

**CHALLENGES AND MOTIVATIONAL FACTORS OF REVIVING
COFFEE CULTIVATION AMONG SMALLHOLDER FARMERS:
A CASE OF HAI DISTRICT, TANZANIA**

MATHIAS ERICK M

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

This research investigated the status of coffee cultivation, motivational factors for reviving coffee cultivation and challenges which face smallholder coffee farmers in Hai district, Tanzania. A Cross-sectional research design was employed with a mixed method (quantitative and qualitative). Data was collected from 120 smallholder coffee farmers and 15 key informants from four villages. Household surveys and interviews were used for data collection. Analysis of quantitative data was done descriptively in which frequencies and percentages were measured. Inferential analysis, particularly the binary logistic regression model, was employed to determine the association between the dependent and independent variables. Qualitative data analysis involves a content analysis. The findings depict the state of coffee cultivation based on the following factors: starting year of cultivation, year of reviving, revived acreage, number of seedlings planted, and production in kilograms. The findings also show several motivational factors; availability of hybrid seeds, availability of free land provided by AMCOS, possibility of gap filling, assistance from organizations such as TaCRI and availability of extension services. Furthermore, the results show challenges in reviving coffee cultivation, such as high agricultural input costs, price fluctuations, a lack of manpower, a limited amount of land, and challenges associated with changing weather conditions. The study concludes that other respondents failed to revive coffee cultivation due to the mentioned challenges. Therefore, it is recommended that the government with cooperation with NGOs, TaCRI, and AMCOS should assist smallholder farmers to minimize or completely avoid the existing challenge.

DECLARATION

I, **Mathias Erick M**, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

.....

Mathias Erick M
(M.A Candidate)

.....

Date

The above declaration confirmed by:

.....

Prof. David Mhando
(Supervisor)

.....

Date

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DEDICATION

This dissertation is dedicated to my beloved parents, Mathias Laurent and Martina Vicent, may the Almighty God bless them abundantly for their efforts, guidance, love, care, and sacrifice for my education journey.

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LIST OF ABBREVIATIONS AND ACRONYMS

AFDB	Africa Development Bank
AMCOS	Agriculture Marketing Co-operative Society
ASDPH	Agriculture Sector Development Programme II
CBD	Coffee Berry Disease
CLR	Coffee Leaf Rust

FAO	Food and Agriculture Organisation
GAIN	Global Agricultural Information Network
ICC	International Coffee Council
ICO	International Coffee Organisation
KNCU	Kilimanjaro Native Co-operative Union
NAIVS	National Agriculture Inputs Voucher System
NBS	National Bureau of Statistics
NGOs	Non-Government Organisation
NSGRP II	National Strategy for Growth and Reduction of Poverty II
SDGs	Sustainable Development Goals
SNAL	Sokoine National Agriculture Library
SPSS	Statistical Package for Social Science
TaCRI	Tanzania Coffee Research Institute
TCB	Tanzania Coffee Board
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WCR	World Coffee Research

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

The coffee plant was discovered in Ethiopia in the 11th Century. It has a white blossom that smells like jasmine and a red, cherry-like fruit, but back then, the leaves of the so-called "magical fruit" were boiled in water and the resulting concoction was thought to have medicinal properties (ICO, 2015). As the fame of the coffee plant spread to other lands, its centuries-long voyage was about to begin. Coffee is produced in more than 70 countries in the world and 97% of these countries are exporting members of the International Coffee Organisation (ICO, 2015). The leading coffee producer in the world is Brazil. In 2018, the statistics show that Brazil produced some 61.7 million bags of coffee while Vietnam came second, with about 29.5 million bags of coffee (Otieno, 2018). Major coffee companies include Starbucks and Dunkin' Donuts that are found in the United States (ICO, 2018). In 2018, Starbucks generated \$24.7 billion in revenue, up 10 percent from the previous year (ICO, 2018). Dunkin' Brands reported sales of more than \$1.32 billion, up 3.6 percent from the previous year (ICO, 2018). Starbucks has a larger footprint, with some 28,218 locations worldwide, while Dunkin' Brands' has 20 500 points of distribution across the globe (ICO, 2018).

World coffee production for 2019/20 was forecasted to be around 5.4 million bags lower than the previous year of 169.1 million, due primarily to Brazil's Arabica trees entering the off year of the biennial production cycle (USDA, 2019). Global production and consumption of coffee have been growing steadily over the past 30 years, and are expected to continue rising, even though the growth rate of global production has been declining (Otieno, 2018). The annual average growth rate of production was 2.6% during

the period between 1991 to 2000, 2.5% between 2001 to 2010 and 1.2% between 2011 to 2017 (WCR, 2017).

The coffee industry has been growing sustainably for over 500 years today. Coffee is one of the most highly consumed beverages in the world and in both producing and consuming countries (UNCTAD, 2018). According to the ICO, more than 120 million people in the world rely on activities related to coffee for their livelihood (ICO, 2018).

Africa is the region with the largest number of coffee producing countries, comprised of Ethiopia, Uganda, Ivory Coast, Central Africa, Ghana, Madagascar, Malawi and Tanzania (ICC, 2015). In the year 2011/2012 coffee production in Africa increased by 16% from 15.7 million bags and in 2012/2013 coffee production reached 16.7 million, accounting for 11.5 % of the total world production (Otieno, 2018).

Ethiopia is Africa's largest coffee producer with total production reaching 7.65 million bags in 2017, accounting for 5% of total global coffee production (AFDB, 2017). Uganda is the second largest coffee producer in Africa with a total output of 5.1 million bags in 2017 (AFDB, 2017). The third largest producer in Africa is Ivory Coast with production output that totaled 1.3 million bags in 2017, with a target in place to increase output fourfold by 2020 (AFDB, 2017).

Coffee may have been first introduced to Tanzania in the 16th century from modern-day Ethiopia (FAO, 2017). The Haya tribe came to use coffee beans as money, and coffee growing could only be authorized by tribal leaders (TCB, 2019). Coffee was first introduced in Kilimanjaro by Catholic Missionaries in the year 1898 and since then there has been no going back and today the demand for Tanzanian coffee is growing more and more (TaCRI, 2018).

It is estimated that over 400 000 households, with an average area of 0.5 -1.0 hectare, are responsible for 95% of the coffee production with the balance produced by over 110 estates (TCB, 2017). In the Kilimanjaro region, 90% of coffee is grown on family-owned plots and the remaining 10% is produced from estates (TCB, 2017). According to TCB (2019), the Kilimanjaro region produces only about 3 135.4 tons of coffee per year out of 65 527.7 tons of coffee produce in Tanzania per year.

Coffee in Tanzania is produced in Kagera, Arusha, Kigoma, Ruvuma, Manyara and Tanga regions (TCB, 2019). In 2019, the Kagera region was the main coffee producer with the total production reaching 29 456.9 tons. Ruvuma stands to be the second coffee producer in Tanzania, producing about 16 104 tons. The third coffee producer in Tanzania is the Songwe region, producing about 10 996 tons, followed by the Kilimanjaro region producing about 3 135.4 tons and last is the Mbeya region producing about 2 204.8 tons (TCB, 2019).

Tanzania produces two types of coffee, i.e. Arabica and Robusta (TCB, 2019). Arabica coffee is grown on the slopes of Mount Kilimanjaro, Mount Meru in the Northern zone and the Southern Highlands such as Mbeya and Ruvuma regions, while Robusta coffee is grown in the Western zone along Lake Victoria in Kagera region (TCB, 2019).

Coffee is one of Tanzania's primary agricultural export crops, representing about 5% of total exports and 24% of traditional cash crops and generating export earnings averaging 100 million US\$ per annum over the last 30 years (TCB, 2017). The coffee industry directly supports over 400 000 families and indirectly supports the livelihoods of 2.4 million Tanzanians (TCB, 2017). There are several reasons for the fluctuation of coffee production in Tanzania. These include internal and external factors such as pests and

diseases, tree aging, poor variety, un-reliable rain and prices (Baffles, 2003; Jaramillo *et al.*, 2013; Craparo *et al.*, 2015 and TaCRI, 2016). The possible effects of a decline in coffee production for small-scale farmers include a decline in income from coffee at a household level (TCB, 2019). Coffee production has declined in recent years and some farmers in Tanzania have abandoned cultivating coffee and uprooted their coffee and replacing it with other fast-growing crops such as maize, beans, Irish potatoes, and bananas (TaCRI, 2016). Some of the common causes of stagnation and decline in coffee production in Tanzania include low prices, old coffee trees above 100 years old, scarcity of land, lack of disease resistance and removal of subsidies (TCB, 2019).

1.2 Statement of the Problem

In the 1985/86 season, the Kilimanjaro region accounted for 19 000 tons of Tanzania's annual coffee production of 25 000 tons (TCB, 2007). However, production of coffee in 2002/03 in the region decreased to 5 000 tons and continued to decrease in 2005/06 up to 3 000 tons. This is in contrast to current coffee production in the Kilimanjaro region, as Kilimanjaro produced only about 3 135.4 tons of coffee per year in 2019, which is less than the half-yearly amount produced on average (TCB, 2019). The Tanzania coffee industry experienced a decline from the early seventies following, among other challenges, the nationalization of large estates (Craparo *et al.*, 2015). The nationalized estates, which were owned and managed by primary societies, faced major managerial difficulties and many were practically abandoned (Craparo *et al.*, 2015). Coffee revival began in the early 1980s with the privatization of a number of previously state-owned estates (Buffer, 2003). For example, about a third of the nationalized estates in the Kilimanjaro region have been privatized and the reasons are due to credit provision collapse, decline in input use and price announcement and retention of dollar expert

earning (Craparo *et al.*, 2015). Some studies (Mkondya, 2009; USAID, 2010; Rutashoborwa, 2013; Andrew and Philip, 2014; TaCRI, 2016; Craparo, 2017; Mhando, 2019) have been conducted in Tanzania context regarding coffee cultivation. However, the studies mainly focused on challenges that have led to the decline of coffee cultivation and production as well as factors that led to re-increasing coffee cultivation and production in general, but did not indicate the factors that could motivate smallholder farmers to revive coffee cultivation and production. Furthermore, the studies failed to address issues that directly impede smallholder farmers' efforts to revive coffee cultivation. Therefore, the current study is aimed at examining challenges and motivational factors toward reviving coffee cultivation among the smallholder farmers in Hai district, Kilimanjaro Region.

1.3 Justification of the Study

During the first five years of ASDPII in Tanzania, coffee was one of the cash crops with a high priority commodity value chain in the Northern Highlands (URT, 2017). Since the crop has been very important among the Chagga and to date, although other crops such as banana and vegetables have been introduced, they have not been able to replace the importance of coffee in the households (TaCRI, 2016).

The study is critical for coffee smallholder farmers, coffee processors, and the government on the one hand, and the government on the other. The study is important in the sense that it will reveal the essential opportunity for them to make efforts by utilizing fully domestic resources such as land, technology and capital. To the government, the study is important in increasing the performance of internal sectors of the economy, especially the agricultural and industrial sectors, by amendable corrective policy instruments and enforcing preventive measures to achieve output.

The current study is in line with Tanzania's development strategies including: The National Strategy for Growth and Reduction of Poverty II (NSGRP II) which, among other issues, focuses on reduction of household income poverty. The study is also in line with Tanzania's Development Vision 2025, Rural Development Strategy (RDS) 2001 and Tanzania Five Year Development Plan (2016-2021). The strategies focus on reducing rural poverty and improving farm households' well-being through reduction of income poverty. The study explores a workable framework which may contribute to assuring no poverty in the Kilimanjaro region as per the first goal of the Sustainable Development Goals (SDGs).

However, ensuring decent employment and economic growth as goal number eight and also ensuring sustainable communities as goal number eleven. Moreover, the study is in line with the National Agriculture Policy of 2013, which, among other things, aims at increasing production and productivity through utilization of the factors of production (land, labour and capital). In addition, the policy aims at enhancing the production of quality products in order to improve the competitiveness of agricultural products in the markets. The study is consistent with the Tanzania Agriculture and Food Security Investment Plan's goal of contributing to national economic growth and household income in accordance with national and sectoral development.

