ANALYSIS OF SOCIAL-ECONOMIC FACTORS AFFECTING CASHEWNUT PRODUCTION IN RUANGWA DISTRICT, TANZANIA

By

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A Dissertation submitted in Fulfillment of the Requirement for Award of the Degree of Master of Science in Economics (PPM) of Mzumbe University

2013

CERTIFICATION

We, the under signed, certify that we have read and hereby recommend for acceptance by the Mzumbe University a dissertation entitled: "**Analysis of Social- Economic Factors Affecting Cashew nut Production in Ruangwa District**", in partial fulfillment of the requirements for the award of the degree of Master of Science in economics majoring Project Planning and Management of the Mzumbe University.

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The literature and citations from other peoples' work have been dully referred and acknowledged in a text and Bibliography

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Date……

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DEDICATION

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ABBREVIATIONS AND ACRONYMS

ASDP	Agricultural Sector Development Program
BLUE	Best Linear Unbiased Estimator
CNSL	Cashew Nut Shell Liquid
FAO	Food and Agricultural Organization
IPM	Integrated Pest Management
NBS	National Bureau of Statistics
OLS	Ordinary Least Squares
PMD	Powder Mildew Disease
URT	United Republic of Tanzania

ABSTRACT

The study was concerned with the analysis of socio-economic factors affecting cashew nut production with special reference to Ruangwa District Council. Data collection was through structured questionnaire administered to 200 respondents selected through random sampling technique. The overall aim of this study was to investigate the socio-economic factors that affect production of cashew nuts in Ruangwa District. The study objective was realized through the utilization of the multiple linear regression models since model consisted seven variables, F-test and Z-test were used to test the overall significance of the variables. The main objective in using this technique was to predict the variability of the dependent variable based on its covariance with all the independent variables.

The methods of analysis used were descriptive statistics and production function analysis using the Ordinary Least Square (OLS) criterion to estimate the parameters of the production function. Econometric techniques were used to estimate the determinants of cashew production. Linear regression analysis using SPSS (16) and STATA (9) software programs were employed for the modeling of cashew nut production as determined by postulated determinants and to assess the relative importance of various variables. Results showed that majority of the farmers were Female engaged in cashew nut production. Cashew nut farming was the main activity as a minimum farm size was 4.125 acres. Results further revealed that farm size (acreage) physical capital, fertilizer, Price, extension services, primary education were positively related to cashew output while labour and secondary education were inversely related.

Based on findings, the study recommend that the government should emphasize on following in order to increase the production of cashew nut including: increase of land size for the purpose of increasing marginal productivity, use of fertilizers, provision of credits to farmers and improvement of infrastructures including roads, communication infrastructures and energy.

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CHAPTER ONE
INTRODUCTION

1.1. Background Information

Cashew is a native of South America with a likely centre of origin in the cerrudos of central Brazil (Mitchell and Mori, 1987). It is thought to have been brought to East Africa and India by the Portuguese in the sixteenth century (Johnson, 1973). The first export of nuts occurred in 1938 when 210 t of raw nuts were shipped to India (Northwood and Mayumbo, 1970) and widespread planting of cashew was carried out after 1945. In a relatively short time it established itself as an important cash crop for smallholders and by 1960, 37,000t of nuts were being exported and it had become Tanzania's fourth most valuable export. Production increased steadily through the 1960s and reached a peak of 145,000t in 1973. Over the next 13 years there was a catastrophic decline to a low of 16,500t in 1986. Acoording to Brown, Minja and Homad, (1984) it is generally agreed that a complex of socio-economic and biological factors are involved.

Cashew nuts has become one of the major agricultural export crops in Tanzania and was the largest foreign exchange earner in the year 2000 (BoT, 2000).The crop is grown in more than 33 districts in the mainland Tanzania, whereby Mtwara, Lindi, Ruvuma and Coast Regions produce the lions share of the crop. Due to its great economic potentials, farmers from a number of other districts in the mainland Tanzania as well as Pemba have shown interest in the crop.

About 280,000 households are engaged in the cashew crop earning subsistence income only. It is estimates that Tanzania has between fourty and fifty million cashew trees. Most of the trees were planted in the sixties in the traditional villages that existed before the Ujamaa Villages Campaign most of the trees were left behind abandoned as farmers moved into their new villages. The drastic fall in output of cashew nuts after the year 1973/1974 is explained by this factor.

Today, probably only between twenty and twenty five million cashew trees are productive (Northwood and Kayumbo, 1970).

Although the crop is also grown in Coastal and Tanga Regions, its economic importance to the rural population in those areas is fairly limited. This is partly because of the existence of alternative crops. That also earns income to the farmer and the availability of nonagricultural income in those areas. However, for the farmers in the southern Coastal Regions of Mtwara and Lindi, the crop accounts for more than three quarters of farmer total cash incomes.

The increase in production recorded between the year 2005/2006 and 2006/2007 is due to a combining effect of the availability of more farm inputs to farmers and the purposeful intervention made by the Central Government, the Local Government and the farmers themselves to improve output of Cashew nut in the said years. This is demonstrated in the statistical table 1 below showing the cashew nut production position in Tanzania from 2002/2003 t0 2006/2007 (Metric tons)

Table 1. Production Statistics 2002/2003 to 2006/2007 (Metric tons)

No.	REGION	2002/3	2003/4	2004/5	2005/6	2006/7
1	Mtwara	55,892	42,158	38,810	42,621	54,006
2	Lindi	18,852	14,912	15,709	15,385	22,879
3	Ruvuma	4,680	12,712	10,563	13,829	6,658
4	Pwani	9,640	6,394	5,471	3,969	6,623
5	DSM	1,763	1,778	1,485	1,086	2,077
6	Tanga	842	973	652	288	30
7	Mbeya	485	180	300	190	300
8	Morogoro	0	0	50	60	0
	Total	**92,154**	**79,107**	**73,040**	**77,428**	**92,573**

Source: Cashew nut Board of Tanzania, 2007

1.1.2. Production in Tanzania

In terms of global production, Tanzania ranks fourth after India, Nigeria and Brazil. Over the last four decades, Tanzanian cashew nut production has shown considerable fluctuation (Table 2). Between the 1990-91 and 1999-2000 seasons, cashew production has increased six-fold from 17 000 tonnes to 106 500 tonnes. It is estimated that this upward trend will continue for the near future, reaching about 130 000 tonnes in the 2000-2001 season (FAO, 2000).

Various factors are responsible for the past decline in cashew production. The 'villagization' policy by Tanzania Government in the 1970s (Brown *et al*., 1984), aimed at reallocating people from their original settlements to communal villages, contributed to some extent to the decline in cashew nut production, since then most farms were abandoned as the villagers were moved to new settlements. The low yields of the 1980s were associated with factors such as poor crop husbandry, pests and diseases, and low producer prices which discouraged many farmers from investing in the crop.

At the beginning of the 1990s, trade liberalization policies, combined with improved crop husbandry, improved tree stock and more investment in research activities, resulted in an improvement in both cashew production and the cashew industry in Tanzania.

Currently, the majority of cashew production in Tanzania is carried out by small-scale farmers in mono- or mixed production systems. An estimated 280 000 households, covering an area of 400 000 hectares, are involved in cashew production. The government is actively supporting farmers in upgrading their current farming systems and practices in order to improve the condition of the trees and maximize agronomic potential. Current yields are about 3 kg per tree, but under optimum conditions, yields of 8 kg per tree are expected (www.fao.org/inpho_archive/content/documents).

Table 2. Leading African producers of cashew Percentage of African and Global production (1961 to 2000)

Year	**2000**	**1998**	**1995**	**1990**	**1985**	**1980**	**1975**	**1970**	**1965**	**1961**
World	1217210	1070774	944070	606681	520973	464215	563795	511939	386303	287535
Total Africa	432955	405271	274971	125745	114795	162502	358035	345772	248350	172050
Mozambique	35000	51716	33423	22524	25000	71100	188000	184000	136000	107000
% of Africa	8.1	12.8	12.2	17.9	21.8	43.8	52.5	53.2	54.8	62.2
% total	2.9	4.8	3.5	3.7	4.8	15.3	33.3	35.9	35.2	37.2
Tanzania	106500	93200	63400	17060	32750	41416	115840	107445	76000	50000
% Africa	24.6	23.0	23.1	13.6	28.5	25.5	32.4	31.1	30.6	29.1
% total	8.7	8.7	6.7	2.8	6.3	8.9	20.5	21.0	19.7	17.4
Nigeria	176000	152000	95000	30000	25000	25000	25000	25000	22000	7000
% Africa	40.7	37.5	34.5	23.9	21.8	15.4	7.0	7.2	8.9	4.1
% total	14.5	14.2	10.1	4.9	4.8	5.4	4.4	4.9	5.7	2.4

Source: FAO, 2000

1.1.3. Contribution of Commercial Crops to the Gross Domestic Product

As the pillar of both the domestic and the export economy, the agricultural sector in Tanzania engages 80 percent of the labor force, which equaled approximately 13.495 million in 1999, while providing 49 percent of the country's GDP (est. 1996). Agricultural products include coffee, sisal, tea, cotton, pyrethrum, cashew nuts, tobacco, cloves, corn, wheat, cassava, bananas, and vegetables (URT survey, 2009).

1.1.3.1. Contribution to Export Earnings

The value of merchandise exports increased to USD 2,021 million in 2007 from USD 1,743.4 million in 2006, an increase of 15.9%. Most of the agriculture sector contribution to the export earnings is in traditional exports. The value of traditional exports reached USD 290.1 million from USD 267.1 million in 2006 an increase of 8.6%. The increase was due to the increase in the price of coffee, cotton, tobacco and sisal in the world market. However, in 2006 the value had declined from USD 354.5 million realized in 2005. Therefore, during the year 2007, the share of traditional agriculture crops export was 14.3 % (Agriculture Sector Review and Public Expenditure Review 2008/09).

According to Tanzania Ministry of Finance Economic survey report (2010), the value of traditional exports increased to USD 559.0 million from USD 479.6 million in 2009, equivalent to an increase of 16.5 percent. This was attributed to increase in the volume and price of tobacco and cashew nuts exported. Those crops accounted for 41.6 and 17.3 percent of all traditional goods exported respectively. Likewise, in 2010 the average price of coffee, cotton, tea, tobacco, cashew nuts and cloves increased compared to 2009. However, the value of exports of coffee, cotton, tea and cloves decreased. Cash crops, such as coffee, tea, cotton, tobacco, cashews, sisal, cloves, and pyrethrum account for the vast majority of export earnings.

In terms of agricultural exports, coffee constitutes the most important cash crop. According to the IMF, coffee accounted for 17.7% of Tanzania's total exports in 1996. At 16.3% of total exports, cotton was the second most important cash crop, followed by cashew nuts (12.7 %), tobacco (6.4%), tea (2.9%), and sisal (0.7 %). In Zanzibar, the major cash crop is cloves, 90% of which are produced on the island of Pemba. The major importers of Tanzania’s agricultural exports consist of the EU countries, especially the United Kingdom, Germany, and the Netherlands.

1.1.3.2. Creation of Employment

Currently 77% of Tanzania's population makes their living out of agriculture. Agriculture sector needs large labour force largely due to its structure. Within this scope, while the share of agriculture in employment was 90% in 1970, the rate regressed to 77% in 2006. The Labour Force Surveys 2001 and 2006 show that the population in agriculture sector employment were 13.9 million (82.2%) and 14.1 million (77%) respectively. However, despite decreasing trend of employment in agriculture sector: agriculture sector is still the largest employer since independence, agriculture sector is a potential sector to contribute effectively in poverty alleviation especially income poverty if well developed (URT, 2010).

1.1.3.3. Provision of Industrial raw materials

Three main cashew products are traded on the international market including raw nuts, cashew kernels and cashew nut shell liquid (CNSL) while the fourth product, the cashew apple is generally processed and consumed locally. The raw cashew nut is the main commercial product of the cashew tree, though yields of the cashew apple are eight to ten times the weight of the raw nuts. Raw nuts are either exported or processed prior to export. Processing of the raw nuts releases the by-product CNSL that has industrial and medicinal applications. The skin of the nut is high in tannins and can be recovered and used in the tanning of hides. The fruit of the cashew tree that surrounds the kernel can be made into a juice with high vitamin C content and fermented to give a high proof spirit.

Cashew kernel is known for its delicious, pleasant taste and for balanced nutritive profile. 100 gms of cashew kernels contributes about 600 calories. The nutritive values present in cashew kernels are protein, fats, carbohydrates and have all the fat soluble vitamins (A, D, E and K) . It is also a source of minerals like calcium, magnesium, phosphorous, potassium, sodium, iron and other minerals, which help to prevent anemic and nervous ailments. Cashew is a perfect food with zero per cent cholesterol. Worldwide it is considered as a snack item.

At present the dry leaves are used as natural manure for the few other crops. The dead branches and twigs are regularly collected for firewood. The fat and protein content are 42.2 and 20.8 per cent (FAO, 2000).

The kernel contains 40% oil, which resembles almonds, and it is used in the treatment of leprosy, warts, worms, and ulcers. It can also be substituted for iodine. Cashew nut oil can be used in creams, massage oils for skins and lip balms. The by-products like cashew nut shell liquid contains 35% of a viscous liquid called CNSL which is a valuable raw material used in a number of polymer based units/ industries for preparation of oil paints, varnishes, water proofing agents, adhesive ingredients, pigments of gums, indelible inks, cardboard finishing reagents, typewriter rolls, automobile break lining and lubricants in air planes. Wood is used in building, boats and ferries, fixing poles, and false ceiling. Cashew testa contains 40% tannin, which is used in large quantity as an auxiliary material for the manufacture of commercial tannin extract unit. The cashew apple is used in preparing fruit juice, syrup, candy, jam, jelly, chutney and pickles of different recipes and also alcoholic drink. Cashew wine is prepared from cashew apple in many countries throughout Asia and Latin America and India particularly in Goa, popularly known as fenni.

The cashew kernels supply about 6000 calories of energy per kg as against 3600 by cereals, 1800 by meat and 650 by fresh fruits. The cashew apple is very rich in vitamin C (262 mg/100 ml of juice) and contains 5 times more vitamin C than an orange. A glass of cashew apple juice meets an adult individual's daily vitamin C (30 mg) requirement. Cashew also plays prominent role in the medicinal industries as a curative of disorders in the human beings such as scurvy, stomachache, diarrhea and cholera etc. respectively. It is consumed as either raw or roasted as it is rich in nutrients and also crisp and tasty. A kernel particle is also used as an excellent poultry food. The consumption of kernels does not lead to obesity and diabetic patients can also take without any problem (Guledgudda, 2005).

1.2. Statement of the Problem

More than 80% of the country's population and about 40% of the export value of the country depend on agriculture (Hoguane, 2000). Thus increasing agricultural production in order to feed population, to produce raw materials for local industry and export in sufficient qualities to sustain a healthy economy, is the major plan of the country (Voortman, 1985).

The Cashew Industry is a sub sector of the agriculture sector, which according to the Tanzania's economy, is the backbone of the economy of the country. The economic importance of agriculture in general arises from the fact that it earns a sizeable amount of foreign exchange to the nation and makes a good contribution to the GDP. Cashew nut is also important relative to other cash crops in foreign exchange earnings. On average it contributes 4% to the total earnings of foreign exchange of the country (http://data.worldbank.com).

