ANALYSIS OF THE DETERMINANTS OF GINGER PRODUCTIVITY IN TANZANIA:

A CASE OF MADABA DISTRICT COUNCIL

ANALYSIS OF THE DETERMINANTS OF GINGER PRODUCTIVITY IN TANZANIA:

A CASE OF MADABA DISTRICT COUNCIL

By

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A Dissertation submitted to the Faculty of Social Science in Partial/Fulfillment of the Requirement for the Award of Master Degree of Science in Economic Policy and Planning of Mzumbe University

2019

CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by Mzumbe University, a dissertation entitled: **The analysis of the determinants of ginger productivity in Tanzania; a case study of Madaba District Council**, in partial fulfillment of the requirements for award of the degree of Master Science in Economic Policy and Planning (Msc-Epp) of Mzumbe University.

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DECLARATION

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I, Paul Peredius, do hereby declare that this dissertation is my own original work and that it had not been presented and will not be submitted to any other University for a Similar or any other degree award

Signature_____

Date_____

ACKNOWLEDGEMENT

I would like to thank my God for granting me life full of his blessings. It is because of his love that I have managed to reach this far; special thanks and praise be to the Almighty God. It is Him who gave me power, energy and courage whenever I felt discouraged in the education journey and other aspects of life.

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DEDICATION

I, Paul Peredius, dedicate this study to my Parents Mr & Mrs. Makuba and my Wife Alistidia Helman for their Moral support all the time that I was away from home for studies but yet for their tolerance when I devoted to supplements their needs whenever they wants for my studies. Also I dedicate this study to my children for their tolerance due to my absence during studies

LIST OF ABREVIATION AND ACROMYMS

ASDP	Agriculture sector development programme
ASDS	Agriculture sector development strategy
BHT	Butyl hydroxyl toluene
BOP	Balance of Payment
BOT	Bank of Tanzania
BOT	Bank of Tanzania
BRN	Big result now
DAICO	District Agricuture, Irrigation and Cooperative
DC	District Council
DEA	Data envelopment analysis
DED	District Executive Director
FAO	Food and agriculture organization
FAOSTAT	Food and Agriculture organization corporate statistical database
FYDP	Five year development plan
FYDP	National Five year Development Plan
GDP	Gross Domestic Product
GI	Gross Income
GM	Gross Margin
KG	Kilogram
LA	Land ownership
LDCs	Least Developed countries
MAFS	Ministry of Agriculture and food security
MIVARF	Marketing Infrastructure Value addition and Rural Finance
NBS	National Bureau of statistics
NVP	Nausea and vomiting pregnancy
ODK	Open Data Kit
OLS	Ordinary least square
PONV	Post operative nausea and vomiting
RUCODIA	Ruvuma Commercialization and diversification of agriculture

SFA	Stochastic frontier Analysis
SPSS	Statistical Package for Social Science
TC	Total Cost
TOAM	Tanzania Organic Agriculture and Food Security
TVC	Total Variable Cost
UN	United Nations
URT	United republic of Tanzania
USA	United State of America
VEO	Village executive Officer
VIF	Variance Inflation Factor
WEO	Ward executive Officer

ABSTRACT

The study investigated the determinants of ginger productivity in Tanzania; a case of Madaba District Council. A cross sectional research design was used; the sample size of 202 respondents was obtained through purposive and non-purposive sampling techniques. STATA version 14 and Statistical Package of Social Sciences (SPSS) and Excel software were used to analyze the data.

The data indicated that ginger determinants involved in the model, it tell the variation obtained in ginger output or produce with the determinants of coefficient of R-squared which revealed that 60 per cent of the variables was explained by the model by itself. In nut shell, it can be concluded that large farm size, farmer`s experience, the education level from primary to diploma of the respondents, age and the use of extension services have significant effects on ginger productivity. The study also indicated that ginger farming was found to be profitable with the gross margin of 87% or 0.87 per acre/per annum. Finally, the study found that the determinants affecting ginger farming in the study area include; inadequate of capital, low price ranging from Tshs. 500 to Tshs. 1500 per one kilogram, unavailability of laborers, poor infrastructure, and ginger middlemen exploitation. Hence it is vital to raise public awareness on the potential for sector. It is recommended that the government should discourage the middlemen who buy ginger direct from the farmers by low price and starting the selling point which increase value addition, to enhance the use of extension services to ensure that ginger farmers in Madaba District have access to ginger improved seed and improved farm inputs, storage and marketing facilities, ginger farmers need to be assisted by providing the soft loans so that to enable them to enhance the area under ginger cultivation which will led to high yield.

Key Words; Ginger productivity, Gross Margin and Ordinary Least Square

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CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

Ginger is an important commercial spices crop in tropical and subtropical countries including Tanzania. Ginger provides economic benefits to the national economy and the public at large. The crop portrays the potential opportunity as a source of income to about 15% Tanzanian residents living in rural areas (NBS population survey report 2015). It is estimated that more than 4000 people are involved in ginger crop production in Tanzania (Fones, (2007); Mahamoud, 2013). Ginger exports account for 13% of the spice/horticultural/agricultural that earned US$ 4,420.2 in 2012 (Tan trade 2016).

Ginger is nutritionally important as a source of vitamins and minerals in its fresh and dried (powdered) forms. It is known to supply significant levels of calcium, potassium, phosphorus, magnesium, niacin and vitamin C. (Raghavan, 2007). Ginger is among numerous herbs known for their health benefits both in traditional and modern medicines. Historically, ginger has a long tradition of being very effective in alleviating symptoms of gastrointestinal distress thereby facilitating digestion and treating stomach upset, diarrhea, and nausea. In herbal medicine, ginger is regarded as an excellent carminative (promoting the elimination of intestinal gas) and intestinal spasmolytic (relaxing and soothing the intestinal tract). Similarly, modern scientific research has revealed that ginger possesses has revealed that ginger possesses numerous therapeutic properties including antioxidant effects, an ability to inhibit the formation of inflammatory and carcinogenic compounds, and direct anti-inflammatory effects (Shukla and Singh (2007), Karna (2015).

Ginger is also a common indigenous Medicine which can be used to Women suffering from Nausea and Vomiting in Pregnancy. Ginger crop is a strong herbal Medicine which is used in Pharmacological and therefore has specific indication

contraindication, precautions and side- effect to many of anticoagulant action (NVP) (Portnoiet and Samwel, 2003; Bryer, 2005

After 6 months clinical experience, it was reported that a 5% solution of ginger essential oil is an effective post-operative nausea and vomiting (PONV) prevention when administered preoperatively, naso-cutaneously concurrently with conventional therapies to general anesthesia patients at high risk for PONV. (Geiger, 2005). Ginger has antioxidant property which is helpful in scavenging free radicals from human body that have the potential to cause cancer. The ginger alcohol extract showed an antioxidant activity comparable with that of butyl ate hydroxyl toluene (BHT) in inhibiting, for instance the lipid per oxidation. The ginger extract also revealed an inhibiting effect of hydroxyl radicals, better than that of quercetin at around the human body temperatures (Shukla and Singh, (2007). Table 1 shows the nutrition data for 100g dry ginge.

Table 1.1: Nutrional data for 100g of dry ginger

Components	Level
Water	9.4 g
Food Energy	347 kcal
Protein	9.1 g
Fat	6.0g
Total carbohydrate	70.8g
Fiber	5.9g
Ash	4.8g
Calcium	116mg
Iron	12mg
Magnesium	184mg
Phosphorus	148mg
Potassium	1342mg
Sodium	32mg
Zink	5mg
Niacin	5mg
Vitamin A	147 IU

Source: FAO 2015

1.1. Ginger Sub- Sector Analysis

1.1.1 The World Production of Ginger

In 2016 the total production of ginger in the world accounted for 3,270,762 tons with the total acreage of 310.43 thousand ha (FAO, 2016). The study further outlined that India, Nigeria, China, Indonesia and Nepal are the major producers of ginger in the world accounting for 86% of the total global production (Table 1.2). India is a leading Country in terms of area under ginger cultivation with 47.48 per cent (149.10 thousand ha) of World's ginger area (313.99 thousand ha). Nigeria stands next to India in area under cultivation. However, India's productivity is poor as compared to other countries. China (10.8 tons/ha) have astonishingly high productivity while India's productivity is 6.70 tons/ha. The countries like USA (34 tons/ha), Fiji Islands (33.4 tons/ha) and Japan (30.7 tons/ha) have astonishingly high productivity but small area under ginger cultivation.

Table 1.2: Top Ten (10)) Countries Ginger production in the world in quantity tons

Country	Rank	Ginger production (tons)	Area under production (ha)	Productivity (tons/ha)
India	1	1,109,000	165,000	6.7
Nigeria	2	522,964	111,196	4.7
China	3	492,905	45,821	10.8
Indonesia	4	340,341	12,932	26.3
Nepal	5	271,863	21,869	12.4
Thailand	6	164,266	9,808	16.7
Cameroon	7	79,273	8,066	9.8
Bangladesh	8	77,290	9,473	8.2
Japan	9	62,244	2,029	30.7
Mali	10	38,589	2,480	15.6

Source: FAOSTAT 2016

1.1.2 The Africa Production of Ginger

Ginger is also cultivated in many countries in Africa including Nigeria, Cameroon, Mali, Ethiopia and Cote d`voire are the major producers of ginger in Africa, having production 111,196 tons, 79,273 tons, 38,589 tons, 10,182 tons and 7,085 tons respectively (FAOSTAT 2016). Tanzania ranks third in ginger exportation in Africa with 5% proportion of the total market after Nigeria and Cameroon that compose 72% and 16% respectively (FAOSTAT 2016). (Table 3)

Table 1.3: Ginger Africa production in tons

Country	Rank	Ginger production(tons)	Area under production(ha)	Productivity(tons/ha)
Nigeria	1	111,196	165,000	0.7
Cameroon	2	79,273	8,066	9.8
Mali	3	38,589	2,480	15.6
Ethiopia	4	10,892	3,567	3.1
Cote d`ivore	5	7,085	600	11.8
Mauritius	6	726	52	14.0
Kenya	7	349	33	10.6
Uganda	8	150	51	2.9
Ghana	9	95	85	1.1
Tanzania	10	45	19	2.4

Source: FAOSTAT 2016

1.1.3 Tanzania production of ginger

In average Tanzania produces five (5) tons of ginger per annum. However, its production trend has been fluctuating from year to year for the last two decades. (Figure 1)

Source: Author's own construction using data from FAOSTAT 2016

Figure 1.1: Trend of Ginger production and productivity from the year 1997 to 2016

Generally ginger is widely produced in the country. However, its production is mainly done in eight regions of the National namely: Mbeya, Tanga, Ruvuma, Coast, Morogoro, Kigoma, Kagera and Kilimanjaro regions (Table 1. 4). Ginger production in Tanzania, is dominated by small holder farmers (18.9%) averaging 0.2-1ha without improved agricultural inputs such as improved seeds and inorganic fertilizers; mostly with family Labor (Magai and Joseph 2010).

Table 1.4: Region order of ginger production (mt) from 2013-2016

Region	2013	2014	2015	2016
Tanga	11,000	8,000	12,200	12,115
Kilimanjaro	10,700	11,200	11,800	11,812
Kigoma	6,200	78,000	10,350	10,250
Morogoro	6,000	7,000	8,700	8,900
Mbeya	5,200	5,800	6,500	7,000
Ruvuma	5,500	4,000	4,750	4,800
Zanziba	2,700	3,100	3,950	4,200
Kagera	2,350	2,800	3,400	3,350
Total	49,650	119,900	61,950	64,443

Source: International trade centre (ITC)

1.1.4 Ruvuma production of ginger

Ruvuma is one of the regions among the regions in Tanzania which produce ginger crop for domestic use and for sale. Ginger was spread in Ruvuma Region more than six years and ginger crop is growing in a single district that is Madaba district council among eight (8) districts found in Ruvuma region. In other district there is no favorable climatic condition to support ginger cultivation. Due to this reason the crop has experienced highly demand to rest of the district and outside Ruvuma which has encouraged the households cultivating ginger to increase the production. For example 4,800 tons produced in the region 2016.eight

In Madaba district, ginger has been the main source of livelihood employing more than 50 percent of the district workforce and ranks the second of the livelihood earning of the district council (Madaba DC investment guide 2017). The area under cultivation of ginger accounts for 21.9% (Madaba DC, 2016). The trend of ginger production in Madaba DC is growing faster due to the fact that area under ginger production increased from 17.5ha in 2012 to 47.8ha in 2015 (Madaba DC, 2016).

Table 1.5: Ginger production in Madaba Distric Council from 2014-2017

	2014	2015	2016	2017
Production (tons)	2300.0	2700.0	4,800.0	4,850.0
Area under ginger production (ha)	180.0	267.0	390.0	412.0
Productivity (output/area)	12.8	10.1	12.3	11.8

Source: DED (Agriculture Department), Madaba DC, 2018

Tanzanian ginger farmers, sell their ginger to collectors from processors or independent collectors/intermediaries that go from farm to farm to buy small amounts, often it is sold at a low price. Through these processors and independent intermediaries, the ginger reaches the local end market. Usage of ginger is widespread in Tanzania. In the fresh form which takes the bulk of it, ginger is used as a tenderizer in barbeque which is very common in Tanzania. It is sent to the local markets of Dar, Moshi, Tanga and Arusha where the price per kilo of chopped dried ginger is 1,000 Tsh. Per kilogram Non-certified organic ginger is commonly sold to small local processors, mainly in Kilimanjaro, Dar es Salaam, Arusha, Tanga Ruvuma and Zanzibar. They process the ginger into powder and pack it either as a single spice or make some 'masalas'. Packaging remains a problem to many of these companies. The ground ginger, is packed into transparent polyethene consumer bags/packets which are not attractive and do not protect the product inside. Non-certified organic ginger is also sold to tea and coffee blenders, like Africa Tea and Coffee Blenders ltd, International Food Packers Ltd and TATEPA Company.

