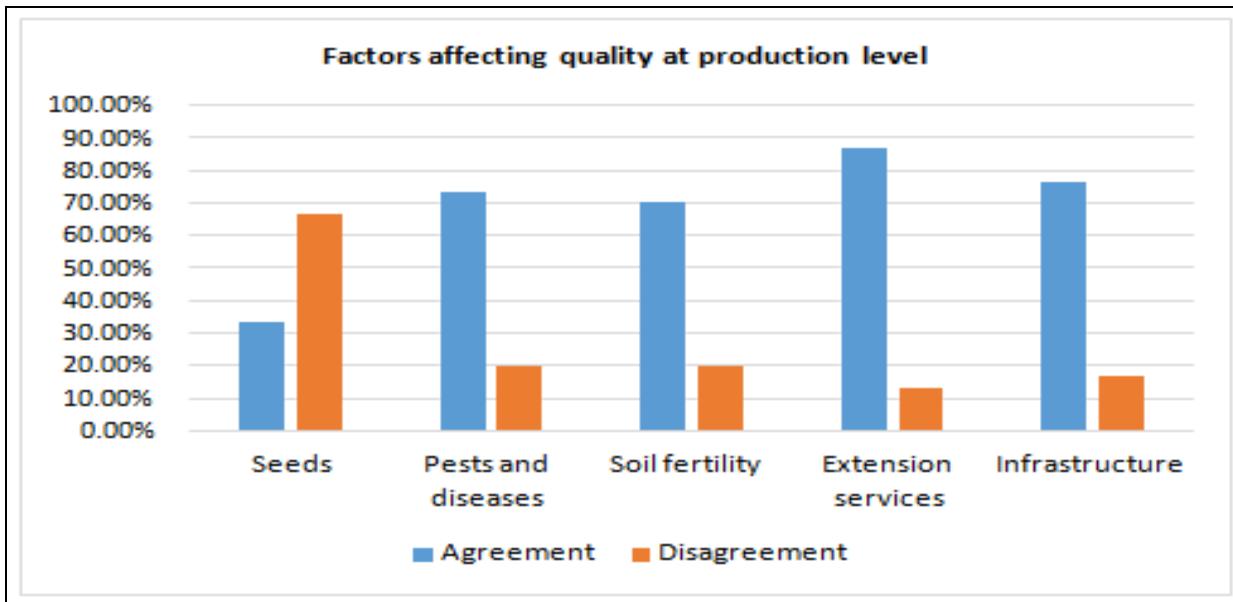
Figure 9: Age of respondents (n=77)

Source: Data from survey

4.2. Factors affecting the quality of rice produced in Rwanda

4.2.1. Production level Factors

The investigation inquired into five factors that were viewed as influential to the quality of rice at production level and the respondents were majority the farmers. According to Figure 4.5, respondents proved that seeds affected quality of rice at 30%, pests and diseases 72%, fertility of the soil 70%, extension services 85% and infrastructure 74% .Pest and diseases, soil fertility and infrastructure affected the farmers' rice at production level.,



Source: Data from survey

Figure 10: Factors affecting quality at production level (n=30)

4.2.2. Post-harvest level factors

According to Figure 11 respondents proved that post-harvest skills (40%) drying methods (80%), threshing (97%) and winnowing and cleaning were the major factors that affected quality of rice. At post-harvest poor winnowing and cleaning (50%), were found to affect rice quality in the study.

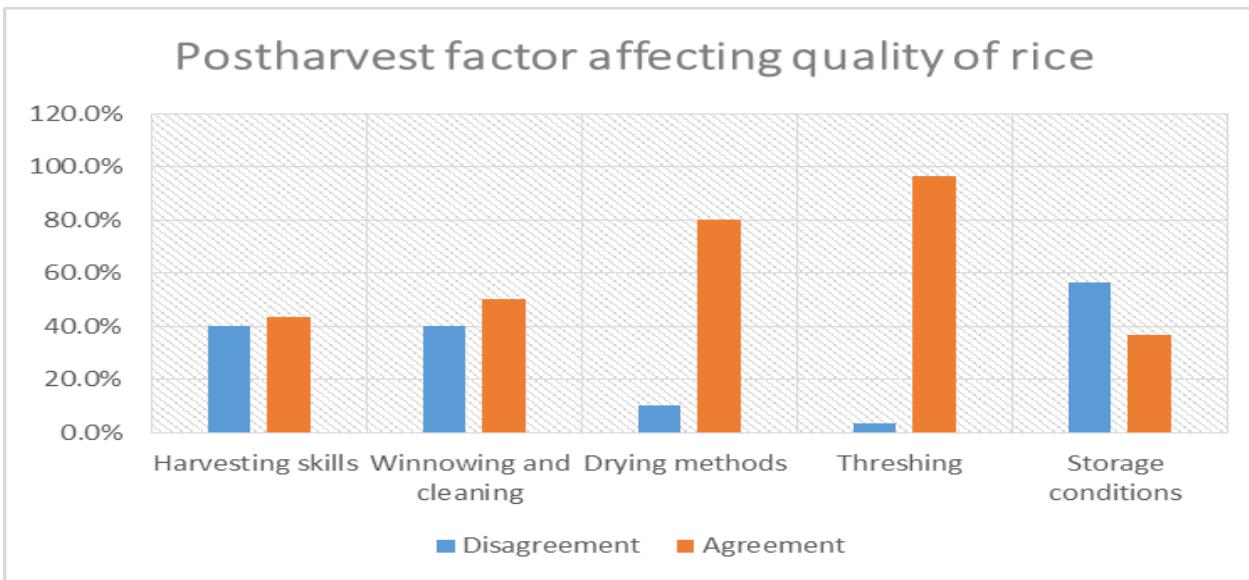


Figure 11: Factors at postharvest level (n=30)

Source: Data from survey

4.2.3 .Processing level Factors affecting quality of rice

According to Figure 12, respondents proved that varietal purity (100%), moisture content, yellowing and cracked (80%),damaged grains were major factors processing factors that affected quality of rice .The quality of rice at processing level was characterized by high moisture content, damaged grains, yellowing, cracked, immature grains and varietal purity. Figure4. 7 summarizes that moisture content was higher than required, the rice was pure, but had damaged grains, yellowing, cracked and immature grains as well as varietal purity existed.

