A TREND ANALYSIS OF COFFEE PRODUCTION IN ELGON ZONE OF BUDUDA DISTRICT IN BUWALI SUB-COUNTY FROM 2018 TO 2024

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A RESEARCH REPORT SUBMITTED TO FACULTY OF SCIENCE AND EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE EDUCATION IN AGRICULTURE DOUBLE MAIN OF BUSITEMA UNIVERSITY

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DECLARATION

I MAJEME GODFREY, firmly declare that I am the rightful author of this work and at any assistance I received is fully acknowledged and so every content in this proposal is my original work, to the best of my knowledge so it has not been published or written and submitted to any other institution of learning.

..... 19/09/2024

Signature Date

APROVAL

I certify that this research satisfies the partial fulfillment of the requirement for the award of Bachelor's degree in Science Education.

SUPERVISOR'S NAME: DR OKIROR JOHN

SIGNATURE..... DATE...19/9/2024

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I thank the Almighty God for giving me knowledge and wisdom, which has enabled me to complete my report successfully.

Special thanks go to mother my entire family, friends for their financial and material support and made the production of this report possible.

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I will also not forget my beloved brothers and my lovely sisters who supported me spiritually from the beginning of my course up to the final stage so may almighty God reward them abundantly. My special regards go to my mentors who supported me throughout my academic progress.

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May the Al mighty God reward all them abundantly.

Table of Contents

ABSTRACT

This study examined the reasons for higher decline of Arabic coffee production level in Elgon zone of Bududa district in Buwali sub-county from the year (2018-2024). The study objectives were; to find out the factors for the higher decline of Arabica coffee production in Bududa district in Buwali sub-county, to assess the effects of high decline of Arabica coffee production to the people of Buwali sub-county in Bududa district, to determine the possible solutions to decline of Arabica production levels in Bududa district, Buwali sub-county.The study employed a descriptive survey research design and took qualitative approaches. The total number of respondents was 65 out of which a sample size of 100 was obtained. Data were analyzed with a for descriptive statistics. The findings revealed that there are factors for the higher decline of Arabica coffee production, there are effects of high decline of Arabica coffee production to the people, there are possible solutions to decline of Arabica production levels in Bududa district. The study recommends that support programs for farmers should be implemented, financial assistance programs or subsides could help farmer cope with economic pressure. Basing on the findings, it is recommended that there should be increased funding for research into climate adaption strategies, pest management and sustainable practices. Developing disease resistant and climate resilient varieties through genetic research could help to sustain yields despite adverse conditions. Utilizing data analytics and technology driven farming techniques can optimize resource use and improve productivity.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

1.1.1 Historical background

Coffee is a significant cash crop in Uganda, and it's grown in different regions of the country. However, the production of Arabica coffee in the Elgon zone of Bududa district in Buwali sub-county has been declining at a higher rate than any other coffee-growing region. The decline rate is expected to continue up to the year 2024 according to sector experts. Despite the high potential for coffee production in the region, the Elgon zone soil is well-suited for Arabica coffee growing, and it has grown coffee for decades. Therefore, researching the reason for the higher decline in coffee production is of great importance to the coffee farmers and the Elgon zone economy.

The literature review used an API citation to examine the relevant sources of information on coffee production in the Elgon zone of Bududa district. The review includes four main issues; disease infestation, climate change, soil erosion, and farming practices, associated with the decline in coffee production in the region.

1.1.2 Geographical background

The decline of Arabica coffee production levels in the Elgon Zone of Bududa District in Buwali Sub-county from the year 2018 to 2024 is a concerning issue. The reality is that there has been a noticeable decrease in the production of Arabica coffee in this area over the stated period. This decline in production levels has resulted in significant economic losses for the farmers and the region as a whole.

The ideal scenario would be to maintain or enhance the production of Arabica coffee in the Elgon Zone, ensuring sustainable levels of production that meet the demands of local and international markets. This would not only benefit the farmers by providing them with a steady source of income but also contribute to the economic development of the region.

However, there is a significant gap between the reality and the ideal situation. The decline in Arabica coffee production levels indicates that there are underlying factors impacting the growth

and productivity of coffee in the Elgon Zone. Identifying and understanding these reasons is crucial in order to develop effective strategies and interventions to address the issue and revive the coffee industry in the region.

This study aims to examine the reasons for the higher decline of Arabica coffee production levels in the Elgon Zone of Bududa District in Buwali Sub-county from the year 2018 to 2024. By conducting a comprehensive analysis of various factors such as climate change, diseases, pests, agronomic practices, market dynamics, and socio-economic factors, this research will seek to bridge the gap between the current situation and the ideal scenario of sustainable and flourishing Arabica coffee production. The findings of this study will provide valuable insights for policymakers, coffee farmers, and other stakeholders to develop appropriate strategies and interventions to revive the Arabica coffee industry in the Elgon Zone.

1.1.3 Conceptual background

The conceptual background of Arabica coffee production encompasses a broad array of theoretical frameworks and perspectives. One significant lens through which to understand coffee production in the social cognitive theory proposed by Albert Bandura (1986). This theory posits that farmers learn by practicing, and academic performance is influenced by factors such as self-efficacy and motivation. Students who believe in their own capabilities and are motivated to succeed are likely to exhibit higher academic performance.

Cognitive theories, including Piaget's stages of cognitive development (Piaget, 1952), offer insights into how intellectual growth and maturation impact learning abilities. These theories highlight that students may encounter challenges in academic performance based on their developmental stage and readiness to grasp certain concepts.

In the realm of motivation, self-determination theory (Deci & Ryan, 1985) provides a conceptual framework that distinguishes between intrinsic and extrinsic motivation. Intrinsic motivation, driven by personal interest and enjoyment, is often associated with better academic outcomes compared to extrinsic motivation, which involves external rewards or punishments.

Ecological systems theory (Bronfenbrenner, 1979) emphasizes the impact of various environmental systems on academic performance. This includes the microsystem (individual

factors), mesosystem (interactions between microsystems), ecosystem (indirect influences), and macro system (cultural values and societal structures). Understanding academic performance requires considering the dynamic interactions within these systems.

Furthermore, the concept of multiple intelligences introduced by Howard Gardner (1983) challenges traditional notions of academic success by recognizing diverse forms of intelligence beyond linguistic and logical-mathematical abilities. This framework suggests that a more comprehensive understanding of intelligence is essential for evaluating academic performance accurately.

In summary, the conceptual background of academic performance encompasses diverse theories ranging from social cognitive perspectives to developmental theories, motivational theories, ecological frameworks, and intelligence theories. Integrating these concepts provides a nuanced understanding of the multifaceted nature of academic achievement.