Ginger cash crop is second spice consumed by many people of Madaba Dc. The first spice consumed is tomato about 22 per cent and pepper being the third and cardamom is the least spice consumed by the residence of Madaba Dc (Madaba investment guidelines 2017). Ginger in Madaba district is cultivated in Wino, Mahanje and Mkongotema Wards.

1.2 Effort geared improvement of Ginger production/productivity

Ginger under the agricultural sector and its related product is among of the priority sector as stipulated in Tanzania export development strategies document as per Ministry Of Agriculture, Food Security and Cooperative (MAFSC, 2016). Therefore ginger farming is vital and potential for the development of the households in Ruvuma region and the likelihood of the society as well.

Madaba and Lushoto and various interventions including, training, asset investments, certification and institutional developments had started (TOAM, 2009). Effort by Tanzania organic agriculture movement (TOAM) to educate the ginger farmers in the main producing area and forming ginger Union in Kilimanjaro, Ruvuma and Tanga region. Tanzania ginger productivity increased up to 2.80/ in the year 2000 where by 70 tons were produced and started to fall in 2001 in which 2.78 or 50 tons were produced, There have been several programmes in recent years in support of agricultural production, marketing improvement and the largest being the Marketing Infrastructure, Value Addition and Rural Finance (MIVARF) in supporting crop production including ginger in Madaba District Council (DAICO office Madaba DC 2017). Other programmes in support ginger in the Region by training the farmers involved in the production of ginger and other crops grown in the area. For example, Ruvuma commercialization and diversification of Agriculture (RUCODIA)

From 2010 productivity increase again up to 2.90 0r 45 tons were produced and in the year 2016 productivity declined to 2.37 tons/hectares (DAICO office Madaba DC 2017)

After the launching of the Agricultural Sector Development Strategy (ASDS I, 2001), this Strategy is a revision of ASDS I based on the review of implementation of the Agriculture Sector Development Program (2006-2014) and other various development efforts during the past period. Among crops, the best performance was recorded in export crops such as sugar, tea and tobacco, which have recorded growth

rates of almost 10 percent per annum. However, these crops are concentrated in specific regions and amongst commercial large scale farmers.

Although they occupy only about 10 percent of cultivated land, they contribute 70 percent of export earnings. Fisheries have been growing at around 5 percent per annum.

Yet the government of the united republic of Tanzania is recently in the implementing the policy of the Big result now (BRN) which introduced in the year 2013- 2014 to transform the Country economy with the aim of achieving Sustainable economic development and growth, including creation of wealth and now agriculture sector is implementing ASDP 11 for the further improvement of agriculture. Also in the financial year 2016/2017 the government of Tanzania budgeted 2billion, in the financial year 2017/2018 budgeted 150.27 billion and in this year 2018/2019 has budgeted 170.27billion to improve Agriculture sector for both cash crops and food crops. Therefore you can see that government has been increasing money for this to make sure that the sector under the Ministry of the Agriculture is improved.

1.3 Statement of the Problem

Although there has been, availability of fertile soil and conducive climate for ginger production and various initiative, strategies and effort taken by government to improve productivity of ginger in Tanzania; but still productivity of ginger is low about 2.42tons/ha or 5.98/acre compared to production potential suggested by ASDP-M &E of 15-20 tons per hector before drying. Therefore this study explores ginger productivity in Madaba District Council.

Several studies of ginger farming have been conducted (Peter, 2010; Donasia, 2016; Mmasa, 2017). Peter (2010) studied, on the factors influencing ginger productivity in Kigoma region, Mmasa (2017) examined the social-economic factors influencing ginger productivity among smallholder's growers in Tanzania- case of Same District.

Donasia (2016) assessed value chain for organic ginger export market from same and Lushoto District. But none of these studies done in Madaba district despite of its potential it has on ginger production in Tanzania.

Therefore, this study bridges the existing gap of knowledge by examining the determinants of ginger productivity using mixed method techniques in Madaba district, Tanzania.

1.4 Objectives

1.4.1 The Main Objective

The main objective of this study was to examine the determinants of ginger productivity in Madaba District Council

1.4.2 Specific objectives

i. To determine the profitability of ginger production in Madaba District Council
ii. To determine the agronomic practices that influence ginger productivity in Madaba District Council
iii. To examine the effect of farm characteristics on ginger productivity in the study area
iv. To examine the influence of socio-economic factors on ginger productivity in Madaba District Council

1.5 Research Questions

i. How much profit is earned by farmers from ginger production in Madaba District Council?
ii. What are the agronomic practices of ginger cultivation in Madaba District Council?
iii. What is the effect of farm cultivation on ginger productivity in study area?
iv. What is the effect socio-economic on ginger productivity in Madaba District Council?

1.6 Scope of the Study

This study was done in Madaba in Madaba District Council particularly in mkongotema, mahanje and Wino wards which are the main producer of ginger crop in the District. The unit of analysis was the farming households that are involved in ginger production in the three wards in Madaba District Council. The study was covered the period from March, 2019 when the researcher was started the fieldwork to April 2019 when the work was finished.

1.7 Significance of the Study

The study will help policy makers and stakeholders at large to understand the factors that hinder ginger productivity in Tanzania and the possible interventions in Agriculture sector or any NGO to improve ginger productivity like subsidization and access to credit by the ginger growers in the study area.

1.8 Organization of the study

This study report is organised as follows: chapter one provides a brief an overview of the background of the problem, chapter two reviews of the most of relevant and current literature on the determinants of ginger productivity in Tanzania. Chapter three research methodology which presented an overview of methodology and procedures applied in the data collection preparation and analysis. Chapter four describes results, discussion, findings of the research and their interpretation basing on the objectives of the study and lastly chapter five provides summary, conclusion and policy recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of the most relevant and current literature on the determinants of ginger productivity in Tanzania, a case of Madaba DC. It highlights studies carried out from different areas. The theoretical literature is first presented and followed by the empirical literature, conceptual framework and finally the research gap.

2.1 Historical back ground of Ginger

Ginger is an annual crop grown in some parts of Tanzania. It is likely to have originated from India as ginger plants there show the most biological variability. Where it is being cultivated in commercial level. Potted ginger plants were carried on local vessels travelling the maritime trade routes of the Indian Ocean and South China Sea in the 5th century AD and probably before. Ginger was advocated in Africa by the colonial masters and it is recently grown in many of African Countries especially in humid tropics. It introduced in Nigeria since 1927 and now it is cultivated in Kubacha, Kwoi, Kafanchan and Kagorko areas in Kaduma State and around the Neighboring area of the plateau state. In the 16th century ginger was introduced to East Africa. In Tanzania ginger was introduced in the late 1980s and the cultivation remained minimal until early 2000s. And the first Region to grow the crop was Kilimanjaro in Same District and later on spread in the other region growing ginger currently. The Societies cultivating ginger cash crop have witnessed social and economic development. But ginger growing, processing and marketing has facing many problem which need attention.

Figure 2.1: Ginger crop

Source: Meghalaya Area, India 2016

2.1.1 Definition and Operationalization of Terms

Productivity is commonly defined as a ratio between the output volume and the volume of inputs. In other words, it measures how efficiently production inputs, such as labor and capital, are being used in an economy to produce a given level of output (Krugman 1994). Productivity is simply efficiency in production, how much output is obtained from a given set of inputs. As such, it is typically expressed as an output–input ratio. Single-factor productivity measures reflect units of output produced per unit of a particular input (Syverson 2012). Alternatively productivity is defined as the way of combining the inputs of production in the process of making output instrument called technology (Saari, 2006).

2.2 Theoretical literature

There are two theories viewed under this section which are production frontier and human capital theory. Both theories explain the production which accelerates ginger productivity. The only difference is that production frontier is taken to be able to estimate the potential contribution of physical inputs to the level of ginger output and human capital theory explains how training on human can lead to future productivity.

2.2.1 The human Capital Theory

The theory was introduced by Bucker (1962) to examine how human capital can be used for investment for future productivity. In a competitive market setting workers always get a wage that equal their marginal productivity and thus in the case of general human capital, workers earn the same wage whenever they work.

Human capital theory helps us understanding the training activities of firms. It introduces a view that education and training present investment which in the future will lead to productivity. In this perspective firm and workers alike depend on investment in human capital to increase competitive, profit and productivity. Becker (1962) assumed that product and labor markets are perfectly competitive introduced the distinction between firm specific and general capital to solve the question of: who bears the cost of training?

2.2.2 Production frontier theory

The stochastic frontier theory proposed by Aigner *et al* (1977) and then extended by Huang and Liu (1994) is a good approach to identify the significance of improving ginger productivity. Consider ginger production denoted by i whose ginger output is determined by the following production function:

$\iota_n(y_i)=x_i\beta + \varepsilon$ where $\varepsilon_{i=}$ vu$_{i-}$ mu (Stochastic Frontier Model)

Where; $_i = 1, 2,\ldots N$; y_i measures the value of ginger out putof the i^{th} productivity;

x_i= is(1x k) vector of inputs and other explanatory variables;

β = is a 1 x k vector of unknown scalar parameters to be estimated.

The error term $vu_{i\,=}$ is an idiosyncratic error similar to that in traditional regression model and is assumed to be independently and identically distributed as $N(0,\sigma^2_{VU).}$ Theterm captures random variation in output due to factors beyond control of the productivity such as weather, measurement errors in dependent variables and omitted explanatory variables. The error term $mu_i$is anon-negative random variable, accounting for the existence of technical inefficiency in production and it is identically distributed as half-normal ($mu_i |_{N(0,\sigma^2)}|$). The inefficiency effect of mu_i is assumed to consist of both unobserved systematic effects, which vary across ginger production. The subtraction of the non negative random variable mu_i ,from the random error $vu_{i,}$ implies that the logarithm of the production is small- than it would otherwise be if technical inefficiency did not exist (Battesse and Coelli, 1992)

Production is basically an activity of transformation which connects factor inputs and outputs Basic Concepts of Production Theory: Classifications of Inputs(i) Labor (ii) Capital (iii) land (iv)raw materials (v) time.

These variables are measured per unit of time and hence referred to as flow variables. An input is a good or service that goes into the production process. As economists refer to it, an input is simply anything which a firm buys for use in its production process an output, on the other hand, is any good or service that comes out of a production process

2.2.3 Production Function

A tool of analysis used in explaining the input-output relationship. In its general form, it holds that production of a given commodity depends on certain specific inputs.

Q = f(K, L)

Increasing production, Q, will require K and L, and whether the firm can increase both K and L or only L will depend on the time period it takes into account for increasing production, that is, whether the firm is thinking in terms of the short run or in terms of the long run. Let's suppose that factor 2, say, is fixed at x_2 in the short run. Then the relevant production function for the short run is $f(x_1, x_2)$. We can plot the functional relation between output and x_1. Note that we have drawn the short-run production function as getting flatter and flatter as the amount of factor 1 increases. This is just the law of diminishing marginal product in action again. It can easily happen that there is an initial region of increasing marginal returns where the marginal product of factor 1 increases as we add more of it. In the case of the farmer adding labor, it might be that the first few workers added increase output more and more because they would be able to divide up jobs efficiently, and so on. However given the fixed amount of land, the marginal product of labor will decrease.

The study used stochastic production frontier and human capital theory. The stochastic production frontier was used to explain the relationship which lead to an increase in the level of output while human capital theory explain how training to human capital in the future will lead to investment on ginger productivity.
However, short run output increase comes from capital accumulation (if the economy is not in steady state) but in the long run output/ productivity increase more rapidly when the combination of capital accumulation and the use of labor power including skilled and unskilled labor and this is mainly in developing Countries like Tanzania.

2.3 Empirical literature review

Different studies on determinants of ginger productivity have been done all over the world. However most of studies have been done in the developed countries and few studies in developing Countries like Tanzania. This may be due to the delay of discovering of the contribution of ginger to the welfare of the people and the Nation at large. Scholars have studied some determinant of ginger productivity like level of education, weed control, spacing, age of respondent, gender, household size, and

farm size in the world , Africa and Tanzania: Ndanmadu and Marcus (2011); Dergisi, 2017; Banchoir, 2012; Mmasa, 2017; Geta & Kifle, 2011; Mohammed & Ahamed 2009; Severine,2016 as follows;

2.3.1 Profitability of ginger production

To determine the profitability of ginger production will use gross margin technique to determine profitability of ginger farming by the households engaged in ginger production. Gross margin (GM) is the difference between the gross farm income and the total variable cost (Olukosi and Erhabor, 1988). Gross margin is a very useful tool in situations where fixed capital is a negligible portion of the farming enterprise as in the case of subsistence agriculture. According to Agboola (2011) gross margin of ginger farming is the difference between the total value of production (total revenue) and the variable costs of production.

Banchoir (2012), carried study on economic performance of ginger productivity in Bangladesh. The study revealed that ginger production was profitable; the study used both quantitative and qualitative method. Ginger farmers got a higher returns on its investment but it did not reach the optimal level, most of the farmers produced output to the maximum frontier output level of (81-95%). But farmers in the study area also mentioned some problems like incidence of seeds, insect infestation to its production. The study recommended on availability of insecticides and fair price for their produce to get optimal level of income.

Bala (2012) analysed of women ginger production and found that profitability of ginger production which had a Gross income (GI) 182,799 and TVC, 82,649 in Nigeria. The study further found that the profitability or return per Naira investment (RNI)= (GM/TVC) was 2.21. This indicate that the gross Margin (GM) is therefore 100,150.00, indicating that every income invested in ginger production in the study area a profit of 2.21 was made. And this can be concluded that ginger production in the study area was economically viable.

Also a study by Ndanmadu and Marcus (2011), on the efficiency of ginger production kaduma state, Nigeria; The study found that Farm total cost per hectare was 286597.59 and the net farm income was 351783.54 was earned. The result further showed that the average rate of returns was 97 kobo which is similar with the findings of Kantio (2010). This is an indication that the production of ginger was profitable in the study area but there is room for more efficiency utilization of resources for ginger production.