1.4 Research Objectives

1.4.1 General objective

To examine the challenges and motivational factors of reviving coffee cultivation among the smallholder farmers in Hai district, Kilimanjaro region.

1.4.2 Specific objectives

The specific objectives

- i. To examine the status of coffee cultivation among the smallholder farmers in Hai district.
- ii. To analyze smallholder farmers' motivational factors for reviving coffee cultivation in Hai district.
- iii. To assess smallholder farmers' challenges of reviving coffee cultivation in Hai district.

1.5 Research Questions

- i. What is the status of coffee cultivation among the smallholder farmers in Hai, Kilimanjaro region?
- ii. What are smallholder farmers' motivational factors for the revival of coffee cultivation in Hai district, Kilimanjaro region?
- iii. What challenges do smallholder coffee farmers face in reviving coffee cultivation in Hai district, Kilimanjaro region?

2.0 LITERATURE REVIEW

2.1 Conceptualisation of Key Concepts/Terms

2.1.1 Smallholder's farmers

According to Lowder *et al.* (2016), smallholder farmers can be defined in various ways depending on the context, country and even ecological zone. However, in the case of this study, smallholder farmers are farmers that use simple and outdated technologies, have low returns, high seasonal labour fluctuations and women play a vital role in production. Nonetheless, smallholder farmers differ in individual characteristics, farm size and resource distribution (Bacon *et al.*, 2014).

2.1.2 Coffee cultivation

Coffee plants grow within a defined area and coffee cultivation is usually done in large commercial operations (Negawo and Beyene, 2017). The Arabica species of coffee is cultivated mostly in Latin America, while the Robusta species predominates in Africa. Both coffee species are grown in India, Indonesia, and other Asian countries, while Tanzania produces two types of coffee, i.e. Arabica and Robusta (WCR, 2017).

2.1.3 Revival of coffee cultivation

Coffee revival is the process of re-cultivating coffee by using the same cultivation methods and cares to prepare their plantations and maintain their trees as other grain and fruit growers (Ram, 2017). The revival of coffee cultivation is part of government commitment to investing in coffee communities for creation of sustainable sources of income, preserve the environment and ensure coffee availability for future generations (Ram, 2017).

2.2 Importance of Reviving Coffee Cultivation in Hai District

According to TCB (2012), the revival of coffee cultivation could provide a sustainable source of income for the household in the future. And that revival of coffee cultivation in Hai district is anticipated to create economic opportunities for the smallholder farmers in the district (TCB, 2012). Therefore, the revival of coffee cultivation would lead to increased coffee production and could diversify the economy of the country instead of an exclusive reliance on mining and other economic activities (TCB, 2012).

2.3 Historical Challenges of Coffee Production in Tanzania

According to TCB (2010), since the mid-1990s, Tanzania's coffee industry has been in a state of decline. The reasons for this are diverse, including falling prices and high production costs which eroded profit margins and income of coffee growers, the age of the coffee trees as well as deficient husbandry practices (Mmari, 2012). It is usually considered that a coffee tree becomes economically unprofitable when it passes the age of 20-25 years. In Tanzania, most of the 240 million coffee trees around the country have exceeded this age. For example, most of the North and particularly the Kilimanjaro region, suffers from this problem (the average age of trees is above 40 years) (Maghimbi, 2007). The change of climatic conditions in most areas in Tanzania has also contributed. Furthermore, coffee production is primarily rain-fed, over which no one has control. Moreover, Kilimanjaro Native Co-operative Union (KNCU) has failed for a long time to provide her members with adequate services, particularly failure to offer the existing best market coffee price. Therefore, due to the above constraints, farmers in Kilimanjaro, especially smallholder farmers, uprooted their coffee and replaced it with other fast-growing crops such as maize and beans (Mhando, 2005).

2.4 Trend of Coffee Production in Tanzania

The coffee production trend in Tanzania is not consistent. There are fluctuations of yield from year to year as shown in figure 1. Unfortunately, when it comes to farmers, they always interpret it as a disappointing message which makes them to respond with low production (TCB, 2017). The production response is only positive when the price goes up. In addition, fall in production in response to international market demands is one of the major causes of unstable production trends (Mhando *et al.*, 2013).

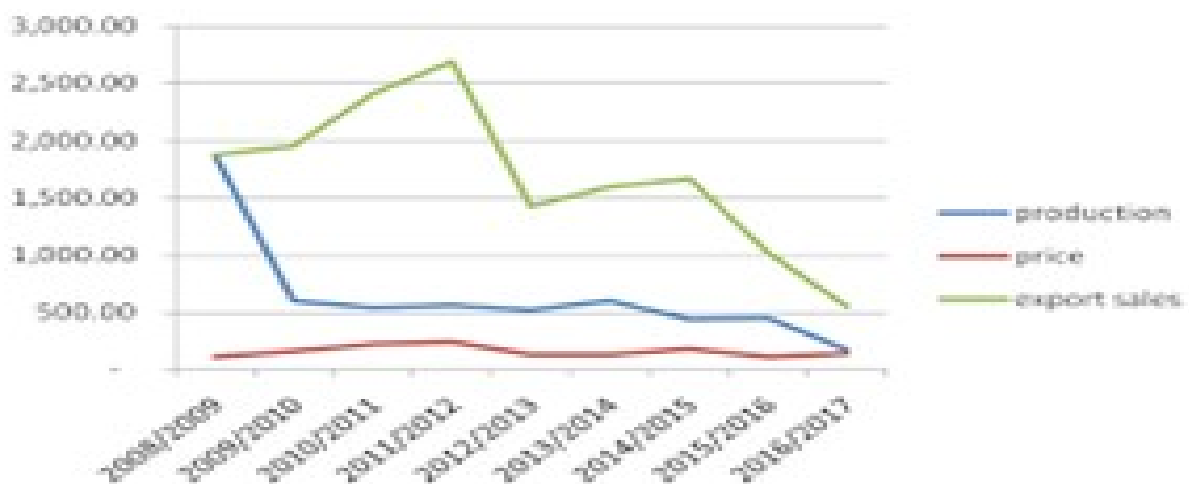


Figure 1: Coffee production trend

Source: Tanzania Coffee Board, (2017)

2.5 Tanzania Coffee Production Policy

As previously stated, total coffee production in coffee growing areas has decreased due to a variety of factors, including reduced public estates, old age of trees, low input use, and increased incidence of pests and diseases. However, this decline in production has been compensated by expansion in new areas where most of the growing areas expansion has been in place (MALD, 1997). Tanzania's government, through the ministry of agriculture and food security, reviewed the 1997 agriculture policy and issued the following policy statements regarding coffee production: "The government will strengthen research services in order to develop new cultivars that combine high yield and disease resistance

to replace current old trees in all coffee growing areas and supply.” In this respect, private sector participation will be invited and encouraged, particularly in the production of planting materials. In order to co-finance coffee research, it will institute a levy on coffee auction sales to finance coffee research and seedlings production programme.

The 1997 policy aimed to increase the use of modern input (inorganic fertilizer, agrochemicals, seed and farm implements) as this is a pre-requisite for archiving sufficient coffee productivity. In implementing this, the Ministry of agriculture and food security established the system as the *National Agriculture Inputs Voucher System (NAIVS)* where farmers are supplied with farm inputs at a subsidized price (MAFSC, 2011).

2.6 Theoretical Framework

2.6.1 Utility maximization theory

The current study was guided by the theory of utility maximization (Johnston and Masters, 2004; Khanna, 2001) to explain the preference of inputs by farmers. Based on the theory, it is presumed that farmers prefer to use an input if and only if the utility derived from the input is higher than the use of other inputs. Although one cannot observe the underlying internal decision-making process of the farmer, one can observe whether the farmer has preferred the use of a specific input or not. Hence, the preference is modeled as a binary choice variable. These models assume that farmers make decisions on the preference of each input independently of the others. Although, this differs much from reality as farmers are faced with multiple preferences in the realm of production, management and marketing. When farm decision making involves consideration of multiple preferences, farmers will employ various criteria to choose one or more inputs from the set. One important criterion is whether preference of a specific input is preconditioned by an earlier

use of the specific input such that the synergistic effect of the two increases the system's productivity.

This means that if the research proves the worth of inputs in coffee farming, there is a high chance for farmers to develop coffee production preference. The theory guided the research into determining the challenges and opportunities that coffee production (input) can bring to farmers in order to rekindle farmers' interest in coffee.

2.7 Conceptual Framework for the Study

A conceptual framework (Figure 2) explains the independent variables and their outcome (dependent variable) are associated. According to Figure 2, reviving of coffee cultivation (dependent variable) is termed as the product of the three independent variables including the status of reviving coffee cultivation, motivational factors and the challenges of reviving coffee cultivation. In addition, it is also pre-supposed the intervening variables which influence the independent variable to function well. The identified intervening variables include the presence of AMCOS and TaCRI.

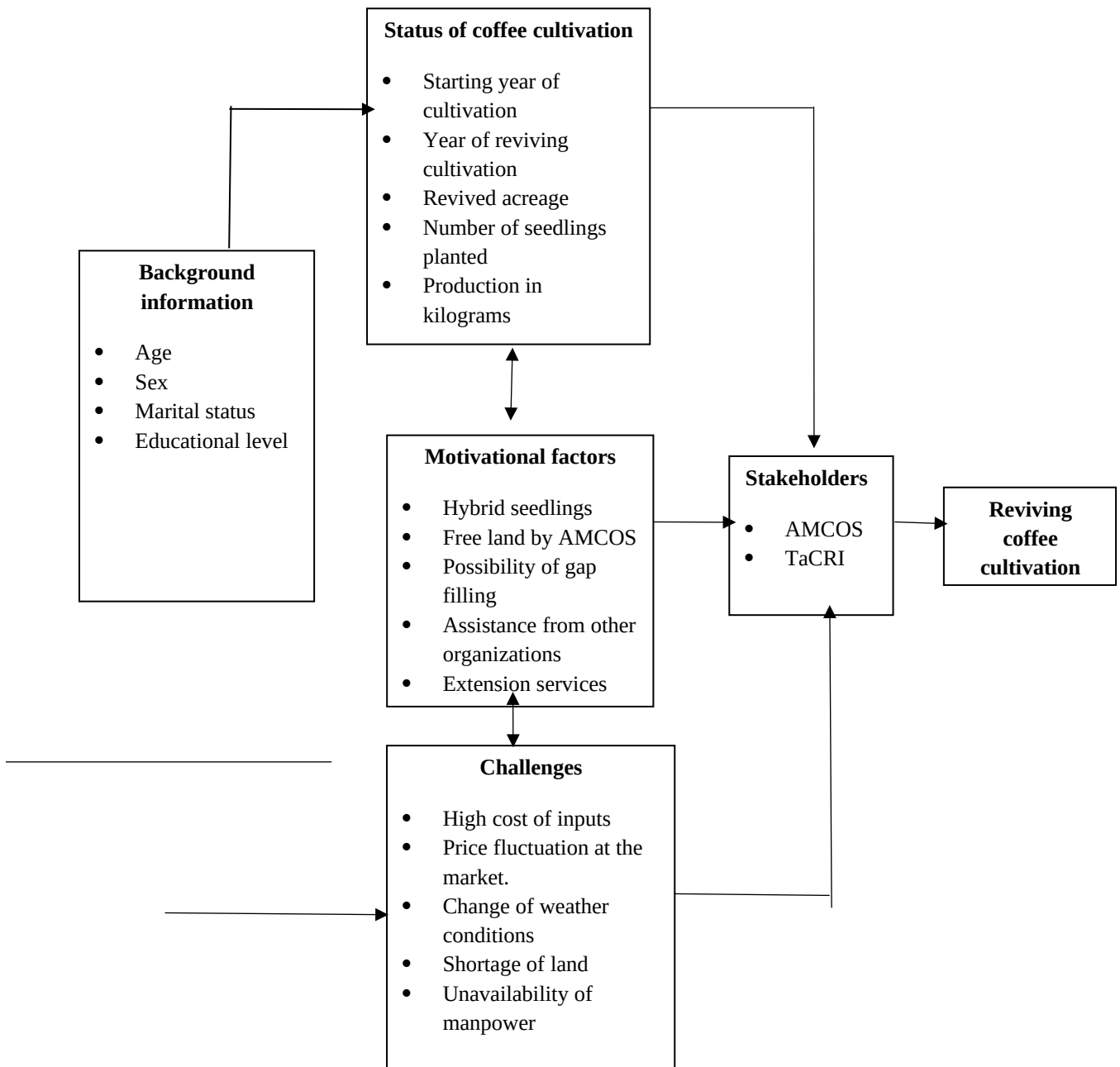
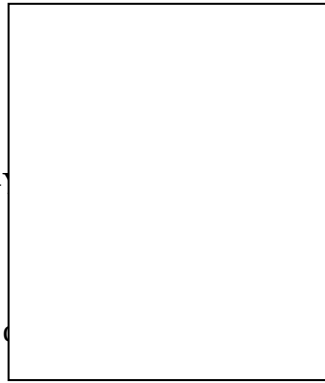