Since 1975, had witnessed a decline in the world production of cashew nuts mainly due to political instability in some African producing countries, socioeconomic problems and the impact of fungal diseases in the major African producers of cashew nuts (FAO, 1993).

Widespread planting of cashew in southern Tanzania was carried out beginning from 1945 after which it developed to an important smallholder cash crop. Expansion first started on the Western Makonde Plateau from where it spread northwards to Lindi and Coast regions and eastwards to Ruvuma, Mtwara, Lindi and Ruvuma areas which produces about 70% of the crop. By 1960, production reached 40,000 tonnes of nuts which were exported. Production continued to increase and reached a peak of 145,000 tonnes in 1973/4 after which there was drastic decline to low of 16,500 tonnes in 1986/7. The reported production decline was a combination of biological and socio-economic factors (Brown *et al.*, 1984).

Table 3. Cashew nut production District wise 1998-2007/08

Years	**Districts**						**Total**
	Lindi	Lindi (R)	Nachingwe a	Ruangwa	Liwale	Kilwa	
1998/99 (MTS)	-	2,625.947	4,283.444	4,474.974	2,853.136	499.759	**14,737.26**
1999/2000 (MTS)	-	4,150.425	4,691.840	3,780.576	4,668.560	360.630	**17,652.03**
2000/01(MTS)	115.550	3,981.798	6,848.451	4,458.281	6,081.100	487.469	**21,972.65**
2001/02(MTS)	130.000	3,959.902	2,649.695	2,347.304	2,469.274	320.000	**11,876.18**
2002/03(MTS)	-	3,499.691	6,020.378	5,560.019	2,713.234	1,058.706	**18,852.03**
2003/04(MTS)	-	3,195.579	3,402.840	3,907.342	3,768.646	637.628	**14,912.04**
2004/05(MTS)	100.000	2,335.501	6,060.349	4,291.738	1,888.692	255.056	**14,931.34**
2005/06(MTS)	500.000	1,011.910	5,381.528	3,947.390	3,577.901	966.320	**15,385.05**
2006/07(MTS)	200.000	726.975	11,458.076	5,056.364	5,299.589	138.318	**22,879.32**
2007/08(MTS)	281.066	3,971.423	6,889.908	8,440.417	3,557.807	693.663	**23,834.28**
Total Lindi Region	**1,326.62**	**29,459.15**	**57,686.51**	**46,264.41**	**36,877.94**	**5,417.55**	**177,032.17**

Source: Cashew nut Board of Tanzania, 2009

Cashew nut production has been significantly continuing to fluctuate in Lindi Region and Ruangwa in particular since 1998-2007/08 as stipulated in Table 3 above, this trend has continued to date, and the information on the factors responsive for this decline is scanty. There is therefore, need to conduct an assessment of the socio-economic factors influencing production of cashew nut and the information generated will come up with recommendations to improve the situation.

1.3 Objective of the Study

The overall aim of this study was to investigate the socio-economic factors that affect production of cashew nuts in Ruangwa District.

1.3.1 Specific Objectives

1. To identify socio-economic factors that affect cashew nuts production.
2. To identify the Correlation between socio-economic factors on cashew nuts production
3. To generate information and provide recommendations to policy makers, that will increase the production of cashew nuts in Ruangwa District and Tanzania in general.

1.4 Scope of the Study

The research study included independent and dependent variables whereby independent variable was social-economic factors affecting the production of cashew nut in Ruangwa and output was considered as dependent variable. Social-economic factors including price, land, seeds, physical capital, education, extension service and fertilizer variables will be considered as independent variable while cashew nut output will be dependent variable.

1.5 Rationale of the Study

a) The study provides information and recommendations that is useful for agriculture policy decision makers, planners, to increase cashew nut productivity in Ruangwa District and Tanzania at large.

b) The study provides information of socio-economic factors influencing cashew nut productivity.

c) The study is conducted as a requirement for the partial fulfillment of successfully award of the Masters of Science in Economics majoring Project Planning and Management.

1.6 Analytical framework

The economic model commonly used to determine the relationship between the various factors and the output in agriculture is production function model. The production function of any farmer is determined by resource availability of the farmer. In agriculture, the production inputs consist of land, labour and capital as the basic factors of production. The expected relationship between output and land is that as more land is brought under production, output is increased (Malassis, 1975). The simplified form of production function is given by:

$$Q=f(L\_d,K,L) \quad (1)$$

Where Q is the production output, which is a function of land (Ld), the capital (K) and the labour force (L) used in production of the same output. A production function may be defined as a mathematical equation showing the maximum amount of output that can be realized from a given set of inputs. The mathematical form of the Cobb-Douglas production function is given by:

$$Q=AL^{\alpha} K^{\beta} \quad (2)$$

Where Q is the output, A is the technology used in the production of output, L is labour input, K is capital input and both are elasticity. Alternatively, a production function can show the minimum amount of inputs that can be utilized to achieve a given level of output (Malassis, 1975). We adopted Malassis idea and extend it by adding other variables including price, fertilizers and physical capital as economic factors , extension services and education as Social factors so that to find out the impact of these factors on farm level production of cashew nut on farmers in Ruangwa District, the functional relationship is specified

1.7 Organization of the thesis

The study has been organized in six chapters.

Chapter One: Entails the purpose of the research. This chapter provides preliminary information about the nature of the research and what will exactly be done.

Chapter Two: reveals literature sources which the researcher passed through when developing his idea about the research. Other people's ideas were incorporated with the aim understanding well the research topic.

Chapter Three: Is the methodology part. This section explains the way the research has been conducted. The methods and techniques adopted.

Chapter Four: This chapter presents the findings as observed during the research. Instruments like, tables were used to present similarities and differences of the research findings.

Chapter Five: This chapter presents discussion of the findings as were presented in chapter Four.

Chapter Six: Is the summary, conclusion and policy implication. The researcher makes summary of what has been done, observed and presented, implications of the findings and recommendations to policy makers. The last part presents the bibliography and the appendices

CHAPTER TWO

LITERATURE REVIEWS

2.1. Introduction

This chapter reviewed the research work done in the fields related to the objectives of the study. For the sake of convenience, the reviews were presented under the following sub-headings theoretical literature, empirical literature, literature overview, conceptual framework and factors affecting cashew nut production

The agriculture sector which employs more than 74 percent of the population grew by 3.6 percent in 2011 compared to 4.2 percent in 2010. Despite slow growth of agriculture sector, Tanzania continued to be food self sufficient whereby food self sufficient ratio averaged 95 percent. This ratio is obtained by comparing domestic food production and food demand. Food self sufficient ratio in 2010/11 was 112 percent compared to 102 percent in 2009/10. In 2011, the value of cashew nuts exports increased to USD 107.0 million from USD 96.9 million in 2010, equivalent to an increase of 10.4 percent. The increase was driven by the rise in average price of cashew nuts in the world market although the volume of cashew nuts exports decreased. It is reported that the average price of cashew nuts in the world market increased by 15.2 percent, from USD 963.2 per tonne in 2010 to USD 1,110.0 per tonne in 2011. However, the volume of cashew nuts exports decreased to 96,400 tonnes in 2011 from 100,600 tonnes in 2010, equivalent to a decrease of 4.2 percent (URT Survey, 2011).

2.2. Theoretical Literature

According to Schultz (1965), population growth is probably the best–known problem of economic development and provides the most publicized argument for expanding agricultural production. Schultz ranks agriculture throughout the world in accordance with the contribution it is making to economic growth. For this purpose, economic growth means simply increases in national income. Agriculture is then one of the sources of national income.

There are countries which practice traditional agriculture, and others modern agriculture. Traditional agricultures occur in a wide variety of institutional forms, ranging from highly communalized systems to small farms organized around their family unit. Generally peasant farms produce in excess of what the farm family chooses to consume and sell that surplus in the market, in order to purchase non-farm goods and services. This surplus varies among farms, regions, and nations. There is also variety in size of farm, state of technology and the degree of specialization in production.

Schultz (1964) argues that agriculture is treated as a source of economic growth, which can act as an engine of development, but the form of investment is important for the realization of this goal. Incentives to guide and reward farmers are seen as an important component of the investment to increase agricultural production. Transforming traditional agriculture into a highly productive sector depends on the investment made on agriculture and the form it takes, makes it profitable. Schultz continues to say that once traditional agriculture is established, the equilibrium is not readily changeable. He further hypothesizes that there are comparatively few inefficiencies in the allocation of factors of production in traditional agriculture.

Lloyd (1975), like Schultz affirms that agriculture plays a role of resource reservoir, which can be drawn on for supplies of food, labor, and finance to fuel the growth of urban activities. In many LDC's such as Kenya for instance, in the study done by Southworth and Johnston (1974), they found that agriculture is by large margin the largest single sector of production. The contribution of agriculture and other rural work to total employment is greater. The share of agriculture is almost two third while non-rural employment makes up seventeen percent of the national total. . Agriculture has contributed significantly to the country's success during the first fifteen years of independence in achieving rapid economic growth without running into major balance of payments crises.

Labor is the primary instrument for increasing production within the framework of traditional agriculture. The analysis done by Mellor (1974) states that families with small farms (a small resource base) will maximize utility by providing greater labor input per acre and achieving higher yield per acre than families with larger farms (a large resource base). It is quite possible that in low-income societies the marginal productivity of labor is so low that it will, even under the most favorable circumstances in regard to the supply and displays of consumer goods, still not equal the slope of the utility curves once the traditional subsistence level has been reached.

The analysis done by Hayami and Vernon (1971) confirms that the relative availability of labor and land in the agricultural sector is a result of original resource endowments and the resource accumulation associated with historical growth processes of each economy. For instance, in Asia, land has been the major factor limiting the increase in output while in the new continents; a relatively inelastic supply of labor has represented the most significant constraint on growth of output. In order to ease the limitation set either by land or by labor; farmers try to economize in the use of the limiting factors or to substitute man–made inputs for it, e.g., fertilizer for land and tractors for labor. The growth path followed by the countries in the new continents seems to reflect a process of easing the limitation set by labor, and the one suggested by Asian countries reflects a process of easing the limitation by land.

Clayton (1964) noted that it is important to know the problem facing peasant agriculture if they are related to raising agricultural productivity. Schultz (1965) says that the technological possibilities have become increasingly more favourable but the economic opportunities that are required for farmers in the low-income countries to realize their potential are far from favourable. He suggests that government intervention is the primary cause of lack of optimum incentives. It therefore becomes important to determine the conditions that are both necessary and sufficient to attain the optimum increase in agricultural productivity.

Hayami and Vernon (1971) hypothesized that the agricultural productivity gap among countries is based on differences in the prices of modern technical inputs in agriculture and differences in the stock of human capital capable of generating a sequence of innovations which enables agriculture to move along the metaproduction function in response to changes in factor and product price relationships. Technological change will have an income effect and a substitution effect; the first one occurs through a real increase in efficiency so that output is increased with no increase in labor input. Technological change may have important interaction with labor input.

Land in traditional mode of production is the main inputs and farmers believe that any person without access to arable land is poor and destitute (Kuamar 1996). So they rely on traditional cultivation, as the only way of living, and even those without or with little land make no other efforts than struggling hard in order to have access to at least a small piece of land through various tenant farming arrangements. Mellor (1974) continues to say that in low–income countries, the land measures the economic and social position. Although most farmers in low–income countries have opportunity to increase their incomes through increased labor input, that is by working harder, the resulting increase in income is normally very low. The pressure of population on the existing land resource may have driven the marginal productivity of labor and other inputs to a level, which favors expanding cultivation outside the extensive margin to successively poorer quality land. Such expansion of the land area is, of course, an indication of declining levels of living may be small.

According to Clayton (1964), the importance of land tenure arrangements in peasant agriculture is a factor impeding progress in agriculture. Labour difficulties due to the seasonal nature of peasant farm organization are also important in determining output. Unsatisfactory marketing arrangements for farm produce and long distance or poor communication resulting in high transport cost hamper the peasant farmer as these may make the sale of surplus unnecessary and not worth while, thus hindering agricultural growth. Poor farming practices are further difficulty in peasant agriculture.

In Rwanda land becomes a serious problem because of the high population density. Land is inherited and subdivided according to the number of members of family. This means that the labor is abundant resource. The total supply of rural labor is too high (US Census Bureau, population Division, 2005). As stated by Mellor (ibid) that there is little relation to the level of factor returns until the population becomes so large that the average product of labor drops close to subsistence level.

Hayami and Vernon (1971) divided the sources (capital) of productivity growth into three broad categories: (i) Resource endowments which include not only the original land resource endowments but also internal capital accumulation in the form of land reclamation and development, livestock, inventories, and so forth. (ii) Technical inputs which include the mechanical devices and the biological and chemical materials purchased from the industrial sector (ii) Human capital which is broadly conceived to include the education, skill, knowledge, and capacity embodied in country's population.

There are, however, a number of genotype and environmental factors that influence tree yields, including soil fertility, moisture, management, and pests. There seems to be little, if any, variations in genotype factors among smallholder cashew trees, whereas, environmental factors vary across different agro-ecologies in Mozambique. Cashew, a drought tolerant crop is grown in a variety of agro-ecological conditions. Often, cashew is found planted on poor soils not suited for other crops. As long as soils are deep and freely drained, cashew responds favorably to high levels of organic matter and mineral nutrients. In these soils, cashew growth is distinctive and mature tree yield differences are less marked because trees can send their roots further down for nutrients (Northwood, 1962; and Opeke, 1982).

In addition to soil type, rainfall level and its distribution along the season are important factors thought to affect yield. High rainfall in general is good for cashew, but at specific times it is not particularly favorable due to the easy development of fruit rot under high rainfall and humidity conditions, at the same time, lack of water can reduce yield. Long periods of below average rainfall make cashew trees lose their leaves and production can be up to 40 percent less than normal. With good rains trees recoup vigor and production can double. It is reported that rainfall levels must be around 900-1,100 mm annually and must also be evenly distributed over the nine to 10 months of its growing season (Opeke, 1982). Despite fruit rot and the high probability of Helopeltis attack due to extra moisture during the wet season, varying rainfall patterns seem to some extent to be related to the biennial bearing characteristics of older cashew trees. Another critical natural factor for cashew development is direct insolation, clear or cloudless skies. While these factors favor cashew production, excessive overcast skies and wind storms, have a negative effect on cashew yields (ibid).

As it was in Tanzania, improvements in tree and field management practices will have the most significant influences on tree yield and overall production in the next five years in Mozambique (Topper and Caligari, 1998; and INCAJU, 1998). However, it seems unlikely that improved management practices will have significant impact on yield, if disease control strategies are not in place. The negative effect of disease incidence on yield is compounded by planting density and spacing, particularly high grouping density when trees mature at irregular spacing (Tsakiris, 1967). For example, yields at close spacing of 20 ft. by 20 ft. are higher in the first fruiting years, but decline considerably over the years as trees become less vigorous and canopies compete with one another. The main reason is the excess demand for evapotranspiration over water availability, as competition for water and nutrients rises, and canopies of adjacent trees overlap (Dagg and Tapley, 1967). As the canopies overlap, fewer panicles and thus nuts are set and increased shading improves powder mildew disease (PMD) survival conditions (Topper et al., 1999).