The study in Tanzania, the empirical evidence shows that few researches have been conducted in Tanzania to determine the profitability of ginger cultivation using the Gross Margin (GM) specifically in Madaba District Council because the study intends to make an analysis of ginger in Madaba District.The study done in Tanzania by Mmasa (2017), on ginger farming to smallholder farmer's income in Same, Tanzania; The study found that ginger production was profitable, with the gross margin of Tanzania shs 7,050,000 per acre. The yield of 7,000 kg/acre recorded in average of three years.

2.3.2 To determine the agronomic practice of ginger productivity in Madaba District Council.

2.3.2.1 Fertilizer use

Banchoir (2012), observed the fertilizer use was one of the determinant of ginger productivity in Bangladesh. The farmers in the study used chemical fertilizers like Urea, TSP, and MP at a rate of 122kg, 137kg, and 145kg per acre, as well. But the use of CAN was more determinant of ginger productivity and was positive and significant.

Geta and Kifle (2011), Studied production, processing and marketing in Southern Ethiopia; SNNPRS is a major fertilizer used for ginger production. The study found that fertilizer use it cannot support a large scale production since the availability of farmyard manure is limited or the rate of its application for optimal yield per unit

area has also not been determined for ginger instead the farmers in larger scale, they use compost as a source of nutrient for ginger production.

Also study by Owwusirbet et al. (2016), on Socio-economic and climate factors on ginger productivity in Nigeria. The study found that fertilizer use had positive influence in ginger productivity. Still the study by Ndanmadu and Marcus (2012), argued that the application of fertilize it improve ginger productivity.

However, there is limited information on the application of fertilizer in ginger production in Tanzania, despite of the limited study done by Mmasa and Mhagama (2017), on social-economic determinant of ginger productivity among smallholders Growers in Same District, Tanzania. The study used both quantitative and qualitative method of analysis. It found that, the use of fertilize under ginger production has significance contribution to ginger farming and hence productivity. They used both quantitative and qualitative methods approaches. Once the farmers use the fertilizer it increases yield and finally productivity.

2.3.2.2 Weed Control

The study by Matin and Hossain (2012), on economic performance of ginger cultivation in Bangladesh; the study found all farmers followed the method of line sowing. Weeding in ginger field was done by all the farmers. All the farmers in both areas weeded their land ranging from one to five weeding. The farmers of Nilphamari weeded their land ranges from three to five times but the farmers of khagrachar weed only one to three times. That why the farmers in Nilphamari get high yield than the farmers in khagrachar.

In the developing Countries several studies have conducted about weed and pest control; the study by Endrias and Asfaw (2011), on cultivation, marketing and processing of ginger farming in Southern Ethiopia. Farmers in Ethiopia follow non-chemical weed management practices that include deep plowing of the seedbed at the end of the rain season and frequent cultivation.

Weed get exposed to the sun periodically and most of them die until dry planting will take place 2 to 3 months after land preparation (January to February).

2.3.2.3 Extension Contact/Service

Several studies have done in Africa, the study by NdaNmadu and Marcus (2011) on the efficiency of ginger productivity on local government of Kaduna area, Nigeria. The study found that increase in the extension contact reduces ginger productivity. Also the study by Geta and Kifle (2011) on production, process and marketing in southern Ethiopia .It found that extension contact is one of the determinants of ginger productivity in Ethiopia.

In Tanzania the study by Mmasa and Mhagama (2017) on social-economic factor influencing ginger productivity in same district. The study used both qualitative and quantitative to analyze the data. The aim was to determine the number of visit that extension officers did for the farmer under ginger production. The study found that there was a little contact between ginger farmers and extension services. Therefore the study recommended the expansion of extension services had significance stimuls to ginger production and eventually productivity.

2.3.2.4 Effects of Socio-economic factors on ginger productivity

The influence of Socio-economic factors under this section includes Age, Education level, Gender, Household size, and farm experience.

2.3.2.5 Age of the household head.

The study carried by Matin and Hossain (2012), on economic performance of ginger cultivation in Bangladesh. The study used both qualitative and quantitative methods. It used ordinary least square as econometric model (OLS). The study found that the age of the household head produced ginger to the maximum level and hence productivity was in the age of (81-95%).

The study done in the developing countries by Bala (2012), on production efficiency of poverty alleviation of Kaduma State Nigeria. The study used descriptive statistics, gross margin analysis, logit regression and t-test**.** The study revealed that about 42% of the women ginger farmers were within the age range of 40-49 years and about 38% are within the age range of 30-39 with a mean of 41 years. This implies that farmers in the study area were young women ginger farmers. The implication of this result is that there is likelihood of high productivity among farmers since majority of the farmers (80%) are less than 50 years of age which shows that they are strong, active and flexible to farming activities. Age is expected to have positive contribution on women ginger farmers' participation in improved ginger production that is why younger farmers are more active in the production of ginger.

In Tanzania also study was carried by Mmasa and Mhagama (2017), on Social-economic factors influencing ginger productivity among smallholder growers in Same District, Tanzania. The researcher was interested to know the age of household in the study with the ideas that it can influence ginger production and hence productivity. The result found that majority of the households interviewed respondents (35%) were aged between 39 to 49 years. The study found significant frequency of the interviewed respondents (29.5%) was aged between 28 to 38 years. Others (17%) were aged between 17-27 years. This implies that the study involves mainly the active about force that in turn will influence production and eventually productivity.

2.3.2.6 Education Levels of the respondents

Education is vital determinant of ginger productivity. From the empirical studies such as Commercial ginger production in north-eastern region India, Yadan (2013) and the study by Matin and Hossan (2012), on economic performance of ginger production in Bangladesh. Observed the education to the farmers who are involved in ginger production that has much contribution to ginger productivity

Also some studies done in Nigeria and Ethiopia in developing Countries indicate that education to the ginger farmers it enhance productivity. Bala (2012), on analysis of Women ginger productivity as the means of farmers households food security, Nigeria. Study shows that about 46% of Women ginger farmers had no formal education while about 7% of the Women ginger farmers had only primary education, about 25% had secondary education while 14% had diploma and only 8% had up to degree level of education. This indicate that farmers education level is high with about 54% having at least one form of education or other, which revealed that women ginger farmers in the production area would be better exposed to more reliable information sources and will greatly influence the decision making in the farm production. This finding is in line with Amaza (2014), in which he reported that education has positive and significant effect on farmer's efficiency in production of ginger. This literacy level will greatly influence the decision making and adoption of innovation by farmers which bring about increase in productivity.

Study by Mmasa and Mhagama (2017) in Tanzania, on social-economic factors influencing ginger productivity among smallholder's growers in Same District. The study used both qualitative and quantitative method to analyze the data. It measured the level of education and its associations with ginger output. Education variable was measured by four-point scale ranging from primary to degree level. The number of years in schooling was then entered in regression model. The study argued that farmer's education level had significant contribution to productivity.

2.3.2.7 Gender

Gender is one of the determinants of observed from empirical studies. The study by NdaNmadu and Marcus (2011), on the efficiency of ginger productivity in Kaduna state, Nigeria; The study used qualitative method through the use of person interview. The study showed that majority about 96.0% of ginger farmers are male and posses an average farm size of 3.09 hectares.

Also the study done in Tanzania by Mmasa and Mhagama (2017), on Social-economic factors influencing ginger productivity among smallholders Growers in Same District, Tanzania. The study used both qualitative and quantitative method to analyze the data. And it indicates that most of the ginger producers are male about 81%. This revealed that men participate more in ginger production than their counterpart.

2.3.2.8 Farm experience

In developed country a number of researches have conducted. Consideration study by Matin and Hossain (2012), on economic performance of ginger production in Bangladesh, the study found that farmers experience was positive and significant. Most of the farmers had 1-18 years in the production of ginger and produced output to the maximum frontier output level (81-95%).

The study in the developing countries such as efficiency of ginger production in selected local government in Kaduna state Nigeria, by NdaNmadu and Marcus (2011), and the study by Bala (2012), on analysis of women ginger productivity in Kaduna state, Nigeria. The study revealed that majority about 59% of the ginger farmers had between 1-20 years of farming experience. This implies that farming experience for ginger farmer is 19 years. This depicts good signal for high productivity. Or implying that such farmers are likely to make decision that would increase their output and income; this findings of Adewumi and Okunmadewa, (2010), that, the more efficient the farmer might be in the use of productive resources and hence productivity.

2.4 Effect of farm characteristic on ginger productivity.

The effect of farm characteristics under this part includes farm size, soil type, farm location and fertility of the land. The explanation is as below;

2.4.1 Farm size

The studies in the developing countries by Bala (2012), on analysis of women ginger production as the means of improving women income in Kaduna state, Nigeria and the study by Ndanmadu and Marcus (2011), on the efficiency of ginger productivity in Kaduna state, Nigeria. The study found that the household with larger farm sizes tend to have high yield than those with smaller size. They also revealed that households with small farm size have the tendency of having low ginger productivity and low income. This is in line with the findings of Sridhar (2009), who assessed the impacts in term of changes in farm size and recorded as significant and positive of farm income due to increase in farm size and consequently to ginger productivity. Yet the study by Onwusiribe (2013), on macroeconomic and climate determinants of ginger productivity in Nigeria showed that large farm size for ginger farming had a short run positive impact on ginger productivity.

Tanzania studies include, Mmasa and Mhagama (2017), on economic factors influencing ginger productivity among smallholders growers in Same District. The study used both qualitative and quantitative methods to analyze the data. Statistical package of social science (SPSS) and excel software were used for data analysis. Generally, concluded that land size under ginger production had significant contribution to ginger farming and hence productivity. The study recommended to enhance the use of extension services to ensure that smallholder ginger seed, marketing facilities and encourage ginger farmers to increase land under cultivation.

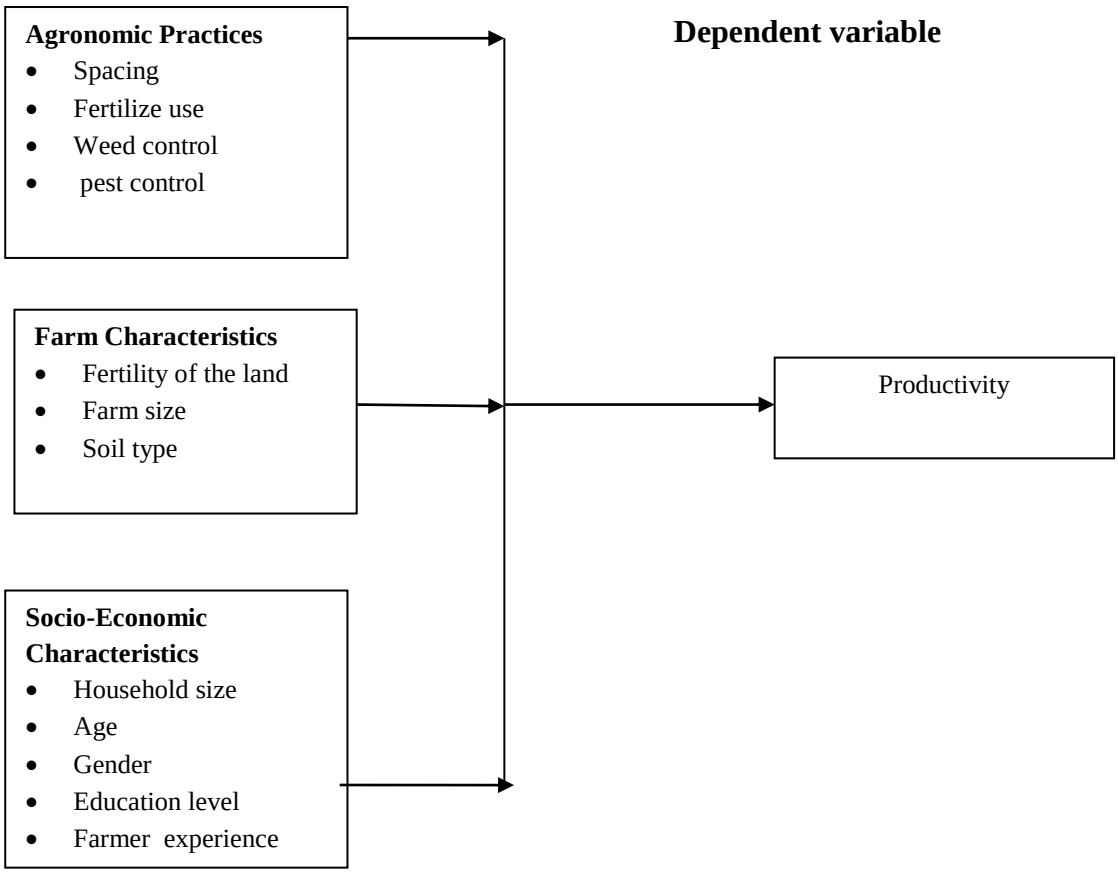
2.4.2 Soil type

With the depreciating soil fertility and availability of arable land for the cultivation of ginger, productivity of ginger is affected negatively (Soule, 2013).The study on ginger production, marketing trend and opportunities by Camacho (2009), in Australia. The study found that high yield of ginger is obtained in well-drained sloping, friable coastal soil of high quality water.

2.5 Conceptual Framework

Basing on the study objectives and the review of literatures, productivity influenced by Agronomic practices, Social- economic factors and farm characteristic, the framework in figure 2 show the independent variables of the study in the left side which are Agronomic practices including spacing, planting season and weed control, farm characteristics and Social- economic characteristics including Age, Gender and family size of household head.

Independent variable



Source: Own Conceptual Framework Construction 2019

Figure 2.2: Conceptual Framework

The Agronomic practices include spacing, planting season, seed material- whether the seed are of high breed and weed control-If the farmer are controlling weeds in the ginger farm, the farm characteristics which include fertility of the land- is the farm land for the production of ginger fertile or not? Farm size- too small or large, Farm location-is the farm located in the high land or low land.