Figure 2: Conceptual framework



3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

Hai district is one of the administrative districts of Kilimanjaro region; the others are Siha, Rombo, Moshi rural, Same and Mwanga. The district is among the famous coffee producing areas in the region (Durrant and Durrant, 2008). This study was conducted in four villages of Hai district, namely Lyamungo Sinde, Lyamungo Kati, Kilanya and Warindoo. Hai district is located in the western part of Kilimanjaro region and borders Arusha region to the south. It encompasses an area of 2,332km² which lies between latitude 3° 10' 00" S and Longitude 37° 10' 00" E (NBS, 2012).

Machame Mashariki and Machame Kaskazini wards are found in the foothills of Mount Kilimanjaro with subsistence agriculture farming in small holdings as the mainstay of the community. According to Tanzania's population and household census in (2012), Hai district had a population of 210 533 out of 102 457 Male and out of 108 076 Female. The average household size was 4.2 and the sex ratio was 95 (NBS, 2012). Hai district is suited to many crops. These include coffee, maize, bananas, avocado, wheat, soybeans, groundnuts and vegetables. The study was carried out in Hai district, Kilimanjaro region. The region is reported to be the first to link cooperative movement to coffee growing, where coffee growers formed a union to market their coffee in the 1920s (Anania and Rwekaza, 2018). Hai district is also the area where the Tanzania Coffee Research Institution (TaCRI) head office is. Therefore, smallholder farmers are encouraged to revive coffee cultivation (TaCRI, 2018).

3.2 Research Design

The study employed a cross-sectional research design because data was collected at once time. This design enabled the researcher to facilitate time and resources, particularly the research budget.

3.3 Research Approach

The study employed a mixed methods approach, i.e. used both quantitative and qualitative. The study employed the mixed methods approach because motivational factors and challenges for reviving coffee cultivation needed to be identified and explained. Therefore, in identification, only close-ended questions (quantitative) were used while open-ended questions (qualitative) were used in questions which needed further explanations. However, the study also included key informants who provided detailed information on the revival of coffee cultivation in the study area. Moreover, use of the quantitative methods approach allowed collection of numeric data that was used to establish association between the independent and dependent variables

3.4 Study Population and Sample Size

3.4.1 Study population

The study target population comprised all the smallholder farmers who cultivate coffee in Hai district. Smallholder farmers were included in the study because they produce coffee and some of them had revived coffee cultivation, making it very simple for the researcher to collect the necessary data. The key informants (Extension officers, TaCRI officers, AMCOS officers, primary society officers and village leaders) were included in the study because they work close to the smallholder farmers who cultivate coffee. In that capacity, they are able to provide detailed information on the motivational factors and challenges of coffee cultivation reviving in the study area.

3.4.2 Sample size

The study used a sample of 120 respondents. This sample size was done in four villages, 30 from each village. Furthermore, according to Maas and Joop (2005), a sample size of at least 30 respondents is reasonably sufficient in social science research studies to ensure normal distribution of the sample mean.

Table 1: **Sample size and Composition**

S/No	Village/Sub-ward	Number of individual smallholder coffee farmers
1	Lyamungo sinde	30
2	Lyamungo kati	30
3	Kilanya	30
4	Warindoo	30
TOTAL		120

3.5 Unit of Analysis

The units of analysis of the study were households of 120 small-scale farmers who cultivate coffee. Likewise, it included farmers who are organized into groups which deal with production of hybrid coffee seedlings.

3.6 Sampling Procedure and Sample Size

3.6.1 Sampling procedure

3.6.1.1 Probability sampling

A probability sampling technique, i.e. simple random sampling, was used to select four villages (Lyamungo Sinde, Lyamungo Kati, Kilanya and Warindoo) for the study. Specifically, a lottery method was employed to select the four villages from the researcher's list of all villages of Hai district. Villages were arranged alphabetically and numbered accordingly. Generally, the numbers of the above mentioned villages were

written on small pieces of paper and placed in a jar. Therefore, all the papers were well and four pieces were picked randomly. A systematic sampling was employed to get households to be involved in the study. In the villages, the researcher stood in a straight line and took every fourth household in the line and involved it in the study. The main reason for applying simple random sampling was to avoid biasness in selecting wards to include in the study.

3.6.1.2 Non-probability sampling

The researcher used purposive sampling to obtain key informants (ward extension officers, village extension officers, TaCRI officers, primary society (AMCOS) officers, District Council officers, and village leaders) in non-probability sampling. The selection of key informants for the study considered their availability during data collection. In addition, they were involved in the study due to their ability to provide detailed information.

3.7 Types of Collected Data

3.7.1 Primary data

Primary data was collected from the smallholder's coffee farmers and key informants through questionnaires and checklist respectively. Primary data aimed to capture different information toward examining the current status of coffee cultivation among the smallholder farmers, and last to assess challenges and opportunities of coffee cultivation.

3.7.2 Secondary data

Secondary data were collected from various reports and publications. The main sources of data were obtained from the central government, Hai District Council, Sokoine National Agriculture Library (SNAL), online reports, journals and magazines.

3.8 Methods of Data Collection

3.8.1 Household survey

In this study, data was collected through a household survey using a questionnaire administered to small-scale coffee farmers. The questionnaires comprised of both closed-ended and open-ended questions. Open-ended questions provided freedom of expression for respondents (small-scale coffee farmers), while closed-ended questions needed respondents to use their own words. The researcher administered questionnaires to 120 small-scale coffee farmers. Therefore, the researcher was required to read and clarify questions for the respondents to understand.

However, prior to administering the questionnaires, the researcher provided detailed information about the research. In the explanation, the researcher emphasized the purpose of the research, its significance, and how it would benefit them and others. The researcher also emphasized the issue of confidentiality, freedom to answer only questions they felt comfortable with, and their right to withdraw from the study at any time without facing any consequences. The main reason for the researcher to read and clarify questions to each respondent was to help those respondents who were not able to read due to their status of being very aged.

3.8.2 Interviews

The in-depth interview was employed to obtain information from the key informants, who were comprised of five categories: ward extension officers, village extension officers, TaCRI officers, primary society (AMCOS) officers, District Council officer and village leaders.

3.9 Data Analysis

3.9.1 Quantitative data analysis

Quantitative data was sorted, coded, summarized and analyzed by using IBM SPSS Statistic. In sorting, all questionnaires which were properly filled were taken and included in other processes for data collection. Fortunately, there were no questionnaires which were not properly filled. Coding involved the process of assigning numerals to each questionnaire for identification reasons, whereas in data summarization, all data with the same characteristics were put into the same group. The main reason for applying all these was to ensure the efficiency of analysis activity by making the process of computation easy.

Furthermore, data for the first objective, i.e. examination of the current status of coffee cultivation among the smallholder farmers in Hai district, was analyzed descriptively. The second objective (analysis of the motivational factor for reviving coffee cultivation) was also analyzed descriptively. The last objective (finding out the challenges of reviving coffee cultivation) was analyzed by using descriptive analysis.

In the third objective, the binary logistic regression was also used to show the association between the status of coffee cultivation and challenges for coffee reviving.

The binary logistic regression model was specified as follows:

$$\text{Log} (p/1-p) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 \dots\dots\dots e_i$$

Where:

Log (p/1-p) = logarithm of chance of status of coffee cultivation being affected by the challenges of reviving coffee cultivation.

P = chance that coffee status is affected by the challenges of reviving coffee cultivation.

e = Error term

X_n = Predictors

X_1 = High cost of agriculture inputs

X_2 = Price fluctuation in the market

X_3 = Change of weather conditions

X_4 = Shortage of land.

X_5 = Unavailability of manpower.

3.9.2 Qualitative data analysis

As earlier stated, the study also collected qualitative data through an interview and open-ended questions. All three objectives included data of this nature. Therefore, analysis of qualitative data in all three objectives was treated differently from quantitative data. Qualitative data was analyzed through content analysis.

Specifically, the following four steps were used in qualitative data analysis.

- i. Each interview was broken down into individual meaning units.
- ii. Similar individual meaning units were regrouped under a unifying theme.
- iii. Underlying characteristics were identified for each theme.
- iv. A summary was built to compare the contents within and across the participants' views.

For more clarification, the table illustrates the two examples of how content analysis was done to get an inference in each discussed term.

Table 2: How content analysis was done

Step	Analysis process	Example quote
1.	Meaning unit	<i>“...sometimes farmers fail to produce more because of changes in weather conditions, and others don’t use inputs like fertilizer”.</i>
2.	Unifying theme	Weather conditions and inadequate inputs caused production to decrease.
3.	Code	Weather conditions and inadequate inputs are challenges for coffee cultivation.
4.	Theme	Coffee cultivation is challenged by weather conditions and inadequate inputs
1.	Meaning unit	<i>“Others have even turned back to cultivation because AMCOS provides land for some of them to grow crops; however, hybrid seeds also attracted them to start cultivating coffee again”.</i>
2.	Unifying theme (condensation)	AMCOS provides land to respondents; hybrid seedling is also practiced in cultivation.
3.	Code	Being provided with land and practicing hybrid seedling.
4.	Theme	Land provided to respondents and the introduction of hybrid seedling are opportunities for coffee cultivation.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Respondents' Socio-Demographic Characteristics

Ambary (2017), argued that in social sciences, respondents' personnel characteristics have a very significant role to play in expressing and giving responses about the problems. The study established socio-demographic characteristics, namely, age, sex, marital status and education level of 120 respondents who were small-scale farmers of coffee.

Table 3: Socio-demographic characteristics of the respondents (n=120)

Variables	Categories	Frequency	Percent
Age	Below 30 years	4	3.3
	31-45 years	15	12.5
	46-50 years	8	6.7
	51-55 years	4	3.3
	56-60 years	22	18.4
	Above 60	67	55.8
Sex	Female	31	25.8
	Male	89	74.2
Marital status	Single	5	4.2
	Married	96	80.0
	Separated	2	1.6
	Widow/widower	17	14.2
Educational level	Primary	104	86.8
	Secondary	13	10.8
	University	2	1.6
	Non-formal	1	0.8

4.1.1 Respondents age

Data in Table 3 shows that 55.8% of the respondents were above 61 years, 18.4% were 56-60 years, 12.5% were 31-45 years, 6.7% were 46-50 years, 3.3% were 51-55 years, and 3.3% of their ages were below 30 years. This implies that respondents who cultivate coffee are older people; it is due to the passive culture that coffee is the crop to be grown by older people. In addition, young people tend to migrate to towns and those who remain

in villages never involve themselves in agricultural activities. Instead, they engage on motorcycles, commonly known as *Bodaboda*, as their self-employment. Furthermore, land problems lead to failure of youths' engagement in coffee farming. According to Anania and Kimaro (2016), land ownership in Arusha and Kilimanjaro is mostly influenced by customary laws, meaning that people acquire land from their parents and grandparents, resulting in age biasness on who should be given land. Youths are not given or inherit land unless they are married or when their parents die, creating a barrier for youths' participation in agriculture.

