A COMPARATIVE ECONOMIC ANALYSIS OF TOBACCO AND GROUNDNUT FARMING: A CASE STUDY OF URAMBO DISTRICT, TABORA REGION

BY

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ABSTRACT

Tobacco farming is well established as the traditional cash crop in Tabora region. However, in recent years, groundnut is one among the cash crops which have been introduced in the area as an alternative source of income for smallholder farmers. Using 2007/2008 cropping season survey and the data from 121 randomly selected smallholder farmers from three villages, this study provides a comparative economic analysis for tobacco and groundnut farming systems. The analysis of quantitative and qualitative data from the survey was done by using Cobb-Douglas production function, gross margin analysis, independent sample t-test, and descriptive statistics such as frequency and multiple responses. The results of the study indicate that gross margin per acre for groundnut was lower than that of tobacco by 569 231.90 Tshs. Gross margins and household's income contribution by the two crops were tested using independent t-test, and revealed a significant difference with the P-value of < 0.007 and P-value <0.000 respectively. Cob-Douglas production function for tobacco and groundnut which was analysed using OLS regression method to estimate the responsiveness of output to inputs revealed that the constant value of groundnut (4.577) is bigger than that of tobacco (4.355), implying that groundnut farmers are more technically efficient than their tobacco counterparts.. As for groundnut, 1% increase in hired labour was associated with 0.392% increase in output while a similar increase in hired labour in tobacco was associated with a decrease of 0.21% in output. This suggests that farmers could be advised to allocate more hired labour in groundnut production than in tobacco production. Unlike in tobacco production, a 1% increase in seed was associated with a decrease of 0.138% in groundnut output. Given the extensive production and marketing constraints, the following policy recommendations are put forward; implementing a sustainable and strong input distribution

system and the need of putting in place marketing programs that would support groundnut crop intensification activities.

DECLARATION

I, NICHOLAUS MUSIMU KUBOJA, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and that it has neither been submitted nor is it being concurrently submitted for degree award in any other Institution.

_____ _____

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The above declaration is confirmed

_____ _____

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(Supervisor)

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DEDICATION

This work is dedicated to GOD the ALMIGHTY the Creator and giver of life to every living creature. To my father Musimu Kuboja and my mother Safira Chillege.

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LIST OF ABBREVIATIONS AND SYMBOLS

APP	-	Average Physical Product
CES	-	Constant Elasticity of Substitution
DALDO	-	District Agricultural and Livestock Development Officer
FOC	-	First Order Condition
GDP	-	Gross Domestic Product
GM	-	Gross Margin
ITGA	-	International Tobacco Growers Association
MAFS	-	Ministry of Agriculture and Food security
MPP	-	Marginal Physical Product
MRT	-	Marginal Rate of Returns
MVP	-	Marginal Value Product
OLS	-	Ordinary Least Square
SNAL	-	Sokoine National Agricultural Library
TORITA	-	Tobacco Research Institute of Tanzania
TR	-	Total Revenue
TVC	-	Total Variable Costs
TSL	-	Tanzania Spices Limited
URT	-	United Republic of Tanzania
US$	-	United States dollar
USA	-	United States of America
WHO	-	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Overview of Tobacco and Groundnut Sectors Worldwide

World tobacco demand is expected to increase at a rate of 1% a year due to an increase in income levels and the growth of population, especially in Asia and Africa. In the developing world, tobacco and cigarette production is also expected to increase due to lower costs of production and less restrictions on cultivation (Mugwagwa, 2008). Over 100 countries produce tobacco in the world. However, the United States of America (USA), Brazil, Zimbabwe, Malawi, India, and Turkey account for 80% of the world tobacco production. Zimbabwe accounts for 18% of the world tobacco exports and 5% of the world's flue cured tobacco production. The country is also the largest producer of tobacco leaf in Africa (Mugwagwa, 2008). In Zimbabwe, Tobacco production contributes over 50% of agricultural exports, 33% of foreign exchange earnings and 10% of Gross Domestic Product (GDP) (Masuka, 2002).

As for the Groundnut, the crop is grown on nearly 24 million hectares between latitudes 40 ^{0} N and 40 ^{0} S with a total global production of 34.5 million tones (FAO, 2000). The vast majority of groundnut is produced in Asia and Africa with 68% and 24% respectively of the total production; and the remaining 8% comes from North America, the Caribbean, Europe and Oceania. Approximately, 94% of groundnut is produced in the developing world, mostly under rain fed conditions.