The social- economic factors that will be studied including the household head engaging in the production of ginger, level of education ranking in year of schooling from informal to formal degree level, household size- whether big or small in ginger farming.

The dependent variable of the study is productivity. Arrows in the Model shows agronomic practices, farm characteristics and the social economic factors as the Independent Variables in the left side while in right side shows the dependent variable which is the productivity.

2.6 Econometric Model.

2.6.1 Model specification and estimation

2.6.1.1 Production Analysis

Productivity function ideas can be explained using combination of N- inputs (X_1, X_2X_3 X_4….X_N) to produce output Y per unit of Input used, which represent a maximum Yield (Productivity) obtained from various combination of inputs. For the sake of this study Cobb-Douglas production function form of stochastic frontier proposed by Battese and Coelli (1995) and confirmed by Yao and Liu (1998) will be used to examine the determinants of ginger productivity in Madaba district. The Cobb-Douglas production function used and estimated by Cobb and Douglas (1928), takes the following form:

$Y = AL^{\alpha_1}K^{\alpha_2}$ …… (1)

Where Q, L and K are output, labour and capital respectively, and A, $\alpha_1$andα_2 are constants;

In this study I propose an extension of the use of Cobb-Douglas production function to include the technological progress and social economic factors within capital as specified in equation 2 as follows;

$Y = b_0 X_1^{\alpha_1} X_1^{\alpha_2} X_1^{\alpha_3} X_1^{\alpha_3} \ldots\ldots\ldots\ldots . X_1^{\alpha_n}$ ……..…… (2)

But for the purpose of estimation the equation (2) will transformed into a log- linear model as shown in equation (3) below

$InY = \beta_0 + \alpha_1 InX_1 + \alpha_2 InX_2 + \alpha_3 InX_3 + \alpha_4 InX_4 + \alpha_5 InX_5 + \alpha_6 InX_6 +$

$\alpha_7 InX_7 + \alpha_8 InX_8 + \alpha_9 InX_9 + \varepsilon_i$……(3)

Where

Y= Yield (total Ginger produced (Kg) per acre)

X_1 = Gender of farmer

X_2 = Age of a ginger farmer

X_3 = Education level of respondent

X_4 = Year of farming Experience

X_5 = Farm size

X_6= Farm distance

X_7= Household size

X_8= Extension Contact/Service

X_9= Land ownership in term of acres

X_{10}= Marital Status

The linear model for this study as expressed in equation (3) will be estimated using Multivariate analysis method to establish the power of influence of Independent variable on dependent variable (Ginger yield). An Ordinary least square model will be employed to examine the determinants of Ginger productivity in Madaba District.

The application of Ordinary least square (OLS) assumes a classical linear function such that there is one- way causation between Independent and Dependent Variables.

2.7 Research Gap

Considerable studies in the ginger sub-sector exists in the Country, for example country sub-sector which involves in the production of ginger like Kilimanjaro, Tanga, Morogoro, Kagera, Kigoma regional sub-sector like the district producing ginger in the region and district sub-sector like the wards involves in the production of ginger, for example mkongotema, mahanje and Wino. Also the study of this nature has conducted by Mmasa and Mhagama (2017), on social- economic factors influencing ginger productivity among smallholders' growers in Tanzania-Case of same district. Yet the study by Donasia (2016), on analysis on chain value for organic ginger export market from Same and Lushoto district in Tanzania and finally the study by Peter (2010), on the factors influencing ginger productivity in Kigoma region. Therefore the study of this nature has never been conducted in Madaba district, Ruvuma region and most of the studies have conducted in the Northern-Eastern Tanzania which differ from Ruvuma region in term of climate and geographical location that might produce difference findings. Even the methodology that I will use differs from the studies done by other authors. This study bridges the existing gap of knowledge by investing the determinants of ginger productivity in Madaba district, Tanzania.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter shows the Methodology that was used during the Study. It comprises Data type, Source, Scope and Coverage; Study Area, Sampling procedure and sample size determination; data collection methods: Model Specification and Estimations Technique; and Data analysis.

3.1 Data Type, Source, Scope, and Coverage

This study used of cross-sectional primary data. The data collected from selected farming households who are involving in Ginger production in Madaba District. The study employed mixed method approaches which are quantitative and qualitative data that was collected and analyzed. The use of mixed method approach is aligning with study objective themes aiming at examining the determinants of ginger productivity in Madaba District Council. The use of mixed method approach was used to increase data reliability for analysis. Quantitative was collected by using structured questionnaires and Qualitative data was collected by using in depth interview in which all important information needed by the study was included regarding the study objectives.

3.2 Study Area

This study used a data which was collected from selected farming households that are involving in Ginger production in Madaba District. Madaba District was chosen for this study because of great potential in ginger production and in 2016 Madaba District Council produced 7,000 tons that was distributed in Tanzania market (Tantrade 2016). Therefore Madaba District was the main study area.

3.3 Sampling Procedure and Sample Size Determination

The study employed stratification sampling. This technique is often referred to as deliberate sampling for heterogeneity (Baradyana and Ame, 2009). In this case, the population of study was divided into strata. That is groups of similar characteristics in the population such as wards. The elements to be included in the sample were then selected from each stratum. The population was categorized according to their Strata such as chosen Wards. Mkongotema, Mahanje and Wino Wards was selected for the study because are the main ginger producer in the district.

In the study, both probability and non-probability sampling techniques was used. Probability sampling technique used because it gives equal chance to the farming households in each group. Regarding selecting sample wards from the district non-probability (purposive) sampling method was used. Sample size depends on sampling error, population size, and variation in the population, with respect to the characteristics of interest. This study applied a simplified formula provided by Yamane (1967) to determine the sample size at the level of precision of 0.09 as:

$$n = \frac{N}{1 + N(\varepsilon^2)}$$

Where, n is the sample size, N is the population that are available in three wards, mahanje, Mkongotema and Wino and e is the level of precision or error margin. The above formula provided approximately 202 sample of ginger farming households selected from Madaba Dc. The population was calculated as follows;

$$n = \frac{409}{1+409(0.05)^2}$$

$$n = \frac{409}{1+0.0225}$$

$$n = \frac{409}{2.0225} = 202$$

Thus the sample size to be selected is 202 respondents

3.4 Data Collection Methods

The study employed two main data collection methods. These are questionnaires and in-depth semi structured interviews. The combination of two methods of data collection ensured information compensation and increased reliability and trustworthiness and good outcomes (Cohen *et al.,* 2007).

3.4.1 Questionnaire

The study used a questionnaire (Appendix D) which has a set of questions in a predetermined order to collect quantitative primary data (Kombo and Tromp, 2006). Closed ended questionnaires were administered to ginger farmer as posed by study objectives. The choice of using questionnaires was based on the fact that they allowed the researcher to cover a large sample and they were easy to administer. Questionnaires gave the respondents freedom to provide information needed to compensate qualitative information in making sure that there was enough information about the study objectives. Structured questionnaires were used because is easy to administer and analyses and was done with the help of Open data kit (ODK) tool.

3.4.2 In-depth semi structured Interviews

In-depth semi structured interviews (Appendix D) was used to gather qualitative primary data from chosen ginger farmers. The rationale of using semi structured interview technique enables the researcher to obtain more detailed information from the targeted respondents. The method facilitated the collection of information quickly and the researcher has a chance to ask follow-up questions in some areas so as to get more information. As explained by Cohen et al. (2001), interviews permitted flexibility in respect of the sequence of the discussion and enabled the interviewer to raise other relevant issues to respondents (ginger farmer) on the targeted objective(s).

The application of interviews enabled the adaptability of the study in terms of following up ideas, probing responses and investigating motives and feelings of respondents (Bell, 2004).

3.5 Gross margin analysis

The gross margin analysis was used to determine the profitability of ginger productivity in Madaba District (objective i). The gross margin calculated as the difference between the gross farm revenue and the total variable cost, Olukosi and Erhabor(1988).

Mathematically it is expressed as;
GM=GI-TVC
Where
GM= Gross Marginn
GI= Gross farm Revenue or Income
TVC= Total Variable Cost

3.6 Data Validity and Reliability

According to Gay *et al.* (2012) validity usually reveals the relationship between study, concepts and its respective indicators used for measurement. It refers to the degree to which a test measures what it is supposed to measure to aid appropriate interpretation of results. They further describe four types of validity, such that; content validity which usually reflects the extent to which the test measures an intended contended content area through both item and sampling validity.

The data was highly expected to be valid because of the approach taken upon obtaining the data. Those steps include stratified multistage random sampling techniques and Yamane formula for calculating sample size which minimize the biasness of the data. Data used to check the model specification error tests and other problems such as multicolinearity, Normality, Correlation and heteroskedasticity

before regression analysis. The problem was identified with the data and measures were used to correct it.

3.7 Data Analysis

In carrying out the analysis of this study Excel, SPSS (Statistical Package for Social Science) and STATA 14 was used to analyze and estimates model adopted in this study. Data analysis involved the generation of descriptive statistics and econometrics model estimation. Descriptive statistics made to explore the data before subsequent analysis could be done and to more specifically to estimate the revenue earned by farmers from ginger production in Madaba District Council. Since this study used cross-section data, standard cross-section econometric diagnostic test was employed. On top of that based on the objectives of the study Ordinary least square regression model estimated to examine the determinants of ginger productivity in Madaba District Council

CHAPTER FOUR

PRESENTATION OF FINDINGS

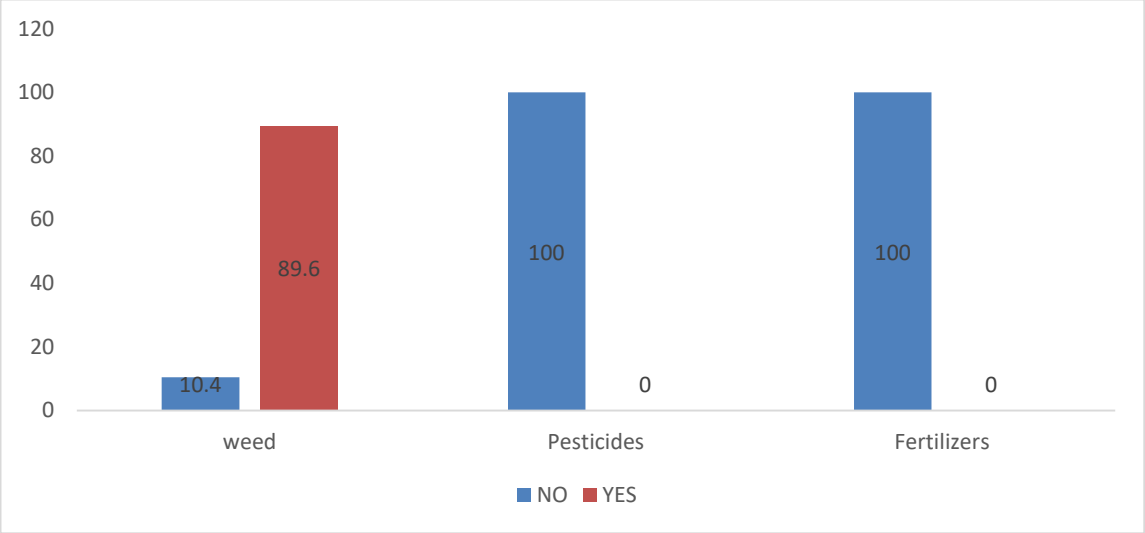
4. 0 Introduction

This chapter presents presentation and interpretations of the findings from the data to answer the objectives of the study. The research investigated on analysis of the determinants of ginger productivity in Tanzania, a case Madaba District. Thesis achieved by providing first the descriptive analysis as the preliminary results, in the second stage, followed by model estimation results to confirm the determinants of ginger productivity in Madaba District Council.

4.1 Descriptive analysis

4.2 Agronomic practices in ginger productivity

The results in figure 4.1 show that in Madaba District Council most of farmers are neither applying fertilizers nor pesticide in the production of ginger but instead they are concentrating on weeds control as the means of increasing ginger productivity. This is because if you use fertilizers and pesticide, you cannot join ginger farmers group which find the common market for their ginger produce. This indicates that most of the Madaba land it still fertile by origin and other area in Madaba are not yet cultivated any crop up now. Also the farmers of ginger in Madaba District Farmers follow the policy of TOAM (Tanzania Organic Agriculture Movement) under which at the beginning when ginger was introduced in Madaba District, spreaded education to ginger farmers on how ginger should be grown up to harvest period and this required the ginger farmers to grow ginger without applying fertilizers and pesticide. The main function of TOAM was to provide technical and institutional support to difference other stakeholders such as farmers and LGAs on the production and marketing of organic ginger.



Source: Author's Computation STATA 14 from Survey data, 2019

Figure 4.1: Distribution of agronomic practices in ginger production

4.2.1 Spacing

Table 4.1 shows that about 98 of the respondents were cultivating ginger using below the recommended spacing, about 103 of the respondents were able to follow and used the recommended spacing and only one (1) respondent was able to use beyond the recommended spacing in ginger cultivation (=30 cm between one ginger line and another) as per Ministry of Agriculture and food security and Cooperatives (MAFC 2016) In the study area there was a group whose cultivated ginger using below the recommended spacing that is less than 30 centimeter or <30cm and about 63.27 per cent of the ginger farmers were able to produce less than 10 tons per acre, about 19.37 of ginger farmers were able to produce between 10-15 tons per acre and about 17.36 per cent of the ginger farmers were able to produce more than 15 tons per acre.