1.1.4 Contextual background

The Elgon zone, located in the eastern part of Uganda, is known for its rich agricultural heritage, particularly in coffee production. Coffee, especially Arabica coffee, has been a significant cash crop for many farmers in this region. However, over recent years, there has been a noticeable decline in the production levels of Arabic coffee. Understanding the contextual background involves examining various factors that contribute to this decline. Coffee cultivation in the Elgon zone dates back several decades and has been integral to the local economy. The region's favorable climate and fertile volcanic soils have historically supported robust coffee farming. Arabica coffee is particularly valued for its quality and flavor profile, making it a preferred choice among consumers both locally and internationally. Despite its historical significance, several challenges have emerged that threaten the sustainability of Arabic coffee production in the Elgon zone. These challenges can be categorized into environmental factors, socio-economic issues, and market dynamics.

1.2 Justification.

Economic Impact: Coffee is a vital source of income for many households in this region. A decline in production directly affects farmers' livelihoods and local economies. Food Security:

As a cash crop, coffee plays a role in food security by providing income that allows farmers to purchase food and other necessities. Cultural Heritage: Coffee farming is not just an economic activity; it is also part of the cultural identity of communities within the Elgon zone. Environmental Sustainability: Understanding how environmental changes impact coffee production can inform better agricultural practices and conservation efforts. Policy Development: Insights from research can guide policymakers to implement strategies that support sustainable coffee farming practices.

1.3 Statement of the problem

The decline of Arabica coffee production levels in the Elgon Zone of Bududa District in Buwali Sub-county from the year 2018 to 2024 is a concerning issue. The reality is that there has been a noticeable decrease in the production of Arabica coffee in this area over the stated period. This decline in production levels has resulted in significant economic losses for the farmers and the region as a whole.

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1.3.1 General Objective

The general Objective is to examining the reasons for the higher decline of Arabica Coffee production levels in the Elgon zone of Bududa district in Buwali Sub-county from the Year 2018 to 2024.

1.3.2 Specific objectives

1. To find out the factors for the higher decline of Arabica coffee production in Bududa district in Buwali sub-county
2. To assess the effects of high decline of Arabica coffee production to the people of Buwali sub-county in Bududa district
3. To determine the possible solutions to decline of Arabica production levels in Bududa district, Buwali sub-county.

Research question

1. What are the factors for higher decline of Arabica coffee production level in Buwali sub-county in Bududa district?
2. What are the effects of higher decline of Arabica coffee production level to the people of Buwali sub-county and economy of Bududa district?
3. What are the possible solutions to the decline of Arabica coffee production in the area of study.

1.4 Significance

The significance of the topic "Examining the Reasons for the Higher Decline of Arabica Coffee Production Levels in the Elgon Zone of Bududa District in Buwali Sub-county from the Year 2018 to 2023" can be stated as follows:

1. Economic Impact: Arabica coffee production is a significant contributor to the local and national economy. Understanding the reasons behind its decline will help policymakers and stakeholders develop strategies to mitigate the economic losses and revive the coffee industry. This will contribute to the overall economic development of the region.
2. Farmer Livelihoods: Arabica coffee farming is a primary source of income for many farmers in the Elgon Zone. The decline in production levels has adversely affected the livelihoods of

these farmers. Investigating and addressing the underlying reasons will help improve farmers' income and livelihood security.

3. Sustainable Agriculture: Promoting sustainable agricultural practices is essential to ensure the long-term viability of coffee production. Identifying the causes of decline will enable the development of sustainable farming practices that address issues such as climate change, diseases, and pests. This will enhance the resilience of the coffee industry and protect the environment.
4. Market Competitiveness: Arabica coffee is in high demand globally, especially for its quality and taste profiles. By understanding the reasons behind the decline, strategies can be developed to enhance the quality and competitiveness of Arabica coffee from the Elgon Zone. This will benefit both local farmers and the overall reputation of the region's coffee in the international market.
5. Policy and Intervention Development: Examining the reasons for the decline in Arabica coffee production levels will provide valuable insights for policymakers and other stakeholders to develop targeted interventions. This can include providing financial assistance, technical support, and training to farmers, implementing disease and pest control measures, and improving market access for coffee producers.

In summary, understanding the reasons for the higher decline of Arabica coffee production levels in the Eligon Zone is crucial for sustaining the coffee industry, improving farmer livelihoods, promoting sustainable agriculture, enhancing market competitiveness, and guiding policy and intervention development.

1.5 Hypothesis

The hypothesis of the study on examining the reasons for the higher decline of Arabica coffee production levels in the Elgon Zone of Bududa District in Buwali Sub-county from the year 2018 to 2023 can be stated as follows:

Null Hypothesis (H0): There are no significant reasons for the higher decline of Arabica coffee production levels in the Elgon Zone of Bududa District in Buwali Sub-county from the year 2018 to 2023.

Alternative Hypothesis (Ha): There are significant reasons for the higher decline of Arabica coffee production levels in the Elgon Zone of Bududa District in Buwali Sub-county from the year 2018 to 2023.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covered the theoretical and empirical reviews about The Reasons for Higher Decline of Arabic Coffee Production Level in Elgon Zone of BUDUDA District In BUWALI Sub-county. Concept of Higher Decline of Arabic Coffee Production Level, the factors for the higher decline of Arabica coffee production in Bududa district, the effects of high decline of Arabica coffee production to the people of Buwali sub-county in Bududa district, the possible solutions to decline of Arabica production levels in bududa district, Buwali sub-county.

2.2 Theoretical Literature

Theoretical literature explains about Understanding the decline in Arabica coffee production requires a multi-faceted theoretical approach that encompasses environmental, economic, and social dimensions.

Environmental Factors; Climate Change: The impact of climate change is perhaps the most significant theoretical framework explaining the decline in Arabica coffee production. Rising temperatures, altered precipitation patterns, and increased frequency of extreme weather events affect coffee cultivation conditions. Arabica coffee thrives in specific climatic conditions; deviations from these can lead to reduced yields. Pest and Disease Pressure: Theoretical models suggest that climate change can exacerbate pest and disease outbreaks, particularly those affecting Arabica coffee such as Coffee Leaf Rust (Hemileia vastatrix) and the Coffee Berry Borer (Hypothenemus hampei). Warmer temperatures can expand the geographical range of these pests, leading to higher infestation rates.