In China, the total yield for the crop has been the highest in the world since 1993. In 2006, China was the world's largest groundnut producer, exporting about 637.4 million kilogram (Peanut Web of China, 2008). China has had a leading overall share of 37.5% of world production of groundnut followed by India (19%) and Nigeria (11%).

Groundnut is also an important cash crop in Sudan. In 2007, Sudan produced about 460 000 tonnes of the total world production of groundnut, and ranked number nine in the world (FAO, 2008). Groundnut is grown mainly for its oil, protein, plant residue and seed cake. The pressed cake remaining after the oil has been extracted from the kernels is a very valuable stock feed with around 50% by weight of protein and in some countries it is used as food ingredients (FAO, 2008). Groundnut is one of the world's principal oil seed crops. It occupies a unique position among oil seeds as it can be consumed directly and can be used in many other ways. Groundnuts are very rich in protein, fat and, more importantly, niacin. However, it is oil which is the chief product of the crop. Oil from groundnuts can be used for cooking; the cake left after the oil is extracted is purified and used in supplementary mixes. As reported by Khidir (2007), groundnut cakes contain 40 – 50% protein, rich in lysine and tryptophan, but poor in methionine and cystine.

1.2 The Salient Features of Agriculture in Tanzania

Tanzania is one of the countries whereby agriculture is still the largest sector with the biggest contribution to the share of the country's economy. In 2004, agricultural sector contributed approximately 51% of the foreign exchange, 75% of the total employment and 47% of the Gross Domestic Product (GDP) (ESRF, 2006). Smallholder farming dominates agricultural production, and the biggest proportion (90%) being that of subsistence. The sales of agricultural products accounts for about 70% of rural household income (ESRF, 2006). During the 1990s, agricultural growth stood at 6.3%, which was higher than in the 1970s and 1980s when the annual growth averaged 2.9% and 2.1%, respectively. During the 1991 to 2000 and 1999 to 2003 periods there was an increase of an average agricultural GDP growth rate of 3.3% and 4.3% respectively (MAFC, 2006a).

Agriculture in Tanzania is dominated by smallholder farmers (peasants) cultivating the average farm sizes of between 0.9 hectares and 3.0 hectares each. About 70 percent of Tanzania's crop area is cultivated by a hand hoe, 20 percent by an oxen plough and 10 percent by a tractor. Tanzania's agriculture is mainly rain fed, with food crop production dominating the agricultural economy. Thus, of a total of 5.1 million ha cultivated annually, 85 percent is under food crop production. In the sector, women constitute the main part of agricultural labour force. The major constraint facing the agriculture sector is the declining labour force and land productivity due to application of poor technology, dependence on unreliable and irregular weather conditions. Both crops and livestock are adversely affected by periodical droughts [http://www.tanzania.go.tz/agriculture.html].

1.3 Agricultural Policy Framework

In Tanzania, the policy framework has been evolving at various levels. The Tanzania Development Vision 2025 emphasizes on the need to transform the economy from a predominantly agricultural one with low productivity to a semi industrial economy with modern rural sector. In this regard, great emphasis is placed on the role of the private sector in stimulating economic growth and developing the rural areas. Thus, the promotion of income generating activities, development of a diverse and strong micro and small-scale enterprise sector, and diversifying the skills based vocational training are an integral part of the strategy for achieving the Development Vision 2025 (Wangwe and Lwakatare, 2004). Since development of rural finance is dependent on a variety of factors that cut across different sectors, the formulation of the Rural Development Policy and Strategy and the Agricultural Sector Development Strategy are an integral part of the overall policy framework for rural finance. The rural development strategy sees the need to diversify the

structure of the economy with a view to reducing dependence on agriculture (Wangwe and Lwakatare, 2004).

1.4 Historical Background of Tobacco and Groundnuts in Tanzania

Similar to other traditional cash crops, tobacco was introduced in the country during the colonial period in the 1930s. The crop has gone through several phases- a reflection of the political and economic orientation of the country during the process of development. In Tanzania, tobacco is one of the major agricultural export crops, being the third largest foreign exchange earner after coffee and cashew nuts (ESRF, 2006). The crop is the main source of income to some 72 000 smallholder farmers who are striving to get, or stay, out of poverty. It also offers employment to many Tanzanians in both tobacco farms and in the three processing factories in Morogoro and Ruvuma regions. In addition, the crop provides raw material for cigarette manufacturing factories, thus offering further employment opportunities in the country (Rweyemamu and Kimaro, 2006).