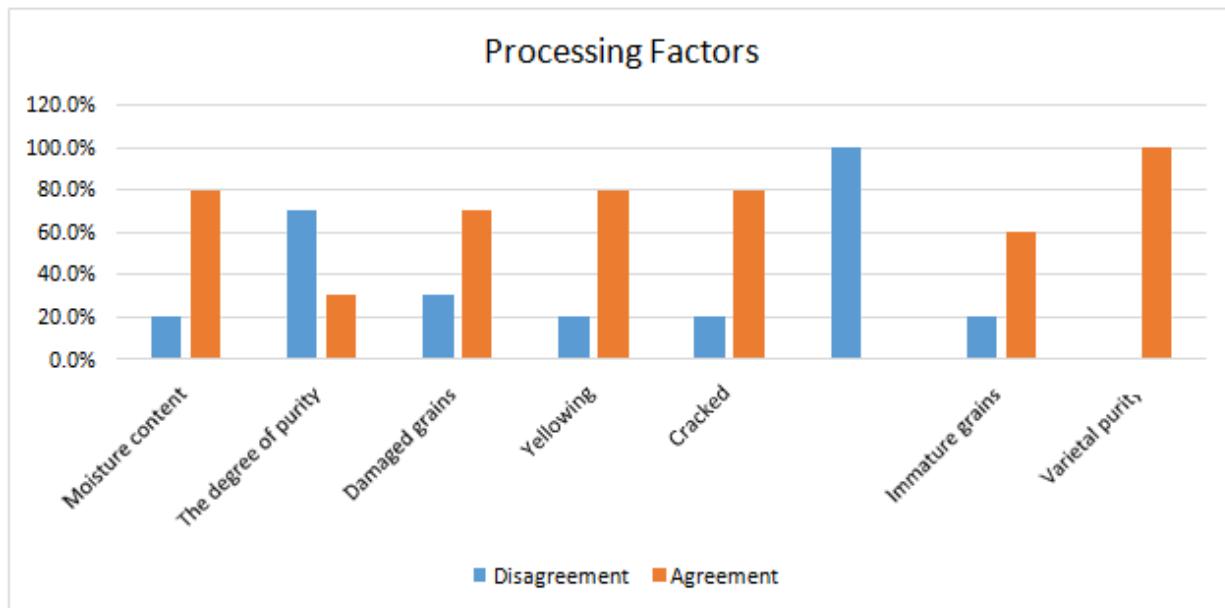


Figure 12: Quality factors at process level (n=10)

Source: Data from survey

4.2.4 .Consumer factors affecting quality of rice

Consumer satisfaction with physical characteristics

According to Figure 13, respondents proved that shape of grain (67 %), rate of breakage (84 %), absence of foreign matter (80%) and whiteness (72%), were the major consumer factors affecting quality of rice(consumer satisfaction). While at the consumer level the shape of rice, high rate of breakage, presence of foreign matter and yellowing were major concerns about quality of Rwandan Rice.

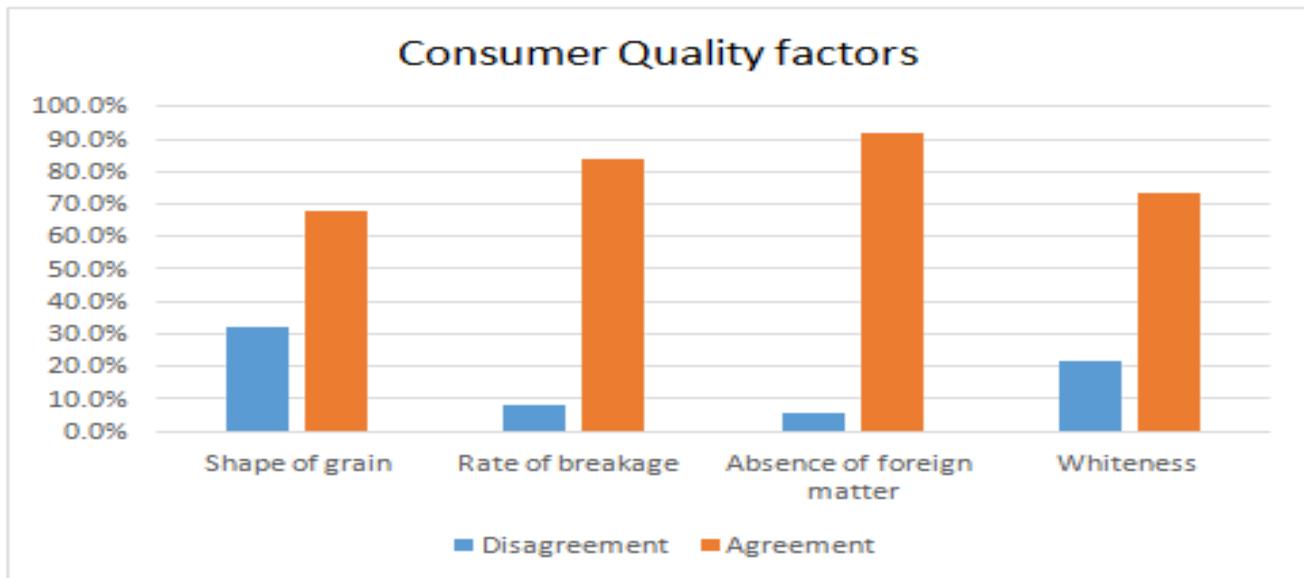


Figure 13: Consumer quality factors (n=77)

Source: Data from survey

4.3. Consumer's satisfaction with cooking characteristics with Rwandan rice

According to the figure 14, consumer satisfaction with Rwandan rice was determined by considering the satisfaction with the cooking characteristics. The results of the study proved that aroma (37%, appearance (25% and color (25%) were the major factors that affected satisfaction of respondents with Rwandan Rice. However respondents were not satisfied with stickiness (91%, taste (88% and cleanness (81%).