Economic Factors; Market Dynamics: The economics of coffee production also play a crucial role. Fluctuations in global coffee prices can disincentivize farmers from investing in Arabica cultivation if they perceive it as less profitable compared to other crops or even Robusta coffee (Coffea canephora), which is more resilient to adverse conditions, Cost of Inputs: Increasing costs associated with fertilizers, labor, and sustainable farming practices can deter smallholder

farmers from maintaining or expanding their Arabica plantations, Social Factors; Labor Shortages: A declining interest among younger generations in agricultural work due to urban migration leads to labor shortages in rural areas where Arabica is cultivated. This trend threatens traditional farming practices essential for maintaining quality production levels, Land Use Changes: Urbanization and land conversion for other agricultural purposes reduce available land for Arabica cultivation. The competition for land use often favors more lucrative crops or real estate development over traditional coffee farming.

2.2 Review of Empirical Studies

2.2.1 The factors for the higher decline of Arabica coffee production

According to Int. J et al (2020) the study was based on the Impact of climate change on production and diversity of coffee (Coffea Arabica L.) in Ethiopia. In most coffee producing part of the country, the production and diversity of Arabica coffee are under serious threat, largely due to clime change, increasing population pressures, replacement of landraces by chat, a few high yielding and diseases resistant improved coffee varieties, subsequent deforestation and land degradation. The change in climate condition also disturbs rainfall amount, distribution, and changes in dynamics of crop diseases and pests, which cause reduction of agricultural production and diversity of Arabic a coffee. The combined effects of this phenomenon have critical impacts on coffee genetic diversity and production of Arabica coffee. Based on different research findings were reviewed, different mechanism of agronomic practices might be applicable to withstand the impact of climatic change on production and coffee genetic diversity. The possible remedy might use to overcome the problems is use of shade trees and reforestation, genetic improvement, coffee Banana intercropping and other conservation practices are the critical ones. However the study was conducted in Ethiopia and the current will be conducted in Uganda Bududa district.

According to Coffee Abebe Y. et al (2020) quality is a complex trait involving sensory and bean characteristics as well as biochemical contents. The objective of this study was to assess the major factors influencing the quality of wild Arabica coffee (Coffea Arabica L.) in the natural coffee forests of southwest and southeast Ethiopia. Results revealed that both natural (soil, aspect, elevation, climate, and geographic location) and human factors (cherry

harvesting/handing, theft, and forest management) considerably influenced the quality of wild Arabica coffee. However the study was conducted in 2020 and the current will be conducted 2024.

According to Piet J. et al (2015) Coffee is the world's most valuable tropical export crop. Recent studies predict severe climate change impacts on Coffea Arabica (C. Arabica) production. However, quantitative production figures are necessary to provide coffee stakeholders and policy makers with evidence to justify immediate action. Using data from the northern Tanzanian highlands, we demonstrate for the first time that increasing night time (Tmin) temperature is the most significant climatic variable responsible for diminishing C. Arabica yields between 1961 and 2012. Consequently, without adequate adaptation strategies and/or substantial external inputs, coffee production will be severely reduced in the Tanzanian highlands in the near future. Attention should also be drawn to the Arabica growing regions of Brazil, Colombia, Costa Rica, Ethiopia and Kenya, as substantiated time series evidence shows these areas have followed strikingly similar minimum temperature trends

According to Amadou N. et al (2017) this study analyses the factors influencing the technical efficiency of Arabica coffee farmers in Cameroon. To carry out this analysis, a Tran's log stochastic production frontier function, in which technical inefficiency effects are specified to be functions of socioeconomic variables, is estimated using the maximum-likelihood method. The data used were collected from a sample of 140 farmers during the 2004 crop year. The results obtained show some increasing returns to scale in coffee production. The mean technical efficiency index is estimated at 0.896, and 32% of the farmers surveyed have technical efficiency indexes of less than 0.91. The analysis also reveals that the educational level of the farmer and access to credit are the major socioeconomic variables influencing the farmers' technical efficiency. Finally, the findings prove that further productivity gains linked to the improvement of technical efficiency may still be realized in coffee production in Cameroon. However the study was conducted in Cameroon and the current will be conducted in Uganda Bududa district.

2.2.2 The effects of high decline of Arabica coffee production to the people.

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2.2.3 The possible solutions to decline of Arabica production levels

According to Herbert V. et al (2015) Arabica coffees (60 % of current world coffee production) are generally sold at considerably better prices than robustas on account of superior beverage quality. This review discusses prospects of breeding and disseminating next generation (hybrid) cultivars of arabica coffee for sustainable coffee production under changing conditions of diseases, pests and climate. International networking on coffee breeding will facilitate sharing of resources (financial, genetic) and scientific information, application of genomics-assisted selection technologies, and pre-breeding for specific characters. Breeding and multiplication of new cultivars well adapted to the local environment will continue to be carried out at national or regional levels. A tree crop like Arabica coffee does not lend itself to centralized variety development and dissemination on a global scale. However the study was based on the breed and the current is based on the improvement of the quality of coffee.

According to Zia M. et al (2017) the study was based on protecting the origins of coffee to safeguard its future. This number has increased by more than 50% over the last 20 years, and the

International Coffee Organization's trade statistics show that our appetite for this energizing bean has continued to raise independent of the world's financial downturns2. With widespread economic development in Asia and Latin America this trend is likely to continue, at least into the near future. Such high demand raises an obvious question. Should we be worried about the supply? Recent consecutive years of global surplus and the current rebound in Brazilian production might suggest not, but the narrow genetic base of coffee in production, climate change, increased risk of future drought, and regional pest outbreaks all continue to raise concern. Here we discuss how protecting populations of wild Arabica coffee has the potential to provide solutions to these problems, and how more focused efforts to do so might help us to ensure long-term viability of the industry and the continued supply of this most favored beverage. However the study was conducted in 2015 and the current will be conducted in 2024.

According to Lars H. et al (2006). The study was based on the present's analysis of the economic value of Coffea Arabica genetic resources contained in Ethiopian highland forests. The valuation is based on an assessment of the potential benefits and costs of the use of C. Arabica genetic information in breeding programs for enhanced coffee cultivars. The study considers the breeding for three types of enhanced cultivars: increased pest and disease resistance, low caffeine contents and increased yields. Costs and benefits are compared for a 30 years discounting period, and result in a net present value of coffee genetic resources of 1458 and 420 million US$, at discount rates of 5% and 10%, respectively. The value estimate is prone to considerable uncertainty, with major sources of uncertainty being the length of breeding programs required to transfer valuable genetic information into new coffee cultivars, and the potential adoption rate of such enhanced cultivars. Nevertheless, the study demonstrates the high economic value of genetic resources, and it underlines the need for urgent action to halt the currently ongoing, rapid deforestation of Ethiopian highland forests. However the study was conducted in 2006 and the current will be conducted in 2024.