4.1.2 Respondents gender

The findings in Table 3 show that 74.2% of the respondents were males while 25.8% were female. The implication here is that men are owners of the land and the heads of the household. Since data was collected from the households whose heads are men, it was very possible to talk with more men than women. The findings are consistent with Cheryl (2001), who came up with similar observations with more men being involved in cash crop production than women in Ghana. The reasons for this trend were linked to the fact that in rural areas, men are often viewed as being responsible for producing cash crops such as coffee, sisal and cotton, while women are responsible for producing food crops such as maize, beans and vegetables for home consumption. Because of their limited access to essential production resources such as land, labour and inputs.

4.1.3 Respondents marital status

The findings in Table 3 show that the majority (80.0%) of the respondents were married, 14.2% widowed/widower, 4.2% single and 1.6% separated. This implies that because 80.0% were married, it might be possible for them to have responsibilities in their families; this might also make them take positive actions wherever they see opportunities

in coffee cultivation. According to Kasogela (2016), marriage is one of the important social institutions. The perception and attitudes of a person can differ depending on their marital status because marriage may make a person more responsible and mature in understanding and responding to the question asked (Kasogela, 2016).

4.1.4 Respondents educational level

The results in Table 4 show that the majority (86.8%) of the respondents had primary education level, 10.8% had secondary education level, 1.6% had university education level and 0.8% had non-formal education. This implies that 86.8% of the respondents have primary school education which helps them to understand and learn new technologies and take positive actions on opportunities. The findings are in line with Ambary (2017) and Okpach *et al.* (2014) who found that primary education contributed to farm productivity as it had a positive effect on adoption of innovations.

4.2 Status of Coffee Cultivation

To understand the status of coffee cultivation of respondents, this section presents data on the year respondents started to cultivate coffee, size of coffee farm, year of reviving cultivation, area in which reviving cultivation was taken, number of seedlings planted, and production in kilograms. The findings are presented in the sub-sections below.

4.2.1 Starting year of coffee cultivation

Table 4 presents the year when respondents started to cultivate coffee; 34.2% of respondents started to cultivate coffee in 1990-1995, 24.2% in 2014-2019, as reported by village leaders in which respondents experienced an increase in price in 2017/2018 where the price increased from 4 000 TZS in 2017 and 5 000 TZS in 2018. Thus, the increase in

coffee prices motivates respondents to start growing coffee. Therefore, prices are the motivator for farmers/respondents with regard to making decisions about cultivating coffee; indeed, the market challenges push away farmers from cultivating coffee. It is suggested that price increases affect the status of coffee cultivation because only a few farmers may opt to grow coffee when there is a problem with prices in the market. Sambuo (2017), states that the low price paid affects farmers in operational costs. Hence, it is not easy for new farmers to start cultivating while the price is low compared to input costs. Furthermore, unstable coffee prices attracted farmers to opt for other stable crop prices in the area, and this has demoralized farmers' participation in coffee production. As a result, low coffee prices do not encourage farmers to begin cultivating coffee; instead, they prefer to cultivate different crops, either for cash crops or food, which are more profitable than coffee, as reported by Mhando *et al.* (2013).

Table 4: Year starting to cultivate (n=120)

Year starting to cultivate	Frequency	Percent
1990-1995	41	34.2
1996-2001	28	23.3
2002-2007	7	5.8
2008-2013	15	12.5
2014-2019	29	24.2

4.2.2 Year of reviving coffee cultivation

The findings in Table 5 show that 62.5% of the respondents have revived their coffee between 2017-2019, 32.7% in 2014-2016, 1.9% in 2008-2010 and 1.0% in 2005-2007. These findings show that a high percentage of 62.5% had revived their coffee cultivation between 2017-2019. This could possibly be due to an increase in coffee prices in the market in 2017 and 2018, when prices increased and coffee producers were paid TZS 4

200 and TZS 5 000 per one kilogram of parchment coffee. This was the highest price paid to coffee producers, which encouraged other farmers to revive their coffee farms. The findings are in line with Ssenkaaba (2019), who reported that price plays a significant role in explaining the behaviour of coffee producers to motivate them to engage in production.

Table 5: Year of reviving coffee cultivation (n=104)

Year of reviving	Frequency	Percent
2005-2007	1	1.0
2008-2010	2	1.9
2011-2013	2	1.9
2014-2016	34	32.7
2017-2019	65	62.5

4.2.3 Revived coffee farms acreage

The findings in Table 6 show that about three quarters (73.1%) of the respondents had revived coffee cultivation by 0.25-1.0 acres, 22.1% by 1.25-2 acres, 2.8% by 2.25-3 acres, 1.0% by 3.25-4 acres and 1.0% by 4.25-5 acres. According to the survey, 73.1% of respondents had revived by 0.25-1.0 acres, which is the lowest rank in the established category, because an increase in household members resulted in land distribution among sons, resulting in 73.1% of respondents owning small portions of land, which also acted as a barrier to their revival for coffee cultivation.

According to Anania and Kimario (2016), land ownership in Arusha and Kilimanjaro is mostly influenced by customs laws meaning that people acquire land from parents and grandparents based on age and sex. Generally, young people are not given or do not inherit land unless they are married or when their parents die, creating a barrier for youths' participation in agriculture. The above is in line with the findings of the study.

It shows how custom laws may lead to the distribution of land into small portions in households. Later, it affects agricultural activities. When a smallholder farmer needs to expand for cultivation, it is cumbersome because each land is found to be occupied by other household members. Thus, the study respondents were only able to revive small portions of land.

About three quarters (73.1%) of the respondent's household farm had been divided into members of the household. Thus, everyone owned a small portion. According to Mugishagwe (2015), Tanzania's agriculture sector has generally been dominated by smallholder farmers who grow different kinds of crops for both domestic consumption and for cash. This causes them to cultivate cash crops on relatively small pieces of land averaging (i.e. 0.9 to 3 acres). It was also reported by village government officers that the small size of land where coffee is cultivated is a result of division of land accordingly to the members of households.

Table 6: Acres Revived by the respondents (n=104)

Revived area (in acres)	Frequency	Percent
0.25-1	76	73.1
1.25-2	23	22.1
2.25-3	3	2.8
3.25-4	1	1.0
4.25-5	1	1.0

4.2.4 Number of seedlings planted by the respondents

Study findings (Table 7) show that 71.1% of respondents have planted less than 500 coffee seedlings. Respondents who increased the number of coffee trees planted reported several challenges; scarcity of land was the main reason, followed by the high price of

seedlings (300 TZS) especially for those respondents who live far from TaCRI station. TaCRI, it was reported that the Research Institute provides hybrid seedlings free of charge to smallholder farmers who live near the station. For all villages far from TaCRI they are supposed to pay for seedlings. For example, Warindoo village was mentioned as among the villages which are not supplied with free hybrid seedlings. Respondents from this village were reported by TaCRI officers to be buying hybrid seedlings from TaCRI. It was also reported that respondents were supposed to pay TZS 200 and TZS 300 per seedling in 2017 and 2018 respectively.

This implies that TaCRI had not provided free hybrid seedlings to all respondents, which might have affected the ability of some of the respondents to purchase seedlings and thus, affected their ability to plant less than 500 seedlings. The findings are in line with the findings by Sambuo (2017), that the decline in coffee output is caused by inadequate resources facing smallholder coffee farmers.

Table 7: Number of seedlings planted by respondents (n=104)

Number of seeds	Frequency	Percent
≤ 500	74	71.1
501-1000	24	23.1
1001-1500	3	2.8
1501-2000	1	1.0
2001-2500	1	1.0
2501-3000	1	1.0

4.3.5 Coffee Production (in kilograms)

Study findings in Table 8 show coffee produced by the respondents in kilograms in 2017, 2018 and 2019. According to Table 8, 85.9% of the respondents produced 100 kilograms or less of coffee in 2017. The low production was also reported by the respondents to be contributed to growing old trees, some of which are more than twenty years old.

Furthermore, Table 8 shows that 76.7% of the respondents produced less than 100 kilograms of coffee in 2018. When the researcher probed the respondents for more clarification of the low production of less than 100 kilograms per year, they attributed this to change in weather and no use of inputs like fertilizer.

“...sometimes farmers fail to produce more because of changes in weather conditions, and others don’t use inputs like fertilizers”.

However, researchers have reported that the annual coffee production in Tanzania has remained stagnant for many years (Baffee, 2011). However, Ruben *et al.* (2018) state that though most families have been able to earn income through coffee production, the income of these households has declined due to the decrease in production.

In addition, Table 8 shows that 85.0% of the respondents produced less than 100 kilograms of coffee in 2019. It was also reported that production decreased due to the high cost of production which hindered producers’ access to obtaining agricultural inputs which are vital for increased productivity. Generally, when a farmer fails to use agriculture inputs effectively, the level of productivity is affected. Moreover, it is very hard for farmers to afford inputs if household income is low. Furthermore, the TCB (2017), argues that the main reason for low production is the price of coffee. When the price of coffee increases, farmers invest in coffee cultivation but, when the price decreases, farmers are discouraged from investing and taking care of their coffee trees.

Table 8: Coffee production in 2017, 2018 and 2019 (n=63, 90 and 100 respectively)

Year	Production in Kilograms	Frequency	Percent
2017	≤ 100	54	85.9
	101-200	4	6.3
	201-300	4	6.3
	≥ 301	1	1.6
2018	≤ 100	69	76.7
	101-200	12	13.3
	201-300	6	6.7
	≥ 301	3	3.3
2019	≤ 100	85	85.0
	101-200	6	6.0
	201-300	4	4.0
	≥ 301	5	5.0

4.3 Motivational Factors for Reviving Coffee Cultivation

Data based on motivational factors for reviving coffee cultivation were collected using a Likert scale with five options (*strongly disagree, disagree, neutral, agree and strongly agree*). The findings are illustrated and discussed in the following sub-sections.

4.3.1 Availability of hybrid seedlings

Study findings in (Table 9) illustrate that 30.8% of the respondents strongly agreed that the availability of hybrid seedlings was an opportunity for reviving coffee cultivation, whereas 46.2% of respondents agreed. From the interviews, it was reported that the availability of hybrid seedlings encourages and attracts respondents to revive coffee cultivation due to hybrid seedlings having higher productivity. TaCRI (2018) reported that hybrid seedlings are diseases resistant to coffee leaf rust (CLR), Coffee Berry Disease (CBD) and produce high quality coffee. According to Lyimo and Owenya (2004), the majority of coffee growers in the country face a lack of improved varieties that are potentially high yielding and resistant to disease and insect pest infestation. Table 9 shows the types of hybrid seedlings available to the respondents.

Table 9: Hybrid seedlings as an opportunity (n=104)

Hybrid seeds are an opportunity to revive coffee cultivation.	Frequency	Percent
Strongly Disagree	6	5.8
Disagree	8	7.6
Neutral	10	9.6
Agree	48	46.2
Strongly Agree	32	30.8

Additionally, 65.4% of the respondents reported to be motivated to revive coffee cultivation due to the availability of hybrid seedlings, specifically the compact variety seedlings (Table 10). The compact seedlings were provided to farmers at a cost of TZS 200 and TZS 300 respectively. This encouraged 65.4% of respondents to plant compact varieties. According to interviews with the Lyamungu ward extension officer, compact hybrid seedlings are preferred because they increase the plant population per acre (1 500-2 000 seedlings) compared to 800-1 000 local seedlings per acre.

Table 10: Types of hybrid seedlings (n=104)

Types of seeds	Frequency	Percent
Compact	68	65.4
Compact and Pop	12	11.5
Compact and KP423	12	11.5
Pop and KP423	3	2.9
Compact, KP423 and Pop	9	8.7

4.3.1.1 Availability of coffee Hybrid seedlings

Fifty-eight point five (58.5%) of the respondents reported purchasing hybrid seedlings at a cost of 200 TZS per seedling, which was considered to be affordable by most of the respondents (Table 11). However, 26.0% said they received free hybrid seedlings from

TaCRI. The implications of these findings is that the current price is affordable and is an opportunity to motivate farmers to revive coffee cultivation.