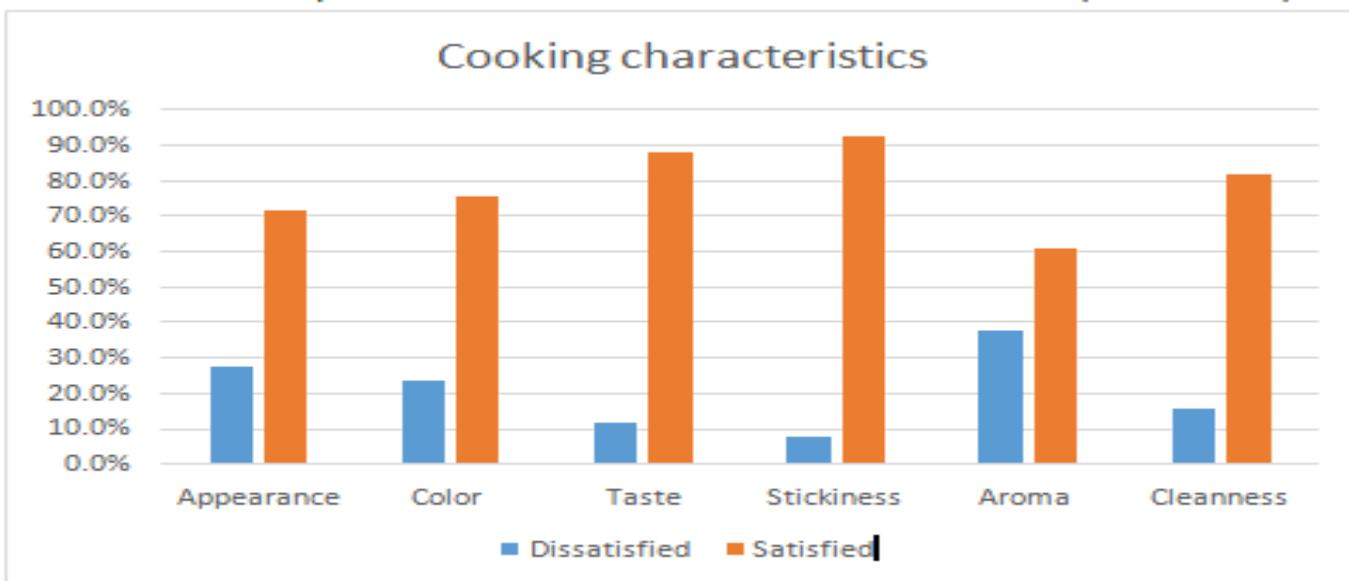


Figure 14: Cooking characteristics (n=77)

Source: Data from survey

4.4. Consumer's satisfactions with Marketing Characteristics

Marketing factors included price, availability, packaging and labelling of the rice. Figure 15, presents the finding and summarizes the levels of satisfaction accordingly. Satisfaction was recorded with the pricing and availability and over as well as packaging and labeling of the rice. The largest dissatisfaction came from the labelling (45%), followed by the packaging (25%) and finally availability with 22%. According to Figure 4.16, over 75% were satisfied with the pricing and availability and over 70% were satisfied with packaging and labeling of the rice. The consumers were highly satisfied with pricing and availability as well as packaging but desired a little more with the labeling.

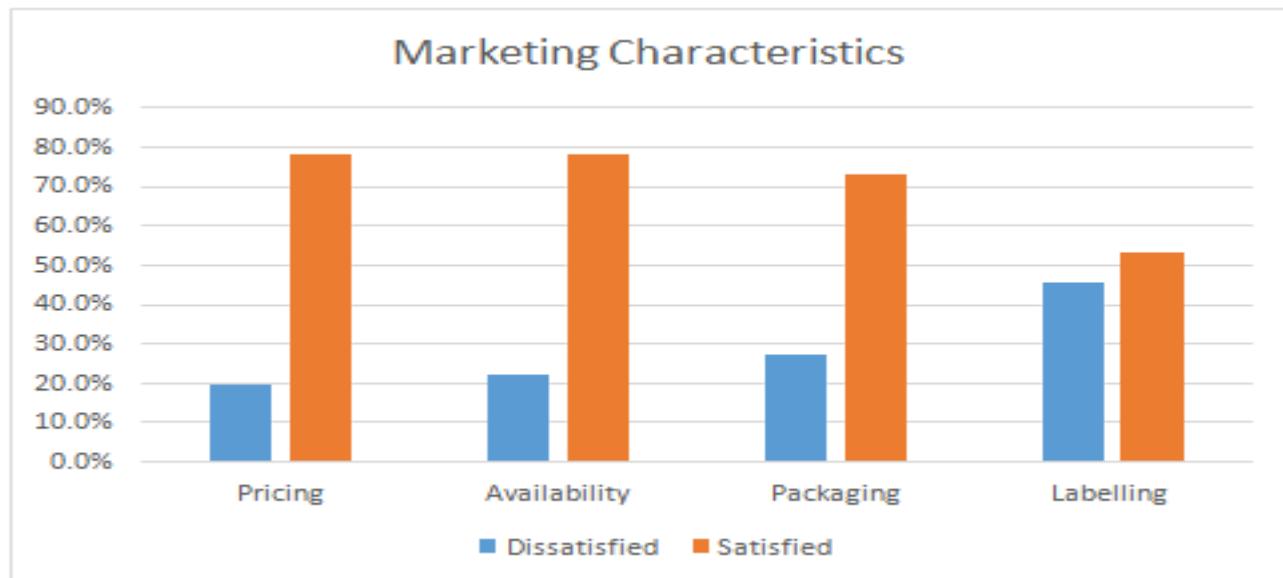


Figure 15: Satisfaction with marketing characteristics (n=77)

Source: Data from survey

4.5 Influence of rice characteristics on satisfaction

A correlation between quality at post-harvest level and satisfaction with physical characteristics

According to table 2, postharvest level factors produced a correlation coefficient $r = -0.398$, $p = 0.029$ implying that the relationship was negative and statistically significant at 0.05 level (2-tail). There is therefore sufficient evidence to conclude that postharvest factors currently practiced in Rwanda did reduce on the physical characteristics of the produced rice. All the other relationships were not statistically significant and provide no significant conclusions. Others=cooking and others

Table 2: Correlation between quality factor at post-harvest level and satisfaction with physical characteristics

	Quality at Post- harvest level		
	Pearson Correlation	Sig. (2-tailed)	N
Physical	-.398*	.029	30

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Data from survey

4.5.1 Process level quality and the satisfaction of consumers

According to the table 3 table the Pearson coefficient, $r=0.645$, $p=0.044$ was produced for the influence of satisfaction with physical characteristics of rice and quality at processing level. This shows that the relationship was positive and statistically significant meriting a conclusion that for every increase in the quality of rice at the processing level, an increase in satisfaction with physical characteristic is registered.