The second group was the group of those whose used the recommended spacing of 30 cent meter between one ginger line and another or = 30 cm and about 64.08 were able to produce less than 10 tons, about 21.36 per cent of the ginger farmers were able to produce between 10-15 tons per acre and about 14.56 of ginger farmers were able to produce more than 15 tons per acre. The last group was the group of those farmers who used beyond the recommended spacing that is above 30 cent meter and about 100 per cent was able to produce less than 10 tons per acre. This results implies that following the recommended standard spacing in ginger production in Madaba District has no any significance to increase ginger productivity. Therefore the recommended spacing for ginger cultivation it need further investigation so as to allow most ot the ginger farmers to get more output which will anable them to get more income for the beterlment of their lives and the development of the Country at large. Similar result was found by Geta and Kifle (2011), in Ethiopia that whether ginger space standard is adhered or not it has no any significant for ginger productivity because ginger productivity depend on many factors like level education and size of the farm cultivated. This is because most of the ginger farmers in Ethiopia used below standard spacing and experienced high yield of ginger production. This is also supported by Pearson chi-square test with p-value=0.871 which indicate an insignificant association between area planted and amount of ginger harvested.

Table 4.1: Distribution of ginger production across spacing

Spacing	**Production (in tons)**			
	<10 tonnes	**10-15 tonnes**	**>15 tonnes**	**Total(respondents)**
	%	%	%	
Below standard(<30cm)	63.27	19.37	17.36	98
Standard(=30cm)	64.08	21.36	14.56	103
Beyond Standard(>30cm)	100.00	0.00	0.00	1
Total	63.86	16.34	19.80	202
Df = 4		**χ^2 = 1.2458, Pr = 0.871**		

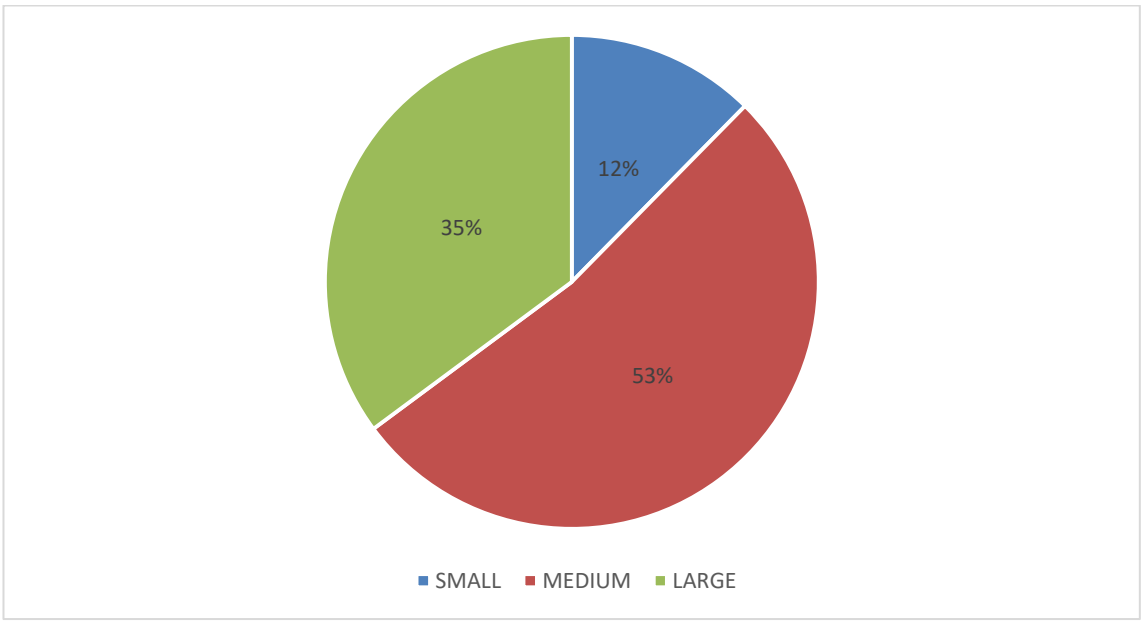
Source: Author's Computation STATA 14 from Survey data, 2019

4.3 Household Socio-Economic Characteristics and its effect on Ginger Yield

4.3.1 Household size

Figure 4.2 indicates the distribution of ginger farmers by household size. The average household size or 53 per cent majority farmers were ranging from 5-8 persons. About 35 per cent had large household size with people ranging from 9 persons and above while few household size ginger farmers had small households with people below 4 persons about 12 per cent. This range is as per NBS that households with 1-4 persons is termed as small, 5-8 persons is termed as medium and 9 and above persons is termed as big household size. According to the report of Oladele (2011), there is a positive and significance relationship between the households' size and the ginger farmer's efficiency. However, the absolute number of persons in a certain family cannot be used to justify the potential for productive farm work. This is because it can be affected by some important factor such as age, sex and health status of the persons in the family

Figure 4.2: Distribution household sizes among ginger farmers



Source: Survey Data, 2019

4.3.2 Age group

Table 4.2 shows that about 122 of the respondents were the group of adult between 18-45 years involved in ginger cultivating and minority of ginger farmers were the group of elder that is above 45 years or > 45 years, in the study area about 63.11 per cent of adults were able to produce less than 10 tons per acre, about 15.57 were able to produce between 10-15 tons per acre and about 21.31 per cent of Adults were able to produce more than 15 tons per acre. The last group was the group of Elders whose about 65 per cent was able to produce less than 10 tons per acre, about 15.50 were able to produce 10-15 tons and finally about 19.50 per cent were able to produce more than 15 tons per acre.

This results implies that the group of children (0-17) years did not participate in ginger production at all and only the groups of the active labor force or group of productive labor force were the major producers of ginger because it is hard activities to deal with and it need a huge capital. This yet supported y pearson chi-square test with p-value =0.782 which show insingnificance association between age group and ginger harvested.

Table 4.2: Distribution of ginger yield across age groups

		Production (in tons)		
AGE	**<10 tonnes**	**10-15 tonnes**	**>15 tonnes**	**Total**
	%	**%**	**%**	
18-45 years(adults)	63.11	15.57	21.31	122
>45 years(elders)	65.00	15.50	19.50	80
Total	63.86	16.34	19.80	202
Df = 4	**χ^2 = 0.4911, Pr = 0.782**			

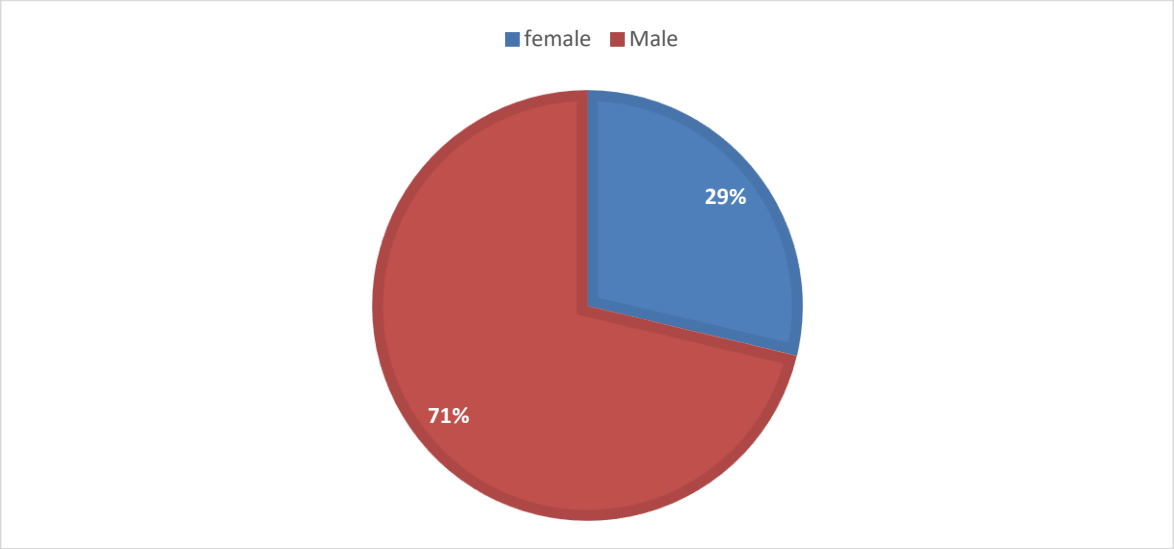
Source: Author's Computation STATA 14 from Survey data, 2019

4.3.3 Gender

The study intended to understand the sex of the respondent so as to identify its influence on ginger productivity. The study involved both females and males and it was found that majority of the respondent (71%) were male. This implies that men

participated more in ginger farming than female who participated in ginger production for about 29 per cent.

Figure 4.3: Percentage distribution by sex



Source: Survey Data, 2019

Table 4.3: Amount of ginger harvest by Sex(in kg)

Gender	Observation	Mean	Std	Min	Max
Male	144	11,131.67	9,684.02	400	60,210
Female	58	8,895.34	5,823.97	600	21,600
Total	202	20,027.01	15,507.99	1,000	81,810

Source: Survey data, 2019

Table 4.3 above shows total amount of ginger harvested by male and female. Male had the highest average of the amount of ginger harvested about 11131.67 and female had an average mean of 8895.34 of the amount of ginger harvested.

4.3.4 Ginger Production across gender

Results in table 4.4 show ginger production across gender. The results furthermore shows that about 63.89 per cent of male were able to produce less than 10 tons per acre or < 10 tons, and 13.89 per cent were able to produce between 10-15 tons per

acre and about 22.22 per cent were able to produce more than 15 tons per acre .The study suggest being a male or female has no significant effects in increasing ginger productivity in Madaba District council. This could be attributed to the fact that female are left at home fulfilling social or family responsibilities which tend to consume most of their time instead of engaging full in production.

Table 4.4: Distribution of ginger yield across gender

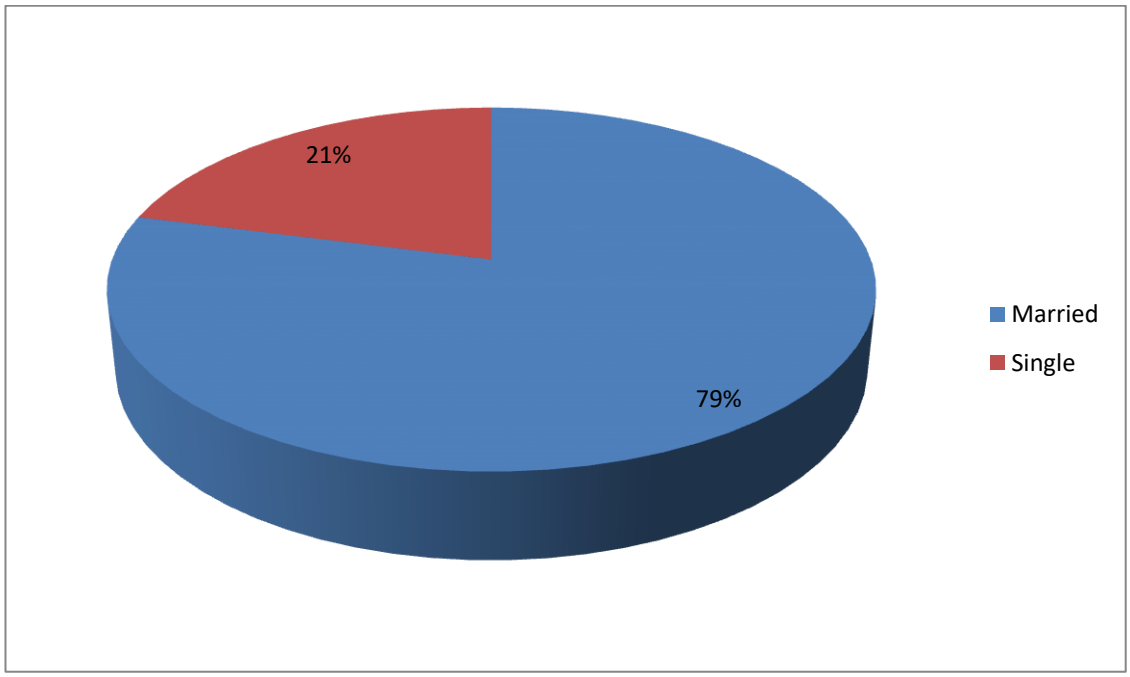
Gender	Production (in tons)			
	<10 tonnes	**10-15 tonnes**	**>15 tonnes**	**Total**
	%	**%**	**%**	
Male	63.89	13.89	22.22	144
Female	62.79	22.41	14.79	58
Total	63.86	16.34	19.80	202
Df = 4	**χ^2 = 3.3229, Pr = 0.190**			

Source: Author's Computation STATA 14 from Survey data, 2019

4.3.5 Marital Status

This part describes marital status of the respondent. Table 4.4 show that 79 per cent of the respondents of ginger farmers were married and about 21 per cent were single

Figure 4.4: Percentage of distribution of respondent by Marital Status.