Tabora is among the Tanzania's regions in which tobacco production is one of the main economic drivers. The region produces about 60% of flue-cured tobacco of the total production of this type of tobacco in the country (Stenson *et al.*, 2003). However, tobacco production in the region has been declining steadily. A decrease in flue-cured tobacco production in Tabora region was recorded to be 10 281 tones and 7390 tones from the crop year 1974/75 to the crop year 1980/81, respectively. Since then, it has been fluctuating but with a decreasing trend. In view of the foregoing facts on tobacco production and marketing in the region, some smallholder farmers have started to shift from involvement in tobacco production to engaging in the production of oil crops such as groundnuts and sunflower.

As for the groundnuts, the crop is grown by smallholder farmers in Tanzania and is one of the major raw materials for edible vegetable oils in the country, and is one of the several oilseeds produced in the country. Groundnut is mainly used as a food crop and consumed directly (Sibuga *et al.*, 1992). Because groundnut is both food and a cash crop, large quantities are sold in informal markets. The crop is consumed in various forms and is considered to be one of the sources of protein for the rural people. The main utility value of groundnut relates to its domestic consumption as seeds and oil since the crop has 25% protein and 50% oil (Okumu, 2007). Apart from the economic and dietary benefits, groundnut which is one of the legumes has been found to be a good fixer of atmospheric nitrogen to the soil when inoculated with the right species of rhizobia (Waddington and Johannes, 1998).

1.5 Research Problem and Justification

The production of tobacco has been increasing gradually, being driven by producer prices and political influence. This has led to inexorable deforestation with far reaching consequences on climate change, food production and increased poverty. In addition to the clearing of forestland for cultivation, it is estimated that about 1 tone of firewood is required to cure one tone of tobacco, which in turn requires a clearance of 2 hectares of forest (Mangora, 2005). In Tabora region, the major agent of deforestation is the flue curing of tobacco using fuel wood from natural forests whereby on average tobacco farmers use about 1 m^3 firewood to cure 57 kg of tobacco (Abdallah and Sauer, 2007). Also in Tabora region, more than 18 000ha are cleared every year for tobacco curing (Stenson *et al.*, 2003). This negative effect of tobacco farming resulting from deforestation

and environmental degradation, especially the reduction in biodiversity and sanitation of rivers and lakes need to be weighed against the benefits in the long run.

In Urambo district, tobacco has been the most important traditional cash crop since 1960s. However, between 1995/96 to 1999/2000 the production of tobacco in the district declined from 13 027 000 tones to 4 675 400 tones, respectively (Masudi *et al.*, 2001). As pointed out by Kalamata (2006), at the beginning of 1996/97, the total production started to decline, reaching its lowest point in 1999/2000. On the other hand, the price of tobacco in the world market has been fluctuating; for example in 1999/2000 and 2003/2004, the price varied between US $ 1.04 and US $ 1.58 per kilogram (MAFS, 2005).

The increase in anti-smoking campaigns in western countries and the associated reduction in demand for tobacco as well as the recently launched work of an International Negotiating Body on Drafting a WHO framework Convention on tobacco control, the need to diversify this crop as a major source of economic livelihood and foreign exchange is evident (WHO, 1999).

Another method used to discourage smoking is an increase in taxes imposed on tobacco sales. In Europe, taxes imposed on tobacco increased dramatically in the late twentieth century. In the USA, local governments in the eighties began prohibiting or restricting smoking in public places, including corporate offices and places of business. The WHO Framework Convention on Tobacco Control of May 2003 aims at involving all member countries in a comprehensive and multi-sectoral control and restriction of accessing and promotion of tobacco products, with the aim of reducing consumption and concomitant morbidity and mortality associated with tobacco use (WHO, 2003).

In view of the above facts concerning tobacco farming, the government and development partners have taken some measures to mitigate the problems. Different initiatives are taken by different stakeholders to develop high-yielding varieties and promote groundnut production, which is environmental friendly and as a substitute of tobacco.