The quality at processing level negatively influenced satisfaction with cooking characteristics though the relationship was weak and not statistically significant.

Table 3: Correlation between processing quality factors and satisfaction

	Quality at processing level		
	Pearson Correlation	Sig. (2-tailed)	N
Physical	.645*	.044	10

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Data from survey

4.6 Qualitative results from Interview

4.6.1 Respondent 1(Rice expert from MINAGRI)

The respondent indicated that the Ministry of Agriculture and natural resources is to provide extension services, provide minerals fertilizers, marshlands development and reclamation, construction of dam for irrigation, providing trainings through field farmers' studies and facilitating farmers in study tours to learn from best practices. However the respondent indicated resistance of farmers on the use improved varieties raising concerns about their effects on the farm land. The respondent further indicated that though the majority of farmers use fertilizer in the adequate, but the access of pesticide is still a big issue in some areas. Among the major factors affecting the quality of rice was insufficient post-harvest infrastructure such as insufficient drying ground, storage facilities, threshing materials, insufficient dam for irrigation, and poor management of dam, existence of informal millers, limited number of qualified staff in marshland development and irrigation competition of water with other crops, lack of appropriate pesticides and financial constraint.

4.6.2 Respondent 2(Rice expert from MINICOM)

The quality of Rice is fair but we are still facing the issue of informal millers producing low quality of rice and traders labeling grade II as grade I to mislead consumers. The ministry and commerce its role is to facilitate the private sector in establishing modern milling facilities, regular inspection to fight informal millers and traders to check the quality and quantity of rice sold. Despite the efforts of the still exists informal millers in rice value chain. The respondent in his recommendations indicates the need to facilitate collaboration with RSB and signing farming contract with farmers, that if this is done can improve the quality of rice. The major factors affecting the quality of rice is insufficient post-harvest infrastructure and existence of informal millers.

4.6.3 Respondent 3 (Rice expert from RSB)

The quality of rice is fair compared to imported rice. The respondent indicated that Rwanda standards board has the role of harmonizing the standard, training processors, and inspection of milling factories to check their compliance with standards. Rwanda standards board its role is to facilitate buying standard machine and provide technicians to calibrate their machines. The respondent indicated that processors have the willingness of producing good quality of rice but they face unfair competition of informal millers because they produce cheap rice. The respondent recommends to follow Rice standards in producing rice .The major challenges highlighted were substandard milling machine, unskilled technicians in some processing plant.

CHAPTER FIVE: DISCUSSION

5.1. Factors affecting the quality of Rwandan rice at production level

Respondents (farmers) proved that seeds affected quality of rice at 30%, pests and diseases 72%, fertility of the soil 70%, extension services 85% and infrastructure 74%. contrary to the 2013 MINAGRI report that seed quality was the major factor influencing quality. This improvement has been achieved due to the strategic move by the government of Rwanda to increase production of Rwandan rice 7 tons by 2018 (Ghins & Pauw, 2017). Pests and diseases however still remained a great challenge to the farmers irrespective of the efforts by the government initiatives. The resistance of farmers on adoption of the pesticides with historical health issues has contributed to the low use of pest and disease control chemicals. The prevalence of soil erosion due to topography of Rwanda has contributed to the infertility of the rice farm land besides the historical financial issues that have affected farmer's ability to acquire fertilizers. The situation is worsened by the poor infrastructure such as irrigation facilities that are quite expensive for the household farmers than the Cooperative farmers. This finding is in consistence with the finding of (Makokha, Kilimo, & Namusonge, 2017). Disease and insects can also have detrimental effects on rice quality

5.2. Factors affecting the quality of Rwandan rice at post-harvest

Respondents (Farmers) revealed that post-harvest skills (40%) drying methods (80%), threshing (97%) and winnowing and cleaning were the major factors that affected quality of rice. At post-harvest poor winnowing and cleaning (50%), were found to affect rice quality in the study. This finding is in consistence with (Pankaj, & Aloka, 2015) who said that some stages in the rice post-harvest system are more critical than others. Among these critical stages, drying and storage are especially important. Between 10 and 40 per cent of the food that is grown never reaches the market or consumer's plate because of inadequate harvesting, drying and winnowing materials, insects and rodents that get into storage containers. It's more difficult to assess qualitative losses, such as loss of edibility, nutritional quality, caloric value, and consumer acceptability of the products than assessing quantitative losses.

5.3. Factors affecting the quality of Rwandan rice at processing-level

Respondents(Processors, COPRORIZ staff) proved that varietal purity (100%), moisture content, yellowing and cracked (80%),damaged grains were major factors processing factors that affected quality of rice .The quality of rice at processing level was characterized by high moisture content, damaged grains, yellowing, cracked, immature grains and varietal purity.

The reason behind is that farmers used stones to thresh the rice and this introduced stone particles in the rice moreover the drying was done on sand. It was observed that most of the rice harvested were dried using natural methods that was highly susceptible to change of weather. This usually affected the moisture content of the rice.

5.4. Consumer satisfaction with physical characteristics

Respondent (Traders &Consumers) proved that shape of grain (67 %), rate of breakage (84 %), absence of foreign matter (80%) and whiteness (72%), were the major consumer factors affecting quality of rice. While at the consumer level the shape of rice, high rate of breakage, presence of foreign matter and yellowing were major concerns about quality of Rwandan Rice.

5.5. Consumer satisfaction with cooking characteristics

Respondent (all) proved that consumer satisfaction with Rwandan rice was determined by considering the satisfaction with the cooking characteristics. The results of the study proved that aroma (37%, appearance (25%) and color (25%) were the major factors that affected satisfaction of respondents with Rwandan Rice. However respondents were more satisfied with sickness (91%, taste (88% and cleanness (81%).

5.6. Consumer satisfaction with marketing factors

According to figure 15, over 75% of consumers were satisfied with the pricing and availability and over 70% were satisfied with packaging and labeling of the rice. The consumers were highly satisfied with pricing and availability as well as packaging but desired a little more with the labeling.

The reason behind is that majority of consumers live near the processing plant, and also farmer benefit from special price as main supplier of the processing plant.