Other factors which contributes to low yields in the study area are fire and sucking pest damage from Helopeltis spp. Damage from fire is also considered to be a major problem and to some extent has a strong negative impact on new cashew planting, given the lack of sufficient economic incentives and institutional innovations within the current legal system to better enforce property rights, and thereby provide incentives for newer smallholder tree investments. Helopeltis damage causes black lesions on panicles and new shoots which leads to its death and thus yield loss. It is believed that there is a high level of PMD incidence and other diseases across most of Mozambique's cashew growing areas, and there seems to be relatively little variation within villages in the study area. The potentially major differences might be across agro-ecological zones, especially in areas with great variation in rainfall patterns and temperature (Jeff Hill, 1998, personal communication).

Fertilizer application: In Brazil, the cashew crop has been seldom manured regularly. Indeed, cashew was not cultivated with intensive management until the new genetic potential of the dwarf-precocious type was introduced. However, cashew crop requires regular fertilizer application, particularly from fruit set onward (Nair et al., 1979). In accordance with Parent and Albuquerque (1972), the combined application of potassium and phosphorus is indispensable in the first stages of cashew growth. Moreover, experiments have demonstrated that regular application of nitrogen, potassium and phosphorus is beneficial for obtaining healthy trees and increasing cashew yields (Azam-Ali and Judge, 2001).

Despite this historical role of agriculture in economic development, both the academic and donor, communities lost interest in the sector, starting in the mid-1980s, mostly because of low prices in World markets for basic agricultural commodities. Low prices, while a boon to poor consumers and a major reason why agricultural growth specifically, and economic growth more generally, was so pro-poor for the general population, made it hard to justify policy support for the agricultural sector or new funding for agricultural research or commodity-oriented projects (World Bank, 2004).

However, with the current high prices in world markets for basic agricultural commodities, and the historical role of agriculture in economic development, there is now renewed interest in the agricultural sector.

2.3. Empirical Literature

Several studies have been done on agricultural production using the production function model, and supply response model to estimate the impact of various factors on output changes. The combination of both allows estimating total impacts of institutional reforms, price realignments and technological factors on agricultural production. Macours and Swinnen (1997), in their paper they quantify the relative importance of the different causal factors of the changes in agricultural production in Central and Eastern Europe since 1989 using a production function and supply response approach. The analysis shows that the deterioration of the agricultural terms of trade explains a considerable part of the production change. The shift of the production to family farms caused a productivity increase due to improved labor effort but the process of disruption of the production structures caused a (temporary) negative effect. The net effect of the restructuring was slightly positive.

Macours and Swinnen (ibid-1997) used the same approach as Lin (1992) who analyzed the impact of Chinese reform on agricultural output and productivity. As Lin, they applied a production function model and a supply response function model to aggregate (sector-level) data. The different causal factors can influence production by inducing changes in input use, or by causing changes in productivity. With the production function model, the factors that influence productivity can be identified. The supply response function model allows indicating all causal factors, the ones that have an impact on productivity as well as the ones that influence the use of production factors. This idea is supported by Mbithi (2000) that the supply response has an impact on economics as well as on agricultural development, poverty, equity and the environment at large; so, policy makers need supply response information on both individual activities and on the sector aggregates.

By comparing the two models, we cannot only determine which factors caused the output changes, but also how this occurred. Their study used the Cobb-Douglas specification of the agricultural production function, which is the most commonly used function in these studies and the results obtained was good.

Two additional arguments were their limited number of observations and it allowed them to compare their estimates of input-output elasticities with respect to each input with the other studies. The amount of output generated with a certain amount of inputs depends on the intensity and quality of input use. For example, workers react on incentives, created by the institutional and economic environment, by changing their labor effort and thus the intensity of the production factors (Leibenstein, 1966; Carter, 1984). To account for the different factors that affect productivity, different production function shifters are included in the model. The specification of the production function is:

$$\ln(\text{OUTPUT it}) = \alpha 0 + \alpha l \ln(\text{CAPITAL it}) + \alpha 2 \ln(\text{LABOUR it}) + \alpha 3 \ln(\text{FERT it}) + \alpha 4 \ln(\text{LAND it}) + \alpha 5\, \text{INDit} + \alpha 6\, \text{DISRit} + (\alpha 7 + \beta \text{CSHi})\text{PRit} + \alpha 8 \text{UNCit} + \epsilon \text{it} \qquad (1)$$

Whereby ***i*** refer to country, ***t*** to year. The ***α***'s and ***β*** are the coefficients to estimate and ***ϵit*** is the error term. The production function has four conventional inputs: capital, labor, fertilizer and land. In addition, four other variables are included to capture the effect of farm restructuring (IND), disruption (DISR), privatization (PR) and uncertainty (UNC).

The impact of the weather on crop output is captured by the conventional inputs, due to the way these were defined in the model. Therefore, a weather variable is explicitly included in the supply response model but not in the production function model. The individual farm variable (IND) is measured as the change in the share of total agricultural land used by individual farms (family farms). This is used as a proxy for the increase in the agricultural working force in individual or family farms and reflects the impact of labor effort on output. With the production function, they indicate the effect of factors that affect output through a change in technical efficiency.

However, also the causal factors for the change in inputs, accounted for in the production function, can be identified. The estimation of a supply function allows quantifying the impact of producer price and input price changes on output changes. Furthermore the importance of factors that affect allocative efficiency as well as technical efficiency can be quantified. The specification of the supply function model is:

$$\ln(OUTPUTit) = \alpha 0 + \alpha l \ln ((PP/IP)it-1) + \alpha 2 \ln(WEATHERit) + \alpha 3\ INDit + \alpha 4DISRit + (\alpha 5 + \beta CSHi)\ PRit + \alpha 6UNCit + \epsilon it \quad (2)$$

The specification for IND, DISR, PR and UNC is the same as in the production function model, where ***i*** refers to country, ***t*** to year, the ***α'***s and ***β*** are the coefficients to estimate and ***eit*** is the error term in the model.

As in the production function model, the dependent variable is normalized around the 1989 value, as well as the price and the weather variables (PP, IP and WEATHER). The relative price index, PP/IP is the ratio of producer prices to input prices and measures the agricultural terms of trade faced by the farmers. PP measures the evolution of the commodity prices. IP measures the evolution of the input prices.

Theoretically, the relevant price variables should be the expected prices. WEATHER measures the rainfall in year t rainfall during the crucial months for crop production (as in Herdt, 1970) and is expected to be positively related to output.

In the discussed paper of McKay et. al. (1997) entitled "Aggregate export and food crop supply response in Tanzania", they used the Nerlove's model devised for single commodities, and the model involves a one stage procedure and directly regresses production on prices and other relevant variables. This study describes the dynamics of agricultural supply by incorporating price expectations and/or adjustment costs. The general form of this supply function is:

$X^*t = a + bP^e_x$ (3)

Where;

X^*t is the desired or equilibrium output X at time t and P^e_x is the expectation of price P_x at time t formed at time t-1.

First there is assumption that the dynamics of supply is driven by price expectation only so that $X^*_t = X_t$. The Nerlove's model price expectations are generally assumed to be adaptative:

$P^e_{xt} = P_{x,t-1} = (P_{x,t-1} – P^e_{x,t-1})$

Or

$P^e_{xt} = P_{x,t-1} + (1-) P^e_{x\,,\,t-1}$ (4)

Hence

$$P^e_{xt} = \sum_{i=1}^{T} (1-)^{i-1} P_{x,t-1}$$

By substituting 4 into 3

$X_t = a + bP_{x,t-1} + (1-)X_{t-1}$ (5)

Where (0<P<1) is the price expectation coefficient, b is the long-term elasticity of X with respect to Px (long-run supply response), and b short term elasticity (immediate response).

Peter and Falcon (1975) , estimate in the model of the Southeast Asian rice economy a cross-section production function for rice for the year 1962 to 1970. A standard Cobb-Douglas production function containing rice area harvested and total fertilizer nutrients applied, with separate intercepts for each country, adequately explains the widely different levels of rice production in the nine countries examined (i.e., Japan, Burma, Thailand, Indonesia, Philippines, Malaysia, Taiwan, Ceylon, and South Korea). The area devoted to rice culture in any country is a long run policy variable, especially in terms of irrigation investment, but it has limited flexibility in the short-run. Thus for a given area, the emphasis must be on the factors that affect output in the short-run, such as fertilizer.

Holding other things constant, the level of fertilizer application determines yields. The empirical estimate of the aggregate fertilizer-yield relationship for the sample of countries using the Cobb-Douglas, log-linear form usually assumed for this type of analyses, the critical parameter is the elasticity of output with respect to fertilizer:

$$Q = AH^{\alpha}F^{\beta} \quad (6)$$

Where Q represents rice production, H is the area harvested, and F is the fertilizer application, the relationship between output (Q) and the ratio of rice price to fertilizer price to the farmer (P) is of the form:

$$Q=(A\beta H^{\alpha} P^{\beta})^{1/1-\beta} \quad (7)$$

The elasticity of Q with respect to P is 1/1-β The result of several alternatives was of estimating the value of β (the coefficient attached to F or F/H). The major criticism levied against the data used was that, no attempt was made to determine amounts of fertilizer actually used on rice.

A test done by Hayami *et al.,* (1971) on the production function was specified as being of the Cobb- Douglas type, assuming unitary elasticity of substitution among inputs. The attempt to test the assumption by estimating the parameters of the CES production function developed by Hayami *et al.,* (1971). The models used for estimation are:

$$\text{Log } (Y/L) = a + b\log W + C\log z \quad (8)$$

And

$$\text{Log } (V/L) = a' + b'\log W + c'\log z \quad (9)$$

Where Y and V are respectively gross output and value added in agriculture; L is labor; W is the wage rate (measured by output); Z is the shorthand notation for nonconventional variables, which shift production function (general and technical education, in this study). Under competitive factor markets b and b' measure the elasticity of substitution (between labor and the aggregate of other conventional inputs, including current inputs in case of b and between labor and capital in the case of b').

In order to be consistent with the C-D production function, the estimated parameters of b and b' should not be significantly different from one, and the estimated parameters of c and c' should not be significantly different from zero. After regressing different equations from the above models, the results of estimation based on data of twenty-two countries, two alternative sets of wage data were employed for estimation: current wage rate (Wt: 1957-62 averages) and lagged wage rate (Wt-1: 1957-62 averages). The lagged wage rate was tried to determine whether the adjustment might not be instantaneous. The results are quite similar, because there is a high correlation between current wage and lagged wage. The Koyck-Nerlove type of distributed lag model was also tried, and the results were implausible, however probably because of inter-correlation between the wage rate and the lagged dependant variables.

Assessing the social and economic impact of improved banana varieties in East Africa, Lusty and Smale (2002), analyzed the household model under perfect market conditions and found that production and consumption decisions are assumed to be made separately. On the production side, which is subject of our study, the household chooses the levels of labor and other variables inputs that maximize farm profits given the current configuration of capital and land and the expenditure constraint. Optimal input choices depend on input prices, output prices, and wage rates, as well as the physical characteristics of the farm technology. In this household model, they prove that soil quality and technologies are considered exogenous factors, which do not change with time. The soil quality is also affected by farmer decisions, since quality declines in terms of soil nutrients and soil organic matter during the production process. Soil quality is affected by two type inputs; yield increasing inputs (such as new banana varieties) and soil conserving inputs. Based on this analysis, it has practical application to the Tanzanian case. However, we note that Lusty and Smale conducted their analysis under the assumption of perfect market information in the East African countries of Uganda and Tanzania. These two countries have almost a similar culture of banana planting with that of Rwanda.

2.4. Literature overview

This section will summarize both theoretical and empirical literature related to the socio-economic factors of production in agricultural development. As can be seen from both theoretical and empirical literature, land, labor and capital are the basic factors of production. Different models and recommendations have been suggested.

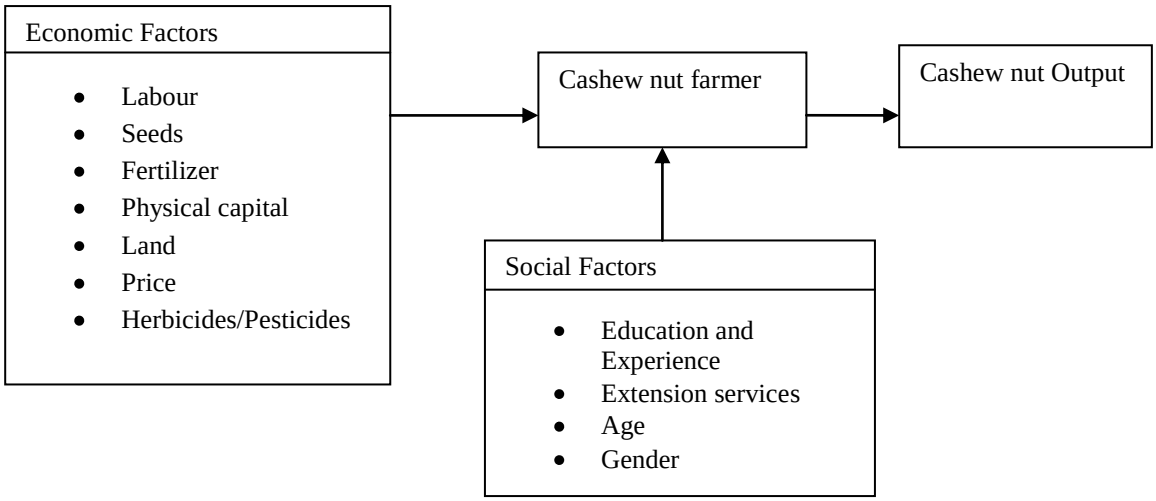
The rate at which an economy becomes transformed from a primarily agriculture economy to mixed economy will depend mostly on the proportion of the labor force, the technique of farming, the capital used, and the way the land is maintained. It has been hypothesized that the differences in technical inputs and human capital do account for every substantial share of the agricultural productivity gap among countries and even within the resource endowments category internal accumulation appears to be relatively important as compared to the original endowments of land (Hayami et al; 1971).

In the Tanzanian context, little emphasis has been accorded to analysis of the socio-economic factors affecting the production in agriculture and cashew nut in particular. Thus this study seeks to fill this inadequacy since the majority of the studies looked are applicable in developed countries where the information provided does not fit very well the situation of Tanzania. In this study an attempt will be made to use production function model to analyze the relationship between the output and the different socio-economic factors affecting cashew nut production in Ruangwa District.

2.5. Conceptual framework

This study relies on the hypothesis that productivity of cashew nut in Ruangwa District is determined by social and economic factors. The identified economic factors are; labour, seeds, fertilizers, physical capital, land, and price whereas the social factors are; education, extension services, Age and Gender.

Figure 1. Conceptual framework showing factors affecting cashew nut productivity



Source: Researcher Construction, 2013

Land, the expected relationship between output and land is that as more land is brought under production, output is increased (Malassis 1975) and vice versa is true. *Labour*, the more the great number of manpower is employed in the cashew nut production activity, the more the large area/land is brought into production and henceforth increases the cashew nut farm productivity. Adult males carry out most cashew activities and particularly the heavy work of rehabilitation; adult females contribute significantly to weeding; harvesting is frequently a family activity. A shortage of labour has probably been one of the most important factors limiting the rehabilitation of abandoned farms, particularly those that were abandoned for many years (Martin *et al.*, 1997).

Physical Capital, the more the physical capital is employed in the farm productivity of cashew nut for improving technology transfer to farmers by employing and training of more extension staff, establishment of village demonstration plots and provide incentives to extension staff including transport facility the more the productivity.