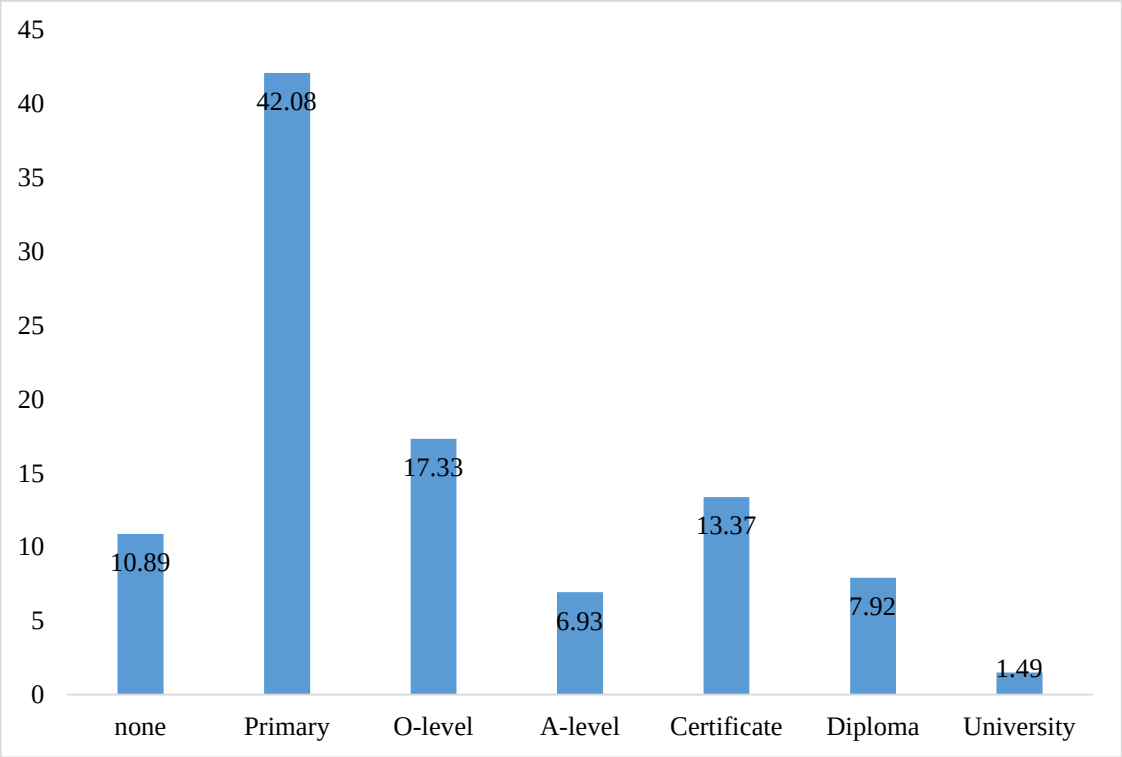


Source: Survey Data, 2019

4.3.6 Education

The researcher intended to understand the level of education of the respondent on ginger productivity. The result in figure 4.4 indicates majority of the households ginger farmer (42.08 per cent) had primary level of education, 17.33 per cent had secondary education, and 10.33 had no formal education while the least group is University level of education which had only 1.49 per cent. Collier (2014) argued that` in order for a nation to obtain chance to play in the global economy, it have to break free of the traps, which is not simple. In order to turn a nation around, it help to have a pool of educated society. It is an advantage to have at least 2/3 of the entire population with secondary education; otherwise it is hard to break from vicious cycle of poverty.

Figure 4.5: Percentage distribution by level of education



Source: Survey Data, 2019.

Table 4.5: Amount of ginger harvested by levels of education (in kg)

	Ob	Mean	Std	Min	Max
None	22	6,293.64	7904.50	400	31,200
Primary	85	8,252.59	6,248.80	1,200	45,600
Secondary	49	9,064.57	7,500.00	700	42,000
Certificate	27	17,511.48	12,664.50	4,000	60,210
Diploma	16	17,621.88	8,476.77	6,000	33,600
University	3	23,600.00	4,543.13	20,400	28,800

Source: Survey data, 2019

Table 4.5 indicates the summary of the amount of ginger harvested based on level of education. Respondent with University education had the highest mean of the amount of ginger harvested about 23600 kilogram followed by the group of Diploma level of education which had the average mean of 17,621.88, followed by the group of certificate level of education about 17511.48 average mean and the last was the

group of those people who did not attend the formal education which had the average mean of 6293.64 amount ginger harvested.

4.3.7 Ginger production across Education levels

The result in Table 4.6 shows the majority of ginger farmers are those respondent with primary education with 85 respondents, followed by those people with secondary education with 35 respondent, followed by those people with certificate education with 27 respondent, followed by those people with diploma education with 16 respondent and the last category was the respondent of university with only 3 respondent. The results furthermore shows that the groups of none educated about 86.36 per cent of the respondents were able to produce less than 10 tons per acre, about 4.55 were able to produce between 10-15 tons per acre and about 9.09 per cent were able to produce more than 15 tons per acre. The group of primary education about 75.29 per cent of the respondents were able to produce less than 10tons per acre, about 17.65 per cent of the respondent were able to produce between 10-15 tons per acre and about 7.06 per of the respondent were able to produce more than 15 tons per acre.

The groups of those people with secondary level of education about 74.29 were able to produce less than 10 per acre, about 11.43 per cent were able to produce between 10-15 tons per acre and about 14.29 per cent of the respondents were able to produce more than 15 tons per acre. The groups of those people with certificate level of education about 33.33 per cent were able produce less than 10 tons per acre, about 18.52 per cent of the respondent were able to produce between 10-15 tons and about 48.15 per cent of the respondents were able to produce more than 15 tons per acre.

Table 4.6: Distribution of ginger production across Education levels

Education level	Production (in tons)			
	<10 tonnes	10-15 tonnes	>15 tonnes	Total
	%	%	%	
None	86.36	4.55	9.09	22
Primary	75.29	17.65	7.06	85
O-level	74.29	11.43	14.29	35
A-level	50.00	42.86	7.14	14
Certificate	33.33	18.52	48.15	27
Diploma	25.00	12.50	62.50	16
University	0.00	0.00	100.00	3
Total	63.86	16.34	19.80	202
Df = 12	**χ^2 = 68.7054, Pr = 0.000**			

Source: Author's Computation STATA 14 from Survey data, 2019

Table 4.6 above indicate that the group of those people with primary level of education about 15 per cent was able to produce less than 10 tons per acre, about 18.52 per cent were able to produce between 10-15 tons per acre and about 62 per cent of the respondents were able to produce more than 15 tons per acre. The groups of those people with University level of education only about 100 per cent of the respondent were able to produce more than 15 tons per acre. This results implies that as the respondent increase the level of education let say from primary to university there is a posibility of increasesing the level of output per unit area and hence productivity.This is because we expect the person with high level of education to be full with high skills and knowledge to deal with things like engaginging in production and will tend to produce the satifactory amount of produce (if other factor held constant) compared with the person with lower education as shown in table 4.7. This yet supported y pearson chi-square test with p-value =0.000 which singnificance association between education and ginger harvested.

4.4 Profitability of ginger production in Madaba District Council.

The gross margin analysis was used to determine the profitability of ginger Production. The gross margin was computed as the difference between the gross

farm revenue and the total cost, Olukosi and Erhabor (1988).The level of inputs used and cost realized in the study area as reported in Table 4.5.The cost of ginger production was grouped into various forms which include Cost of labor, Cost of farm inputs and Cost of transportation. The average cost of seeds seemed to be higher about 516,534.7 Tsh/acre, followed by the average cost of farm weeding with 132,950.5 Tsh/acre, average cultivation cost was 95,940.6 Tsh/acre, average cost of packing was 88,217.8 Tsh/acre, average cost of bush clearing was 85,095 Tsh/acre, the average cost of transportation was 79,029.7 Tsh/acre and the least average cost of ginger production was observed to be cost of planting about 60,133. The wide variation in the cost of production used by the farmers could be attributed to the fact that they differ depending on its importance for stimulation of ginger productivity.

Table 4.7 below show that ginger farmers in the study area are utilizing their resources and that is why the potential yield was high than the cost of production while seeds it seems to contribute high cost of production by constituting about 35 per cent of the total cost in ginger farming and the average gross income (GI) from ginger production was 11,149,046.25 kilogram, the average variable total cost (TVC) was 1,478,426.14 kilogram, gross margin from ginger production in Madaba District Council is 0.87 0r 87 per cent. This result revealed that ginger farming was profitable in the study area; ginger farmers received high returns on its investment but did not reach the optimal level and still there is a room for more efficiency utilization of resources for ginger production.

Table 4.7: Returns and cost from ginger production (in kg/acre)

Variables	Value(Total average cost)/acre	%contribution
(A) Variable Cost		
Bush clearing	850,99.41	6.0
Seeds	516,534.6	35.0
Fertilizer	0	0.0
Pesticides	0	0.0
Weeding	132,950.50	9.0
Harvesting	420,519.80	28.0
Transportation	79,029.70	5.0
Packaging materials	88,217.82	6.0
Storage	0	0.0
Cultivation	95,940.59	0.6
Planting	60,133.66	0.4
Total Variable Cost(TVC)	1,478,426.14	
Quantity (in kg)	10,489.55	
Price (per kg)	1,062.87	
(B) Gross Income(GI)=P XQ	11,149,028.01	
(C) Gross Margin(GM)=(GI-TVC)/GI	87%	

Source: Author's Computation STATA 14 from Survey data, 2019

4.5 Empirical Results

This part gives the diagnostic tests as well as econometric results of Ordinary least square models as discussed in chapter four.

4.6 Diagnostic Test

4.6.1 Multicollinearity Test

A presence of multicollinearity among variables can increase the variance of the coefficient estimates which lead to unstable and difficult to interpret. It also vitalities the statistical power of the analysis and can cause the coefficients to switch signs. Due to serious effect collinearity of independent variables might have in a model it was vital to test for multicollinearity problem. Multicollinearity was thus tested using the variance inflation factor (VIF) in STATA, the results show that there was no

serious problem of multicollinearity between the independent variables as shown in Table 4.8 with an average of 1.56 which is tolerable, the maximum VIF of the variables was 3.05.

Table 4.8: Multicollinearity test results for independent variables

Variables	VIF	1/VIF
Married	1.15	0.868
Sex	1.1	0.905
Primary	3.05	0.328
O.Level	2.35	0.425
A.level	1.65	0.604
Certificate	2.28	0.439
Diploma	1.77	0.564
University	1.31	0.762
Age	1.16	0.864
Experience	1.33	0.752
Farm distance	1.21	0.824
Farm size	1.61	0.621
Farm ownership	1.06	0.944
Extension service	1.23	0.813
Membership	1.15	0.868
Mean VIF	1.56	

Source: Author's Computation STATA 14 from Survey data, 2019

Also the pair wise correlation matrix indicate that there is low/small and tolerable correlation ($0.02<|r|<0.6$) among variable to be used in Linear regression model. Expect for the correlation between output and farm size which indicate high correlation. The correlation matrix showed the maximum correlation of 0.49 between farm size and ginger output or productivity. However this correlation was less than perfect correlation (1). Therefore was no correlation problem among variables.

Table 4.9 Correlation results for independent variables

	Yield	M_status	Gender	Age	Education	Hhsize	Experience	Farm_distance	Fsize	Farm_own	Ex_service	Member
Yield	1.000											
Marital_status	0.031	1.000										
Sex	-0.108	-0.006	1.000									
Age	-0.056	-0.306	0.188	1.000								
Education	0.498	0.0006	-0.040	0.019	1.000							
Hhsize	-0.037	-0.194	0.052	0.450	0.115	1.000						
Experience	0.474	-0.084	-0.001	0.055	0.274	-0.062	1.000					
Farm_distance	0.213	0.015	-0.079	-0.022	0.134	-0.025	0.302	1.000				
Fsize	0.464	0.000	0.083	0.039	0.444	0.002	0.387	0.262	1.000			
Farm_ownership	-0.042	0.056	0.016	-0.033	-0.013	-0.149	0.015	0.067	-0.048	1.000		
Ex_service	-0.381	0.050	-0.076	-0.075	-0.222	-0.061	-0.196	-0.006	-0.348	0.076	1.000	
Member	0.134	0.000	0.104	0.029	0.001	-0.066	0.164	0.200	0.185	-0.037	-0.107	1.000

Source: Author's Computation STATA 14 from Survey data, 2019

4.6.2 Heteroskedasticity test

In testing heteroskedasticity, the white test was used where the null hypothesis is that homoscedasticity is present. Test yield a high chi2 statistic (18.95) which is significance at 1% (prob chi2<0.0000) as shown in table 4.10 in which the null hypothesis is rejected and conclude that there is a presence of heteroscedasticity. The problem was then solved by running the regression with robust to produce robust command standard errors.

Table 4.10 Heterescedasticity test results for independent variables

Chi2(1)	18.95
Prob>chi2	0.0000

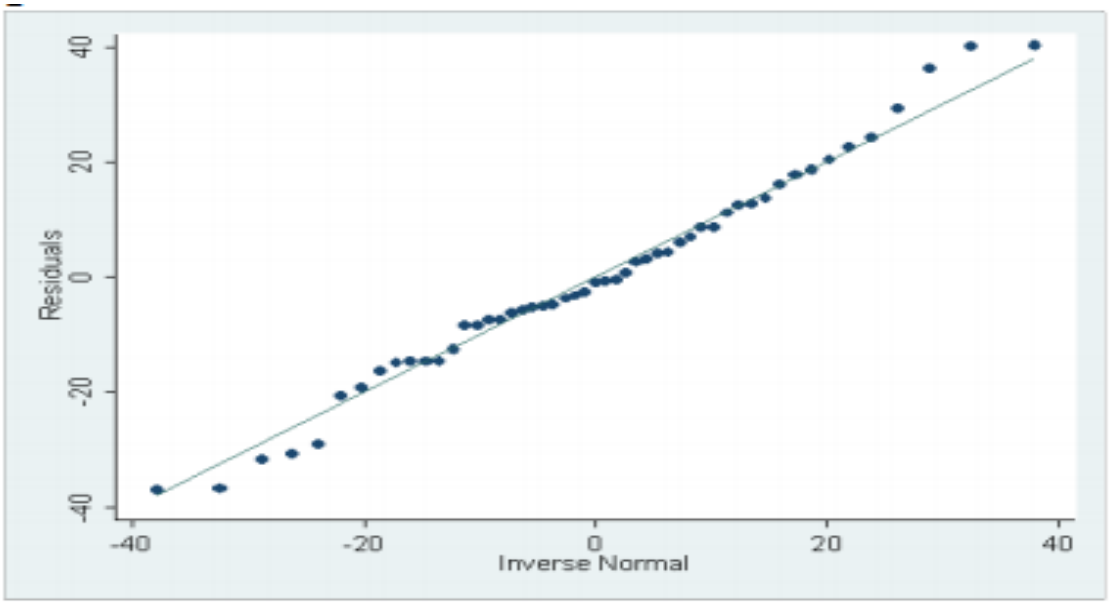
Source: Author's Computation STATA 14 from Survey data, 2019

4.6.3 Normality Test

A normality test is used to determine whether sample data has been drawn from a normally distributed population (Gujarati 2004). This is a plot of the inverse of the standard normal cumulative versus the ordered observations. If the underlying distribution of the data is normal, the points will fall along a straight line. Deviations

from this line it will indicate that it is non-normality. Therefore figure 4.6 revealed that model is normally distributed due to the fact that most of the points were fallen along the straight line.