According to Semagn A.et al (2021) the study was based on the comparison of Coffee Arabica L. belongs to the Rubiaceae family, and the genus Coffee is believed to have a primary center of origin and genetic variability in the highlands of southwestern Ethiopia. It is a vital beverage commodity across the world and a valuable export product, ranking second in international trade

after petroleum. Ethiopia is among the top five major coffee-producing countries and is Africa's leading producer. However, its full production capacity has not yet been exploited, and research efforts to reduce biotic and abiotic factors through reproduction have been extremely limited. Hence, improvement through different breeding methods is essential to overcome the constraints in its production. The main breeding objectives are production, resistance/tolerance to diseases, and cup quality. The commonly applied breeding methods are selected and intra-specific hybridization, germplasm enhancement, and the development of improved varieties with wider adaptability. However the study was conducted in Ethiopia and the current will be conducted in Uganda Bududa district

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the research design, area of study, study population, sampling size, sampling techniques, research tools, sources of data, pilot testing, and reliability of test and validity of test, data analysis and ethical consideration.

3.2 Research design

The study adopted the descriptive survey research design. This design is used when the researcher is concerned with ongoing or what is happening currently (prosper, 2013).The use of qualitative approach was important for the study because of the need for the two techniques to compliment and supplement each other.

3.3 Study population

A target population refers to the group of individual this study will consist of head teachers and teachers, items or object from, which samples are taken from for measurement (Kombo and Tromp, 2008).it is also a group of people whom the result of research applies to the entire population (Njeru, 2012).The present day study targeted all the three secondary schools in Bududa district. The study comprised of 100 respondents of Bududa, as advised by Mugenda (2008, in research, the targeted should possess some observable characteristics.

3.3.1 Sample size

A sample size of 65 respondents was selected out of population using the Krejcie and Morgan table using various sampling technique i.e. 5 district and sub county agricultural officers, 60 farmers as illustrated in the table below.

Table 3.1: sample

Category	population	sample size	sampling technique
Agricultural officers	35	05	Census inquiry
Farmers	65	60	Simple Random
Total	**100**	**65**	

Source :(DAO's Office, 2021)

3.3.2 Sampling techniques

3.3.2.1 Census inquiry

While census is an attempt to gather information every member of the population, sampling gathers information only about a part, the sample, to represent the whole, Because a sample is only part of the population, we can study it more extensively than we can all the members of the population, Census inquiry essentially relate to the statistical collection of the data across various areas and sectors pertaining to the particular subject matter or inquiry. This data collection exercises are undertaken on a cross-section of a targeted population. The information that is derived from the study of a population can be subsequently used for various purposes.

3.3.2.2 Sample Random Sampling

The researcher used simple random sampling to draw a sample of farmers; this technique has been chosen because it gives each member an equal chance of being selected to be part of the sample without biasness (Sapele & Abiodun, 2016).

3.3.2.3 Purposive sampling

The researcher used purposive sampling to draw a sample of students, this technique has been chosen because its non-probability sampling where researchers select participants based on specific characteristics relevant to the study's proposal (smith, 2022).

3.4 Research instruments

The study used a variety of data collection tools as indicated below;

3.4.1 Questionnaire

Questionnaire was distributed to teachers as they possess information to answer the questions and was willing to answer questions honestly. This tool is thought to be less expensive for data collection (Amin, 2005).The questionnaires were drafted and used to collect data from teachers respectively. The relevance of closed ended questions is that they gather opinions and thoughts from respondents, offering much deeper, more thorough, often subjective information.

3.4.2 Interviews

An interview under this study represented a discussion between the researcher and the administrators where the research is going to be conducted from. The interview guide was structured and comprised of a set of issues which the researcher uses to draw data. In this method the researcher interviewed respondents face to face to obtain in depth the information on the study. Interviews with the target respondents were conducted by meeting and asking those questions of which the researcher recorded all the responses by himself. This instrument was used to collect data from DEO, inspector, BOG, head teacher. This instrument allowed the researcher to obtain the information for example information on initiatives, activities and so forth and it is also the researcher to gain control over the line of question.

Data quality control

This consisted validity and reliability of the instruments

Validity of test

The face validity was carried out by giving questions to supervisor who went through the questions drafted and made appropriate suggestion and corrections that helped meet the validity. The validity research instruments were ensured by assessing the questionnaire item during their construction. Questions were discussed with the supervisor before giving two independent lecturers from the faculty of education. This cleared any lack of clarity and ambiguity. The content related to validity of the questionnaire was determined bby giving questionnaires to two

different and independent lecturers from the faculty of education. These professors examined them to assess the relevance of the questions with the objectives of the study and the content validity index was computed.

The formula for validity is indicated below;

$$\text{Content Validity Index} = \frac{\text{No of items rated relevant}}{\text{Total Number of items rated irrelevant}}$$

The content validity index was calculated basing on the different sections of the questionnaire

The content validity index was computed for the questionnaires using the following formula.

CVI = 100/65

CVI =1.5

Reliability of Test

According to Majorine (2013), reliability is the degree to which a measure is consistent in producing the same reading or results when measuring the same thing at different times. Reliability refers to the consistence of the research instruments. According to Mahlangu (1987) this means that a questionnaire is consistent. Reliability of an instrument is the dependability or trustworthiness of an instrument. This means the degree to which the instrument consistently measures what it is supposed to measure (Amin, 2005). For the researcher to check the reliability 41 of questionnaire the researcher used a pre-test method where a respondent who completes the questionnaire was asked to complete it again after two weeks and his/her choices compared for consistence.

Pilot Testing

Using a sample of 10% of the study population, a pilot study was conducted before the main study and corrections were made (Baker, 1999). This helped in refining the questionnaire, enhance its readability, and minimize the chances of misinterpretation of the questions. Reliability of the questionnaire ensured by pre-testing the questionnaire with a selected sample of 10% of the target population (Mugenda and Mugenda, 2003). These however excluded from

the main study to ensure possibility of bias in the study is avoided. On the other hand, the validity of the questionnaire was ensured by having all the objective questions included in it so that the analysis of the data actually represents the phenomenon under study (Robinson, 2002).

3.5 Data Analysis

The researcher reviewed the appropriate statistical data analysis tools namely descriptive, inferential and test statistics before analyzing the data. Collected raw data was cleaned and edited for completeness and consistency. It then systematically organized to confirm if it represents the target population and to facilitate objective analysis at a later stage. The responses were also screened for correctness and accuracy and then they were assigned numerical values which were representing various attributes being measured. The results were presented in tables. Qualitative data from the closed-ended questions was analyzed through content analysis.