Education (Farmer knowledge), there is a great need of improving farmer knowledge on technical issues related to cashew growing and processing together with farm business management. If at all special training for farmers is provided in accordance to their requirements will lead to the increase of cashew nut productivity and vice versa is true. *Fertilisation*, the more the application of nitrogen and phosphate (Fertilizers) the more the output of cashew nut and vice versa is true. *Price*, the expected high price of cashew nut will lead to high production and vice versa is true. Since price will act as a motivator to the cashew nut farmer

2.6. Hypothesis

This study has two hypotheses; the null hypothesis denoted by H_o and Alternative Hypothesis denoted by H_1, the acceptance of null hypothesis will lead to rejection of alternative hypothesis and vice versa is true.

H_0: Production of cashew nut in Ruangwa District is determined by socio-economic factors

H_1: Production of cashew nut in Ruangwa District is not determined by socio-economic factors

CHAPTER THREE
RESEARCH METHODOLOGY

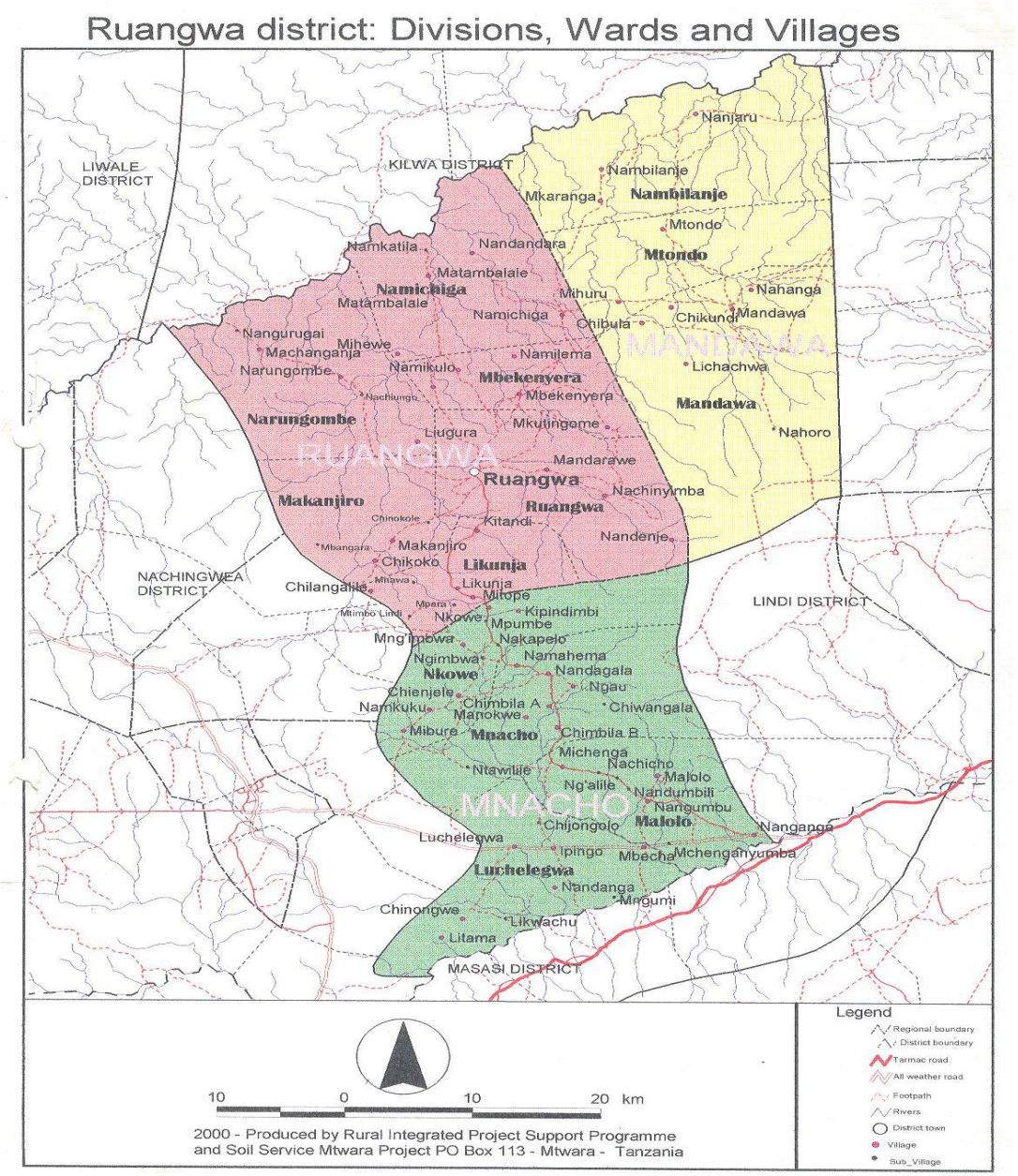
3.1. Introduction

This chapter explain the research methodology used in this study. The sub tasks covered in this chapter includes; Study area, Demographic characteristics , District Economic activity , model specification for the study, Econometric model, Estimation techniques, Regression model , Sample and sampling method ,Data and methods , Limitations of the study.

3.2. Study Area

The research study was done in Ruangwa District. It's one of the 6 Districts which form Lindi Region with a total area of 2,560 km^2 which is approximately equal to 256,036 hectors. It lies between latitude $9.5^{0\ S}$ and 10^0 S and longitude 38.5^0E and 39.5^0E. The district shares borders with Kilwa District in the north, Liwale in the Northwest, Nachingwea and Masasi in the South and Lindi in the East. Arable land covers about 204,826 hectors, natural and planted forests 40,614 hectors and 10,562 hectors is used for human settlements and other uses. The District has 89 registered villages, 379 sub villages (hamlets), 21 wards that form 3 Divisions of Mandawa with an area of $744km^2$, Mnacho that has $970km^2$ and Ruangwa with an area of $840km^2$.

Figure 2: Ruangwa district: Divisions, Wards and Villages



Source: Ruangwa District Planning Section, 2013

3.3. Demographic Characteristics

Based on the 2012 Population and Housing Census, Ruangwa has 131,080 inhabitants, of whom 63,265 are males and 67,815 are females (NBS Census, 2012).The dominant ethnic group is Mwera.

Table 4: Population of Ruangwa District Council by Sex, Average Household Size and Sex Ratio

Serial No.	Ward/Shehia	Population (Number)			Average Household Size	Sex Ratio
		Total	Male	Female		
	Total	**131,080**	**63,265**	**67,815**	**3.5**	**93**
1	Ruangwa	5,435	2,546	2,889	3.7	88
2	Mbekenyera	11,257	5,398	5,859	3.6	92
3	Nkowe	5,264	2,610	2,654	3.3	98
4	Malolo	7,405	3,572	3,833	3.3	93
5	Luchelegwa	4,528	2,210	2,318	3.4	95
6	Chienjele	8,691	4,216	4,475	3.3	94
7	Namichiga	5,165	2,542	2,623	3.6	97
8	Narungombe	8,407	4,086	4,321	3.4	95
9	Makanjiro	3,323	1,632	1,691	3.3	97
10	Likunja	8,425	4,123	4,302	3.4	96
11	Mnacho	6,607	3,195	3,412	3.4	94
12	Mandawa	6,662	3,140	3,522	3.6	89
13	Nambilaje	6,182	3,044	3,138	3.7	97
14	Chunyu	5,810	2,801	3,009	3.5	93
15	Mandarawe	3,796	1,807	1,989	3.4	91
16	Nachingwea	8,142	3,769	4,373	3.4	86
17	Matambarale	5,071	2,492	2,579	3.6	97
18	Chibula	2,937	1,476	1,461	3.4	101
19	Nandagala	5,314	2,529	2,785	3.7	91
20	Nanganga	4,959	2,425	2,534	3.5	96
21	Chinongwe	7,700	3,652	4,048	3.5	90

Source: NBS census, 2012

3.4. District economic activity

A substantial area of Ruangwa District is fully utilized for subsistence farming to enable the inhabitants to earn their living income. The arable land is 204,826 hecters while the main crops grown are cassava, paddy, sorghum, maize coconut, sesame, legumes and cashew nut. Animal keeping is now becoming an important activity. Animals include cattle, goats, sheep, pigs and guinea fowls. Income per capita stand at 296,700 generated mainly from agriculture/livestock and commercial activities.

3.5. Model specification for the study

The analysis of socio-economic factors affecting cashew nut production in Ruangwa District was determined by using a numbers of data collected from the Respondents. Specifications of the Empirical Model were as follows;

Q=f (N, Kp L, F, P, Ed) **(1)**

Where,

Q=total output of cashew nut in terms of quantity (in kilograms) produced,

N=acreage in terms of acres under cashew nut crop,

Kp=physical capital in terms of Tanzanian shillings (Tshs) spent on equipments,

L= labor in terms of man-hours spent on the farm,

F= fertilizer use in terms of Tanzanian shillings (Tshs) spent on fertilizer,

P= price of cashew nut

Ed =level of education attained by the respondent

(It is a dummy variable where 0 = Primary, 1 = secondary and above)

β= is the partial beta coefficient each independent variable.

U= error term.

The above model from (Malassis 1975) was adopted and being modified by adding one variable (Extension services).Therefore the modified regression line now becomes,

Q=f (N, Kp L, F, P, Ed, Ext) **(2)**

Where,

Q=total output of cashew nut in terms of quantity (in kilograms) produced,

N=acreage in terms of acres under cashew nut crop,

Kp=physical capital in terms of Tanzanian shillings (Tshs) spent on equipments,

L= labor in terms of man-hours spent on the farm,

F= fertilizer use in terms of Tanzanian shillings (Tshs) spent on fertilizer,

P= price of cashew nut per kilogram

Ed =level of education attained by the respondent

(It is a dummy variable where 0 = Primary, 1 = secondary and above)

Ext= Number of extension service provided through training

β= is the partial beta coefficient each independent variable.

U= error term.

3.6. Econometric Model

The econometric model is specified as follows;

$$LnQ=ln\beta_0 + \beta_1 lnN_1 + \beta_2 lnK_{P2} + \beta_3 lnL_3 + \beta_4 lnFert_4 + \beta_5 lnP_5 + \beta_6 lnEd_6 + \beta_7 lnExt_7 + U \quad \textbf{(3)}$$

3.6.1. Expected signs of explanatory variables

Table 5. Expected signs

Dependent variables	Explanatory Variables	Expected signs	Explanations of the relationship
Output (Q)	Acreage (N)	+	Output is positively related to acreage. As more land is brought under cashew nut production, output is increased
	Physical Capital (Kp)	+	Output is positively related to Physical capital. The more households invest in cashew nut production, the more the output increases.
	Labor (L)	+	Output is positively related to labor. The more households use hired labor, the more they increase output
	Fertilizer (Fert)	+	Output is positively related to fertilize. The more households use fertilizer, the more they increase the output.
	Price	+	Expected high price of cashew nut will make its output to increase. When the households expect an increase in price of cashew nut, they will be motivated to increase the output
	Education level (Ed)	+	Output is related to education. This means that the more the households are educated, the more output will increase.
	Extension service	+	Output is related to extension service provided to the households. This means that the more the households are trained, the more output will increase.

Source: Research Construction, 2013

3.7. Estimation Techniques

Using Ordinary Least Squares (OLS) technique, the coefficients of the above variables were estimated. For the study to estimate with OLS, the Cobb-Douglas production function had to be a transformed model, to satisfy the Classical Linear Regression Model (CLRM), so as to come up with the usual assumption of Best Linear Unbiased Estimator (BLUE) of α and β respectively. (Gujarati, 2009:159 and 207) and implies a cob-Douglas production function with unit elasticity of substitution (Maddala, 2002: 217).

3.8. Regression Model

3.8.1. Chi-square Test for Association between Variables

A research study on under-five mortality in Bangladesh done by Uddin, Hossain, and Ullah (2000), used contingency analysis to test significance association between dependent and independent variables by applying the Chi-square ($\chi 2$) test in which $\chi 2 = \Sigma(Oij/Eij) - N$, follows a $\chi 2$ distribution with (r-1)(c-1) degrees of freedom. Also, SPSS (16) instruction manual support the use of Chi-square test to test the association between two variables by explaining that 'A number of tests are available to determine if the relationship between two cross tabulated variables is significant. One of the more common tests is Chi-square. One of the advantages of chi-square is that it is appropriate for almost any kind of data'. On the other hand, in order to observe the effects of the independent variable (Xi) on the dependent variable (Yi) linear regression analysis was used.

Where, Oij= Observed frequency in the ith column and jth row of the table

Eij= Expected frequency in the ith column and jth row of the table

N= Number of observations, r= number of rows, c= number of column

$\chi 2$= Notation sign for Chi-square statistic

Σ= Summation sign

3.9. Sample and Sampling Method

The data used in this study was collected from 9 administrative villages of Ruangwa district using probability sampling method. Two villages are in urban area and they are almost equal in respect to life style and social organization. On the other hand, three are sub-urbanized villages while the rest 4 villages are in rural areas having similar economic characteristics; they are all rural, predominantly agricultural, with almost subsistence levels of production. All villages included in the sample were chosen randomly from clusters of villages within the larger administrative area.

To get more representative information, the sample included teenagers, women and men who engage in agriculture, this helped to identify some of trends and differentials within the three groups. The sample within each village consisted of farmers aged 14+, respondents were also required to give some information about their families. For the purposes of this study, 200 respondents were involved.

The study used primary data from the communities who were purposively selected based on the level of cashew nut production. Variables included in the questionnaire were , acreage in terms of acres, physical capital, labor in terms of man-hours spent on the farm, fertilizer, price of cashew nut per kilogram, level of education attained by the respondent (It is a dummy variable where 0 = Primary, 1 = secondary and above), Number of extension service provided through training

3.10. Data and Methods

Linear regression analysis using SPSS (16) and STATA (9) software programs were employed for the modeling of cashew nut production as determined by postulated determinants and to assess the relative importance of various variables. Initially, to observe the correlation between dependent variables and independent variable, chi-square cross-tabulation test was performed whereby variables that have associations were identified at 1%, 5% and 10% levels of significance respectively. Identified associated variables were then included in the logistic regression analysis.

From the logistic regression, associated beta-coefficients and their 95% confidence interval telling upper and lower limits were generated. Significant variables at ($P < 0.05$, $P < 0.01$ and 0.10) were considered as determinant factors of cashew nut production. Lastly, to identify the significance of each categorical variable of the determinant factors, a reference category was chosen and a STATA command for categorical variables was performed were by beta coefficients and their 95% confidence limits were generated ready for interpretations.

3.11. Limitations of the Study

The study was limited to time and fund as a result the whole of Ruangwa District population could not be studied, but the sample of two hundred households were chosen randomly in the whole district used to give information on the impact of the socio-economic factors that affect the production of cashew nut in the whole district.

The study also encountered difficulties during interview, which was due to the low awareness level of the farmers who do not keep record of agricultural information that was needed for this study. To overcome the above problem, we spent much time with the respondents in discussing the various economic factors affecting production of cashew nut in the area.