Figure 4.6: Normality test



Source: Survey Data, 2019.

4.7 Interpretation of Ordinary Least square Model (OLS)

Result as shown in table 4.11 indicate that the estimated coefficient of Farm size was found to be positive and statistically significant at 1% level; this indicates that as the farmers increase the farm size under ginger production it lead to an increases in the level of yield of ginger farmers about .449 per unit area and eventually ginger productivity.

The coefficient an extension services was positive and statistically significant at 5% level which implies that ginger farmers who have an extension services was able to increase the level of output by .165 per unit area compared to those who did not received and used extension services. This connected with the farmers who were given advice and visited by the extension officers in ginger farming have a higher

possibility of producing more ginger per unit area as compared to farmers with no contact with extension officers. This is due to fact that extension services education exposes the farmer on the source of technology to improve production techniques which results into the increase farm performance.

Table 4.11: The determinants of ginge productivity in the study area (OLS Model)

Variables	Coef	Robust Std.Err	t-test	P>t
Married	0.078	0.128	0.61	0.544
Sex	-0.116	0.095	-1.23	0.221
Education				
Primary	0.634	0.250	2.53	0.012**
O.Level	0.509	0.264	1.93	0.055*
A.level	0.731	0.269	2.71	0.007***
Certificate	0.827	0.272	3.04	0.003***
Diploma	0.986	0.268	3.68	0.000***
University	0.603	0.426	1.42	0.158
Age	-0.009	0.004	-2.44	0.015**
Experience	0.136	0.036	3.77	0.000***
Farm distance	-0.013	0.014	-1.03	0.306
Farm size	0.449	0.066	6.84	0.000***
Farm ownership	-0.001	0.156	-0.01	0.993
Extension service	0.165	0.083	2.00	0.047**
Membership	0.026	0.123	0.21	0.835
_cons	7.71	0.341	22.64	0.000
			Number of obs	202
			Prob> F	0.0000
			R-Squared	0.6095

Note: *** means significant at 1 percent, ** significant at 5 percent and * significant at 10 percent.

Source: Author's Computation STATA 14 from Survey data, 2019

The coefficient of farmer`s experience was positive and statistically significant at 1%. This revealed that the more the farming experience and it determine, his ability to make effective farm management efficiencies because of accumulation skills in order to have the highest possible output about .136 compared with lower experience which eventually increases the farmer`s productivity.

The coefficient of age was negative and statistically significant at 5% level influencing ginger productivity. This indicates that as the age of the respondent of ginger farmer increases by one year in Madaba District was able to lower the level of output by .009. Younger ginger farmers are expected to have greater efficiency because they are stronger in ginger farming and high personality decision make up on adopting farming practices, thereby having greater efficiencies in ginger productivity.

Also the coefficient of education levels were positive and statistically significant at 5% for primary school, 10% for ordinary secondary school, 1% for advanced secondary school, 1% for certificate level of education and 1% for diploma level of education and the level output were increasing as the person move from one level of education to next level of education for most of levels of education that is .634, .731, 827 and 986 respectively. This implies that educated farmers seems to understand and follow the advice from the extension officers on the importance of using improved technology and the use of proper inputs as recommended rates compared to those non level of education.

The result further indicates that about 60 per cent of the variables were explained by the model itself. This implies that the model was well estimated and explained to provide the required results of the findings.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

5.0 Introduction

This chapter presents the discussion of the findings from the analysis and the chosen literature together with theories used in chapter two. The chapter gives out the findings obtained from analysis done in relation to the findings obtained by the other studies. The discussion is done in relation to the highlighted specific objectives in the first chapter which have been achieved through regression. The discussion was based on the specific objectives of the study which is discussed below;

5.1 To determine the profitability of ginger production

The researcher wanted to know whether ginger farming is profitable in Madaba DC by calculating the cost used in the production and revenue obtained by the ginger farmers. Ginger farmers received high return on ginger farming despite of the problems were facing like low price, shortage cheap labor, poor infrastructures lack of capital, but it did not reach the optimum level. Appropriate level of input use and time of operation is essential for achieving higher yield and profits. The average costs incurred and revenue obtained per acre for ginger were estimated to determine the profitability of ginger production in the study area (Table 4.5). The Gross Income (GI) was 11,149,028 while TC (Total Variable Cost) was 1,478,426. The gross margin (GM) was therefore was 0.87 or 87%. A similar result was reported by Banchoir (2012), carried study on economic performance of ginger productivity in Bangladesh. The study revealed that ginger production was profitable that is ginger farmers received high returns on its investment than the cost of production. This implies that appropriated use of land cultivated by ginger and use of extension service were essentials for achieving high yield and profit.

Also the study by Bala (2012), in Nigeria on the analysis of women ginger production. The study found that the ginger cultivation in the study area was economically viable and profitable.

5.2 To examine the effect of farm characteristics on ginger productivity

The study examined the effect of the farm characteristics with the aim of knowing which size of the land is likely to influence ginger productivity. The study found that farm size was found statistically significant and positive at 1% level. This result revealed that those farmers cultivating large piece of land are likely to get high yield and income than those farmers cultivate small piece of land. In the study area most of farmers who were involved in ginger production owned the land and few of them who were hiring the land. Since the large size of the land influence ginger productivity, therefore the government, individuals and non government organization should continue to educate and encourage the ginger farmers to expand the size of the land under ginger production so as to be able to get high yield and finally to get large income which will improve the livelihood of the ginger farmers.

This results implies that most of the Madaba land still fertile by origin and other area in Madaba are not yet cultivated any crop up now. Also the farmers of ginger in Madaba District seem to follow the policy of TOAM (Tanzania Organic Agriculture Movement) under which at the beginning when ginger was introduced in Madaba District, spreaded education to ginger farmers on how ginger should be grown up to harvest period and this required the ginger farmers to grow ginger without applying fertilizers and pesticide. The main function of TOAM was to provide technical and institutional support to difference other stakeholders such as farmers and LGAs on the production and marketing of organic ginger. This results align with Bala (2012) result which found positive and significant relationship between farm size and ginger productivity. This result revealed that, the households with larger farm sizes tend have more outputs than those with smaller farm sizes.

On the other hand this is contrary with Ndanmadu and Marcus (2011) who found that farm size under ginger cultivation does not increase the level of output. The study revealed that farm size under ginger cultivation seem to be larger than what the farmers can effective manage. This is probably due to poor access to extension education and service or situation whereby other production inputs are not adequately and efficiently employed.

5.3 The influence of social-economic on ginger productivity

The influence of Socio-economic factors includes age, education level, gender, household size. The aim of this objective was to determine which socio-economic factors are likely to influence ginger productivity in the study area. The coefficient of education levels were positive and statistically significant at 5% for primary school, 10% for ordinary secondary school, 1% for advanced secondary school, 1% for certificate level of education and 1% for diploma level of education which implies that educated farmers are likely to understand and follow the advice from the extension officers on the importance of using improved technology and the use of proper inputs. Furthermore education enhance entrepreneurial and management skills, and increase productivity both in farm and non-farm sectors. Yet it provides other livelihood options in the event of farm failure or natural disaster that could lead to low income. This is because households with good education or skills have the capacity to seek employment in the wage sector while participating in farm activities as well. The earning from such employment opportunities can be used to invest in or expand ginger farm activities. A similar finding was obtained by Mmasa and Mhagama (2017), on social-economic factors influencing ginger productivity among smallholder's growers in Tanzania. Also a similar result was observed by Hossain and Matin (2012) in Banladesh and Bala (2012).On increasing production efficiency of ginger in Nigeria. Since the education has shown an positive influence on ginger productivity, the government should continues with its policy of providing free education from primary level to secondary level so that many Tanzanian can get education which will help them in various economic activities especially in the

production of ginger which has shown to improve the welfare of the people in Madaba District Council.

Both female and male were involved in ginger farming but the majority of ginger producers were male about 71 per cent. This is because most of the female are tied with social responsibilities like caring of children, cooking for the family which make them not to engage full in ginger production rather than depend on their husband to provide the family needs. Similar result were reported by Mmassa and Mhagama (2017), on social-economic factors influencing ginger productivity in Same District and the study by Damina et.al (2013), on the factors influencing ginger productivity in Nigeria. Both studies found that majority of the respondent in ginger farming were male.

The coefficient of farmer`s experience was positive and statistically significant at 1%. This revealed that the more the farming experience and it determine, his ability to make effective farm management efficiencies because of accumulation skills in order to have the highest possible output which increases the farmer`s income. Similar results obtained by Adetula (2006), noted that the longer a person stays in a particular job the better the efficiency the level of output tend to produce.

5.4 The agronomic practices of ginger cultivation

The agronomic practices of ginger productivity under this part include spacing, fertilizer use, and weeding and pest control. Farmers in the study area were using weeding and spacing as the means of achieving high output. They were neither applying fertilizers nor pesticide and the agronomic practices that were used no even one that was influencing ginger productivity. Many farmers in Madaba District Council were using below the recommended spacing that is 30 centimeter between one ginger line and another line to increase the level of output because they said that when they use the recommended spacing the level of output tend to be low but when they use below standard of less than 30 centimeter the level of output tend to be high.

Therefore, there is need for the stakeholders of agriculture development and the government via ministry food and agriculture to revise the current recommended standard so as to enable the ginger growers to get more output and income for their betterment of lives. Similar result was found by Geta and Kifle (2011), in Ethiopia that whether ginger space standard is adhered or not it has no any significant for ginger productivity because ginger productivity depend on many factors like level education and size of the farm cultivated. This is because most of the ginger farmers in Ethiopia used below standard spacing and experienced high yield of ginger.

This thesis also supported by Pearson chi-square test with p-value=0.871 which indicate an insignificant association between area planted and amount of ginger harvested

CHAPTER SIX

SUMMARY, CONCLUSIONS AND POLICY IMPLICATION

6.0 Introduction

This chapter provides the summary of the study findings as well as concluding. It also suggests policy Implications based on the findings obtained from the study. Area of further study was suggested as well as a way of fillings up the gap which study was not able explains.

6.1 Summary of the Study Findings

The study was about the analysis of the determinants of ginger productivity in Tanzania; a case of Madaba District Council. Ginger productivity in Madaba is vital topic of discourse owing to the economic importance of the crop for employment creation through value addition and as an important export earner. Semi structured questionnaires and Semi a structured interview was used to collect a sample size of 202 households responded for the questionnaires. Data was recorded in the excel, SPSS and were able to answer four objectives which are agronomics practices, how much profit earned by ginger farmers, effect of farm characteristics on ginger productivity, and the effect of social-economic on ginger productivity.

The study examines the effect of the farm characteristics with the aim of knowing which size of the land is likely to influence ginger productivity. Since the large size of the land it influence ginger productivity it time to the government, individuals and non government organization to continue to educate and encourage the ginger farmers to expand the size of the land under ginger production so as to be able to get high yield and finally to get large income which will improve the livelihood of the ginger farmers.

The agronomic practices of ginger productivity under this part include spacing, fertilizer use, and weeding and pest control. Farmers in the study area were using weeding and spacing as the means of achieving high output. They were neither applying fertilizers nor pesticide and the agronomic practices that were used no even one that was influencing ginger productivity. Many farmers in Madaba District Council were using below the recommended spacing that is 30 centimeter between one ginger line and another line to increase the level of output because they said that when they use the recommended spacing the level of output tend to be low but when they use below standard of less than 30 centimeter the level of output tend to be high. Therefore, there is need for the stakeholders of agriculture development and the government via ministry food and agriculture to revise the current recommended standard so as to enable the ginger growers to get more output and income for their betterment of lives.

The effect of Socio-economic factors under this section includes Age, Education level, Gender, Household size. The aim of this objective was to examine Socio-economic factors that are likely to influence ginger productivity in the study area. The coefficient of education levels were positive and statistically significant at 5% for primary school, 10% for ordinary secondary school, 1% for advanced secondary school, 1% for certificate level of education and 1% for diploma level of education which implies that educated farmers are likely to understand and follow the advice from the extension officers on the importance of using improved technology and the use of proper inputs which led to an increase in the ginger productivity in the study area. The study identified that 29 per cent of the respondent were female. This implies that men participated more in ginger production than female because most of the female in are tied with social responsibilities like caring of children, cooking for the family which causes not to engage full in ginger production rather than they depend on their husband to provide the family needs. The household size that were engaged in ginger farming ranged from 1-8 persons which was interpreted as the

medium size household as per National bureau of Statistics (NBS) and majority of ginger farmers (62%) had access to extension visit.

Ginger farmers received high return on ginger farming despite of the problems were facing like low price compared to the cost of production, poor infrastructures lack of capital, but it did not reach the optimum level. Appropriate level of input use and time of operation is essential for achieving higher yield and profits. The average costs incurred and revenue obtained per acre for ginger were estimated to determine the profitability of ginger production in the study area. The Gross Income (GI) was 11,149,028 kilogram while TC (Total Variable Cost) was 1,478,426. The gross margin (GM) was therefore was 0.87 or 87%. Given that ginger is an important cash crop in Madaba, any attempt to enlarge its productivity would be a right step towards the resolution of ginger crisis, jobs can be directly created from enhanced ginger production with small improvement in the technology which will increase household income and consequently will diversify the economic activities. Apart from diversifying economic activities an increased ginger production will provide further employment opportunities for the unemployed citizens in the country.

6.2 Conclusion of the Study

Based on the findings on this study it can be concluded that, given that ginger is an important cash crop in Madaba District Council any attempt to increase its productivity would be a right step toward the resolution of ginger crop crisis. Furthermore job can be directly created from increasing ginger production with small improvement in the technology which will increase household income and subsequently enhance ginger productivity. Lastly, increase in ginger production will provide more employment opportunities for unemployed people in Madaba District Council. This is in view of the important of ginger.