In Tanzania, several studies on groundnut production have been carried out. Such studies include that of Kafiriti (1990), which looked at the importance of timely harvesting of groundnut. In the Kafiriti's study the author also concentrated on the role of cropping system in sustainability groundnut production (Kafiriti, 1994). This is after the earlier study (Kafiriti, 1989), whereby the author addressed groundnut based intercropping systems. Another study by Mpiri (1991) focused on the progress of groundnut crop protection work in Tanzania. Again the author investigated the integrated approach to the management of groundnut diseases. There is also a study by Mwenda (1990) which evaluated the performance of recently released groundnut cultivars in Tanzania.

Despite the fact that these studies have addressed different components of groundnut production, little is known about the contribution of groundnut production to the economy of smallholder farmers' vis-à-vis other cash crops production in Tanzania, specifically Urambo district in Tabora region. The results of the current study would not only shed light for decision making among different development partners but also it would provide the basis for decision making for farmers who are operating under scarce resources. Therefore, this study is an attempt to undertake a comparative economic analysis of tobacco and groundnut farming and their contribution to farmers' income. This information is deemed necessary since resources for agricultural production are scarce.

1.6 Objective of the Study

1.6.1 Main objective

The main object of the study is to examine the economic benefit of tobacco vis-à-vis groundnut enterprises.

1.6.2 Specific objectives

i. To compare the profitability of groundnut to that of tobacco farming in the study area.
ii. To compare the contribution of tobacco and groundnut enterprises to household's income in the study area.
iii. To estimate the responsiveness of tobacco and groundnut outputs to the main factors of production by estimating the production elasticity of the inputs.

1.6.3 Hypotheses

Basing on each specific objective, the following hypotheses were tested;

i. There is no significant relative profitability of growing groundnut with tobacco which is competing for resources use in the study area.
ii. There is no significant difference on the mean contribution of household's income between tobacco and groundnut enterprises in the study area.
iii. Tobacco and groundnut outputs are not influenced by the main factors of production (size of land cultivated, labour, seeds and fertilizer).

1.7 Organization of the Report

This thesis is organized as follows: Chapter One is about the background information whereby the worldwide overview of tobacco and groundnut production sub-sectors, salient features of Tanzanian agriculture, agricultural policy framework, historical background of tobacco and groundnut, research problem and justification, objectives of the study and hypotheses are presented. In Chapter Two relevant literature is reviewed whereas Chapter Three presents the research methodology and estimation procedures. Chapter four presents the results and the discussion. Finally, Chapter five presents the conclusion and recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

This section presents a synthesis of issues related to comparative economic analysis of tobacco and groundnut farming. The review begins with the theory of production and factors of production in sections 2.2 and 2.3, respectively. The theory of agricultural products marketing and concept of crop diversification are reviewed in section 2.4 and 2.5, respectively. Tobacco and groundnut industry in Tanzania are discussed in section 2.7 and 2.8, respectively. The following two subsequent sections discuss the economic benefits of alternative cash crops to tobacco and analytical techniques.

2.2 The Theory of Production

In the Encyclopaedia Britannica (2004) the theory of production has been defined as an effort to explain the principles by which a business firm decides how much of each commodity that it sells (its “outputs” or “products”) it will produce, and how much of each kind of labour, raw material, fixed capital good, etc, that it employs (its “inputs” or “factor of production”) it will use. The assertions are that there is a producer who seeks to maximize profits or minimize costs subject to producing a given output level in a production process (Henderson *et al.*, 1995). The production process is the transformation of inputs into outputs.

A production process is cost efficient if it costs less of the inputs by producing more of the outputs. This is explained well by the optimization behaviour of the producer (Koutsoyannis, 1992). The behaviour of the producer is under the assertion that a producer

wants to maximize output for a given cost or minimize cost for a given output level. For the sake of determining the profitability of alternative production opportunities, the physical data must be combined with price and cost information as well as data on the availability of various land, labour, and capital resources. This will help in making appropriate production decisions for the farm or firm (Boehlje *et al.*, 1984). To get reliable and meaningful estimates it is essential to include all relevant variables used in the production process.