Table 11: Price of coffee hybrid seedlings in Tzs (n=104)

Price of coffee hybrid seeds in Tzs	Frequency	Percent
200	61	58.6
300	16	15.4
Free of charge	27	26.0

According to Table 12 below, 53.9% of the respondents reported that hybrid seedlings are beneficial due to their high yields. High yields are an important factor in agriculture, which is measured by crop output per unit of land (Mmari, 2012). Table 12 below show 26.9% of respondents claimed that hybrid seedlings are resistant to diseases. TaCRI officers asserted this observation of hybrid seedlings being more resistant to diseases and higher yielding than traditional seedlings. According to TaCRI Auction Results 2020-2021, control of diseases and pests through the introduction of hybrid seeds is very crucial for increasing coffee yield. The most common diseases claimed to face coffee cultivation include Coffee Berry Disease (CBD) and Coffee leaf Rust (CLR) (Hillary *et al.*, 2019). These findings are also supported by Hemmed *et al.* (2018), who argue that genetic diversity is a boom for developing new varieties via hybridization with improved yield and pest and disease resistance.

Table 12: Benefits of coffee Hybrid seedlings as per respondents (n=104)

Benefits of coffee hybrid seedlings	Frequency	Percent
High yields	56	53.9
Diseases resistant	28	26.9
High cup quality	20	19.2

4.3.2 Availability of land provided by AMCOS

The findings in Table 13 indicate that 34.6% of respondents claimed that the availability of land provided by AMCOS was a motivational factor for reviving coffee cultivation, whereas 28.8% strongly agreed. Earlier, AMCOS provided land to cultivate food crops, because coffee trees were uprooted when farmers stopped cultivating coffee. However, 27.5% of respondents were reported to be provided with land by AMCOS. After cutting the coffee trees, land was allocated to other uses, particularly food crop cultivation. According to one of the AMCOS leaders, AMCOS now feels that there is a need to provide the coffee farmers with land to grow food crops to avoid cutting off coffee trees.

In the interview session, one of the interviewees said:

“Other respondents had turned back to coffee cultivation because AMCOS provided land for some of them to grow food crops such as maize, beans and banana; however, hybrid seeds also attracted them to start cultivating coffee again (AMCOS officer)”. (Machame Mashariki ward, on 03/04/2020)

Also, one of the AMCOS staff members stated:

“We, as AMCOS, our task is to increase productivity. We used to provide land to smallholder coffee farmers for cultivation”.

Since then, coffee farmers have abandoned coffee farming in favor of alternative land uses such as livestock, fish ponds, or even crop cultivation (Machuka, 2016). AMCOS feel that to revive coffee cultivation, they need new land for the farmers. The findings are also supported by Atania and Rwekaz (2018), who reported that mixed farming is dominant among the natives, mostly due to land scarcity.

Table 13: Land provided by AMCOS as an opportunity (n=104)

Land provided by AMCOS	Frequenc y	Percent
Strongly Disagree	22	21.2
Disagree	16	15.4
Neutral	0	0.0
Agree	36	34.6
Strongly Agree	30	28.8

According to the findings in Table 14, 72.5% of respondents had not received any land from AMCOS, while only 27.5% had received 0.25-1 acre of land. This implies that though smallholder coffee farmers were attracted to revive coffee cultivation due to provision of land by AMCOS, 72.5% were not provided with land. Thus, demand outweighed supply.

Table 14: Land distributed to the Respondents by AMCOS (n=104)

Land received from AMCOS	Frequency	Percent
0.25-1 acre	33	27.5
Not received any land	87	72.5

4.3.3 Possibility of gap filling

Amend (2002), reported that the Kilimanjaro region has a good reputation for producing high quality coffee which is recognized all over the world. The good quality of Kilimanjaro coffee originates from its rich volcanic soil, which gives it a good and unique taste (Amend, 2002). Thus, because of its good quality, it fetches high prices in the market. These are some of the reasons which motivated coffee farmers in Hai district to revive coffee cultivation. Thus, with shortage of land for reviving coffee cultivation, farmers have opted for gap filling as one way of reviving coffee cultivation and increasing

income. The following section provides information on respondents who have revived coffee cultivation. Table 15 illustrates the possibility of filling gaps by respondents.

Study findings (Table 15) show almost 55.7% and 38.5% of the respondents agreed and strongly agreed that the possibility of gap filling was a major motivational factor for reviving coffee cultivation. It was reported by respondents (smallholder farmers) reviving coffee cultivation to fill gaps left after abandoning coffee cultivation. However, another implication is that improvement in agricultural inputs, particularly the availability of improved seedlings, have motivated respondents to think more about filling the emerging gaps. Furthermore, the findings match with the findings by Girabi and Mwakaje (2013), who found that access to improved agricultural inputs supports smallholder farmers to adapt to new farming techniques and enables them to use their present resources successfully.

Table 15: Possibility of filling gaps (n=104)

Possibility of filling gaps as an opportunity for coffee reviving	Frequency	Percent
Strongly Disagree	0	0.0
Disagree	0	0.0
Neutral	6	5.8
Agree	58	55.7
Strongly Agree	40	38.5

4.3.4 Assistance from other organisations

The findings in Table 16 show that 58.0% and 25.0% of respondents agreed and strongly agreed that assistance from other organisations (*TaCRI and Kilimo Hai cha Kahawa*) was a motivational factor for respondents to revive coffee cultivation. Interviews with TaCRI and *Kilimo Hai cha Kahawa* officers revealed that they have been cooperating with government extension officers to provide awareness on proper coffee husbandry practices.

This reveals that respondents were facilitated to revive coffee cultivation by TaCRI and *Kilimo Hai cha Kahawa*, which used to create awareness on coffee cultivation. Samwenda (2016) shows that Hai district has various organisations with varying interests in supporting agriculture development, ranging from those who are public owned to private extension services. However, Peterson (1997), described institutional factors affecting the operation of extension services to be the presence of organisations, both private and public, which support agriculture and thus facilitate the role of the extension organization.

Table 16: Assistance from other organizations (n=104)

Assistance from other organizations	Frequency	Percentage
Strongly Disagree	4	3.6
Disagree	13	10.5
Neutral	3	2.9
Agree	59	58.0
Strongly Agree	25	25.0

Table 17 shows that 54.8% of the respondents were provided with hybrid seedlings by TaCRI and *Kilimo Hai cha Kahawa* as assistance to increase productivity, 39.4% received extension services and 5.8% were trained on market information. The key informants from TaCRI and *Kilimo Hai cha Kahawa* claimed to provide extension services through training and seminars with respondents every year. Generally, training increases knowledge of the respondents on protecting diseases for increased productivity. This implies that awareness creation of agricultural practices by different organizations (TaCRI and *Kilimo Hai cha Kahawa*) has motivated respondents to turn back into coffee cultivation. In fact, these findings are in line with findings by Pyk (2017), that organisations play an important role in linking smallholder coffee farmers (producers) and

consumers and supporting smallholder coffee farmers with useful knowledge of production techniques.

Table 17: Assistance received by the respondents from organizations (n=104)

Kinds of assistance	Frequency	Percent
Provision of hybrid seeds	57	54.8
Provision of extension services	41	39.4
Training on market information	6	5.8

4.3.5 Provision of extension services to the respondents

Study findings (Table 18) show that 84.6% and 10.6% of the respondents agreed and strongly agreed respectively that the availability of extension services was an opportunity for respondents to revive coffee cultivation respectively. It was reported that TaCRI, AMCOS with cooperation with government extension officers had been providing extension services to respondents on good agricultural practices in relation to coffee cultivation. Thus, the availability of extension services has been crucial to reviving coffee cultivation by respondents. These findings are in line with studies by Ktenga *et al.* (2014); Nederlof and Wennink (2010), respectively, which show that agricultural extension describes the services that provide rural people with access to knowledge and information they need to increase productivity and sustainability of the production systems and improve their quality of life and livelihoods. Mugishangwe (2015), states that extension services contribute to strengthening the assets of the smallholder farmers and hence enabling them to adapt and sustain their livelihoods in a changing context.

Table 18: Provision of extension services in coffee production (n=104)

Availability of extension services	Frequency	Percent
Strongly Disagree	0	0.0
Disagree	5	4.8
Neutral	0	0.0

Agree	88	84.6
Strongly Agree	11	10.6

In addition, the findings in Table 19 show that 59.6% of respondents were trained on proper coffee husbandry practices for increased productivity. The practices included pruning, mulching and fertilizer application, spraying of pesticides, fungicides and herbicides. The findings. A research by Mulie (2014), found that many coffee farmers were performing badly because of poor extension services. However, according to Mugishagwe (2015), extension services contributed to strengthening smallholder farmers' assets, thus, enabling them to adapt and sustain their livelihoods in a changing context.

Table 19: Types of extension services offered to the respondents (n=104)

Types of extension services	Frequency	Percent
Extension information	33	31.7
Good coffee husbandry practices	62	59.6
Increasing productivity	6	5.8
Protection of diseases	3	2.9

4.4 Challenges for Reviving Coffee Cultivation

Data on reviving challenges was gathered using a Likert scale with five options (*strongly disagree, disagree, neutral, agree, and strongly agree*). The statements were based on six indicators of challenges for reviving cultivation. These include; high costs of agriculture inputs, types of agricultural inputs, price fluctuation in the market, change in weather conditions, shortage of land, and unavailability of manpower. The findings are illustrated and discussed through the following sub-sections.

4.4.1 High cost of agriculture inputs

Table 20 presents findings on the high cost of agriculture inputs as one of the challenges to the revival of coffee cultivation. The table shows that 42.0% and 28.6% of respondents agreed and strongly agreed that high costs of inputs are a challenge for the revival of coffee cultivation. 11.4% and 8.5% disagreed and strongly disagreed, whereas 9.5% were found neither to agree nor disagree. The village leaders reported that, though farmers are encouraged to revive coffee cultivation, they are still challenged by the high costs of inputs such as fertilizers, seedlings, and pesticides. This means that although respondents have decided to turn back into coffee cultivation, their efforts are still affected by challenges of unaffordability of inputs. Here, the inference can be made that in order for respondents to gain high productivity through the new investment (reviving coffee cultivation) they had made, they had to be facilitated by either the government or other agricultural stakeholders to obtain cheap agricultural inputs. It is also reported that failure to apply effectively agricultural inputs affects productivity (Andrew and Philip, 2014). The researcher was also able to highlight that the high cost of agricultural inputs is a bottleneck for reviving coffee cultivation, which is consistent with Ncube *et al.* (2010) who report that the high cost of inputs makes it difficult for coffee farmers to apply the recommended inputs for higher coffee yields.

Table 20: High cost of agriculture inputs (n=104)

High costs of inputs	Frequency	Percent
Strongly Disagree	09	8.5
Disagree	12	11.4
Neutral	10	9.5
Agree	43	42.0
Strongly Agree	30	28.6

4.4.1.1 Types of agricultural inputs

Study findings in (Table 21) show that 65.6% of the respondents use manure in coffee cultivation, because it is obtained easily in their homes and sometimes, at a local level without involving the use of money. According to Anania and Rwekaza (2018), the cost of agriculture inputs such as seedlings, pesticides, fertilizers and equipment are still not affordable to the majority of coffee farmers, reducing the yield that the coffee farmers get from their coffee farms.