5.7. Correlation

All Pearson correlation coefficient for the relationship between consumer quality factors and satisfaction were not statistically significant and therefore though the relationship showed that quality of rice affected physical characteristics negatively, cooking characteristics positively and other factors negatively, there is no statistical evidence to support the hypothesis that consumer quality influences their satisfaction. The respondents majorly being located in the rural areas might have had no choice but consume the available rice given its low price as compared to other brands and therefore had no comparison to use to evaluate their own local ones.

The Pearson coefficient, $r=0.645$, $p=0.044$ was produced for the influence of satisfaction with physical characteristics of rice and quality at processing level. This shows that the relationship was positive and statistically significant meriting a conclusion that for every increase in the quality of rice at the processing level, an increase in satisfaction with physical characteristic is registered. The quality at processing level negatively influenced satisfaction with cooking characteristics though the relationship was weak and not statistically significant.

CHAPTER SIX: CONCLUSIONS

The results of the study confirmed that key production factors that affected quality of rice were pests and diseases ,fertility of the soil , extension services and infrastructure .Thus the study concludes that production factors that affected quality of rice in the study area.

The results of the study concluded that key post-harvest factors that affected quality of rice were drying methods, threshing, and winnowing and cleaning were the major factors that affected quality of rice. Thus the study concluded that post-harvest factors that affected quality of rice in the study area.

The results of the study proved that the major processing factors that affected quality of rice were varietal purity, moisture content, yellowing and cracked and damaged grains.

The study proved that for every increase in the quality of rice at the processing level, increase satisfaction of consumers with physical characteristic.

The study concluded that other factors influencing consumer' choice were (Price, availability, labelling and packaging) and consumers were satisfied with the physical, cooking and marketing characteristics (Price, availability, labelling and packaging).

The diagram below summarizes factors affecting the quality of Rwandan rice at production, post-harvest and processing level factors.

The diagram shows that the main causes of low quality of Rwandan at production level are pest and diseases, poor soil fertility, insufficient extension services and insufficient infrastructures. At post-harvest level the main causes are poor winnowing and cleaning, poor storage conditions, manual threshing, inadequate harvest skills and inadequate drying methods.

At processing level the main factors affecting the quality of Rwandan rice are varietal purity, damaged grains, degree of purity, high moisture content, cracked and immature grains. The analysis concluded that all those factors are interrelated.

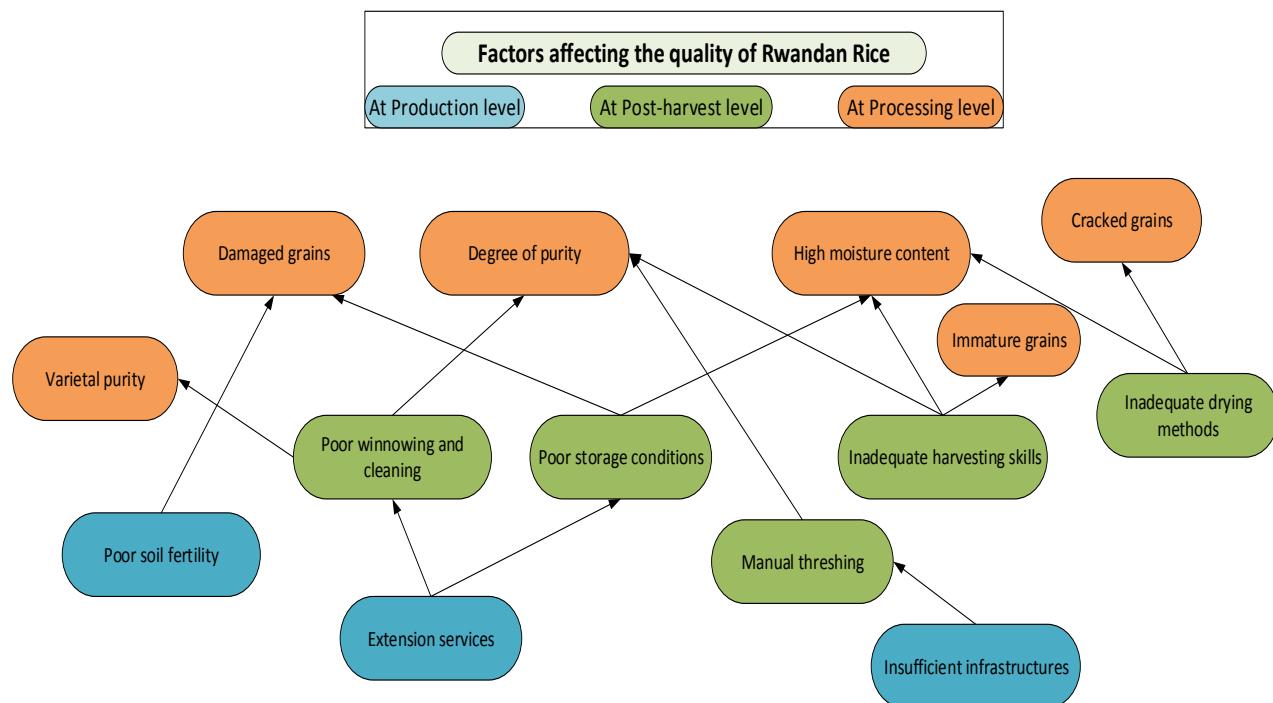


Figure 16: Casual diagram: Factors affecting the quality of Rwandan rice

Source: Author 2018

CHAPTER 7: RECOMMENDATIONS

The results of the study concluded that key production factors that affected quality of rice were pests and diseases ,fertility of the soil , extension services and infrastructure .Thus the study recommends that ministry of Agriculture and natural resources to increase in the numbers of extension worker providers to reduce the farmers' extension worker ratio to increase extension contacts for the purposes of technology transfer through trainings, information dissemination about rice farming production.

The results of the study found that pests and diseases affected the quality of rice, thus the study recommends that ministry of Agriculture and natural resources should sensitize and mobilize farmers on use of pesticides through farmer field school and trainings and also emphasize on the current policy of input subsidy to be easily accessible to farmers, this can reduce the challenge pests and diseases. There is also need to provide trainings to producers to equip them on measures disease and pest control measures.

The results of the study concluded that fertility of the soil also affected the quality of rice, thus Ministry of Agriculture and natural resources need to strengthen the current policies of soil conservation measures by sensitizing farmers to terrace their land and dispose of the crop residues such as straws by effectively recycling the nutrients stored in the residues through decomposition in their fields. This can improve on the fertility of the soil.