CHAPTER FOUR

PRESENTATION OF THE FINDINGS

3.1. Introduction

This chapter explains procedures which were followed in order to get results and shows major findings of the study. These findings are basically related to the main objective of the study which is the analysis of social- economic factors affecting cashew nut production in Ruangwa. Descriptive statistical analysis was used to present cross tabulation results demonstrating the contribution of age, education, sex in terms of gender in the cashew nut production. In the study econometric techniques to test and estimate contribution of each social- economic variables affecting cashew nut production was employed. Tests which are shown in this chapter are Model regression analysis, Multicollinearity, Heteroscedasticity, Link-test for Model specification error for the entire variables in the study and robust command based on White's test with the purpose of obtaining more consistent parameters due to the presence of severe heteroscedasticity problem.

3.2. Descriptive Statistical Analysis

The descriptive analyses were conducted with the help of the statistical software package SPSS and the results are displayed below. The statistical tests were done using the null hypothesis, which assumes that there was no difference between the groups. At 10% significance level, the null hypothesis cannot be rejected for either group. A data set was constructed for a statistical analysis, to which a linear regression was applied. The data set was constructed based on the cashew nut productivity of the Ruangwa District in 2011 as dependent variable

Based on evidence from the descriptive analysis of socioeconomic characteristics of respondents in the study area in Table 6 shows that 70.5% of the sampled cashew nut farmers were females and 29.5% were males.

The results show that more women are involved in cashew production in Ruangwa District Council than men. This is consistent with the results of Keyser (2007) who revealed that Female's labor participation in rural areas is higher compared to their participation in urban areas, and is also slightly higher than male's rural participation. This is also the case in Ruangwa District, where women's participation is higher than men's. However It also shows that both men and women can take cashew production as a business and a source of employment.

The results of the study show that most cashew farmers in Ruangwa District are ageing since a greater percentage of the cashew farmers interviewed (64%) were above forty (40) years. Very few cashew farmers in Ruangwa District (19.5%) were aged between 26-40 years and (16.5%) of the respondents were below twenty (26) years. Farmers in this age group constitute the very energetic youth and are likely to work effectively to increase their yields. 16.5% of youth involved cashew nut production could indicate that the future of the cashew industry, especially in Ruangwa District is unwelcoming. The youth are the future growers of the cashew crop and if cashew nut supply is to be sustained, there is the need for youth to be encouraged to go into cashew production.

From the study, it was realized that a higher percentage of cashew farmers in Ruangwa (52.5%) are illiterate. Such farmers did not receive formal education. About 15.5% of cashew farmers ended in the primary school while 32% of them were educated up Secondary School level. The higher percentage of illiterate farmers could have negative impact on the adoption of new production technologies. Generally education is thought to create a favourable mental attitude for the acceptance of new practices especially of information-intensive and management-intensive practices (Waller *et al*., 1998; Caswell *et al*., 2001). Education is thought to reduce the amount of complexity perceived in a technology thereby increasing a technology's adoption.

According to Ehler and Bottrell (2000), one of the hindrances to widespread adoption of especially Integrated Pest Management (IPM) as an alternative method to chemical control is that it requires greater ecological understanding of the production system. The study also revealed that 86.5% of cashew farmers in Ruangwa have access to extension service. Most studies analyzing access to extension service in the context of agricultural technology show its strong positive influence on adoption. Yaron *et al.*, (1992) show that its influence can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies

Table 6. Socioeconomic characteristics of cashew farmers

Characteristic	Frequency	Percentage (%)
Gender		
Female	141	70.5
Male	59	29.5
Total	**200**	**100**
Age		
below 26 years	33	16.5
26-40 years	39	19.5
41 and above	128	64
Total	**200**	**100**
Education		
Illiterate	105	52.5
Primary	31	15.5
Secondary	64	32
Total	**200**	**100**
Contact with Extension Officers		
Contact	173	86.5
No Contact	27	13.5
Total	**200**	**100**

Source: Field survey data, 2013

3.3. Statistical analysis of the study variables

One of the objectives of this research study was to identify the social economic variables that influence cashew nut productivity in Ruangwa. Therefore, this section examines the determinants of cashew productivity based on analysis of Multiple Regression Models, which shows the relationship between the dependent variable and the independent variables. A statistical summary and explanation of the independent variables included in the model are provided in Table 7.

Table 7. Statistical analysis of the study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
output	200	2006.295	1255.607	360	6250
Acreage	200	4.125	2.739874	1	15
Labour	200	10.5	2.457682	8	20
lncapital	200	14.04907	0.4756199	12.89922	15.37366
Fertilizer	200	1325600	475413.2	450000	3000000
Price	200	1168.05	180.7736	800	1500
Extension	200	3.150754	0.7832766	1	6
dnon_edu	200	0.155	0.3628129	0	1
dsec_	200	0.32	0.4676467	0	1

Source: Field survey data, 2013

3.3.1. Interpretation from the statistical analysis Table 7

Descriptive statistical analysis shows that Output of cashew nut produced by households surveyed was estimated at an average of 2006.295 kilograms per year. The highest output per household was 6250 kilograms, while the minimum quantity was 360 kilograms. Acreage per household is at an average of 4.125 acres. The household with the highest property of land under cashew nut had 15 acres and the one of a minimum property of land under cashew nut had an acre.

Physical Capital (Kp), which is defined in terms of Tanzanian shillings (Tsh) used in the cashew nut farm per year, was at an average of Tsh 14.04907, while the lowest amount was Tsh 12.899922. The highest amount of money was Tsh 15.37366 per households.

The average labor hired by households was estimated at 10.5 hours, while the minimum hired was 8 hours. The maximum hours spent during the period of one year, was estimated at 20 hours. The money spent on fertilizer was at an average of Tsh 1,325,600; with a minimum amount of money spent was Tsh 450,000. The maximum spent on fertilizer was Tsh 3,000,000 per household per year. Price of cashew nut was at an average of Tsh 1,168.05 per kilogram of cashew nut. The household who sold his cashew nut at the minimum price was selling at Tsh 800, and the maximum price was at Tsh 1,500.

The study shows that, extension services were at an average of 3.150754 per household trained. The households that received only once minimum extension service while 6 maximum extension services was provided. Most studies analyzing access to extension service in the context of agricultural technology show its strong positive influence on adoption. Yaron *et al.,* (1992) show that its influence can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies.

3.4. Data Management

Data management was done by coding some variables and transforming some variables into natural logarithm. This is due to the fact that some variables were difficult to be tested unless otherwise they are transformed into different format. All codding and transforming were done by using statistical packages such as SPSS and STATA.

3.5. Regression Diagnostics

This was primarily performed with the model to observe the exact level of significance of each estimated value, checking on how well our data meet the assumption of OLS regression; when we do linear regression, we assume that the relationship between the

response variable and the predictors is linear. The regression results unveiled that the independent variables labour , physical capital and secondary education were not statistically significant to the model with their negative signs meaning that their elasticities were below zero and acreage, fertilizer,price,extension service and primary education were statistically signinificant.

Table 8. Regression results

Output	Coef.	Std. Err.	t	P>|t|	[95% Interval]	Conf.
Acreage	265.6358	19.15487	13.87	0.000***	227.8523	303.4193
Labour	-4.67394	15.4	-0.3	0.762	-35.05089	25.703
Capital	-309.1	150.7574	-2.05	0.042**	-606.4727	-11.72639
Fertilizer	0.001027	0.000147	7.01	0.000***	0.0007377	0.0013156
Price	1.286219	0.214188	6.01	0.000***	0.8637263	1.708712
Extension	182.8892	41.96956	4.36	0.000***	100.1031	265.6754
dnon_edu	-167.902	94.86633	-1.77	0.078**	-355.0281	19.22496
dsec_edu	-9.49313	74.42161	-0.13	0.899	-156.2918	137.3056
_cons |	1891.587	1914.105	0.99	0.324	-1884.04	5667.213
					Number of obs	200
					F(8, 190)	178.17
					Prob > F	0.000
					R-squared	0.8824
					Adj R-squared	0.8774

Note: (***) Indicate significance at 1% level , (**) Indicate significance at 5% level , (*) Indicate significance at 10% level

Source: Field survey data, 2013

3.6. Model Specification

3.6.1. Linktest for model specification error

Gujarati D.N & Porter D.C (2009) made assumption that the "Regression model used in the analysis is "correctly" specified, but if the model is not "correctly" specified, we encounter the problem of model specification error or model specification bias".

After conducting a linear regression we did a link test, we found that the probability (P>|t|) of _hatsq is 0.955 as indicated in Table 9 equivalent to 95.5% which is good for model specification error .This implies that the model was well specified (modeled) since the probability of _hatsq is as large as possible (Approaching to one).

Table 9. Linktest for model specification error

Output	Coef.	Std. Err.	t	P>|t|	[95%	Conf. Interval]
hat	1.003861	0.072569	13.83	0	0.860745	1.146977
_hatsq	-6.85E-07	0.000012	-0.06	0.955	-0.0000244	0.000023
_cons	-4.062384	93.04846	-0.04	0.965	-187.5671	179.4423
					Number of obs	200
					F(2, 196)	735.21
					Prob > F	0
					R-squared	0.8824
					Adj R-squared	0.8812

Source: Field survey data, 2013

3.6.2. Test for Multicollinearity

After having seen that, model was well specified by conducting a link test; we went further by conducting a test for multicollinearity. Gujarati (2007) suggests that if there is multicollinearity among variables, some correlated variables have either to be dropped or combining cross sectional and time series data, or additional of new variables or transformation of variables or do nothing. As cited from Gujarati (2007) if multicollinearity problem is serious only two choices can be done; Follow some rules of thumb or do nothing. In this study the "do nothing" could be opted if the high R^2 would be accompanied with the near or exact linear dependencies as the original design of the model.Gujarat (2009, page 340) suggests that, 'the larger the value of variance inflation factor (VIF_j), the more troublesome or collinear the variable. As a rule of thumb, if the VIF of variance exceeds 10, which will happen if R^2_j exceeds 0.90, the variance is said to be highly collinear s' since a variable whose VIF values are greater than 10 may merit further investigation. Estimation results showed that there was no problem with Multicollinearity in our data as shown in Table 10.

Table 10 .Test for Multicollinearity

Variable	VIF	1/VIF
lncapital	5.33	0.187469
Fertilizer	4.91	0.203691
Acreage	2.82	0.355042
Price	1.61	0.622898
Labour	1.53	0.653177
dsec_edu	1.29	0.772826
dnon_edu	1.28	0.782463
Extension	1.16	0.861275
Mean VIF	**2.49**	

Source: Field survey data, 2013

3.6.3. Test for heteroscedasticity

The *hettest* and *whitetst* are based on the null hypothesis that the variance is constant. Therefore, when the probability is large, we will accept the null hypothesis of constant variance. The assumptions of the classical linear regression model is that the variance of each disturbance term u_i , conditional on the chosen values of the explanatory variables, is some constant number equal to σ2 (Gujarati, 2004). This is the assumption of homoscedasticity, or equal (homo) spread (scedasticity), that is, equal variance. Symbolically, $E(u)^2 = \sigma^2$, where i = 1, 2. . . n.

In this study testing for heteroscedasticity was done by using Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, commanding "*estat hettest*". The problem of heteroscedasticity was found and we transformed one of the variable to natural logarithms, However the problem persisted since Chi-square of 4.16 which was significant at a Prob>0.0413 (10% level) indicated the presence of heteroskedasticity problem as stipulated in the Table 11.

Table 11 : Test for heteroscedasticity, "estat hettest"

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
H_o: Constant variance
Variables: fitted values of Output
chi2(1) = 4.16
Prob > chi2 = 0.0413

Source: Field survey data, 2013

Heteroscedasticity is defined as a situation in which the variance of the dependent variable varies across the data, and is common for cross-sectional data. This problem with heteroscedasticity is frequently found in regression analysis (Greene, 1997). When heteroscedasticity is severe, ignoring it may bias standard errors and p-values of the regression (Gujarati, 2000). However, in order to obtain more consistent parameters, the following regression was run with the robust command that is based on White's test Table 12.

Table 12.Regression run with the robust command

Output	Coef.	Robust Std. Err.	t	P>|t|	(95%	Conf.Interval)
Acreage	265.6358	22.35033	11.89	0.000*	221.5491	309.7224
Labour	-4.673943	19.23298	-0.24	0.808	-42.61154	33.26366
lncapital	-309.0995	123.8092	-2.5	0.013*	-553.3167	-64.88243
Fertilizer	0.0010267	0.0001577	6.51	0.000*	0.0007155	0.0013378
Price	1.286219	0.1784869	7.21	0.000*	0.9341485	1.638289
Extension	182.8892	51.26163	3.57	0.000*	81.77421	284.0042
dnon_edu	-167.9015	92.97491	-1.81	0.073**	-351.2972	15.49408
dsec_	-9.49313	56.52956	-0.17	0.867	-120.9993	102.013
_cons	1891.587	1585.28	1.19	0.234	-1235.422	5018.596
					Number of obs	200
					F(8, 190)	321.48
					Prob>F	0.000
					R-squared	0.8824
					Root MSE	429.29

NB: (***) indicate significance at 1% level,(**) indicate significance at 5% level , (*) indicate significance at 10% level

Source: Field survey data, 2013

From the results R^2 =0.8824, imply that 88.2% of the variation in cashew nut output is explained by the explanatory variables.

CHAPTER FIVE

DISCUSION OF THE FINDINGS

5.1. Introduction

This chapter gives out regression results, an estimation results, discussion of the study findings and gives all statistical interpretations of the study. What shown in this chapter are conclusive research model with all studied variables as well as tests of all hypothesis involved in the study.

5.2. Regression Results

Using OLS technique of the Multiple Regression Model, the coefficients of the variables was estimated. For the study to estimate with OLS, the Cobb-Douglas production function was transformed to satisfy the Classical Linear Regression Model (CLRM), so that to come up with the usual assumption of Best Linear Unbiased Estimator (BLUE) of α and β respectively. (Gujarati 2009:159-207) and implies a cob-Douglas production function with unit elasticity of substitution (Maddala 2002:217).

The command of linear regression gave the estimation results as it can be seen in Table 12. An estimation results are substituted/fitted in the proposed model as follows.

lnQ=1891.587 + 265.6358lnN1 – ln(309.0995lnKP2) - 4.673943lnL3 + 0. 0010267lnFert4 + 1.286219lnP5 - 167.9015ln edu +9.49313lndsec + 182.8892lnExt7 + u_i **(1)**

From the fitted estimation model standard errors and t-tests are shown from the equation above. Also R^2, adjusted R^2 and probability of F are shown. From the results R^2 =0.8824, imply that 88.2% of the variation in cashew nut output is explained by the explanatory variables. The high value of R^2 implies that at least the regression results are reasonable. Since computed F(8, 190) value is 321.48 exceeds critical F value from Table 11 at 1% level of significant which is Prob > F = 0.0000, therefore the null hypothesis was rejected and an alternative hypothesis was not rejected that the F value is statistically significant, which implies that cashew nut production in Ruangwa is being

influenced by some socio-economic variable including acreage , physical capita, fertilizer , price , extension services and primary education.