Table 21: Types of agricultural inputs (n=61)

Agricultural inputs	Frequency	Percent
Chemical fertilizers	1	1.6
Chemical fertilizer and herbicides	3	4.9
Chemical fertilizer, herbicides, and pesticides	12	19.7
Herbicides and pesticides	5	8.2
Manure	40	65.6

4.4.2 Price fluctuation of coffee in the market

Study findings (Table 22) show the price fluctuation of coffee in the market as a challenge to the revival of coffee cultivation. According to the table, 32.4% and 28.6% of respondents, respectively, strongly agreed and agreed that market price fluctuation is a challenge to the revival of coffee cultivation. According to reports, respondents are hesitant to restart coffee cultivation because they are uncertain about coffee prices in global markets. However, respondents also claimed to have no chance to negotiate for coffee prices. Thus, unpredicted coffee prices in the market provide a challenge to the respondents deciding either to turn back into coffee cultivation or not. However, the difficulties in predicting the price is due to the situation in the world market on which

Tanzania is dependent. In fact, Sengere (2016), argues that supply and demand in the world market drives price fluctuations which are beyond the control of coffee farmers.

Table 22: Price fluctuation of coffee in the market (n=104)

Price fluctuation of coffee in the market	Frequency	Percent
Strongly Disagree	18	17.1
Disagree	13	12.4
Neutral	10	9.5
Agree	30	28.6
Strongly Agree	33	32.4

Table 23 shows that, in 2018, the price increased from 4 200 TZS per kilogram in 2017 to 5 000 TZS per kilogram. However, it decreased to 3 000 TZS in 2019, which is lower compared to those of 2017 and 2018. AMCOS officers reported that coffee prices decrease or increase depending on the world market prices. The findings are in line with Huka *et al.*, (2014) who conducted research on price fluctuation of agricultural products and its impacts on small-scale farmers' development in Kilimanjaro. Their research results suggest that price fluctuation of agricultural products is a challenge towards achievement of small farmers' development, which results in shifting to other production activities based on food crops such as beans, maize and banana.

Table 23: Price of coffee in TZS for the period of 2017 to 2019

Year	Price in TZS
2017	4200
2018	5000
2019	3000

4.4.3 Change of weather conditions

Table 24 shows that 40.0% and 30.5% of the respondents strongly agreed and agreed that change in weather conditions is a challenge to the revival of coffee cultivation in Hai district, whereas 14.3% and 9.5% strongly disagreed and disagreed and 5.7% were neutral. However, it was reported by Machame Mashariki ward extension officer that variation of rainfall and temperature affects the production of coffee. The reason being that coffee cultivation requires good rainfall distribution and high humidity. Therefore, unpredictable weather changes cause several challenges in coffee production in Hai district. Nonetheless, annual weather differences are more important in coffee cultivation than eventual climate change. The problems associated with weather challenges include drying of leaves of coffee when temperature increases and sometimes high rain causes fruit to take on moisture, which makes cherries heavier, leading them to drop to the ground (TaCRI, 2016).

According to Abel (2016), variation of rainfall and temperature as a result of climate change will continue to decrease coffee yield in the Kilimanjaro region. It was reported by TaCRI officers that it has been difficult for other farmers to revive coffee cultivation because of the change in weather they experienced in 2014/2015. This finding is in line with findings by (Craparo *et al.*, 2015) that, despite the fluctuation in prices, Tanzania has been experiencing various other challenges associated with climate change. Table 25 shows weather conditions reported by respondents which constrained their coffee cultivation.

Table 24: Effects of Change of weather conditions on Coffee production (n=104)

Change of weather conditions	Frequency	Percent
Strongly Disagree	15	14.3
Disagree	10	9.5
Neutral	6	5.7
Agree	31	30.5
Strongly Agree	42	40.0

Findings in Table 25 show that 59.6% of the respondents identified shortage of moisture/drought as the major climatic condition constraining farmers' revival of coffee cultivation. It was reported that, in 2014/2015, respondents got low yields due to drought. Therefore, respondents were resistant to reviving coffee cultivation because of drought. According to Hagggar and Schepp (2012), drought and excessive rainfall normally results in a decline in coffee yield. Therefore, to avoid the risk, farmers need to adopt various practices such as irrigation, mulching and planting shade crops/trees. It is right therefore to make an inference that when farmers, particularly respondents of this study, fail to apply irrigation, mulching and planting shade trees, they will continue to be challenged by weather conditions, thus, leading to low productivity.

Table 25: Problems associated with changing of weather conditions (n=104)

Change of weather conditions	Frequency	Percent
Disease	3	2.9
Excessive rainfall	39	37.5
Drought	61	59.6

4.4.4 Shortage of land for coffee cultivation

Study findings (Table 26) show the shortage of land as a challenge facing respondents in reviving coffee cultivation. According to the findings, 10.0% and 84.6% of respondents strongly agreed and agreed that a lack of land is limiting the revival of coffee cultivation in their area. However, in recent years, when prices have been reported to rise, farmers

have limited land for coffee revival because their land has been useful for growing other crops. Reviving of coffee cultivation needs the availability of enough land to establish new plants. Therefore, shortage of land is a challenge for turning back to coffee cultivation.

According to Machuka (2016), coffee farmers have abandoned coffee farming in favor of other land uses such as livestock, fish ponds, or growing other crops. Respondents typically plant coffee and other food crops on their customary land due to land scarcity, according to a key informant interview with TaCRI officers. According to Babin (2012) and Inu (2015), declining land availability has challenged farmers and contributed to low coffee production. The key informants' officers from AMCOS reported that, in households, farmers can no longer expand the land under coffee cultivation due to severe land shortages. Households are hesitant to allot more land for resurrected coffee cultivation. For example, some households are sub-dividing their coffee land size to meet the needs of household members. Thus, land shrinkage generation after generation. The findings are supported by Aba *et al.* (2012) that other households facing land shortages for food gardening have uprooted coffee to plant food crops.

Table 26: Shortage of land (n=104)

Shortage of land	Frequency	Percent
Strongly Disagree	0	0.0
Disagree	5	4.8
Neutral	0	0.0
Agree	88	84.6
Strongly Agree	11	10.6

4.4.5 Shortage of manpower for coffee cultivation

The study findings, as shown in Table 27, show that a lack of manpower for coffee cultivation posed a challenge to the crop's revival. The findings in Table 27 show that 37.1% and 27.7% strongly agreed and agreed that the shortage of manpower is a challenge for the revival of coffee cultivation in their area. Respondents reported that coffee cultivation in the Hai district to a high extent (55.8%) involved older people i.e. (above 60 years) (as shown in Table 1). Therefore, the more energetic young manpower is highly needed to help these older people. Unfortunately, young people do not involve themselves in agricultural activities; instead, they tend to migrate to towns for casual jobs (Sengere, 2016). As a result of a lack of manpower, reviving coffee cultivation is associated with other activities such as grafting and clonal propagation. On the other hand, respondents reported that since the revival of coffee cultivation is expected to increase productivity, it also increases demands for manpower, both skilled and unskilled. The picture that emerges from the findings is that respondents are challenged by the lack of manpower, both skilled and unskilled. The findings are in line with Sengere (2016), that labour shortages are a universal problem among smallholders, including members of cooperatives. The shortage of labour is considered to be one of the most prominent constraints on coffee productivity and production among farmers.

Table 27: Shortage of manpower for coffee cultivation (n=104)

Shortage of manpower for coffee cultivation	Frequency	Percent
Strongly Disagree	19	18.1
Disagree	15	14.3
Neutral	5	4.8
Agree	27	27.7
Strongly Agree	38	37.1

4.5 Association between status of coffee cultivation and challenges of coffee reviving cultivation.

A binary logistic regression was run to predict the association between status of coffee cultivation and challenges of coffee reviving cultivation. The predictors included; high costs of agriculture inputs, price fluctuation at the market, changes of weather condition, shortage of land, and unavailability of manpower. The results in Table 28 show the statistical significance in the “Sig” column. From these results it is found that; high cost of agriculture inputs ($p=0.018$), change of weather condition ($p=0.000$), shortage of land ($p=0.006$), and unavailability of manpower ($p=0.009$). These results add significant value ($p<0.05$) to the status of coffee cultivation (dependent variable), this means there is association between them and status of coffee cultivation. The results for price fluctuation at the market show ($p=0.190$), this means there is no association ($p\geq 0.05$) with status of coffee cultivation.

The findings reveal that whenever respondents face the challenges in coffee cultivation, they were to be affected in coffee status. This means the challenges particularly those which show the statistical associations were being as obstacles for the respondents to increase production, it is because they failed to increase the numbers of trees, also they fail to expand the land for cultivation. However, the challenge of price fluctuation is seen not to affect the status of coffee cultivation, this is because even if the price increase or decrease the size of farm and numbers of tree never decrease or increase.

In addition, the results in Table 28 indicates $R^2 = 99.1\%$, this means that 99.1% of used variance was explained by all independent variables, while the remaining i.e. 0.9% was explained by other factors unknown to a researcher.

Table 28: Binary logistic regression results

Quality of care	B	S. E	Wald	Sig.	Exp(B)
High costs of Agriculture inputs	-0.780	0.330	5.579	0.018	0.458
Price fluctuation at market.	-0.302	0.231	1.719	0.190	0.739
Change of weather condition.	-0.075	0.012	41.048	0.000	0.928
Shortage of land.	0.643	0.235	7.515	0.006	1.903
Unavailability of manpower.	-0.872	0.334	6.810	0.009	0.418
$R^2 = 99.1\%$					
Adjusted $R^2 = 99\%$					

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Based on the study findings, it can generally be concluded that respondents have revived coffee cultivation due to the presence of different motivational factors. It is also concluded that the presence of these motivational factors has improved productivity through application of hybrid seedlings, use of extension services and agricultural assistance from different organisations such as TaCRI and *Kilimo Hai cha Kahawa*. Though provision of free land by AMCOS is taken as a motivational factor to revive coffee cultivation, most respondents did not obtain land from AMCOS.

This study also concludes that respondents have not fully adopted the process of revival coffee cultivation because the process itself is associated with various challenges that affect productivity. High input costs, market price fluctuations, weather conditions, and a lack of manpower are among the challenges. It is also concluded that respondents find difficulties to addressing other challenges because they need technical skills or assistance from experts. For example, in order to address challenges associated with weather

conditions, respondents need to get assistance from agricultural experts and extension officers who could suggest better ways to minimize effects.

Apart from conclusions based on motivational factors and challenges of reviving coffee cultivation, this study also develops a conclusion based on the status of coffee cultivation. The conclusion states that, while there are motivational factors for reviving coffee cultivation, the status of coffee cultivation is still not in doubt due to the presence of reviving challenges that the respondents face, and as a result, they fail to increase productivity because they continue cultivating in a small portion with few planted trees, resulting in low productivity.

5.2 Recommendations

Based on the study's findings, the following recommendations are made to boost coffee cultivation revival:

- The government and non-governmental organisations (NGOs) should help all smallholder farmers return to coffee farming. This could be done through providing them with soft loans, free extension services and land for cultivation. The smallholder farmers could also be provided with affordable inputs at the right time. This could be done through the active functioning of the AMCOS shops which are currently not functioning.
- The government and other developmental stakeholders such as TaCRI and AMCOS should provide agricultural services to smallholder farmers to enable them to increase productivity and update the status of cultivation. This could be done through increasing provision of extension services, making advocacy to young

people to encourage participation in agricultural activities, providing soft loans to smallholder farmers and providing affordable inputs at the right time.

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APPENDICES

Appendix 1: Questionnaire for smallholder coffee farmers' information

Section A: Introduction

Dear Respondent(s)

You are invited to participate in an academic research study conducted by MATHIAS ERICK M Masters of Arts in Project Management and Evaluation from college of social science and humanities under department of Policy Planning and Management at Sokoine University of Agriculture, Morogoro-Tanzania.

Please note the following:

- In this study the name of respondent is optional. Your name(s) is optional to appear on the questionnaire and the answers you give will be treated as strictly confidential.
- Please answer the questions in the attached questionnaire as completely and honestly as possible. This should not take more than 20 minutes of your time.

- The results of the study will be used for academic purpose only.