The results of the study revealed that key post-harvest factors that affected quality of rice were drying methods, threshing, and winnowing and cleaning, thus the study recommends Ministry of Commerce and Rwanda standards board to facilitate farmers to access modern machine for threshing and drying by linking processors to Business Development Funds and facilitate them to access to finance

The results of the study proved that the major processing factors that affected quality of rice were varietal purity, moisture content, yellowing and cracked and damaged grains.

The study recommends that in order to enhance the quality of rice grains through improved management practices of harvesting, drying and storage of rice grains, the Ministry of Trade and Industry should introduce efficient and effective regulations on trading of rice grains and raise the standards of milling operations and thereby improve the quality and competitiveness of locally produced rice grains.

The Ministry of trade and commerce and Rwanda standards board in order to improve the quality of rice, there is need to harmonize standards with EAC countries producing rice and eliminate informal millers, intensify inspection of factories, and traders on compliance with standards and promoting private enterprises in the rice value chain.

The horizontal and vertical integration between all stakeholders involved in Rice production should strengthened by creating a structured cluster of all stakeholders and the role of each player should be well performed in order to increase the quality of locally produced rice.

REFLECTION PAPER

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Code: 000015621

Date: 14/September/2018

I. The Introduction

Conducting research project is one of the requirement of Van Hall University in order to fulfill the requirements of Master's in Agricultural Production Chain Management Specialization in Horticulture.

4 months ago I have started conducting a research on effects of quality of Rwandan rice to the consumer satisfaction, in CROPRORIZ NTENDE one of big cooperative producing rice at more than 900 ha in Gatsibo district.

The topic was chosen to provide answers to different actors and supporters along rice value chain, by conducting a research of on factors affecting the quality of Rwandan rice and knowing to what extent the quality of Rwandan rice affect the consumer satisfaction and suggest possible solution to improve the quality of rice produced in Rwanda.

The research was directed by two main questions "What are factors that influences the quality of rice produced in Rwanda?", "To what extent are the consumers of Rwandan rice satisfied?" Under this, six sub-questions were formulated to find answers to main questions.

In the process of data collection, the main methods used was library search, questionnaire and interview guide. The questionnaire was developed for the purpose of finding factors affecting the quality of Rwandan rice and also measuring the extent at which quality of rice produced influences consumer satisfaction in Rwanda. The questions were formulated according to the objective of the study, the survey and the interviews were conducted consistently.

With quantitative data, the data processing, tabulation and editing was done with the use of SPSS and Ms excel while qualitative data were analyzed by causal diagram.

II. Steps of the research

Steps of the research	Activities	My role	The relevance of the activity	Challenges
Topic	To choose research topic To identify the problem Formulating objectives, main questions and sub questions	After deciding that my research will focus on rice value chain, I started identifying the main problem within the chain, defining my objectives, formulating my main question and sub-questions	I learnt how these steps are very crucial to the success of the research. I enjoyed this process which was part of my current job back home	The big challenge in this part was to formulate sub-question answering main question and also main question answering the objectives I had to do this exercise several times but finally managed to do so.
Data collection	Desk research	I searched through the internet for academic journals, thesis, books, reports, etc. using key word rice, value chains, rice quality, and consumer preferences for my study. I read existing literature related to my topic. The quality of rice was discussed in different research at regional and local level.	This activity helped me to choose relevant literature for my topic It deepened my knowledge on rice value chain and helped me to understand more on the issues along the rice value chain.	I had to review various documents to get relevant information to my topic. It was sometimes frustrating when I couldn't find the information needed.
	Survey <ul style="list-style-type: none">• Identifying key respondents• Preparing questionnaire• Conducting survey	The introduction letter was presented to COPRORIZ-NTENDE to allow me to collect data from their cooperative. Questionnaires were distributed to the farmers, the staff of COPRORIZ-NTENDE, and staff of the processing plant (Gatsibo Rice),	This activity helped me to have a clear reality from the ground which was sometimes different to what I read in literature This part was very crucial to my thesis it helped to collect quantitative data which helped me to answer my questions.	Some places were very difficult to access due to the bad conditions of roads Some respondents were reluctant to answer my questions and the fact of not showing required cooperation in responding to the questionnaire. Some appointments with the farmers were conflicting with their harvest

		traders and consumers.	I enjoyed most the time I spent with farmers, they were enthusiastic to answer my questions even suggested to know the outcome of the research.	
	Interview <ul style="list-style-type: none"> • Preparing check list • Conducting interview 	My role was to prepare check list and booking appointment with key informants	I enjoyed conducting interview since it helped me to collect information from key informants which master the rice value chain.	I had to reschedule my appointment several times. Due to the busy schedules of government expert.
Data processing	Data entry	For quantitative data I used coding to summarize data by classifying different responses given into category. After eliminating errors, codes were assigned to each answer. For qualitative data I had to transcribe directly after the completion of each interview.	This activity helped me to master the use of SPSS which is very relevant to my career back home	The challenging part was that some information was not answering the questions of the research
	Data analysis	Quantitative data was analyses by doing cross tabulation and correlation while qualitative data was analyzed by using SWOT analysis and Casual diagram	This part helped me to evaluate my findings towards my research question and also enabled me to present my findings of the research.	This part enabled me to realize that some information was missing from the analysis because maybe I didn't ask right questions or because there was information left behind during the transcript part.
Writing a report	Make the structure of the report	My role was to first of all make the structure in order to know how many chapter and what is the content of each chapter	This activity made me feeling much more confident in my writing abilities because it improved my skills in research writing.	It was not easy to write the report in clear way that every reader could understand what I meant. I had to read different reports and theses to more understand how to do it.

III. Conclusions

During four months, my self-esteem and self-confidence were increased and will be reflected back to me and others in many ways. I can now look back and realize that this experience has helped me both as a student and as civil servant. I learnt to manage people and achieving many things in a short time, I now feel much more confident in my writing abilities and research skills. Presentation skills are essential in almost any professional setting, and I am sure the presentation aspect of this thesis has helped to develop that as well.

This was achieved due to the knowledge and skills gained from different courses of study; but also by the valuable input from my supervisor which helped me to shape my work.