2.3 Labour, Land Productivity and Induced Technological Change

This section reviews in brief the role of labour, land productivity, and technological changes (i.e. fertilizers, seeds and pesticides) on crop production. Productivity is the ratio of output to input. The earliest approach to productivity measurement was based on the ratio between aggregate output and a single input, which results into a partial productivity measurement such as land or labour productivity. Different development paths in different countries or regions within a country could be studied using partial productivities. Hayami and Ruttan (2004) in their pioneering study of the induced innovation concept used partial productivity changes over time in different countries to test their theory. In economic development, labour is typically the most significant input for traditional agriculture. In land-constrained countries such as Malawi, agricultural production is mainly constrained by the quantity and quality of land input. The ranges of possibilities for land utilization and agricultural production therefore are delineated by the major geo-environmental parameters of topology, climate, and soils. Within this range, the actual patterns of land use are determined by a number of factors namely the demand for agricultural products, available technologies (mainly seed technology and fertilizer use), and the land/labour ratio. Although it is possible to increase production through increased labour input, the

effect on production is normally low. The use of off-farm inputs such as fertilizers, pesticides and other chemicals typically provide greater potential for increased production and productivity. Coelli *et al.* (2003) in their study using a stochastic production frontier model to measure total factor productivity growth, technical efficiency change and technological change in Bangladesh crop agriculture reported that land, fertilizer, labour and animal power appeared to be the major determinants of agricultural growth. However, land remains the single most important input with an output elasticity of 0.67 followed by animal power at 0.22 and fertilizer at 0.13, respectively. Reasonably enough, for a labour surplus economy, labour has the lowest output elasticity of only 0.08 (Coelli *et al.*, 2003).

2.4 The Theory of Agricultural Products Marketing

The need for price and cost data to make adequate farm management decisions underscores the necessity for expertise in the field of marketing (Kohls *et al.*, 1980). To maximize income or even to survive, farmers must not only produce the crop or livestock efficiently, but also they must buy the inputs and sell the products at prices that result into a profit. The ability to analyse the market and to reflect the changing market expectations in production schedules, input purchasing and product selling strategies are essential components of profitable farming.

2.5 Crop Diversification

Diversification refers to the allocation of resources to a variety of enterprises the outcome of which are not closely related. The opposite of output diversification is specialization, where firms concentrate their resources on a small number of enterprises. Specialization in production may be expected to lead to efficiency gains through the division of labour and management resources. This division is to take advantage of specialist skills and

knowledge and ‘learning by doing’, saving time in labour use by not having to switch between tasks, and the avoidance of bottlenecks in the allocation of labour and management resources caused by their simultaneous requirement in different activities during peak periods of the production cycle.

Diversification efficiencies act in the opposite direction to specialization efficiencies. They derive from the longstanding reliance by smallholders on flexibility in their production processes that is provided by a portfolio of different farming enterprises. In an uncertain production environment, the ability of family members to vary their levels of participation among different enterprises and labour activities can help overcome difficulties arising from unanticipated events.

Crop diversification is supposed to be a step towards agricultural development. It has the effect of reducing the risk in crop production caused by fluctuations in market related variables. Diversification is also a step towards market oriented production which means farmers will not only be producing for their family’s consumption but for the market as well (World Bank, 1994; URT, 2003). Ashimogo *et al.* (2003) summarizes the role of crop diversification as being the one aiming at ensuring security in basic food items, increasing and stabilizing earnings from agricultural exports and lastly to reduce import dependence on products where a country has a comparative advantage without losing insight of the primary objective of increasing farm income.

2.6 Economies of Diversification

Dynamic process in production is the diversification of production away from a long-established, well-adapted and well-understood cropping system for subsistence purposes,

with carefully refined cultivation methods that have proven to be an efficient way of feeding people (Sharma, 2004), to less well understood commercial cropping activities. These commercial activities nevertheless offer potential for diversification economies to smallholders, leading to productivity gains that increases returns to their land and labour inputs. According to Sharma (2004), smallholders have been most successful in increasing productivity when diversifying their activities through an adaptive growth strategy, entailing a combination of new cash cropping ventures. In respect of input usage, Sharma (2004) observes that the main path to the development of smallholder farming systems has been through improved 'technology' management practices and field husbandry methods that are simple and mostly inexpensive in cash terms'. This path requires considerable ability to make efficient use of family labour and management resources.

2.7 Tobacco Industry in Tanzania

Tanzania is the fourth biggest tobacco producing country in Africa. According to official statistics, Tanzania had an estimated annual tobacco production of 30,000 tons (URT, 2005). It is however, assumed that production has increased significantly between 1994 and 2000. Tobacco production in Tanzania is strongly driven by political and economical pressures put on the farmers on the grounds that it brings revenue to the government, and exports bring in foreign exchange. For example, in 1995, tobacco contributed about USD 30 million as revenue levied on tobacco taxes, and it ranked the sixth foreign exchange earner for Tanzania (Kalamata, 2006).