From the fitted estimation model all constant values are shown except standard errors and t-tests. For all variables there is a difference in standard error and t-tests as follows; acreage, se = 22.35033 and t-test = 11.89, physical capital (lncapital, se = 123.8092 and t-test = -2.50), fertilizer, se =0.001577 and t-test = 6.51, price, se = 0.1784869 and t-test = 7.21, extension, se =51.26163 and t-test =3.57, primary education (dnon_edu, se = 92.97491 and t-test -1.81)

5.3. Cashew production function analysis

From the regression results, Acreage, fertilizer, physical capital, price, extension service and primary education were observed to affect cashew output significantly and hence are the determinants of cashew production in the study area. Acreage, fertilizer, price and extension services were significant at 1% whereas physical capital and primary education were significant at 5%. The R^2 value for the regression is 0.8824 and this means that 88.24%.of the variations in cashew output are explained by the factor inputs. Also from the F-statistic it can be concluded that the overall regression is significant at 1% significance level. The values of the coefficients indicate the elasticity of the various inputs to the output.

Considering acreage, the elasticity value indicates that if land under cultivation is increased by 1%, the yield of cashew would increase by 265.6358%. If quantity of fertilizer, price, and extension services increase by 1%, yield of cashew would increase by 0.0019267%, 1.286219% and 182.8892% respectively, because they are positively related to cashew output. This is in line with the results of Goni et al., (2007) who conducted a study into the analysis of resource-use efficiency in rice production in the lake Chad area of Borno state, Nigeria and found out that a unit increase in the level of seed, farm size, and fertilizer will lead to 12.6, 127.2, and 20.5 percent changes in rice output respectively.

Abang et al., (2001) also reported that education was positively related to the value of marginal product though not statistically important. This might be due to the fact that educated farmers were able to adhere to and adopt new farming technologies. Others such as Aderinola (1988), Aderinola and Kolawole (1996), Eremie and Akinwumi (1986) and Ojo (2000), investigated the productivity of sugar cane production, mechanized food crop farming, rice production and maize farming respectively and they found out that farmers' socio-economic characteristics including education and experience were significant determinants of agricultural production and profitability.

Imoudu (1992) also showed that farm size is a significant determinant of maize output and profitability in Ondo- State. The results of the study are also in consonance with those of Ohajianya (2006) in Imo State, Nigeria, and Onyenweaku et al., (1996). Labour and years of experience however had negative coefficients indicating that an increase in labour and years of experience will lead to a decrease in yield and this corroborates Stephen et al., (2004), who studied resource-use efficiency in cowpea production in North East Zone of Adamawa State, Nigeria and reported an inverse relationship between labour and output. The negative sign of years of experience is contrary to a priori expectation. This is probably due to the fact that farmers with long years of experience used to obsolete methods of farming, traditional tools and species which do not encourage high output.

Results further showed that variables such as acreage, fertilizer, price and extension services are positively related to cashew output while physical capital and primary education are inversely related.

Table 13.Estimate of the production function analysis.

Output	Coef.	Robust Std. Err.	t	P>|t|	(95%	Conf.Interval)
Acreage	265.6358	22.35033	11.89	0.000*	221.5491	309.7224
Labour	-4.673943	19.23298	-0.24	0.808	-42.61154	33.26366
lncapital	-309.0995	123.8092	-2.5	0.013*	-553.3167	-64.88243
Fertilizer	0.0010267	0.0001577	6.51	0.000*	0.0007155	0.0013378
Price	1.286219	0.1784869	7.21	0.000*	0.9341485	1.638289
Extension	182.8892	51.26163	3.57	0.000*	81.77421	284.0042
dnon_edu	-167.9015	92.97491	-1.81	0.073**	-351.2972	15.49408
dsec_	-9.49313	56.52956	-0.17	0.867	-120.9993	102.013
_cons	1891.587	1585.28	1.19	0.234	-1235.422	5018.596
					Number of obs	200
					F(8, 190)	321.48
					Prob>F	0.000
					R-squared	0.8824
					Root MSE	429.29

NB: (***) indicate significance at 1% level,(**) indicate significance at 5% level , (*) indicate significance at 10% level

Source: Field survey data, 2013

5.4. Results and Discussion

5.4.1. Acreage

From the findings output from cashew nut production was positively related to acreage as shown by the coefficient of 265.63. Implying that as households expand acreage under cashew nut production by 1%, the output will increase by 265.63% if all other factors remain constant. This is statistically significant at 1% level. This confirms what Malassis (1975) said in the literature, that the expected relationship between output and land is that, as more land is brought under production, output is increased. It is believed that intensified smallholder scheme use of land would lead to increased yield or output per ha of cropped area.

This increase in land productivity would cause a positive impact on labour productivity provided this productivity is not neutralized or even outweighed by declining land per labour ratio. A rise in land productivity may be caused by increasing land shortage and corresponding decline of the land per labour ratio, which would compel the producers on small holdings to intensify cultivation despite falling labour productivity. This constitutes the central theme of the debate on the inverse relationship between size of holdings and land productivity (Bharadwaj 1974)

5.4.2. Physical Capital

From the results, Physical Capital as a factor does not have influence on output from cashew nut as reported the coefficient (-309.09). Output from cashew nut production is negatively related to physical capital as reported by the coefficient -309.09 and is statistically significant at 5% level. This means that when the physical capital increases by 1%, the output from cashew nut production decreases by 309.09 % if all other factors remain constant. Most cashew farmers have very little available capital and formal credit facilities for small farmers are poorly developed in the south of Tanzania. Since rural finance is so limited, it is important that low-cost options are available for improving cashew husbandry and that good returns are obtained on investments in improved husbandry. (Naliendele ARI, 1996). Smallholder productivity today and in future will no doubt depend on economic, technical and market efficiencies for definition of smallholder output levels and development (Pachico, 1980). When farmers are inefficient in the management of resources, an improvement in allocation of resources minus innovations in new technologies could raise smallholder cashew output. On contrary availability of new productive technologies which are however inefficiently applied would reduce the gains by smallholders and society at large. Experience, however shows that immediate and uniform adoptions of innovations in agriculture are quite rare (Feder 1981).

5.4.3. Fertilizer

From the findings output from cashew nut production is positively related to fertilizer as shown by the coefficient of 0.001.This implies that a 1% increase in fertilizer results into a 0.001% increase in output if all other factors remain constant, and it is statistically significant at 1% level. Chemical control of Powder mildew disease (PMD). Research in the early 1980s showed that PMD could be controlled by spraying trees with wettable sulphur during the flowering season and 2- to 3-fold increases in yield were obtained (Casulli, 1981a; Intini and Sijaona, 1983a; Sijaona, 1984).

5.4.4. Price

The output from cashew nut production is positive related to price of cashew nut as shown by the positive coefficient of 1.28. This means that a 1% increase in price of cashew nut, the output is expected to increase by 1.28% if all other factors remain constant. The results are statistically significant at 1% level. Price was varying because farmers sell the cashew nut according to its quality and size. In spite of several small price rises, between 1969 and 1977 the producer price for cashew fell by about a half after adjusting for inflation .The major improvements in cashew pricing and marketing since 1989, have therefore lifted two of the primary constraints on production and have created a very favourable environment for tackling other constraints (Brown et al., 1984)

The recent Asian experience points to the pertinent role of government in both stabilizing and supporting prices for encouraging and sustaining technology adoption among smallholders (Gabre-Madhin et al.2003). Free market prices of agricultural output and inputs should infact be used as policy instruments and not solely left to market forces for determination due to inherent market imperfections. Market-based stabilization as is practiced in developed countries would place stability burden on government instead of markets and thus risks would be transferd away from producers leading to higher smallholder tea productivity.

5.4.5. Labor

From the results, Labor as a factor does not have influence on output from cashew nut as reported the coefficient (-4.67). This means that as household increases hired labor by 1%, the output from cashew nut production decreases by 4.67% if all other factors remain constant. The result was statistically statistically insignificant. In this study, majority of households surveyed hired laborers in different activities of cashew nut production. A positive sign was expected, but the results illustrate a 0.86% decrease. A shortage of cash limits the use of hired labour to l&37% of households. Most cashew activities and particularly the heavy work of rehabilitation are carried out by adult males, adult females contribute significantly to weeding; harvesting is frequently a family activity. A shortage of labour has probably been one of the most important factors limiting the rehabilitation of abandoned farms, particularly those that were abandoned for many years (Naliendele ARI, 1996)

Labour and years of experience however had negative coefficients indicating that an increase in labour and years of experience will lead to a decrease in yield and this corroborates Stephen et al., (2004), who studied on resource-use efficiency in cowpea production in North East Zone of Adamawa State, Nigeria and reported an inverse relationship between labour and output. The negative sign of years of experience is contrary to a priori expectation. This is probably due to the fact that farmers with long years of experience are used to obsolete methods of farming, traditional tools and species which do not encourage high output.

Although hired labour is necessary in smallholder tea production, cost of hired labour remains high leading to underplucking (Etherington 1973). In many cases, Greenleaf price per kg is not inflation factored, payments are delayed and thus marginal returns and quantity produced. Smallhollders become highly indebted and fail to setlle financial obligations thus forcing smallholders towards abodoning tea fields in search for alternative income generating activities.

5.4.6. Education

From the results, Secondary education as a dummy variable does not have influence on output from cashew nut as reported the coefficient of (-9.49). This means that as household education for secondary increases by 1%, the output from cashew nut production decreases by 9.49% if all other factors remain constant. The result was statistically insignificant.

From the results, primary education as a dummy variable shows a negative impact on cashew nut output, This means that as household primary education increases by 1%, the output from cashew nut production decreases by 167.9015%. The result was statistically insignificant. Household cashew nut productivity could therefore be improved by farmers being more efficient in production techniques. Feder (1981) however noted that, immediate and uniform adoption of innovations is rare in agriculture, probably due to inherent differences in educational background and enterprise management levels and low cashew nut prices. However farmers who are determined to improve and are conscious of inherent limitations of their present knowledge and traditional techniques of production are on their way to success (Anthony *et al.,* 1979).

The higher percentage of illiterate farmers could have negative impact on the adoption of new production technologies. Generally education is thought to create a favourable mental attitude for the acceptance of new practices especially of information-intensive and management-intensive practices (Waller *et al.,* 1998; Caswell *et al.,* 2001).

Education is thought to reduce the amount of complexity perceived in a technology thereby increasing a technology's adoption. According to Ehler and Bottrell (2000), one of the hindrances to widespread adoption of especially Integrated Pest Management (IPM) as an alternative method to chemical control is that it requires greater ecological understanding of the production system.

5.4.7. Extension services

From the results, the availability of extension services to farmers had an influence on output from cashew nut as reported the coefficient (182.88). This means that the increase of extension services to farmers in terms of training by 1%, the output from cashew nut production increases by 182.88% if all other factors remain constant. The results are statistically significant at 1% level. Most studies analyzing access to extension service in the context of agricultural technology show its strong positive influence on adoption. According to (Kirsten et al 2008), to intensify agricultural production, households may require access to a range of support services, including improved seeds, inorganic fertilizers, credit, technical advice, market information and output market linkages.

Households actually require the input of motivated and qualified extension staff, smaller farmer extension ratio, improved production record keeping and profit estimating skills. Households output may also be affected because farmers fail to adopt and accept technology available and greenleaf price per kg. (Venkata Ram, 1981). Most studies analyzing access to extension service in the context of agricultural technology show its strong positive influence on adoption In fact Yaron et al., (1992) show that its influence can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies.

5.5. Hypothesis Testing

Hypothesis testing determines the validity of the assumption (technically described as null hypothesis) with a view to choose between two conflicting hypotheses about the value of population parameter. Kothari (2007), highlighted that hypothesis testing helps to decide on the basis of a sample data, whether a hypothesis about a population is likely to be true or false. From that view, also during this study some hypotheses (assumptions) were taken which were used to justify socio-economic factors affecting are statistically significant contributing to production of cashew nut in Ruangwa or not statistically significant.

lnQ=1891.587 + 265.6358lnN_1 – ln(309.0995lnK_{P2}) + 0.001$lnFert_4$ + 1.286lnP_5 – 167.901ln don edu + 182.88$lnExt_7$

Se	1585.28	22.3503	123.8092	0.001577	0.1784869	96.97491	51.8892
t	1.19	11.89	-2.50	6.51	7.21	-1.81	3.57

Hypothesis 1; There is a positive contribution of acreage to cashew nut output.

As according to various literature reviews above, we expected the co-efficient value of the acreage variable to be positive (that means greater than zero) which indicates the positive relationship between the two variables. Therefore we test null hypothesis H0: $b_1=b^*_1$ against alternative hypothesis H1:$b_1 \neq . b^*_1$ According to the rule as cited from Koutsoyiannis (2003 , page 84) if the observed if we choose 5% level of significance each tail will include the area (probability) which correspond to 0.025 at each end of the curve (Z_1 = -1.96 and Z_2 = 1.96) from the Standard Normal distribution table . If the Z^* falls in the critical region (Z^* > 1.96 or Z^* < -1.96) we reject our Hypothesis and accept the alternative. From our study the t calculated found to be t^* (11.9). This implies that the calculated t^* falls within the critical region. Therefore we reject our hypothesis and accept the alternative. That is the estimate 265.6358 is statistically significant at 5%, 265.6358 is the partial regression co – efficient of the variable acreage of land, and tells us that, when the influence of the variables physical capital (lncapital), fertilizer, price, extension services, primary education (dno edu) are held constant, acreage of land increases by one unit on average the cashew nut output will increase by 265.6358 which is in acres under cashew nut crop

Hypothesis 2; There is a positive contribution of Physical capital to cashew nut output.

As according to various literature reviews above, we expected the co-efficient value of the acreage variable to be positive (that means greater than zero) which indicates the positive relationship between the two variables. Therefore we test null hypothesis H0: $b_1=b^*_1$ against alternative hypothesis H1:$b_1 \neq . b^*_1$ According to the rule as cited from Koutsoyiannis (2003 , page 84) if the observed if we choose 5% level of significance

each tail will include the area (probability) which correspond to 0.025 at each end of the curve (Z_1 = -1.96 and Z_2 = 1.96) from the Standard Normal distribution table . If the Z^* falls in the critical region (Z^* > 1.96 or Z^* < -1.96) we reject our Hypothesis and accept the alternative. From our study the t calculated found to be t^* (-2.50). This implies that the calculated t^* falls within the critical region. Therefore we reject our hypothesis and accept the alternative. That is the estimate -309.0995 is statistically significant at 5%, -309.0995 is the partial regression co – efficient of the variable Physical capital (lncapital), and tells us that, when the influence of the variables acreage of land, fertilizer, price, extension services, primary education (dno edu) are held constant, Physical capital (lncapital) increases by one unit on average the cashew nut output will decrease by 309.0995 which is in which is in Millions of Tanzanian shillings

Hypothesis 3; There is a positive contribution of fertilizer to cashew nut output.

As according to various literature reviews above, we expected the co-efficient value of the acreage variable to be positive (that means greater than zero) which indicates the positive relationship between the two variables. Therefore we test null hypothesis H0: $b_1=b^*_1$ against alternative hypothesis H1:$b_1 \neq . b^*_1$ According to the rule as cited from Koutsoyiannis (2003 , page 84) if the observed if we choose 5% level of significance each tail will include the area (probability) which correspond to 0.025 at each end of the curve (Z_1 = -1.96 and Z_2 = 1.96) from the Standard Normal distribution table . If the Z^* falls in the critical region (Z^* > 1.96 or Z^* < -1.96) we reject our Hypothesis and accept the alternative. From our study the t calculated found to be t^* (6.51). This implies that the calculated t^* falls within the critical region .Therefore we reject our hypothesis and accept the alternative. That is the estimate 0.0001577 is statistically significant at 5%

0.0001577 is the partial regression co – efficient of the variable fertilizer, and tells us that, when the influence of the variables acreage of land, Physical capital (lncapital), price, extension services, primary education (dno edu) are held constant, fertilizer increases by one unit on average the cashew nut output will increase by 0.0001577 which is in which is in Millions of Tanzanian shillings.