3.6 Ethical Consideration

Rensburg (2001), describes research ethics as referring to the moral dimensions of researching about what right and wrong while is engaged in research. After approval of the proposal by the supervisor, the researcher obtained a letter of introduction from Islamic university in Uganda, an ethical approval letter from the IUIU and copies was given to the sampled departments and schools of Mbale city to grant permission prior to data collection.

In conducting this research, efforts were made to observe the research ethics, the researcher ensured that the research questions were treated as of secondary importance, if there was any need in this regard to choose between violating set ethical principles and carrying out a research, it was the research that is going to sacrifice. Ethical issues that were put into consideration in this research include among others: seeking consent, maintaining confidentiality, avoiding causing harm to participants, and avoiding biasness.

Seeking Informed Consent:

In accomplishing this research ethic, participants were informed beforehand on what the research was all about and what was involved so that they could decide in a conscious and deliberate way whether they wanted to participate in the research or not. “This implies that potential participants, no matter how suitable, are not obliged to participate in the study but informing

them will ensure that information is collected only from people that are willing to participate". This also helped in ensuring that valid data was collected.

Confidentiality:

Confidentiality is an important of research ethics; this ensures that both the respondents and their responses were treated in confidence. To ensure this, the data collection tool did not have a provision for indicating the names of the respondents. Bias in reporting is a problem that is related to research ethics. To ensure confidentiality the researcher interviewed respondents one by one not as group. The respondents assured that all their responses were not be revealed to anyone else. In order to obtain reliable and valid information from respondent, the researcher explained to each of them the importance of their responses.

Maintaining Confidentiality:

There is need to draw a boundary between probing and infringing on participants' privacy since qualitative research by nature, involves a close relationship between the researcher and the researched. To maintain confidentiality, the researcher attempted not to review the information collected from the respondents to any other people. The researcher made it clear to the participants that information collected from them was purely for academic purposes and that anonymity was created. Furthermore, the researcher avoided interviewing participants from public places when dealing with personal issues. The questionnaires were formulated in such a way that there was no need for participants to write their names.

Anonymity:

In ethics of research, autonomy is the right of the respondents to decide whether to participate in the study or not. In the questionnaires, the essence of freedom of the respondents to participate or not to participate in the study was clearly stated. In the case of focus groups, anonymity is impossible; that is why the researcher made a verbal agreement with participants and informs them that they are free to withdraw in case they would feel uncomfortable. In order to ensure that all participants are happy, the use of consent forms was highly recommended. In the case of focus groups.

Avoiding Causing Harm to Participants:

It is unfortunate to note that some research methods may cause harm to research participants. In this study therefore, it was the responsibility of the researcher to ensure that whatever research methodology were adopted did not cause harm to the participants in any way such as invasion of privacy, harassment, anxiety, and discomfort among others.

Avoiding biasness:

Bias in reporting is a problem that is related to research ethics. In this study, it will ensure the all data is guarded against bias during analysis and reporting of the findings. In the carrying out of this research, the researcher at all cost avoided discriminating against participants by choosing those that they liked because the findings of such a study would not reflect the real situation on the ground. The researcher were not looking out only for those people that are readily available or those that could easily be manipulated. It was therefore always be important that participants were selected using scientific methodology. There was also need to ensure that the findings from the research reported objectively.

Understanding:

It ensured that participants understood what was explained and was given the opportunity to ask questions and have them answered by the researcher. The informed consent document was written in lay language, avoiding any technical jargon. In this regard, the researcher was ensured that this rule was abided by.

Voluntariness:

The researcher ensured that participant's consent to participate in the research was voluntary, free of any pressure or promises of benefits unlikely to result from participation

CHAPTER FOUR

PRESENTATION OF FINDINGS

4.1 Introduction

This chapter presents the research findings, data analysis and interpretation. The findings are presented under the following subtitles: background information of the respondents and to the factors for the higher decline of Arabica coffee production in, the effects of high decline of Arabica coffee production to the people, the possible solutions to decline of Arabica production levels in Bududa district, Buwali sub-county.

4.1 Demographic Data

Table 4.1: Showing the Sex of the respondents

Response	**Frequency**	**Percentage**
Male	45	69
Female	20	31
Total	**65**	**100**

Source: Primary Data, 2024

In this above table 69% of the respondents were males and 31% were females. This implies that majority of the respondents were males and the minority were females. This led to the decision to interview male respondents only as key informants.

Table 4.2: Showing the age group of the respondents

Response	Frequency	Percentage
20-29	22	34
30-39	25	38
40-49	13	20
50 and above	5	8
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 34% of the respondents were in the age bracket of 20-29, 38% of the respondents were in 30-39 years, 20% of the respondents were in 40-41 years, 8% of the respondents were 50 years and above. This implies that the majority of the respondents were in the age bracket of 30-39 years and the minority were 50 years and above.

Table 4.3: Showing the Education Level of the respondents

Response	Frequency	Percentage
Certificate	41	63
Diploma	19	29
Degree	5	8
Masters	00	0
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 63% of the respondents had certificates, 29% of the respondents had reached diploma level, 8% of the respondents had reached degree level and 0% of the respondents had

reached masters level. This implies that the majority of the respondents were certificates holders and the minority had reached masters.

4.3.0 The factors for the higher decline of Arabica coffee production in Buwali sub-county

Table 4.3.1: Influences of Agricultural practices and technology adoption on coffee production

Response	Frequency	Percentage
Strongly Agree	24	37
Agree	15	23
Neutral	1	2
Disagree	12	18
Strongly Disagree	13	20
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 37% of the respondents strongly agreed that Agricultural practices and technology adoption influences Arabica coffee production level. 23% of the respondents agreed, 2% were neutral, 18% of the respondent disagreed and 20% of the respondents strongly disagreed that Agricultural practices and technology adoption influences Arabica coffee production level. This implied that the majority of the respondents strongly agreed that Agricultural practices and technology adoption influences Arabica coffee production level and the minority disagreed with the argument.

According to Talengera, et al (2021) this research investigated the determinants of adoption intensity of Climate Smart Agricultural (CSA) practices in Arabica coffee production in Bududa district. Tobit regression model was used to assess determinants of adoption intensity of CSA practices. Results showed that majority of the farmers (67.3%) hardly obtained any credit and majority of them (64.5%) never had access to extension services.

Table 4.3.2: Showing that there is impact of pest and diseases on Arabica coffee yields.