While these economic aspects of tobacco hold true for Tanzania, they do not invalidate the fact that increasingly more people are falling victims of the tobacco related health hazards. The consumption of tobacco is widespread across the country among men, and it is also

increasing among women. Although studies have shown that smoking is more widespread in the rural areas of Tanzania, more smoking populations are still found in the urban areas.. The mean age of the onset of cigarette smoking in Tanzania is 10 years, and the daily smoking rates are highest in the “well off” groups, between the ages of 25 to 64 years. Also on average, adolescents attending school smoke less than those not attending school (Kalamata, 2006).

2.7.1 Tobacco production and marketing

As intimated above Tobacco is ranking high in foreign exchange earner, therefore it is among the major export crops in Tanzania, ranking fourth after coffee, cotton and tea. The crop has very good prospects of expanding to becoming the number one crop because the country has great potential to hold acreage or increase productivity or both. Tanzania produces three types of Tobacco; flue cured, fire cured, and burley tobacco. The main Tobacco growing areas in Tanzania include Iringa, Tabora, and Mbeya regions, which grow flue-cured tobacco. Ruvuma, Kagera and Kigoma regions grow fire-cured tobacco and parts of Morogoro, Tanga, Lindi and Kagera regions mainly grow burley tobacco. . The major contentious issues facing the tobacco industry include low level of technology on the crop production and the adverse effects caused by the industry to the environment.. Despite these facts, the production of the crop has continued to increase from 16 000 tones in 1990/91 to 30 000 tones in 1995/96 (URT, 2005).

2.8 Groundnut production and marketing

In Tanzania, groundnuts are grown by small holder farmers and the crop is one of the major raw materials for edible vegetable oils in the country. Groundnuts are grown in most parts of Tanzania below 1500m altitude, and the crop is grown entirely under rain fed

condition. The major growing regions in Tanzania include Mtwara, Tabora, Shinyanga, Kigoma, Dodoma and Mwanza, where annual rainfall varies between 500 and 1200mm (Mwenda *et al.,* 1985). The two main groundnut growing zones have different rainfall amounts and distribution during the growing season. One zone covers Mtwara, Ruvuma, Kigoma, Tabora and Mwanza regions, which have unimodal rainfall falling from October/November to May/June with a brief dry spell from a few days to a few weeks in January or February (Mwenda, 1985). The second zone covering Morogoro, Central and north eastern parts of the country has bimodal rainfall distribution, with short rains in November/December and long rains from March to May/June.

In Tanzania, groundnuts are grown almost solely as a subsistence crop. Since 75 percent of Tanzania's cultivated lands are in dry, low fertility areas, groundnut yields have as a result been declining in recent years. Lack of high yielding varieties, poor cultural practices, and weak marketing incentives are among the factors identified for the decline in the production of groundnuts. Other serious problem limiting yields and causing heavy losses include diseases such as rosette, leaf spot and groundnut rust. The yield of 120 to 400kg/ha have been experienced in several groundnut growing parts of Tanzania. These are low compared to the 1000 to 1500kg/ha obtained in other groundnut growing African countries [http://idrinfo.idrc.ca].

2.9 Economic Benefits of Alternative Cash Crops to Tobacco

A study done by Mathania (2007) on the analysis of production and marketing potential for paprika as an alternative crop to tobacco in Urambo district in Tabora region found out that a unit production cost for tobacco was 581 288.52 higher compared to that of paprika. Paprika production was also found to be a profitable enterprise with a gross margin of Tshs

250 950/acre when farmers sell their produce to Tanzania Spices Limited (TSL) and Tshs 392 070/acre if they sell to Western Zone for Tobacco Cooperatives Union (WETCU). A study done by Mshiu (2007) on comparative analysis of contract farming modalities in Mtibwa for sugarcane farming and tobacco farming in Tabora revealed that the gross margin realized by tobacco contract farmers was significantly higher than that earned by sugarcane contract farmers. The Mshiu (2007) study findings have also been supported by Cobb-Douglas production, which revealed that farmers in tobacco contractual arrangement accrue more benefits than those in sugarcane contractual arrangement.