Section B: Background information:

Date of interview..... District

Ward..... Street/Village

Respondent Name..... Phone number

• **Social–Demographic characteristics of the smallholder’s farmers**

1. Age of the respondent.....
2. Sex of respondent
 - i. Female []
 - ii. Male []
3. Marital status?
 - i. Married []
 - ii. Single []
 - iii. widowed []
 - iv. Separated []
 - v. Any other specify.....
4. What is your education t level?
 - i. Primary []
 - ii. Secondary []
 - iii. Tertiary []
 - iv. University []
 - v. Any other specify.....
5. What is your main Source of income?
 - i. Employed []
 - ii. Crop cultivation []
 - iii. Livestock keeping []
 - iv. Registered business []
 - v. Petty business []

Section C: The status of coffee cultivation among the smallholder farmers

6. What is the size of your coffee farm?
7. When did you start to cultivate coffee years?
8. How many coffee trees do you have in your plot?
9. How many Kgs did you produced for the last 3 years?

Years	2017	2018	2019
Kgs			

10. Has the coffee output been increasing over the years?
 - i. Yes []
 - ii. No []
11. If yes, why?
 - i. Availability of land []
 - ii. Good weather condition []
 - iii. Use of inputs like fertilizer []
 - iv. Availability of extension service []

- v. Others specify.....
12. If no, why?
- i. Shortage land []
 - ii. Change weather condition []
 - iii. Didn't use inputs like fertilizer []
 - iv. Shortage extension service []
 - v. Shortage capital []
 - vi. Others.....
13. Do you use agricultural inputs?
- i. Yes []
 - ii. No []
- a) If yes, which one?
- i. Chemical fertilizers []
 - ii. Herbicides []
 - iii. Pesticides []
 - iv. Others.....
- b) If no, why not?
- i. Inputs is very expensive []
 - ii. It not available on time []
 - iii. They destroy land []
 - iv. I don't know how to use []
 - v. Others
14. If you use, where do you get the agricultural inputs?
- i. From a primary society []
 - ii. From institutions []
 - iii. From farmers group []
 - iv. Purchasing from input dealers []
 - v. Others (explain).....
15. Do you receive extension services for your coffee cultivation?
- i. Yes []
 - ii. No []
- a) If yes, who provide extension services?
- i. NGO []
 - ii. Government extension service []
 - iii. From a cooperative society []
 - iv. From farmers groups []
 - v. From institutions []
 - vi. Others (specify).....
- b) If not, how do you manage coffee cultivation without extension services?
- i. Through local experience []
 - ii. Through looking others []
 - iii. Through use indigenous methods []
 - iv. Other (mention).....
16. Are there farmers groups dealing with coffee production in your area/village?

- i. Yes []
 - ii. No []
- a) If yes, are you a member?
 - i. Yes []
 - ii. No []
- a) If not, why not?
 - i. Wastage of time []
 - ii. Located far from the village []
 - iii. Do not have any benefits to coffee farmers []
 - iv. Have no criteria []
 - v. Others (mention).....
- 17. If yes, what is the name or group/organization?
- 18. How is the group assisting you in coffee production?
 - i. Provision of Extension services []
 - ii. Inputs distribution []
 - iii. Selling coffee seedlings []
 - iv. Provision of Marketing information []
 - v. Assist in Coffee marketing []
 - vi. Others (specify).....
- 19. Have you heard about hybrid coffee seedling
 - i. Yes []
 - ii. No []
- a) If yes, Have you planted hybrid coffee seedlings in your plot?
 - i. Yes []
 - ii. No []
- b) If yes, how many seedlings have you planted?
- c) Where did you get it?
 - i. From farmers groups []
 - ii. From neighbors []
 - iii. From cooperative []
 - iv. From NGO []
 - v. From TaCRI []
 - vi. Others (mention).....
- d) If purchased, how much did you pay for per one seedling?
- 20. Have you harvested already?
 - i. Yes []
 - ii. No []
- a) How much coffee did you harvest from one tree?
- b) Are these hybrid coffee seedlings profitable?
 - i. Yes []
 - ii. No []

- b) If yes, why?
- i. High yields
 - ii. Diseases resistant
 - iii. High productivity
 - iv. High cup quality
 - v. Others (mention).....
- d) If No, why not?
- i. Low yield
 - ii. Low resistance to diseases
 - iii. Poor cup quality
 - iv. Other (mention).....
- e) What are the challenges of cultivating hybrid coffee seedlings?
- i. Prices of seedlings []
 - ii. High Water requirements []
 - iii. Land availability []
 - iv. Availability of seedlings []
 - v. Others (mention).....

Section D: Challenges of reviving coffee cultivation

21. Do you understand the importance and meaning of reviving coffee cultivation practices?

- i. Yes []
- ii. No []

a) If yes, what is it?

- i. Changing from cultivation of conventional to hybrid coffee seedlings []
- ii. Reducing number of coffee trees []
- iii. Improving coffee cultivation practices []
- iv. Gap filling
- v. Others (mention).....

22. Are farmers in your area reviving coffee production?

- i. Yes []
- ii. No []

a) If yes, how?

- i. By planting hybrid seedlings []
- ii. By Cutting down trees and planting hybrid seedlings []
- iii. By replacing/gap filling with conventional seedlings []
- iv. by replacing conventional to hybrid coffee []
- v. By gap filling with conventional coffee []
- vi. By increasing application of agricultural inputs []
- vii. Others (mention).....

- b) If no, why not?
- i. Harvesting from coffee still low []
 - ii. Poor coffee cultivation practice []
 - iii. Reduced number of coffee trees []
 - iv. Low number of farmers planting hybrid seedling []
 - v. By decrease application of agriculture inputs []
 - vi. Others (mention).....

23. What was the selling price of coffee per Kg?

Years	2017	2018	2019
Price			

24. When did you apply fertiliser for the last time?

25. Which fertilizer/input did you apply for the last time?

26. Are you satisfied with the price offered in the market for the above crop?

- i. Yes []
- ii. No []

a) If not satisfied, how do you maintain coffee cultivation?

- i. Doing nothing []
- ii. by application of manure []
- iii. by using indigenous methods []

27. Are some of the small-scale farmers abandon coffee cultivation due to challenges?

- i. Yes []
- ii. Not []

28. How do you think about the level of challenges of reviving coffee cultivation with the following terms? (Please tick in the box that is relevant to the statements)

S/N	Challenge	Strong Disagree	Disagree	Undecided	Agree	Strong Agree
28a	Low coffee price					
28b	High agricultural inputs					
28c	Shortage of man power					
28d	Shortage of land					
28e	Change of climate condition					

29. What are the challenges of reviving coffee production in your area?

- i. Availability of hybrid seedling []
- ii. High costs of hybrid seedlings []
- iii. Availability of land for reviving []
- iv. Prices of coffee at the market []
- v. Availability of extension service []
- vi. Availability of man power []
- vii. Change of weather condition []
- viii. High price of agriculture inputs []

30. How do you overcome these challenges and continue with coffee cultivation?

- i. Giving them free inputs []
- ii. Distribution and planting of hybrid seeds []
- iii. Extension services []
- iv. Giving them subsidies and loan []
- v. Ensure good coffee price []
- vi. By using manure []
- vii. By using indigenous methods like use rabbit urine, ashes []
- viii. By using local experience []
- ix. Reduced the size of farm []
- x. Others (mention)

Section E: Motivational factors for reviving coffee cultivation

31. Have you revived coffee cultivation?

- i. Yes []
- ii. No []

a) If yes

Year of reviving	Area re-establish	Number of trees re-establish

b) If no why not?

- i. High costs of agricultural input []
- ii. Shortage land []
- iii. Shortage Capital []
- iv. Shortage availability of coffee seedlings []
- v. Low coffee prices []
- vi. Shortage of man power []

32. What are the motivational factors of reviving coffee production in your areas?

- i. Anticipation of increase in future prices []
- ii. Importance of Kilimanjaro Brand []
- iii. Availability of hybrid seeds with higher production and diseases resistant []
- iv. Availability of land []

- v. Possibility of gap filling []
- vi. Assistance from other organizations []
- vii. Availability coffee specialist []
- viii. Availability of Training(education) on good cultivation practice[]
- ix. Other (mention).....

33. Is there any institution which assists you to revive coffee cultivation?

- i. yes []
- ii. No []

a) If yes please mention such institutions and assist toward revive coffee cultivation

Number	Institutions	Kind of Assistance to farmers for reviving
1		i. Provision of hybrid coffee seedling[] ii. Offer extension service[] iii. Provision of market information [] iv. Inputs distribution[] v. Others.....
2		i. Provision of hybrid coffee seedling[ii. Offer extension service[] iii. Provision of market information[] iv. Inputs distribution[] v. Others.....
3		i. Provision of hybrid coffee seedling[] ii. Offer extension service[] iii. Provision of market information[] iv. Inputs distribution[] v. Others.....

34. As smallholder coffee farmer do you receive any motivations?

- i. Yes []
- ii. No []

a) If yes please mention and how influence you to revive coffee cultivation?

No	Opportunities	How influence you to revive coffee cultivation
1	Availability of	i. These seeds are resistant to drought[]

	hybrid seeds	ii. These seeds are high yield[] iii. High resistance to diseases and insect[] iv. Good cup quality[] v. Do not need a lot of water[] vi. Do not need more medicine[] vii. They are marketable[] viii. Other.....
2	Offer extension service e.g. provision of training(education) on good cultivation practice	i. To know proper coffee husbandry practices such as raising seedlings, how to pruning[] ii. To get extension information and new technology[] iii. To know how protect coffee from diseases[] iv. To know how to make your coffee of the best quality it's needed in the marketplace[] v. To know how to increase coffee productivity[] vi. To know the application of agriculture inputs[] vii. Others.....
3	Provision of land to cultivate food crops (AMCOS provide the land to some smallholders coffee farmers to plant food crops with	i. To increase coffee productivity [] ii. To increase size of coffee farm[] iii. To increase number of trees[] iv. To get market []. v. Others.....

	conditions)	
4	Improvement of coffee price	i. To get high profit from coffee production[] ii. To increase coffee income[] iii. Others.....

a) If no why not?

- i. There no farmers group deal with coffee production []
- ii. Are not a member []
- iii. Shortage of capital []
- iv. Shortage of land []
- v. No institution/organization provide opportunities []
- vi. Others.....

35. How many seedlings do you receive?

36. What type of seed do you receive?

37. What the size of land does receive from AMCOS.....

38. Your household income generate from coffee production increase per year?

- i. Yes []
- ii. No []

a) If no why?

- i. Low coffee price []
- ii. Low production []
- iii. High agriculture input price []
- iv. Shortage of land []
- v. Others.....

39. What your household incomes generate from coffee production in three years?

Years	2017	2018	2019
Income			

40. How do you think about the level of motivational factors for reviving coffee cultivation with the following terms? (Please tick in the box that is relevant to the statements)

S/N	Motivational factor	Strong Disagree	Disagree	Undecided	Agree	Strong Agree
40a	Availability of hybrid seedlings					
40b	Availability of land provided by AMCOS					
40c	Possibility of gap					

	filling					
40d	Assistance from other organizations					
40e	Availability of extension services					

Appendix 2: Checklist for primary society

1. Who are your members?
2. How many members do you have?
3. How do you assist your members in coffee production and management?
 - i. Marketing[]
 - ii. Distribution of agricultural inputs[]
 - iii. Extension services[]
 - iv. Distribution of hybrid seedlings[]
 - v. Others (mention).....
4. In this area, what status of coffee cultivation among the smallholder farmers for three years?

Years	2017	2018	2019
Number of acres cultivated			

5. In three years how many tons of coffee did you collect from farmers and those tones are increase per year?

Years	2017	2018	2019
Tons			

6. Are farmers reviving coffee in your areas?

- i. Yes
- ii. No
- a) If yes, why?
 - i. By planting hybrid seedlings[]
 - ii. By Cutting down trees and planting hybrid seedlings[]
 - iii. By replacing/gap filling with conventional seedlings[]
 - iv. by replacing conventional to hybrid coffee[]
 - v. By gap filling with conventional coffee[]
 - vi. By increasing application of agricultural inputs[]

b) Please give me the numbers of farmers who have revived coffee cultivation in your area per three years?