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APPENDICES

Appendix 1: Questionnaire

For the respondents:

I. Personal identification of respondents

1. Distribution of respondent per gender (tick one).

Male

Female

2. Distribution of respondent per education Level (tick one).

None Primary level Vocation training Secondary school
Bachelor Masters PhD Other

3. Distribution of respondent per occupation

Farmer

Processor

Trader

Civil servant

4. Distribution of respondent per experience (tick one).

1 – 3	4 – 6	7 - 10	Above 10

5. Distribution of respondent per age (tick one).

20 – 25	26 - 30	31 – 35	36 – 40	Above 40

I.QUESTIONNAIRE

For farmers (only)

	Strongly disagreed	Disagree	Not sure	agreed	Strongly agree
Factors affecting quality of rice in Rwanda	1	2	3	4	5
The quality of seeds affect the quality of rice					
Pests and diseases affect the quality of rice					
Soil fertility affect the quality of rice					
Extension services affect the quality of rice					
Infrastructure affect the quality of rice					
Postharvest factors					
Harvesting skills affect the quality of rice					
Winnowing and cleaning affect the quality of rice					
Drying methods affect the quality of rice					
Bagging and packaging affect the quality of rice					
Storage conditions affect the quality of rice					
Consumers and traders					
Rate of breakage affect the quality of rice					
Shape of grain affect the quality of rice					
Whiteness affect the quality of rice					
Absence of foreign matter affect the quality of rice					

To the staff of processing plants

Moisture content affects the quality of rice	1	2	3	4	5
The degree of purity affects the quality of rice					
Damaged grains affects the quality of rice					
Yellowing affects the quality of rice					
Cracked affects the quality of rice					
Varietal purity					
Immature grains affects the quality of rice					
Discolored/fermented grains affects the quality of rice					
Satisfaction (consumers, staff, and traders)					
	1	2	3	4	5
I am satisfied with					
Physical following characteristics of milled rice					
I am satisfied with Rate of breakage					
I am satisfied with Shape of grain					
I am satisfied with Whiteness of the rice					
I am satisfied with Absence of foreign matter					
Cooking Characteristics					

I am satisfied with appearance					
I am satisfied with Color					
I am satisfied with Taste					
I am satisfied with Stickiness					
I am satisfied with Aroma					
I am satisfied with Cleanliness					
What are other factors that influence consumer choice?					
Others					
I am satisfied with Pricing					
I am satisfied with Availability					
I am satisfied with Packaging					
I am satisfied with Labeling					

II.CHECK LIST FOR THE INTERVIEW

Questionnaire for Specialist in charge of Rice value chain/MINAGRI

- What is your general insight into the quality of rice at production level?
- What is the involvement of the Ministry in producing quality paddy rice?
- How do you collaborate with farmers in terms of improving quality?
- What are the factors that you think are the cause of low quality of paddy rice?

Questionnaire for Specialist in charge of Rice value chain/MINICOM

- What is your general insight into the quality of rice at processing and trading level?
- What is the involvement of the Ministry in producing quality rice?
- How do you collaborate with processors in terms of improving the quality?
- What are the factors that you think are the cause of low quality of rice?

Questionnaire for Specialist in charge of Rice standard /RSB

- What is your general insight into the quality of rice at processing level?
- What is the involvement of RSB in producing quality rice?
- How do you collaborate with processors in terms of improving the quality?
- What are the factors that you think are the cause of low quality of rice?

Appendix 2: Tables from SPSS tabulation with the full list of annexes

Annex i: Gender of respondents

Table 1 .Gender of respondents

		Occupation						Total	
		Traders		Cooperative		Farmers			
		staff	staff	staff	staff	Consumers	Government		
Gender	Male	Count	19	3	9	2	15	1	49
		%	38.8	6.1	18.4	4.1	30.6	2.0	100.0
	Female	Count	11	1	3	1	10	2	28
		%	39.3	3.6	10.7	3.6	35.7	7.1	100.0
Total		Count	30	4	12	3	25	3	77
		%	39.0	5.2	15.6	3.9	32.5	3.9%	100.0

Annex ii: Educational Level of respondents

Table 2 Educational Level of respondents

		Education level			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	11	14.3	14.3	14.3
	Primary	16	20.8	20.8	35.1
	Vocational training	12	15.6	15.6	50.6
	Secondary School	31	40.3	40.3	90.9
	Bachelor	7	9.1	9.1	100.0
	Total	77	100.0	100.0	

Annex iii: Experience with Rwandan rice of respondents

Table 3 Experience with Rwandan rice of respondents

		Occupation						Total	
		Traders		Cooperative	Farmers	Processing	Consumers	Government	
		staff	staff	staff	staff	staff	staff		
Experience	1-3 years	Count	4	0	2	0	10	0	16
	years	%	25.0	0.0	12.5	0.0	62.5	0.0	100.0
	4-6 years	Count	7	1	3	1	6	0	18
	years		38.9	5.6	16.7	5.6	33.3	0.0	100.0
	7-10 years	Count	9	1	2	1	2	3	18
	years	%	50.0	5.6	11.1	5.6	11.1	16.7	100.0
	above 10 years	Count	10	2	5	1	7	0	25
	years	%	40.0	8.0	20.0	4.0	28.0	0.0	100.0
	Total	Count	30	4	12	3	25	3	77
		%	39.0	5.2	15.6	3.9	32.5	3.9	100.0

Annex iv: Age of respondents

Table 4 .Age of respondents

		Occupation						Total	
		Traders		Cooperative	Farmers	Processing	Consumers	Government	
		staff	staff	staff	staff	staff	staff		
Age	20-25 years	Count	2	0	0	0	5	0	7
	years	%	28.6	0.0	0.0	0.0	71.4	0.0	100.0
	26-30 years	Count	11	1	7	2	13	0	34
	years	%	32.4	2.9	20.6	5.9	38.2	0.0	100.0
	31-35 years	Count	9	1	1	0	4	3	18
	years	%	50.0	5.6	5.6	0.0	22.2	16.7	100.0
	36-40 years	Count	6	0	1	1	0	0	8
	years	%	75.0	0.0	12.5	12.5	0.0	0.0	100.0
	above 40 years	Count	2	2	3	0	3	0	10
	years	%	20.0	20.0	30.0	0.0	30.0	0.0	100.0
	Total	Count	30	4	12	3	25	3	77
		%	39.0	5.2	15.6	3.9	32.5	3.9	100.0