Rweyemamu (2001) studied the economic analysis of cash crop production and marketing in Tanzania under liberalized economy using the case study of tobacco in Songea district. The gross margin analysis was conducted for the two competing crop enterprises in the area, tobacco and maize to establish the relative economic profitability of the crops. The analyses revealed that although tobacco production is potentially a profitable enterprise relative to the international market, smallholders are not protected and are paid less than the potential value of their product. The overall effect is a net taxation of tobacco production system at the farm level. Thus, the existing marketing arrangements under liberalization have made the enterprise uncompetitive with low resource allocation efficiency. There is therefore, a net disincentive to produce the crop. The gross margin analysis indicates that tobacco was more profitable compared to maize but considering labour requirements the former, unlike the later, is a highly labour demanding crop with low returns to labour.

2.10 Analytical Techniques

2.10.1 Profitability analysis

The gross margin analysis aims at estimating the cost of production and returns to factors of production/or resource use. Msangi (2001) used gross margin analysis to compare resource use efficiency between SURUDE, HPI and non-project supported smallholder dairy farmers in Turiani, Morogoro rural district. Rweyemamu (2001) in his study of economic analysis of cash crop production and marketing in Tanzania under a liberalization market economy used gross margin analysis for the two competing crop enterprises in the area, tobacco and maize in order to establish the relative economic profitability of the crops. Mutayoba (2005) using the gross margin analysis examined the relative competition of vanilla with the most important traditional cash crop (coffee) enterprise in Bukoba district. Ngairo (1993) used gross margin of the main crops maize, potatoes and pyrethrum in order to establish the relative economic profitability of various smallholders' production. Mwikila (1992) also used the gross margin per hectare for the two crops (i.e. tobacco and maize) to obtain the most profitable enterprise. Senkondo (1988) used gross margin per hectare for the sugar cane and paddy to obtain the most profitable enterprise. The gross margin analysis was also employed by Mathania (2007) to compare the relative profitability of paprika and tobacco.

Regardless of its usefulness, according to Ferris *et al.* (2000) gross margin has the following limitations:

i. Gross margin is not a profit figure. Fixed costs have to be covered by the gross margin before arriving at a profit figure.
ii. Gross margin can vary widely form one year to the next year. This is due to the difference in market prices, weather conditions, and efficiency. Gross margin can

also differ considerably from farm to farm. This can result into differences in performance levels or differences in the overall systems of production or methods of recording. A comparison of average gross margins can be useful but it should be done over a number of years. However, it gives the starting point in the assessment of the enterprise.

Therefore, in this context the gross margin analysis was useful in comparing the gross margin of tobacco with that of groundnut in the study area so as to identify which enterprise is more profitable than the other. In order to counteract the above shortcomings a partial budget analysis using Marginal Rate of Return (MRT) and independent sample t-test statistic were used to evaluate the relative profitability of the two farming enterprises (i.e. tobacco and groundnut).

2.10.2 Production function

The Cobb-Douglas production function was developed by an American economist Paul Douglas and mathematician Charles W. Cobb. It is specified as follows:

$$Q = AL^{\alpha}K^{\beta} \qquad \text{(i)}$$

Where;

A is the intercept (constant term)

α and β defines the transformation ratio of the inputs (elasticity of production)

L and K are labour and capital inputs, respectively

Q is output.

Capital can be interchanged with labour without affecting the output. Cobb and Douglas also suggest that the share of labour and capital within an economy are relatively constant

over time. The analysis of Cobb-Douglas production function is used to examine the influence of factors inputs to production. When we estimated the Cobb-Douglas production function, and find that $\alpha+\beta=1$, which implies constant returns to scale; and when $\alpha+\beta<1$, which implies decreasing returns to scale; and when $\alpha+\beta>1$, implies increasing returns to scale. In the above equation, the relationship between output and inputs is nonlinear. In order to apply OLS regression to estimate parameters the equation will be log-transformed to become linear as shown in equation (ii)

$$Inq = InA + \alpha InL + \beta InK + \varepsilon \qquad \text{(ii)}$$

Where:

q is total output of the i^{th} farms

A is the constant term of the regression

α and β are elasticities of production with respect to the i^{th} input

L i^{th} input used in the production process

K i^{th} input used in the production process

ε is the error term assumed to capture the influence of random variables

This production function was used by Mwakalobo in his study of analysing resource productivity and allocation efficiency of coffee smallholder farmers in Rungwe district (Mwakalobo, 2000). Mshiu (2007) used the same production function to examine factors influencing production of sugarcane and tobacco crops in contract farming. In this study the same production function was used to test whether the average outputs of tobacco and groundnut is not influenced by the main factors of production (size of land cultivated, labour, seeds and fertilizer) by using OLS regression analysis.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Overview

This section presents the research methodology adopted in this study. The section begins with the description of the study area and study design used, these are followed with the sampling procedures and data collection techniques both of which are presented in sections 3.4 and 3.5 respectively. The chapter ends with the presentation of data analysis in section 3.6.