Hypothesis 4: There is a positive contribution of price to cashew nut output.

As according to various literature reviews above, we expected the co-efficient value of the acreage variable to be positive (that means greater than zero) which indicates the positive relationship between the two variables. Therefore we test null hypothesis H0: $b_1=b^*_1$ against alternative hypothesis H1:$b_1 \neq . b^*_1$ According to the rule as cited from Koutsoyiannis (2003 , page 84) if the observed if we choose 5% level of significance each tail will include the area (probability) which correspond to 0.025 at each end of the curve (Z_1 = -1.96 and Z_2 = 1.96) from the Standard Normal distribution table . If the Z^* falls in the critical region (Z^* > 1.96 or Z^* < -1.96) we reject our Hypothesis and accept the alternative. From our study the t calculated found to be t^* (7.21). This implies that the calculated t^* falls within the critical region. Therefore we reject our hypothesis and accept the alternative. That is the estimate 0.1784869 is statistically significant at 5%, 0.1784869 is the partial regression co – efficient of the variable price, and tells us that, when the influence of the variables acreage of land, Physical capital (lncapital), fertilizer, extension services, primary education (dno edu) are held constant, price increases by one unit on average the cashew nut output will increase by 0.1784869 which is in which is in thousands of Tanzanian shillings.

Hypothesis 5: There is a positive contribution of extension services to cashew nut output

As according to various literature reviews above, we expected the co-efficient value of the acreage variable to be positive (that means greater than zero) which indicates the positive relationship between the two variables. Therefore we test null hypothesis H0: $b_1=b^*_1$ against alternative hypothesis H1:$b_1 \neq . b^*_1$ According to the rule as cited from Koutsoyiannis (2003 , page 84) if the observed if we choose 5% level of significance each tail will include the area (probability) which correspond to 0.025 at each end of the curve (Z_1 = -1.96 and Z_2 = 1.96) from the Standard Normal distribution table . If the Z^* falls in the critical region (Z^* > 1.96 or Z^* < -1.96) we reject our Hypothesis and accept the alternative. From our study the t calculated found to be t^* (3.57).

This implies that the calculated t^* falls within the critical region. Therefore we reject our hypothesis and accept the alternative. That is the estimate 182.8892 is statistically significant at 5%, 182.8892 is the partial regression co – efficient of the variable extension services, and tells us that, when the influence of the variables acreage of land, Physical capital (lncapital), fertilizer, price, primary education (dno edu) are held constant, extension services increases by one unit on average the cashew nut output will increase by 182.8892 which is in a number of training.

Hypothesis 6: There is a positive contribution of primary education (dno edu) to cashew nut output

As according to various literature reviews above, we expected the co-efficient value of the acreage variable to be positive (that means greater than zero) which indicates the positive relationship between the two variables. Therefore we test null hypothesis H0: $b_1=b^*_1$ against alternative hypothesis H1:$b_1 \neq . b^*_1$ According to the rule as cited from Koutsoyiannis (2003 , page 84) if the observed if we choose 5% level of significance each tail will include the area (probability) which correspond to 0.025 at each end of the curve (Z_1 = -1.96 and Z_2 = 1.96) from the Standard Normal distribution table . If the Z^* falls in the critical region (Z^* > 1.96 or Z^* < -1.96) we reject our Hypothesis and accept the alternative. From our study the t calculated found to be t^* (-1.81). This implies that the calculated t^* falls within the critical region. Therefore we reject our hypothesis and accept the alternative. That is the estimate -167.9015 is statistically significant at 5%, -167.9015 is the partial regression co – efficient of the variable primary education (dno edu), and tells us that, when the influence of the variables acreage of land, physical capital (lncapital), fertilizer, price, extension services are held constant, primary education (dno edu) decreases by one unit on average the cashew nut output will increase by -167.9015 which is in a number household attained primary education.

CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

6.1. Summary of Study Findings

The main objective of this study was to investigate the socio-economic factors influencing the production of cashew nut in Ruangwa District. After estimating the relationship between the output of cashew nut and various socio-economic factors, the findings shown that various socio-economic factors have to be reviewed in order to improve the production of cashew nut in the country.

From the regression results, Acreage, fertilizer, physical capital, price, extension service and primary education were observed to affect cashew output significantly and hence are the determinants of cashew production in the study area. Acreage, fertilizer, price and extension services were significant at 1% whereas physical capital and primary education were significant at 5%. These are factors on which, the government should give emphasis, in order to increase the production of cashew nut. Labour and secondary education have shown a negative coefficient but explained an insignificant relationship to the cashew nut output. There are other factors such as education and labour which in this study have shown a negative coefficient and explained an insignificant relationship to the cashew nut output. One of the reasons is that educated people run away from rural areas to towns.

Labour and years of experience however, had negative coefficients indicating that an increase in labour and years of experience will lead to a decrease in yield and this corroborates Stephen *et al.,* (2004), who studied on resource-use efficiency in cowpea production in North East Zone of Adamawa State, Nigeria and reported an inverse relationship between labour and output. The negative sign of years of experience is contrary to a priori expectation.

This is probably due to the fact that farmers with long years of experience are used to obsolete methods of farming, traditional tools and species which do not encourage high output.

The R^2 value for the regression is 0.8824 and this means that 88.24%.of the variations in cashew output are explained by the factor inputs. Also from the F-statistic it can be concluded that the overall regression is significant at 1% significance level. The values of the coefficients indicate the elasticity of the various inputs to the output.
However based on these findings, we can conclude that acreage, physical capital, fertiliser, price and extension services are the important socio-economic factors that have effect on the production of cashew nut in Ruangwa.

6.2. Conclusion

From the findings regression results, Acreage, fertilizer, physical capital, price, extension service and primary education were observed to affect cashew output significantly and hence are the determinants of cashew production in the study area. Acreage, fertilizer, price and extension services were significant at 1% whereas physical capital and primary education were significant at 5%.

6.3. Policy Recommendations

The following comprise policy recommendation aimed at increasing household cashew nut productivity .It is hoped that the recommendations contained here under will contribute to the government's vision to increase cashew nut output. The recommendations aimed at increasing household cashew nut productivity are given hereunder on the basic of research finding:

Based on the above findings, it is recommended that:-

i. Since the land is fixed, the government should encourage the use of fertilizer, and it can do this by providing incentives for the setting up of cooperative shops

in order to provide fertilizers to households at an affordable price, so as to increase the level of production.

ii. Farmers should be encouraged to use fertilizers and pesticides so as to increase productivity. Among other things, farmers should have more access to extension services in order to improve their knowledge of farm management. Also, the government should introduce the farmers to formal education through adult literacy education, evening classes and establishment of demonstration farms. Government should improve its method of gathering and dissemination of information that is vital for households; this also requires government to increase its current level of extension services.

iii. Education and mobilization of farmers is needed to promote wide adoption and use of the recommended disease tolerant/resistant clones and cultural practices to reduce over reliance on chemical pesticides (ASDP, 2009). The current scenario surrounding the low cashew nut productivity in Ruangwa requires the government to provide credit facilities that will enable households to access such credit at a reasonable cost.

iv. The government should encourage private sector to invest in credit facilities like small–scale banks to offer credit to farmers at affordable rates. This should be through legislation to facilitate credit creation.

v. Government should strive to develop roads, water, energy, and communication infrastructure. This will increase smallholder's economic opportunities by reducing transaction costs and allowing farmers to get access to marketing information for productivity and smallholder cashew nut profitability. Infrastructure development benefits are;

- **Economic Opportunity**

  Essential infrastructure increase agricultural and non-farm opportunities in rural areas by increasing agricultural productivity, cutting costs of inputs and outputs, and encouraging greater use of efficiency-generating technologies.

Transport and telecommunication services promote communication and information flow between communities and with urban centers, fixing information asymmetries and linking farmers to markets for goods and input supply as well as agricultural extension advice.

- **Social Benefits**

  Better communications provide access and influence over political and local decision making. Electrification broadens access to electronic communication and radio. Well-delivered, quality infrastructure attracts better teachers and agriculture extension agents and stimulates agro-industrial development.

- **Improvement of Security and Risk Management**

  High quality essential infrastructure reduces the vulnerability of poor to disaster and shock. Good drainage, a well maintained network of roads, and telecommunications facilitate relief and food redistribution and help alleviate the effect of flooding, drought, famine, and earthquakes. Good transport facilities help stabilize food prices and through arbitrage ensure that poor sellers receive fair prices. Because of their employment potential, infrastructure works programs can be important components of crisis mitigation packages during times of economic shock.

vi. Government should help smallholder cashew nut peasants to establish their own processing factories, manage them as private bodies and engage in international cashew nut sales.

vii. Government needs to create a framework under which smallholder cashew nut farmers can be provided with basic cashew nut production inputs to facility timely availability and application of inputs. Government could recover interest free input loans by deductions from cashew nut sales arrangements with buyer.

viii. Domestic capital markets serving the rural sector should be strengthened to increase access to capital, enhance business skills, and encourage risk-taking.

Better marketing systems could dramatically cut these losses and are a fertile area

for development using a private sector approach and cost recovery mechanisms.

ix. Fast tracking operationalisation of agriculture bank to finance smallholders.

x. Facilitate linkages between the market and smallholders, such as contract farming, to enhance the poverty reduction impact.

xi. The government should ensure extension services and research technology are efficiently supplied to farmers for the purpose of increasing productivity and profitability. The extension services provided should address vulnerability as well as productivity and offer new options from which poor households can choose depending on individual circumstances.

xii. Smallholder assistance should be linked to infrastructure development and to the provision of education, health, and judicial services.

xiii. Agribusiness programs should focus on improving a country's policy, regulatory, and institutional environment, while assistance to individual enterprises should be secondary.

xiv. Effective trade associations need to be created to protect and promote the industry's interest.

xv. Flexible and adaptive forms of vertical coordination for farmer associations, farmers credit groups, marketing boards, and effective contract enforcement need be effected.

6.8. Areas for further research

Further studies should be carried out using adequate models and panel data (if possible) to verify the magnitude and major sources of the differences in the effects of determinants of cashew nut productivity in the various cashew producing zones of the country with a view of designing policies based on each zone's peculiarities

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APPENDICES

Appendix I

Questionnaire.

A: HOUSEHOLD QUESTIONARE

Dear Respondent;

I kindly request you to participate in this study that aims to examine social economic factors affecting cashew nut production in Lindi region. This is purposely for the fulfillment of the requirement for the award of Master of Science in Economics (Msc. Economics). I would be grateful if you would volunteer to spare your time to assist in this Study by answering the questionnaire which is intended to capture your ideas and perceptions on the analysis of social economic factors affecting cashew nut production in Lindi region. The information will be used confidentially and only for the purpose of this study, your cooperation will be highly appreciated. Please answer the question as per instruction given.

I. GENERAL INFORMATIONS

A.

Questionnaire number ……. Date of Interview:…….

Gender. Male…….. Female……..

Age: …….

District:…… Division…….. Village……

Ethnicity……

B.

Education:

( ) Completed primary school ( ) Uncompleted primary school

( ) Secondary school ( ) College ( ) Higher level

Number of the Family's Farmer: _____ Women _____ Men

II. LAND USE AND ITS DISTRIBUTION

1. Farming system structure infrastructure.

   Total Area: (ha)……Cultivated Area: (ha) ……

2. a. Identification of the farmer in terms of its occupation in the farming system:

   ( ) Landlord ( ) Tenant ( ) Partner ( ) Resident worker ( ) Settler

2. b. would you please give us information on area, age and output of your cashew farm in 2011?

No	**Cashew age (year)**	**Area (ha)**	**Expected output (kg)**	**Actual output (kg)**	**Cost (000 Tshs)**
1					
2					
3					
Total					

2. What kind of asset ownership is used in the cashew farming system?

   Materials

   Spraying ( ) Yes ( ) No quantity (number of ownership)…….

   Weeding ( ) Yes ( ) No quantity (number of ownership)…….

   Ploughing ( ) Yes ( ) No, quantity (number of ownership)…….

   Grating ( ) Yes ( ) No

   Irrigation pump ( ) Yes ( ) No quantity (number of ownership)…….

   Cultivator ( ) Yes ( ) No quantity (number of ownership)…….

   Do they contribute to the growth of output? Yes () No()

3. How long have you occupied in cashew production? ……..... (year)

4. Do you have any irrigated cashew crop area?

   Yes ( ) No ()

   If ***yes***, how many hectare? _____

5. Do you use any fertilizers and agrochemical to improve the cashew crop?

   ( ) Yes ( ) No

   If ***No***, why? _____

If ***Yes***, list all the fertilizers and agrochemicals in accordance with the following Questions:

Agrochemicals	**Name or Formula**	**Amount (Kilo or Litter per Hectare)**	**Time (per Month)**
Organic nutrients			
Chemical nutrients			
Herbicide			
Fungicide			
Others			

6. In accordance with the following options, identify your(s) main problems in the cashew

   system:

   ( ) Lack of capital

   ( ) Lack of rural credit

   ( ) Transportation problems

   ( ) Distance between the Pecém Port and the farming system

   ( ) Availability of specific products for cashew

   ( ) Others like: _____

Information on harvested and sold cashew crop in 2011

7. At the beginning of the crop, how much did you spend on planting, harvesting and selling cashew nut in 2011?

No	Cost items	Amount (000 Tsh)
1 Fertilizer/Pesticide 2 Weeding 3 Harvest 4 Preservation, storage 5 Drying 6 Others (specify) Total		

8. Complete the following table in accordance with the cashew production, which was sold in 2011:

Product	**Amount (Kg)**	**Price per kg**
Cashew nut		
Cashew apple		
Product in nature	**Amount of trays**	**Price per tray**
Cashew apple + nut		

Public policies

9. Do you receive actually any kind of technical support? ( ) Yes ( ) No
10. Do you have knowledge about any specifically agricultural financial support for the cashew system?

    ( )Yes ( )No

    If ***Yes***, which: _____
11. Do you really acquire training on cashew nut farming? Yes () No ()

    If yes, fill the table below

Type of training	Duration	Aded Value/Impact

Appendix II

Analyzed collected Data for the estimates of the Production function.