Response	Frequency	Percentage
Strongly Agree	40	62
Agree	18	28
Neutral	0	0
Disagree	2	3
Strongly Disagree	5	7
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 62% of the respondents strongly agreed that there is impact of pest and diseases on Arabica coffee yields, 28% of the respondents agreed, 0% were neutral, 3% of the respondent disagreed and 7% of the respondents strongly disagreed that there is impact of pest and diseases on Arabica coffee yields, This implied that the majority of the respondents strongly agreed that there is impact of pest and diseases on Arabica coffee yields, and the minority disagreed with the argument. This means that there is impact of pest and diseases on Arabica coffee yields.

According to Rolando C. et al (2020) the assessment of crop yield losses is needed for the improvement of production systems that contribute to the incomes of rural families and food security worldwide. However, efforts to quantify yield losses and identify their causes are still limited, especially for perennial crops. Results showed that pests and diseases led to high primary yield losses (26%) and even higher secondary yield losses (38%). We identified the fruiting nodes and the dead productive branches as the most important and useful predictors of yields and yield losses.

Table 4.3.3: Negative consumer behavior towards Arabica coffee products.

Response	Frequency	Percentage
Strongly Agree	29	45
Agree	18	27
Neutral	1	1
Disagree	10	15
Strongly Disagree	8	12
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 45% of the respondents strongly agreed that there is negative consumer behavior towards Arabica coffee products, 27% of the respondents agreed, 0% were neutral, 15% of the respondent disagreed and 12% of the respondents strongly disagreed that there is negative consumer behavior towards Arabica coffee products**.** This implied that the majority of the respondents strongly agreed that that there is negative consumer behavior towards Arabica coffee products and the minority strongly disagreed with the argument**.** This means that there is negative consumer behavior towards Arabica coffee products.

According to V. et al (2018) the purpose of this study was to determine the behavioural intention of speciality coffee consumers in South Africa, using the Theory of Planned Behaviour. The results of the stepwise multiple regression analysis demonstrate the utility of the Theory of Planned Behaviour as a conceptual framework for predicting the behavioural intention of speciality coffee consumers. The findings indicate that attitude, subjective norms and perceived behavioural control are important predictors of behavioural intentio

4.4.0: The effects of decline of Arabica coffee production in Buwali sub-county

Table 4.4.1: impact on livelihood on decline in Arabica coffee production.

Response	Frequency	Percentage
Strongly Agree	22	34
Agree	18	28
Neutral	0	0
Disagree	15	23
Strongly Disagree	10	15
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 34% of the respondents strongly agreed that there is impact on livelihood on decline in Arabica coffee production, 28% of the respondents agreed, 0% were neutral, 23% of the respondents disagreed and 15% of the respondents strongly disagreed that Students feel that that there is impact on livelihood on decline in Arabica coffee production. This implied that the majority of the respondents strongly agreed that that there is impact on livelihood on decline in Arabica coffee production and the minority disagreed with the argument. This means that that there is impact on livelihood on decline in Arabica coffee production**.**

According to Ulrike G. et al (2012) what is the impact of product certification on small-scale farmers' livelihoods? To what extent does the participation of Ethiopian small-scale coffee farmers in certified local cooperative structures improve their socioeconomic situation? To answer these questions. Differences in production and organizational capacities between the local cooperatives are mirrored in the extent of the certification benefits for the smallholders. "Good" cooperatives have reaped the benefits of certification, whereas "bad" ones did not fare well. In this regard the "cooperative effect" overlies the "certification effect.

Table 4.4.2: social and community impact on the decline of Arabica production.

Response	Frequency	Percentage
Strongly Agree	29	45
Agree	18	27
Neutral	1	1
Disagree	10	15
Strongly Disagree	8	12
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 45% of the respondents strongly agreed that there is social and community impact on the decline of Arabica production, 27% of the respondents agreed, 1% were neutral, 15% of the respondent disagreed and 12% of the respondents strongly disagreed. This implied that the majority of the respondents strongly agreed that there is social and community impact on the decline of Arabica production and the minority strongly disagreed. This means that there is social and community impact on the decline of Arabica production.

According to Lars H. et al (2015) this paper presents an analysis of the economic value of Coffee Arabica genetic resources contained in Ethiopian highland forests. The valuation is based on an assessment of the potential benefits and costs of the use of *C. Arabica* genetic information in breeding programs for enhanced coffee cultivars. The value estimate is prone to considerable uncertainty, with major sources of uncertainty being the length of breeding programs required to transfer valuable genetic information into new coffee cultivars, and the potential adoption rate of such enhanced cultivars.

Table 4.4.3: changes in the price of Arabica coffee production.

Response	Frequency	Percentage
Strongly Agree	40	62
Agree	18	28
Neutral	0	0
Disagree	2	3
Strongly Disagree	5	7
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 62% of the respondents strongly agreed that there are changes in the price of Arabica coffee production, 28% of the respondents agreed, 0% was neutral, 3% of the respondent disagreed and 7% of the respondents disagreed. This implied that there are changes in the price of Arabica coffee production, and the minority disagreed. This means that there are changes in the price of Arabica coffee production.

According to Asep N. et al (2018) the purpose of this study was to determine the form of channels, functions, and marketing efficiency of Arabica Coffee. Knowing an efficient marketing channel makes it easy for farmers to choose coffee marketing channels in order to obtain a more rational selling price. Based on the research results, it can be revealed that there are four Arabica Coffee marketing channels: Two Geo- and two non-Geographical Indications marketing channels, respectively. In terms of efficiency, channel I in Arabica Coffee marketing is the most efficient geographical indication, because the lowest total Margin value is 69,700, the highest value of marketing efficiency is 2.88 and the Farmer's Share value is greatest at 10%.

4.5.0: The possible solutions to decline of Arabica production levels in Buwali sub-county

Table 4.4.1: Sustainable farming practices implemented to improve Arabica coffee yields

Response	Frequency	Percentage
Strongly Agree	30	47
Agree	28	43
Neutral	0	0
Disagree	2	3
Strongly Disagree	5	7
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 47% of the respondents strongly agreed that there is sustainable farming practices implemented to improve Arabica coffee yields, 43% of the respondents agreed, 0% was neutral, 3% of the respondent disagreed and 7% of the respondents disagreed. This implied that there are sustainable farming practices implemented to improve Arabica coffee yields, and the minority disagreed. This means that there are sustainable farming practices implemented to improve Arabica coffee yields.