6.3 Policy Implications

The findings had drawn the following implication with relation to the study. Sizes of the land, education levels from primary to diploma, the use of extension service, farmer`s experience have positive influence on ginger productivity and age had negative statistically significant influencing ginger productivity in the study area. It remains necessary for ginger farmers to be educated with better numeracy and literacy skills about ginger farming. It is very indispensable to carry on assisting and supporting extension service through adopting participatory and cheap extension service method instead of using those that are universally practiced and developing a system for recording information pertaining needs assessment of farmers so as to ensure relevant service are expanded to the ginger farmers ability of producing more output and a cut in production cost which modifies production of ginger farmers to be more profitable.

Also the study portrayed that sizes of the land it is likely to influence ginger productivity. Therefore the government and other private sector should promote productivity by providing subsidies to those who are increasing the size of the land under ginger farming by giving agriculture inputs, capital to individual, groups and companies who shows to engage full in the production of ginger. This is due to the fact that many farmers fail to cultivate the big farms because big ginger farm it is expensive to operate and some are thinking to withdraw due to the fact that they lack enough capital.

The study indicated that from primary to diploma levels of education was positive and statistically significant influencing ginger productivity. The government should continue to provide free education as it is done currently so as to enable more people especially from primary schools to diploma levels of educations to engage in the production of ginger because it is profitable. This means that the findings portrayed that most of ginger farmers and the ones who produce more output are those with primary education and above except university level.

The educated people are saying this kind of activity is too difficult and are waiting for the collar jobs which help them to work in the offices. The government should provide education to group of tertiary to change their altitude and engage to this opportunity and stop waiting to be employed by the government instead to adopt self employment because the capacity of the government to employ people is to low compared to the number of educated people available in the country.

This will saves as the tool of poverty alleviation and to enable the county to reach in the middle income country as was planned by the government in the vision of 2025.

The government should think to open up ginger semi-processing industry in the study area. This is because during study the farmers were complaining to be paid low price compared to the cost of production .Sometimes they were paid 500 Tsh. Per kilogram which it seem to be low price to them. Yet the industry will help to observe the produced ginger and process them to make final product. Existence of ginger industry in local area will create local market to the produce brought by the ginger farmers and this will encourage more individuals, people, and more companies to think to start up ginger farms due to the availability of local markets which will increase the level of output and hence productivity. This also will diversify the economy activities by creating more employment opportunities as the result the government will be able to get more revenue for the strengthening the development of the nation at large.

The government should improve the infrastructure such as roads, and cannels where big and small farm of ginger are established. If this is done will simply by making more accessible to where ginger is produced when the customers want to buy the output. Also will help the ginger farmers to transport their produce from where ginger is produced to the market place and the government should set the price floor so that farmers can be in the good side of not being exploited by the middlemen who pretend to be like the joint venture between the ginger farmers and market source

The government should create conducive environment and educate the farmers to start the ginger farming irrigation scheme instead of depending on rain seasons only because Madaba District Council have some big source of water like luwira river and rugogo river that can serve as a source of water for irrigation. This will ensure daily availability of ginger product and further generation of income by the ginger farmers all the time.

6.4 Areas for Further Studies

The study was conducted in Madaba District Coucil which is a small part of Tanzania and the research was not able to cover many areas in Tanzania due to scarce of resources and shortage of time. The following are the area where further investigation is required so that can find more determinants of ginger productivity;

i. **Emphasis on Organic Farming.** The farmers of ginger farming in Mababa district is Organic by default, this is due to farmers of in study area neither apply the chemical fertilizers nor chemical pesticides in ginger cash crop. They only apply available farmyard manures (cow, pig, poultry and rabbit manures), in all part of the District. In this way the ignorance of the farmers about the technological advances in turning out to be a key to development. Considering the enhancing demand for organic produce all over the world the farmers can definitely hope to get better return for their output. But first and foremost they need to have marketable surplus which is available in the region. The surplus that need to be properly collected, stored, package and transported to distant market after due certification. Therefore there is a lot of scope to popularize the organic ginger produce for export in foreign Nation from the region and set on organic produce based on ginger industry in the region.
ii. **Introduction, Evaluation and Improvement;** Introduction of the Native and exotic high yielding strains of ginger suitable for the Nation. Ginger breeding should be done for high yielding and good quality varieties with resistance to biotic and a biotic stress.

iii. **Economic and Technology transfer.** The cost benefit analysis for various gingers farming system is needed. There are immerse demand to enhance the extension system to transfer of technologies generated and providing training to ginger farmers.

6.5 Limitation of the study

It should be understood that any study must have some sanctions and these sanctions or limitation can be grouped into two types. There were strong limitations and minor limitation during the field work. The strong limitation includes the followings; bad weather condition which involved the heavy rainfall. Heavy rainfall destructed some infrastructures such as roads and cannels which caused some areas to be difficult to be accessible easily to collect data and sometimes it forced the researcher to delay to reach the ginger household farmers until was stopped. Another is scarcity of resources such as fund which caused the researcher to delay to go to field to collect data until when the fund from various sources was obtained according to planned budget and during the data collection process those people who were owning transport were demanding a huge amount of many complaining that the infrastructure was bad which cause their transport to damage. This situation caused the researcher to increase budget of data collection and the fund was needed for the payment of meal and accommodation for the researcher and paying the village members who was given by village leadership to assist the researcher to pass in different household those were involving in ginger production and these village leadership had the problem asking a lot of money from the research so as the can corporate fully.

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APPENDICES

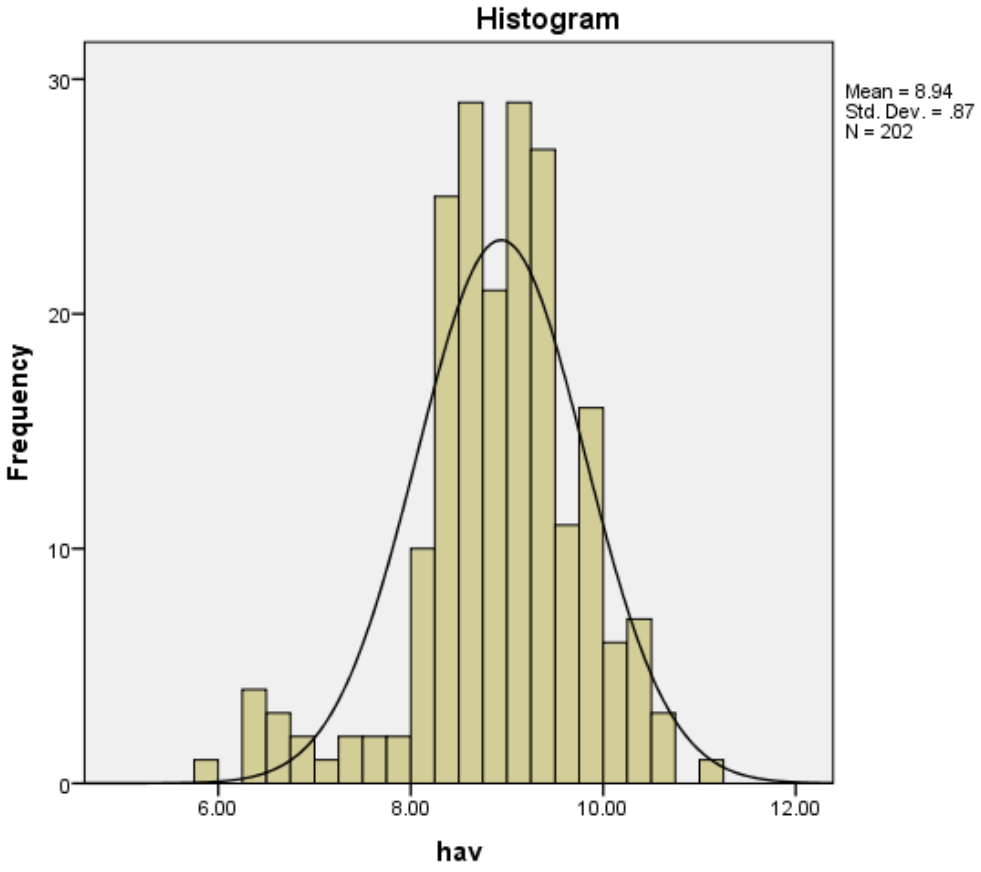
Appendix A: Summary Statistic of Variable

Variable	Obs	Mean	Std. Dev.	Min	Max
Yield	202	10489.550	8795.853	400	60210
Marital status	202	1.035	0.183	1	2
Gender	202	0.713	0.454	0	1
Age	202	41.554	9.638	22	63
Education	202	2.995	1.557	1	7
Household size	202	2.693	1.099	1	8
Experience	202	3.515	1.474	1	8
Farm distance	202	7.334	2.996	1	20
Farm size	202	1.286	0.932	0.5	7
Farm ownership	202	0.921	0.271	0	1
Extension service	202	0.441	0.498	0	1
Member	202	0.144	0.352	0	1

Appendix B: ANOVA Results

Source	ss	df	ms
Model	1.0641e+10	11	976326528
Residual	4.91022e+09	190	25843068
Total	1.5551e+10	201	77367038

Appendix C: Histogram of Normally Distribution



Appendix D: QUESTIONNAIRE FOR HOUSEHOLD SURVEY

This is research that will be administered by **PAUL PEREDIUS** a student from the Mzumbe University pursuing M-EPP. Iam currently carrying out research on **analysis of the determinants of ginger productivity;** A case of ginger farming households in Madaba district of Ruvuma Region. All information attained will be used for academic purpose only and will be treated with strict confidentiality. I humbly request your time in fulfilling it. Thanks

REGION …… Name of interviewer……

DISTRICT …… Date of interview ……

WARD …… Name of Supervisor …….

VILLAGE …… Questionnaire Number……

SECTION ONE: DEMOGRAPHIC CHARACTERISTICS

1. What is your name (household head)? ……..
2. What is your marital status? 1= Married [ ] 2= Single [ ] 3= Divorced [ ]
3. What is your sex? 1= Male [ ] 2= Female [ ]
4. What is your age? ……. years (household head)
5. What is your highest grade of education? 1= none [ ] 2=Primary [ ] 3= O level [ ] 4. = A level [ ]5= Certificate [ ] 6= Diploma [ ] 6= University [ ]
6. How many household members do live in this house?……

   (a) Children……. (b) Adults ……. (c) Dependent ……..
7. Did you migrate to this village? [ ] 1=Yes ( ) 2=No
8. If yes, what motivated you to move? 1= Looking for land to farm ginger [ ] 2= Parent moved [ ] 3=Start new job or business [ ] 4= Look for work [ ] 5= Marriage [ ] 6= To live with relatives [ ] 7= Divorce [ ] 8= Job transfer [ ] 9= Other(specify)……..

SECTION TWO: GINGER PRODUCTION AND OTHER ATTRIBUTES

9. Did you participate in ginger production in the last harvest season? 1= Yes [ ] 2= No
10. For how long have you been participating in ginger production? …….. (Years)
11. What is the average distance from home to the farm? …… KMs
12. What size of the land did you cultivate in the last harvest season (in Acres)? ……..
13. Means of ownership? (a) owning( ) (b) hiring ( )
14. Did you use fertilizers on plot in the last harvest season?[ ] 1=Yes 2=No
15. What type of fertilizer did you use? (a) Chemical ( ) (b) organic ( ) (c) Composite
16. Please identify the cost you incurred by each input in ginger production by filling the table below

Cost items	**Unit price**	**Quantity**	**Total cost**
Bush clearing (acres)			
Seeds			
Fertilizer			
Pesticides			
Weeding			
Harvesting			
Transportation			
Packaging materials			
Storage			

17.What space did you use between one ginger seed? …… (Centimeters)

18.Did you access and receiveany credit on your plot in last harvest season? [ ] 1=Yes 2=No

1. 19. Where did you get the loan?[1] *VICOBA ( ) [2] microcredit institution ( ), SACCOS, Bank ……..*

20. What amount did you get? …….. (Tsh)

21. What was the repayment schedule ……

22. What is the interest rate? ……

23. For how long do you repay the loan? ……

24. Did you receive any extension advisory services on your plot in last harvest season? [ ] 1=Yes 2=No

25. Did you harvest any ginger on cultivated plot in last harvest season? 1= Yes [ ] 2= No [ ]

26. If yes, what was the quantity harvested in the last harvest season? …… kg

27.Did you sell any of the ginger produced in the last harvest season? 1= Yes [ ] 2= No [ ]

28. Ifyes, what was the quantity sold? ..... kg

29. What is the market source of your ginger produce? (a) Government ( ) (b) NGO ( ) (c) other private buyers ( )

30. Number of Buyers availability? (a) Many ( ) (b) few ( )

31.What quantity do you sell to your market Source?.....in term of kg?

(a) Government…….kg (b) NGO……kg (c)other private buyers……..kg

32. What was the price of ginger last season? …… Tsh

33. Are you a member of farmer Association? 1= Yes [ ] 2=No [ ]

34. Which type of association?

35. Advantages of joining the association

36. Terms and conditions for you to become a member

37. What challenges are you facing in ginger production and marketing?
……
……
……
……

38. What option do you think can be adopted to address the challenges?
……
……
……
……

NB; This questionnaire will be asked in Kiswahili language to the respondents in Madaba District in the Wards selected by the Researcher and two or one member from the Village Executive Officer(VEO) office.

VITA

EDUCATION PROFILE

Duration	Qualification	Name of Institution
• 2017-2019	Msc Eco, policy & Planning	Mzumbe University
• 2010-2013	BA. Economics	SAUT-MWANZA
• 207-2009	Diploma in Education	Kasulu Teachers Collage
• 2005-2007	ASSE	Mwenge Open Academy
• 2001-2004	OSSE	Izigo Secondary School
• 2000-2001	Mason & Brick laying	VETA –Mbeya

Career History and Training

Date of Placement	Title	Institution
• 2013 Up to date	Economist	Songea Municipal Council
• 2010-2013	Project Coordinator	John Hopkins University-Dar
• 2009-2010	Purchasing & supplier	Fish Industry –Mwanza

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