Annex v: Factors at production level

Table 5: Factors at production level

	Strongly Disagree		Disagree		Not sure		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	Median
	12	40.0	8	26.7	0	0.0	8	26.7	2	6.7	30	2
The quality of seeds are not good												
Pests and diseases don't affect the quality of our rice	1	3.3	5	16.7	2	6.7	20	66.7	2	6.7	30	4
Soil fertility affect the quality of our rice	6	20.0	0	0.0	3	10.0	16	53.3	5	16.7	30	4
I receive Extension services	3	10.0	1	3.3	0	0.0	19	63.3	7	23.3	30	4
We don't have enough Infrastructure	3	10.0	2	6.7	2	6.7	16	53.3	7	23.3	30	4

Annex vi: Factors at post-harvest level

Table 6 Factors of quality at postharvest level

	Strongly Disagree		Disagree		Not sure		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	Median
	2	6.7	10	33.3	5	16.7	11	36.7	2	6.7	30	3
I have good rice Harvesting skills												
I don't do good Winnowing and cleaning of paddy rice	0	0.0	12	40.0	3	10.0	13	43.3	2	6.7	30	4
Drying grounds are insufficient	3	10.0	0	0.0	3	10.0	14	46.7	10	33.3	30	4
Paddy rice Threshing method aren't appropriate	1	3.3	0	0.0	0	0.0	19	63.3	10	33.3	30	4
Storage conditions appropriate	12	40.0	5	16.7	2	6.7	9	30.0	2	6.7	30	2

Annex vii: Process level factors

Table 7. Factors of quality at process level

	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree		Total	
	N		N		N		N	%	N	%	N	Median
	1	10.0	1	10.0	0	0.0	4	40.0	4	40.0	10	4
Moisture content of rice is above 14%												
The degree of purity is high	0	0.0	7	70.0	0	0.0	3	30.0	0	0.0	10	2
High level of Damaged grains	0	0.0	3	30.0	0	0.0	7	70.0	0	0.0	10	4
Low Yellowing of rice	1	10.0	1	10.0	0	0.0	7	70.0	1	10.0	10	4
Low Cracks	2	20.0	0	0.0	0	0.0	6	60.0	2	20.0	10	4
Discolored/fermented grains	9	90.0	1	10.0	0	0.0	0	0.0	0	0.0	10	1

Presence of immature grains	1	10.0	1	10.0	2	20.0	5	50.0	1	10.0	10	4
Varietal purity	0	0.0	0	0.0	0	0.0	5	50.0	5	50.0	10	5

Annex viii: Quality factors at Consumer level

Table 8. Quality at consumer level

	Strongly Disagree		Disagree		Not sure		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	Median
Rice is of appropriate Shape of grain	4	10.8	8	21.6	0	0.0	12	32.4	13	35.1	37	4
Rate of breakage is high	2	5.4	1	2.7	3	8.1	23	62.2	8	21.6	37	4
Rwandan rice is not White enough	4	10.8	4	10.8	2	5.4	25	67.6	2	5.4	37	4
Presence of foreign matter	2	5.4	0	0.0	1	2.7	25	67.6	9	24.3	37	4

Annex ix: Consumer's satisfaction with physical characteristics of Rwandan rice

Table 9: Satisfaction with Physical characteristics

	Strongly Disagree		Disagree		Not sure		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	Median
I am dissatisfied with Rate of breakage	0	0.0	10	13.0	0	0.0	55	71.4	12	15.6	77	4
I am dissatisfied with Shape of grain	12	15.6	0	0.0	2	2.6	53	68.8	10	13.0	77	4
I am dissatisfied with Whiteness	2	2.6	1	1.3	3	3.9	55	71.4	16	20.8	77	4
Rice has high amount of foreign matter	5	6.5	3	3.9	1	1.3	44	57.1	24	31.2	77	4

Annex: Consumer's satisfaction with cooking characteristics of Rwandan rice

Table 10. Satisfaction with cooking characteristics

	Strongly Disagree		Disagree		Not sure		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	Median
I am satisfied with appearance	2	2.6	19	24.7	1	1.3	20	26.0	35	45.5	77	4
I am satisfied with Color	13	16.9	5	6.5	1	1.3	12	15.6	46	59.7	77	5
I am not satisfied with Taste	3	3.9	6	7.8	0	0.0	29	37.7	39	50.6	77	5
I am satisfied with Stickiness	0	0.0	6	7.8	0	0.0	34	44.2	37	48.1	77	4
I am not satisfied with Aroma	9	11.7	20	26.0	1	1.3	19	24.7	28	36.4	77	4
I am not satisfied with Cleanness	0	0.0	12	15.6	2	2.6	37	48.1	26	33.8	77	4

Annex xi Marketing factors influencing consumer's satisfactions

Table 11. Satisfaction with other characteristics

	Strongly Disagree		Disagree		Not sure		Agree		Strongly Agree		N Median	Total
	N	%	N	%	N	%	N	%	N	%		
I am not satisfied with Pricing	7	9.1	8	10.4	2	2.6	19	24.7	41	53.2	77	5
I am satisfied with Availability	3	3.9	14	18.2	0	0.0	44	57.1	16	20.8	77	4
I am not satisfied with Packaging	4	5.2	17	22.1	0	0.0	29	37.7	27	35.1	77	4
I am not satisfied with Labeling	23	29.9	12	15.6	1	1.3	28	36.4	13	16.9	77	4

Annex xii. Photos taken during data collection





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Annex xiii. Acceptance letter for academic research



COPRORIZ - NTENDE

INTARA Y'IBURASIRAZUBA
AKARERE KA GATSIBO
UMURENGE WA RUGARAMA – RWIMBOGO – GITOKI

Gatsibo on 12th June 2018

Dear,

GAUDENCE MUKAMURENZI

Van Hall Larenstein University of Applied Sciences

Agricultural Production Chain Management - Horticulture Chains

Telephone: 0788531239

RE: ACCEPTANCE FOR ACADEMIC RESEARCH

We are pleased to inform you that you have been given the opportunity to data collection for your academic research thesis purpose entitled "**“THE QUALITY OF RICE PRODUCED AND CUSTOMER SATISFACTION IN RWANDA”**. A Case study COPRORIZ NTENDE Gatsibo district" in quality assurance from 25th June to 5th JULY 2018

Best regard!

RUGWIZANGOGA Elysée

President of COPRORIZ NTENDE