S/N	Output in kg	Acreage	Lncapital in Tsh	Labour	Fertilizer in Tsh	Price	dnon_edu	dsec_edu	Number of extension services	Age	Sex
1	500	1	13.86	8	1,300,000	800	1	0	0	3	1
2	800	1	14.51	12	1,500,000	1,000	1	0	0	3	1
3	2,700	1	14.22	8	1,500,000	1,400	0	0	6	3	1
4	6,250	15	15.37	14	3,000,000	1,400	0	0	4	3	1
5	2,000	5	14.51	10	1,500,000	1,200	0	0	3	2	2
6	1,620	3	14.29	10	1,800,000	1,100	0	0	3	3	1
7	1,080	5	14.51	20	1,300,000	900	1	0	3	3	2
8	1,215	3	13.86	10	1,000,000	1,300	0	1	3	3	1
9	1,800	3	14.00	8	1,300,000	1,350	0	1	3	2	1
10	2,160	4	14.15	10	1,500,000	1,380	0	0	5	2	1
11	1,200	4	13.82	8	1,020,000	1,000	0	0	2	3	1
12	1,620	3	14.08	8	1,320,000	1,200	0	0	3	2	2
13	2,500	5	14.12	12	1,350,000	1,200	0	0	3	2	1
14	1,080	2	13.82	8	1,500,000	900	0	1	3	3	2
15	3,000	5	14.15	12	1,500,000	1,300	0	0	4	3	1
16	1,380	4	13.85	8	1,000,000	1,000	0	1	3	3	1
17	1,600	4	14.00	8	1,300,000	1,100	0	0	3	2	2
18	540	1	13.59	8	1,000,000	800	0	1	3	3	1
19	800	2	13.59	8	1,020,000	800	0	1	3	3	1
20	2,000	4	14.08	12	1,030,000	1,200	1	0	3	3	1
21	1,260	3	13.84	12	1,000,000	1,200	0	0	3	3	2
22	2,835	7	14.15	12	1,300,000	1,400	0	1	3	3	1
23	4,400	10	14.85	12	2,000,000	1,500	0	0	3	3	1
24	3,960	9	14.52	12	1,890,000	1,300	0	0	3	3	1
25	2,645	5	14.35	12	1,300,000	1,300	0	0	3	3	2
26	900	3	13.38	8	880,000	800	0	1	3	3	1
27	3,000	5	14.15	8	1,500,000	1,350	0	1	3	3	2
28	2,430	6	14.15	8	1,020,000	1,400	0	0	3	3	1
29	1,500	3	14.00	8	1,300,000	1,100	1	0	3	3	1

30	360	1	12.90	8	500,000	800	0	1	3	3	2
31	729	1	12.90	8	450,000	800	0	1	3	3	1
32	1,215	3	12.90	12	560,000	1,200	0	1	3	3	2
33	3,240	3	14.22	12	1,680,000	1,300	0	0	3	3	1
34	736	2	13.46	8	500,000	800	0	0	3	3	1
35	1,836	4	13.93	12	1,250,000	1,200	0	1	3	2	1
36	2,430	5	14.08	12	1,600,000	1,300	1	0	3	3	1
37	3,800	8	14.22	12	1,940,000	1,400	1	0	3	3	1
38	1,380	3	13.80	12	1,280,000	1,200	0	0	3	3	2
39	2,420	5	14.08	12	1,200,000	1,200	1	0	3	2	2
40	1,242	2	13.65	8	1,030,000	1,200	0	0	3	0	2
41	4,725	7	14.65	16	1,900,000	1,400	0	0	3	3	1
42	798	2	13.86	12	940,000	900	0	1	3	0	2
43	500	1	13.86	8	1,300,000	800	1	0	0	0	1
44	800	1	14.51	12	1,500,000	900	1	0	0	0	2
45	2,700	1	14.22	8	1,500,000	1,300	0	0	6	3	1
46	6,000	13	15.37	14	3,000,000	1,500	0	1	0	3	1
47	2,000	5	14.51	10	1,500,000	1,200	0	0	3	2	2
48	1,620	3	14.29	10	1,800,000	1,200	0	0	3	3	2
49	1,080	4	14.40	13	1,300,000	1,200	0	0	3	3	1
50	1,300	3	14.08	10	1,000,000	1,200	0	1	3	3	1
51	1,800	3	14.00	8	1,300,000	1,200	0	1	3	2	2
52	2,050	4	14.08	11	1,500,000	1,200	0	0	5	2	1
53	1,200	4	13.82	8	1,020,000	1,200	0	0	2	3	2
54	1,900	4	14.04	12	1,030,000	1,200	0	0	0	2	2
55	1,260	3	13.84	12	1,000,000	1,000	0	1	3	3	1
56	2,835	7	14.15	12	1,300,000	1,300	0	1	3	3	1
57	4,400	10	14.85	12	2,000,000	1,400	0	0	3	3	1
58	3,960	9	14.36	14	1,890,000	1,400	0	1	0	3	1
59	2,645	5	14.35	12	1,300,000	1,200	0	0	3	3	1
60	900	3	13.38	8	880,000	1,100	0	0	0	0	1
61	3,000	5	14.15	8	1,500,000	1,400	0	1	3	3	1
62	2,430	6	14.15	8	1,020,000	1,300	0	0	3	2	2
63	1,500	3	14.00	8	1,300,000	1,350	1	0	3	3	2

64	360	1	12.90	8	500,000	800	0	1	3	3	1
65	729	1	12.90	8	450,000	1,000	0	1	3	3	1
66	1,400	3	13.59	13	1,030,000	1,200	0	0	0	3	2
67	3,240	3	14.22	12	1,680,000	1,200	0	0	3	3	1
68	736	2	13.46	8	500,000	900	0	0	3	3	1
69	1,836	4	13.93	12	1,250,000	1,300	0	1	3	2	2
70	2,500	5	14.08	12	1,600,000	1,000	0	0	3	2	1
71	3,800	8	14.29	14	2,020,000	1,100	0	0	3	3	1
72	1,380	3	13.80	12	1,280,000	1,100	0	0	3	0	1
73	2,420	5	14.08	12	1,200,000	1,200	1	0	3	2	2
74	1,242	2	13.65	8	1,030,000	1,200	0	0	3	3	2
75	1,620	3	14.29	10	1,800,000	1,200	0	0	3	3	1
76	1,080	4	14.40	13	1,300,000	1,400	0	0	3	3	2
77	1,300	3	14.08	10	1,000,000	1,500	0	1	3	3	1
78	1,800	3	14.00	8	1,300,000	1,300	0	1	3	2	1
79	2,050	4	14.08	11	1,500,000	1,300	0	0	5	2	2
80	1,200	4	13.82	8	1,020,000	800	0	0	2	3	2
81	1,900	4	14.04	12	1,030,000	1,350	0	0	0	3	1
82	1,260	3	13.84	12	1,000,000	1,400	0	1	3	3	2
83	2,835	7	14.15	12	1,300,000	1,100	0	1	3	3	1
84	4,400	10	14.85	12	2,000,000	1,400	0	0	3	3	1
85	3,960	9	14.36	14	1,890,000	1,200	0	1	0	3	2
86	2,645	5	14.35	12	1,300,000	1,400	0	0	3	2	1
87	900	3	13.38	8	880,000	1,000	0	0	0	3	1
88	3,000	5	14.15	8	1,500,000	1,300	0	1	3	3	1
89	2,430	6	14.15	8	1,020,000	1,200	0	0	3	2	2
90	1,500	3	14.00	8	1,300,000	1,300	1	0	3	3	1
91	360	1	12.90	8	500,000	900	0	1	3	3	1
92	729	1	12.90	8	450,000	1,200	0	1	3	3	2
93	1,400	3	13.59	13	1,030,000	1,200	0	0	0	3	1
94	3,240	3	14.22	12	1,680,000	1,200	0	0	3	3	1
95	736	2	13.46	8	500,000	800	0	0	3	0	1
96	1,836	4	13.93	12	1,250,000	900	0	1	3	2	2
97	2,500	5	14.08	12	1,600,000	1,100	0	0	3	2	1

98	500	1	13.86	8	1,300,000	900	1	0	0	3	1
99	800	1	14.51	12	1,500,000	1,300	1	0	0	3	1
100	2,700	1	14.22	8	1,500,000	1,500	0	0	6	3	1
101	6,250	15	15.37	14	3,000,000	1,200	0	0	4	3	2
102	2,000	5	14.51	10	1,500,000	1,200	0	0	3	2	2
103	1,620	3	14.29	10	1,800,000	1,200	0	0	3	3	1
104	1,080	5	14.51	20	1,300,000	900	1	0	3	3	2
105	2,420	5	14.08	12	1,200,000	1,200	1	0	3	2	1
106	1,242	2	13.65	8	1,030,000	1,000	0	0	3	0	1
107	4,725	7	14.65	16	1,900,000	1,300	0	0	3	3	1
108	798	2	13.86	12	940,000	900	0	1	3	3	2
109	500	1	13.86	8	1,300,000	800	1	0	0	3	1
110	800	1	14.51	12	1,500,000	800	1	0	0	3	2
111	2,700	1	14.22	8	1,500,000	1,200	0	0	6	3	1
112	6,000	13	15.37	14	3,000,000	1,300	0	1	0	3	1
113	2,000	5	14.51	10	1,500,000	1,200	0	0	3	3	1
114	1,620	3	14.29	10	1,800,000	1,200	0	0	3	2	1
115	1,080	4	14.40	13	1,300,000	1,200	0	0	3	3	1
116	1,300	3	14.08	10	1,000,000	1,200	0	1	3	3	2
117	1,800	3	14.00	8	1,300,000	1,200	0	1	3	3	1
118	2,050	4	14.08	11	1,500,000	1,200	0	0	5	3	1
119	1,200	4	13.82	8	1,020,000	1,200	0	0	2	3	1
120	1,900	4	14.04	12	1,030,000	1,300	0	0	0	2	1
121	1,260	3	13.84	12	1,000,000	1,100	0	1	3	0	2
122	2,835	7	14.15	12	1,300,000	1,300	0	1	3	3	1
123	4,400	10	14.85	12	2,000,000	1,300	0	0	3	3	1
124	3,960	9	14.36	14	1,890,000	1,400	0	1	0	3	1
125	2,645	5	14.35	12	1,300,000	1,200	0	0	3	3	1
126	900	3	13.38	8	880,000	800	0	0	0	0	2
127	3,000	5	14.15	8	1,500,000	1,200	0	1	3	3	1
128	2,430	6	14.15	8	1,020,000	1,200	0	0	3	2	2
129	1,500	3	14.00	8	1,300,000	1,200	1	0	3	3	1
130	360	1	12.90	8	500,000	800	0	1	3	3	2
131	729	1	12.90	8	450,000	800	0	1	3	3	1

132	1,400	3	13.59	13	1,030,000	1,200	0	0	0	3	1
133	3,240	3	14.22	12	1,680,000	1,400	0	0	3	3	1
134	736	2	13.46	8	500,000	900	0	0	3	3	1
135	1,836	4	13.93	12	1,250,000	1,200	0	1	3	2	2
136	2,500	5	14.08	12	1,600,000	1,200	0	0	3	2	1
137	3,800	8	14.29	14	2,020,000	1,300	0	0	3	3	1
138	1,380	3	13.80	12	1,280,000	1,200	0	0	3	3	2
139	2,420	5	14.08	12	1,200,000	1,400	1	0	3	3	1
140	1,242	2	13.65	8	1,030,000	1,200	0	0	3	0	2
141	1,620	3	14.29	10	1,800,000	1,100	0	0	3	2	1
142	1,080	4	14.40	13	1,300,000	1,200	0	0	3	3	1
143	1,300	3	14.08	10	1,000,000	1,200	0	1	3	3	1
144	1,800	3	14.00	8	1,300,000	1,200	0	1	3	2	1
145	2,050	4	14.08	11	1,500,000	1,300	0	0	5	2	1
146	1,200	4	13.82	8	1,020,000	1,200	0	0	2	0	1
147	500	1	13.86	8	1,300,000	800	1	0	0	0	2
148	800	1	14.51	12	1,500,000	800	1	0	0	0	1
149	2,700	1	14.22	8	1,500,000	1,300	0	0	6	3	1
150	6,250	15	15.37	14	3,000,000	1,400	0	0	4	3	1
151	2,000	5	14.51	10	1,500,000	1,300	0	0	3	2	1
152	1,620	3	14.29	10	1,800,000	1,200	0	0	3	2	2
153	1,080	5	14.51	20	1,300,000	1,200	1	0	3	0	1
154	1,215	3	13.86	10	1,000,000	1,200	0	1	3	0	1
155	1,800	3	14.00	8	1,300,000	1,200	0	1	3	3	1
156	2,160	4	14.15	10	1,500,000	1,100	0	0	5	3	2
157	1,200	4	13.82	8	1,020,000	1,200	0	0	2	0	1
158	1,620	3	14.08	8	1,320,000	1,200	0	0	3	2	1
159	2,500	5	14.12	12	1,350,000	1,200	0	0	3	2	1
160	1,080	2	13.82	8	1,500,000	1,200	0	1	3	3	2
161	3,000	5	14.15	12	1,500,000	1,400	0	0	4	3	1
162	1,380	4	13.85	8	1,000,000	1,200	0	1	3	0	2
163	1,600	4	14.00	8	1,300,000	1,300	0	0	3	3	1
164	540	1	13.59	8	1,000,000	900	0	1	3	0	1
165	800	2	13.59	8	1,020,000	900	0	1	3	3	2

166	2,000	4	14.08	12	1,030,000	1,200	1	0	3	3	1
167	1,260	3	13.84	12	1,000,000	1,200	0	0	3	3	1
168	2,835	7	14.15	12	1,300,000	1,200	0	1	3	3	1
169	4,400	10	14.85	12	2,000,000	1,300	0	0	3	3	1
170	3,960	9	14.52	12	1,890,000	1,400	0	0	3	3	1
171	2,645	5	14.35	12	1,300,000	1,380	0	0	3	3	1
172	900	3	13.38	8	880,000	1,100	0	1	3	0	1
173	3,000	5	14.15	8	1,500,000	1,150	0	1	3	3	1
174	2,430	6	14.15	8	1,020,000	1,200	0	0	3	2	2
175	1,500	3	14.00	8	1,300,000	1,100	1	0	3	0	1
176	360	1	12.90	8	500,000	800	0	1	3	0	1
177	729	1	12.90	8	450,000	1,200	0	1	3	0	1
178	1,215	3	12.90	12	560,000	1,200	0	1	3	0	1
179	3,240	3	14.22	12	1,680,000	1,300	0	0	3	3	2
180	736	2	13.46	8	500,000	900	0	0	3	0	1
181	1,836	4	13.93	12	1,250,000	1,200	0	1	3	3	1
182	2,430	5	14.08	12	1,600,000	1,300	1	0	3	3	1
183	3,800	8	14.22	12	1,940,000	1,300	1	0	3	3	1
184	1,380	3	13.80	12	1,280,000	1,100	0	0	3	0	2
185	2,420	5	14.08	12	1,200,000	1,300	1	0	3	2	1
186	1,242	2	13.65	8	1,030,000	1,200	0	0	3	0	1
187	4,725	7	14.65	16	1,900,000	1,400	0	0	3	3	1
188	798	2	13.86	12	940,000	900	0	1	3	0	1
189	500	1	13.86	8	1,300,000	900	1	0	0	0	2
190	800	1	14.51	12	1,500,000	1,100	1	0	0	0	1
191	2,700	1	14.22	8	1,500,000	1,200	0	0	6	3	1
192	6,000	13	15.37	14	3,000,000	1,400	0	1	0	3	1
193	2,000	5	14.51	10	1,500,000	1,300	0	0	3	2	2
194	1,620	3	14.29	10	1,800,000	1,300	0	0	3	3	1
195	1,080	4	14.40	13	1,300,000	1,000	0	0	3	0	2
196	1,300	3	14.08	10	1,000,000	1,200	0	1	3	0	1
197	2,645	5	14.35	12	1,300,000	1,200	0	0	3	3	1
198	900	3	13.38	8	880,000	1,000	0	1	3	0	1
199	3,000	5	14.15	8	1,500,000	1,200	0	1	3	3	1
200	2,430	6	14.15	8	1,020,000	1,200	0	0	3	3	1