According to Meijboom P. et al (2016) Arabica coffees (60 % of current world coffee production) are generally sold at considerably better prices than robust as on account of superior beverage quality. However, costs of production are much higher, mainly due to more stringent demands for soil and climatic conditions, crop management, primary processing and control of several pests and diseases including the potentially very destructive coffee leaf rust (CLR) and berry disease (CBD. International networking on coffee breeding will facilitate sharing of resources (financial, genetic) and scientific information, application of genomics-assisted selection technologies, and pre-breeding for specific characters. Breeding and multiplication of new cultivars well adapted to the local environment will continue to be carried out at national or regional levels

Table 4.5.2: Use of technology to enhance Arabica coffee production

Response	Frequency	Percentage
Strongly Agree	27	41
Agree	23	35
Neutral	1	2
Disagree	9	14
Strongly Disagree	5	8
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 62% of the respondents strongly agreed that there is emphasis on technology to enhance Arabica coffee production, 28% of the respondents agreed, 0% was neutral, 3% of the respondent disagreed and 7% of the respondents disagreed. This implied that There are emphasis on technology to enhance Arabica coffee production, and the minority disagreed. This means that There are emphasis on technology to enhance Arabica coffee production**.**

According to Meijboom P. et al (2016) Arabica coffees (60 % of current world coffee production) are generally sold at considerably better prices than robust as on account of superior beverage quality. However, costs of production are much higher, mainly due to more stringent demands for soil and climatic conditions, crop management, primary processing and control of several pests and diseases including the potentially very destructive coffee leaf rust (CLR) and berry disease (CBD. International networking on coffee breeding will facilitate sharing of resources (financial, genetic) and scientific information, application of genomics-assisted selection technologies, and pre-breeding for specific characters. Breeding and multiplication of new cultivars well adapted to the local environment will continue to be carried out at national or regional levels.

Table 4.5.3: Government policies support to the revival of Arabica coffee production

Response	Frequency	Percentage
Strongly Agree	40	62
Agree	18	28
Neutral	0	0
Disagree	2	3
Strongly Disagree	5	7
Total	**65**	**100**

Source: Primary Data, 2024

In the above table, 62% of the respondents strongly agreed that there are government policies support to the revival of Arabica coffee production, 28% of the respondents agreed, 0% was neutral, 3% of the respondent disagreed and 7% of the respondents disagreed. This implied that there are government policies support to the revival of Arabica coffee production and the minority disagreed. This means that there are government policies support to the revival of Arabica coffee production.

The study was conducted in six sub districts of Simalungun district, North Sumatra, Indonesia. The research objective was to establish the influence of socioeconomic and ecological factors on production of specialty Arabica coffee. Benefit of coffee certification compared to conventional coffee was analyzed by independent t-test. Increased production of Arabica coffee could be achieved by intensification strategy through: increased application of suitable fertilizer recommendations, facilitation of coffee farm credit, optimization of land use (intercropping or multi-strata coffee), optimization of family labour used, and application of GAPs (shade tree, organic fertilizer, coffee pruning, land conservation, and control of CBB). Ecological dimensions have important role in the development of specialty Arabica coffee in the Simalungun highland

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusions, recommendations, and suggested areas that for further research in relation to the current study.

5.2 Conclusions

This section presents conclusion of the objective, based on the findings in chapter four and discussions of the findings.

The Objectives of the study were to find out the factors for the higher decline of Arabica coffee production in Bududa district in Buwali sub-county**,** to assess the effects of high decline of Arabica coffee production to the people of Buwali sub-county in Bududa district and to determine the possible solutions to decline of Arabica production levels in Bududa district, Buwali sub-county. The findings revealed that there are factors for the higher decline of Arabica coffee production, there are effects of high decline of Arabica coffee production to the people, there are possible solutions to decline of Arabica production levels. This is due to the fact that 60% of the respondents strongly agreed and agreed that Agricultural practices and technology adoption influences Arabica coffee production level. 90% of the respondents strongly agreed and agreed that there is impact of pest and diseases on Arabica coffee yields. 72% of the respondents strongly agreed and agreed that there is negative consumer behavior towards Arabica coffee products**.** 62% of the respondents strongly agreed and agreed there is impact on livelihood on decline in Arabica coffee production. 72% of the respondents strongly agreed and agreed that there is social and community impact on the decline of Arabica production. 90% of the respondents strongly agreed and agreed that there are changes in the price of Arabica coffee production. 90% of the respondents strongly agreed and agreed that there is sustainable farming practices implemented to improve Arabica coffee yields. 76% of the respondents strongly agreed and agreed that there is emphasis on technology to enhance Arabica coffee production. 90% of the respondents strongly agreed and agreed that there are government policies support to the revival of Arabica coffee production. The researcher therefore concludes that there are factors for

the higher decline of Arabica coffee production, there are effects of high decline of Arabica coffee production to the people, there are possible solutions to decline of Arabica production levels in Bududa district. The researcher concludes that there are reasons for higher decline of Arabic coffee production level in eligon zone of Bududa district in Buwali sub-county from the year (2018-2024) since there are factors for the higher decline of Arabica coffee production, there are effects of high decline of Arabica coffee production to the people, there are possible solutions to decline of Arabica production levels. This confirms the reasons for higher decline of Arabic coffee production level.

Recommendations

On the basis of the study findings,

1. The study recommends that support programs for farmers should be implemented, financial assistance programs or subsides could help farmer cope with economic pressure.
2. The study recommends that there is need to increase funding for research into climate adaption strategies, pest management and sustainable practices.
3. Developing disease resistant and climate resilient varieties through genetic research could help to sustain yields despite adverse conditions.
4. Utilizing data analytics and technology driven farming techniques can optimize resource use and improve productivity.

Areas for Further Studies

On the basis of the study findings and conclusions, the following are the areas for further research;

1. Another researcher can carry out a research on the impact socio cultural factors affecting coffee farming in Mbale region.
2. Another researcher can carry out a research influence of technological innovations in coffee farming in Bududa district.
3. Another researcher can carry out a research on the genetic diversity and breeding programs among Arabica coffee varieties.

REFERENCES

Avelino J., Cristancho M., Georgiou S., Imbach P., Aguilar L., Bornemann G., Läderach P., Anzueto F., Hruska A.J., Morales C. (2015). The coffee rust crises in Colombia and Central America (2008–2013): impacts, plausible causes and proposed solutions. Food Security.

Jaramillo J., Chabi-Olaye A., Borgemeister C. (2009). Validating IPM strategies for antestia bug pest management on Arabica coffee through on-farm demonstrations.

Kagezi H.G.K.; Kucel P.; Tushemereirwe W.K.; Ragama P.E.; Kubiriba J.; Nakabonge G.; Kutyabami P.; Opolot O.K.(2019). Impact assessment of wilt disease on robusta and Arabica coffees at field level: A case study from Uganda.