Years	2017	2018	2019
The number of new coffee farmers			

c) If no, why not?

- i. Harvesting from coffee still low []
- ii. Poor coffee cultivation practice []
- iii. Reduced number of coffee trees []
- iv. Low number of farmers planting hybrid seedling []
- v. By decrease application of agriculture inputs []
- vi. Others (mention).....

7. How do you assist your members in reviving coffee cultivation?

- i. Advising to reduce number of aged trees[]
- ii. Advising on planting hybrid coffee seedlings[]
- iii. Initiation of a coffee seedlings nursery in our areas[]
- iv. Others (mention).....

8. Do you know, what is the importance of reviving coffee production in your areas?

- i. Increasing of household income[]
- ii. Alternative sources of income[]
- iii. Employment availability[]
- iv. Increase coffee status []
- v. Promote other sectors like industry[]
- vi. I do not know[]
- vii. Other (mention).....

9. How many seedlings have you distributed/sold to your members in the last three years?

Years	2017	2018	2019
Number of seedlings distributed			

10. What are the challenges facing farmers to revive coffee cultivation in your area?

- i. Shortage of of hybrid coffee seedlings[]
- ii. High costs of hybrid coffee seedlings []
- iii. Scarcity of land for reviving[]
- iv. Low prices of coffee at the market[]
- v. Shortage of extension services[]
- vi. Scarcity of labour []
- vii. Change of weather condition[]
- viii. High price of agriculture inputs[]
- ix. Other (mention).....

11. How can you help farmers in your area in order to overcome these challenges and continue with coffee cultivation?

- i. Distribution of free agriculture inputs[]
- ii. Distribution and planting of hybrid coffee seedlings []
- iii. Provision extension services[]
- iv. Giving them subsidies and loan[]
- v. Ensure good coffee price []

- vi. Others (mention)
10. What are the opportunities for farmers to a revival of coffee cultivation in your area?
- i. Availability of hybrid seeds with higher production and diseases resistant[]
 - ii. Assistance from other organizations[]
 - iii. Availability coffee extension services[]
 - iv. Availability of Training(education) on good cultivation practice[]
 - v. Anticipation of future prices[]
 - vi. Importance of Kilimanjaro Brand in the world market[]
 - vii. Availability of land to cultivate alternative crops[]
 - viii. Possibility of gap filling in their farms[]
 - ix. Other (mention).....
11. As an organization what kind of assistance you have done and continue to do towards
reviving coffee cultivation among the smallholders farmers in your area?
- i. Provision of hybrid coffee seedling[]
 - ii. Offer extension service[]
 - iii. Provision of market information []
 - iv. Inputs distribution[]
 - v. Availability of land []
 - vi. Others (mention).....

Appendix 3: Checklist for village extension officers and village government

1. What is your role in coffee production and marketing?
 - i. Provide training on nursery establishment[]
 - ii. Provide training on how to pruning[]
 - iii. Application of fertilizer and medical[]
 - iv. How to protect coffee from diseases[]
 - v. Adoption of new technology[]
 - vi. Market information[]
 - vii. Provide training on how to make coffee best quality needed in the market[]
 - viii. Others (mention).....
2. How do you assist farmers in production and marketing?
 - i. Extension services
 - ii. Others (Mention).....
3. How many coffee farmers do you reach in a?
 - i. Week[]
 - ii. Month[]
 - iii. Three months
 - iv. Six months
 - v. Year[]
4. What kind of agriculture inputs are used by farmers?
 - i. Chemical fertilizers[]

- ii. Herbicides[]
 - iii. Pesticides[]
 - iv. Machine[]
 - v. Other (mention).....
5. In your area how many farmers groups dealing with coffee production?
6. What assist of those groups have had on coffee farmers?
- i. Provision of Extension services []
 - ii. Inputs distribution[]
 - iii. Selling coffee seedlings []
 - iv. Provision of Marketing information []
 - v. Assist in Coffee marketing[]
 - vi. Other (Mention).....
7. Are farmers in your areas reviving coffee cultivation practices?
- i. Yes
 - ii. No
- a) If yes, how?
- i. By planting hybrid coffee seedlings[]
 - ii. By Cutting down trees and planting hybrid coffee seedlings[]
 - iii. By replacing/gap filling with conventional seedlings[]
 - iv. By replacing conventional to hybrid coffee seedlings[]
 - v. By gap filling with conventional coffee[]
 - vi. By increasing application of agricultural inputs[]
 - vii. Other (mention).....
- b) If no, why not?
- i. Harvesting from coffee still low []
 - ii. Poor coffee cultivation practice []
 - iii. Reduced number of coffee trees []
 - iv. Low number of farmers planting hybrid seedling []
 - v. By decrease application of agriculture inputs []
 - vi. Others (mention).....
9. How many farmers have planted a hybrid coffee seedling in your areas per three years?

Years	2017	2018	2019
-------	------	------	------

Number of farmers have planted a hybrid coffee seedlings			
---	--	--	--

10. What motivate farmers to plant new hybrid in your area?

- i. Availability of land to cultivate alternative crops[]
- ii. Price of hybrid coffee seedlings[]
- iii. Availability of hybrid coffee seedlings[]
- iv. Climate condition[]
- v. Market availability[]
- vi. Other (mention).....

11. What are the challenges of cultivating hybrid coffee seedlings?

- i. Shortage of hybrid coffee seedlings[]
- ii. High costs of hybrid coffee seedlings[]
- iii. Scarcity of land for reviving[]
- iv. Low prices of coffee at the market[]
- v. Shortage of extension services[]
- vi. Scarcity of labour []
- vii. Change of weather condition[]
- viii. High price of agriculture inputs[]
- ix. Other (mention).....

12. What kind of service has been donating to farmers toward reviving of coffee cultivation and how farmers have been get it?

- i. Provision of training(education)[]
- ii. Provision of market information[]
- iii. Provision of capital[]
- iv. Provision of agriculture inputs[]
- v. Provision of new seeds[]
- vi. Others (mention).....

13. What are the opportunities for reviving coffee production in your areas?

- i. Assistance from other organizations[]
- ii. Availability coffee extension services[]
- iii. Anticipation of future prices[]

- iv. Importance of Kilimanjaro Brand in the world market[]
- v. Availability of land to cultivate alternative crops[]
- vi. Possibility of gap filling in their farms[]
- vii. Other (mention).....

14. In your place what kind of institutions you work together toward reviving coffee cultivation and what kind of assistance play together toward reviving coffee cultivation?

No	Kind of institutions you work together	Kind of assistance play together toward reviving coffee cultivation
		vi. Provision of hybrid coffee seedling[] vii. Offer extension service[] viii. Provision of market information [] ix. Inputs distribution[] x. Land for reviving[] xi. Provision of capital[] xii. Others.....

Appendix 4: Checklist for TaCRI

1. A research institution dealing with coffee, how do you see the status of coffee cultivation among the smallholders?
2. What is your role in reviving coffee production and marketing?
 - i. Providing Extension services to farmers[]
 - ii. Producing hybrid coffee seedlings[]
 - iii. Distributing coffee seedlings at reduced prices[]
 - iv. Others (mention).....
3. How many varieties of hybrid coffee seedlings do you have?
 - i. Compact[]
 - ii. Organic coffee[]
 - iii. Pop[]
 - iv. Kp39[]
4. Among these varieties, which one is suitable and recommendable for small-scale farmers?
 - i. Compact[]
 - ii. Organic coffee[]
 - iii. Pop[]
 - iv. Kp39[]
5. How many hybrid coffee seedlings have you produced in the last 5 years?
6. Who are your clients?
 - i. Coffee plantation[]
 - ii. Smallholders farmers[]
 - v. Farmers groups[]

- vi. District councils[]
- vii. Primary society[]
- viii. Others (mention).....
- 7. What is number of farmers who came to take these new hybrid seeds?
- 8. How can small-scale farmers benefits from hybrid coffee seedlings?
 - i. Costs reduction[]
 - ii. Diseases resistant[]
 - iii. Early maturity[]
 - iv. High yields[]
 - v. High cup quality[]
 - vi. Others (mention).....
- 9. Are farmers in your areas reviving coffee cultivation practice?
 - i. Yes
 - ii. No
- a) If yes, how?
 - i. By planting hybrid coffee seedlings[]
 - ii. By Cutting down trees and planting hybrid coffee seedlings[]
 - iii. By replacing/gap filling with conventional seedlings[]
 - iv. By replacing conventional to hybrid coffee coffee[]
 - v. By gap filling with conventional coffee[]
 - vi. By increasing application of agricultural inputs[]
 - vii. Other (mention).....
- b) If no, why not?
 - i. Harvesting from coffee still low []
 - ii. Poor coffee cultivation practice []
 - iii. Reduced number of coffee trees []
 - iv. Low number of farmers planting hybrid seedling []
 - v. By decrease application of agriculture inputs []
 - vi. Others (mention).....
- 10. Why are farmers in Lyamungo Sinde and kati motivated in reviving coffee cultivation than those who are far like Warindoo?
 - i. Free of hybrid coffee seedlings[]
 - ii. Availability coffee seedlings nursery[]
 - iii. Presence of demonstrations plot[]

- iv. Inputs availability[]
- v. Availability of training(education) on good cultivation practice[]
- vi. Other (mention).....

11. What are the challenges facing smallholder's farmers in reviving coffee cultivation?

- i. Shortage of hybrid coffee seedlings []
- ii. High costs of hybrid coffee seedlings []
- iii. Scarcity of land for reviving []
- iv. Low prices of coffee at the market []
- v. Shortage of extension services []
- vi. Scarcity of labour []
- vii. Change of weather condition []
- viii. High price of agriculture inputs[]
- ix. Others (mention).....

12. As research institution, how do you help farmers to overcome these challenges and continue with coffee cultivation?

- i. Provision of hybrid coffee seedling[]
- ii. Offer extension service[]
- iii. Provision of market information []
- iv. Inputs distribution[]
- v. Availability of land []
- vi. Others (mention).....

13. What are your advices do you give to smallholders' coffee farmers who would like to revive coffee production in their areas?

Appendix 5: Checklist for District Council

1. What was the coffee production situation for the three years (2017-2019)?
2. In your area what kinds of role play toward reviving of coffee cultivation?
 - i. Providing Extension services[]
 - ii. Providing hybrid coffee seedlings[]
 - iii. Distributing coffee seedlings at low prices[]
 - iv. Improve price of coffee at market[]
 - v. Providing agriculture inputs[]
 - vi. Others (mention).....
3. As a government actor, how do you ensure that farmers have access to agricultural inputs and new agriculture technology?
 - i. To reduced agriculture input price[]
 - ii. To give them input in term of credit[]
 - iii. Others (mention).....
4. In your area, what are the challenges facing farmers to revive coffee cultivation?
 - i. Shortage of hybrid coffee seedlings []
 - ii. High costs of hybrid coffee seedlings []
 - iii. Scarcity of land for reviving []
 - iv. Low prices of coffee at the market []
 - v. Shortage of extension services []
 - vi. Scarcity of labour []
 - vii. Change of weather condition []
 - vii. High price of agriculture inputs[]
 - ix. Other (mention).....

5. As government actor, how do you help farmers to overcome these challenges and continue with coffee cultivation?
 - i. Provision of hybrid coffee seedling []
 - ii. Offer extension service []
 - iii. Provision of market information []
 - iv. Inputs distribution []
 - v. Availability of land []
 - vi. Others (mention).....

6. What are the opportunities of reviving of coffee cultivation among the smallholders farmers in your area?
 - i. Assistance from other organizations[]
 - ii. Availability coffee extension services[]
 - iii. Anticipation of future prices[]
 - iv. Importance of Kilimanjaro Brand in the world market[]
 - v. Availability of land to cultivate alternative crops[]
 - vi. Possibility of gap filling in their farms[]
 - vii. Other (mention).....

7. Any other opinion?

THANK YOU