Waller J.M.; Bigger M.; Hillocks R.J.(2007). Coffee pests, diseases and their management.

Kagezi, H., Kucel, P., & Wanyama, I. (2018). Sustainable Coffee Production. Springer.

Mugagga, F., Kakuru, W., & Ssentongo, J. (2019). Impact of Agrochemicals on Soil Health. Academic Press.

Oxfam International. (2017). Climate Change and Coffee Production. Oxfam Research Reports.

Yebirzaf Yeshiwas Melese, Semagn Asredie Kolech (2021) Sustainability,

Lars Hein, Franz Gatzweiler (2006) Ecological economics

Zia Mehrabi, Philippe Lashermes (2017) Nature Plants

ACW Craparo, Piet JA Van Asten, Peter Läderach, Laurence TP Jassogne, SW Grab. 2015 Agricultural and Forest Meteorology

Amadou Nchare (2017) the African Economic Research Consortium

Abebe Yadessa, Juergen Burkhardt, Endashaw Bekele, Kitessa Hundera, Heiner Goldbach (2020) African Journal of Plant Science

Abaynesh Asegid Int. J. Res. Stud. Sci. Eng. (2020)Technol,

Savary S, Willocquet L. Simulation Modeling in Botanical Epidemiology and Crop Loss Analysis. The Plant Health Instructor.

Avelino J, Cristancho M, Georgiou S, Imbach P, Aguilar L, Bornemann G, et al. The coffee rust crises in Colombia and Central America (2008–2013): impacts, plausible causes and proposed solutions. Food Security. 2015;

Oerke EC. Crop losses to pests. Journal of Agricultural Science. 2006;

Cooke BM. Disease assessment and yield loss. In: Cooke BM, Jones DG, Kaye B, editors. The Epidemiology of Plant Diseases: Springer Netherlands; 2006. p. 43–80.

Savary S, Mille B, Rolland B, Lucas P. Patterns and Management of Crop Multiple Pathosystems. European Journal of Plant Pathology. 2006;

Avelino J, Ten Hoopen M, DeClerck F. Ecological Mechanisms for Pest and Disease Control in Coffee and Cacao Agroecosystems of the Neotropics. In: Rapidel B , F D , JF LC , J B , editors. Ecosystem Services from Agriculture and Agroforestry Measurement and Payment: Earthscan; 2011..

Allinne C, Savary S, Avelino J. Delicate balance between pest and disease injuries, yield performance, and other ecosystem services in the complex coffee-based systems of Costa Rica. Agriculture, Ecosystems & Environment. 2016;

. Savary S, Teng PS, Willocquet L, Nutter F. Quantification and Modeling of Crop Losses: A Review of Purposes. Annu Rev Phytopathol. 2006;

Nutter FW, Teng PS, Royer MH. Terms and Concepts for Yield, Crop Loss, and Disease Thresholds. Plant Disease. 1993;7

Zadoks JC, Schein RD. Epidemiology and plant disease management. New York: Oxford University Press Inc.; 1979

Oerke EC, Dehne HW, Schonbeck F, Weber A. Crop Production and Crop Protection. Estimated losses in major food and cash crops. Amsterdan, The Netherlands: Elsevier; 1994.

Cheatham MR, Rouse MN, Esker PD, Ignacio S, Pradel W, Raymundo R, et al. Beyond yield: plant disease in the context of ecosystem services. Phytopathology. 2009;

DaMatta FM, Ronch CP, Maestri M, Barros RS. Ecophysiology of coffee growth and production. Braz J Plant Physiol. 2007

Smith HM, Samach A. Constraints to obtaining consistent annual yields in perennial tree crops. I: Heavy fruit load dominates over vegetative growth. Plant Sci. 2013;

McCook S, Vandermeer J. The Big Rust and the Red Queen: Long-Term Perspectives on Coffee Rust Research. Phytopathology. 2015;

Baker P. The 'Big Rust': an update on the coffee leaf rust situation. Disease & Pest Control 2014;C&CI:37–9.

DaMatta FM. Ecophysiological constraints on the production of shaded and unshaded coffee: a review. Field Crops Research. 2004;

Simko I, Piepho HP. The area under the disease progress stairs: calculation, advantage, and application. Phytopathology. 2012;

R_Core_Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria URL 2014.

Bates D, Maechler M, Bolker B, Walker S. Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software. 2015;

APPENDICES

Appendix I: Questionnaire

Examining The Reasons for Higher Decline of Arabic Coffee Production Level Questionnaire (ERHDACPQ) for Local leaders

Dear **respondent**,

I am a student offering a bachelor's degree from the Busitema university (KIU) pursuing a bachelor's of science in Education. I am conducting research on "**Examining the Reasons for Higher Decline of Arabic Coffee Production Level in Eligon Zone of BUDUDA District."** I humbly ask for your attention and spare some of your valuable time and respond to the questions that follow. Your responses shall contribute to the success of this study and will be treated with maximum confidentiality. Your responses will be used only for purposes of this study.

PART A: Demographic information

Please tick [✓] the most appropriate alternative that corresponds to items given.

A1	Gender: Male: ☐ Female: ☐
A2	Age: 20-29 ☐ 30-39 ☐ 40-49 years Above 50 years ☐
A3	Highest professional qualify cations Certificate ☐ Diploma ☐ Bachelor's Degree ☐ Master's Degree ☐

Indicate your level of agreement *with each of the following items by* ***ticking*** *[✓] in the corresponding boxes, using the scale that follows.*

Agreement Scale:

Scale/Weight	Name	Initials

1	**Strongly Agree**	**SA**
2	**Agree**	**A**
3	**Neutral**	**N**
4	**Disagree**	**D**
5	**Strongly Disagree**	**SD**

PART B: Examining The Reasons For Higher Decline Of Arabic Coffee Production Level						
1. The factors for the higher decline of Arabica coffee production		**Agreement scale**				
		SA	**A**	**N**	**D**	**SD**
1.1	Agricultural practices and technology adoption influences Arabica coffee production level.					
1.2	There is impact of pest and diseases on Arabica coffee yields.					
1.3	There is negative consumer behavior towards Arabica coffee products.					
2	**The effects of high decline of Arabica coffee production to the people.**					
2.1	There is impact on livelihood on decline in Arabica coffee production.					
2.2	There is social and community impact on the decline of Arabica production.					
2.3	There are changes in the price of Arabica coffee production.					
3	**The possible solutions to decline of Arabica production levels**					
3.1	There are sustainable farming practices implemented to improve Arabica coffee yields.					

3.2	There are emphasis on technology to enhance Arabica coffee production.					
3.3	There are government policies support to the revival of Arabica coffee production.					