3.2 Description of the Study Area

The study was conducted in Urambo district, Tabora region. Urambo district was selected due to the fact that the area has a relatively longer experience in flue cured tobacco production. Furthermore, following the British survey which was conducted soon after the Second World War, Urambo was among the areas deemed suitable for the production of groundnut.

3.2.1 Location and background information

Urambo district lies between longitudes 31^0 E and 32.5^0 E and between latitudes4 ^{0}S and 5.7 ^{0}S. The area covers a total area of 25 995square kilometres. It has four divisions, 23 wards, 97 registered villages. There are also 11 unregistered villages in three wards within Ulyankulu refugees' settlement. The district receives an annual rainfall ranging from 900mm – 1200mm. The rain starts in November and ends in April. The area has an annual mean temperature of 30 ^{0}C and mean minimum temperature of 16.4 ^{0}C. The temperature is highest in October just before the start of the rain season, and falls gradually to December

and remains relatively constant until May. The temperature is lowest between May and August. Urambo has a well drain medium-textured soil, with loamy sand or sand loam topsoil and sandy clay loam sub soil. In areas where soils are liable to flooding, the soils are deep and predominantly sandy clay loam and clay textured. The upland vegetation in the district is miombo woodland mixed up with wetland vegetation of *mbuga* wooded grassland and *mbuga* grassland.

3.2.2 Population

The district has a population of 443 679, which consists of 219 177 males and 224 502 females. The main ethnic groups in the district are Nyamwezi, Ha, Sukuma, Fipa, Sumbwa and Nyakyusa.

3.2.3 Economic occupation

The economic activities in the district are predominantly agriculture and livestock keeping. Other economic activities in the district include beekeeping and fishing. as for the agricultural sector, the crops grown include maize, rice, cassava, beans and sweet potatoes as food crops; and flue cured tobacco, groundnuts, and sunflower as cash crops. Among the cash crops, tobacco is the main cash crop in terms of its contribution to the economy of the district, followed by other crops such as Moringa, Oil palm, Vegetables, paprika (Capsicum *sp*) and fruits.

3.3 Study Design

The study used cross section design and employed a survey method. Using this design the data were collected by using structured questionnaires.

3.4 Sampling Procedures

Purposive, multistage and random samplings were carried out. In the first stage, purposive and multistage area samplings were used to obtain divisions, wards and villages which cultivate tobacco and groundnut. All four divisions in Urambo district were sampled, and these were Urambo, Ulyankulu, Kaliua and Usoke divisions. Due to shortage of funds Kaliua division was randomly selected from the four divisions. From Kaliua division three different villages that comprise tobacco and groundnut farmers were sampled. The villages sampled were Kaliua, Kasungu and Kasisi. A multi-stage sampling was chosen because it took into account the delineation of the study area in terms of divisions, wards and villages. The sampling frame or target population of this study consisted of all groundnut and/or tobacco growers in the study area. A Random sampling procedure was used to obtain a sample size of 121 respondents of which 60 were tobacco farmers and 61 were groundnut farmers.

3.4.1 Sample frame

The sampling frame or target population of this study consisted of all groundnut and/or tobacco growers in the study area.

3.4.2 Sample unit

The sample unit of this study was the head of the household.

3.4.3 Sample size

A sample size of 121 respondents was used in this study. This comprised of 60 tobacco and 61 groundnut growers in the study area.

3.5 Data Collection

3.5.1 Primary data

Primary data were collected from 121 tobacco and/or groundnut growers. A structured questionnaire was designed in such a way that it was able to capture both qualitative and quantitative data on household identification variables namely, farm activities, labour use and other purchased inputs, output and marketing of tobacco and groundnut. In addition, critical personal observation and informal discussion with farmers were conducted to explore and solicit more information.

3.5.2 Secondary data

Secondary data on various aspects including the trend of tobacco and groundnut production overtime and the organization of tobacco and groundnut marketing systems were obtained from reports and other documentary materials from relevant institutions and organizations available inside and outside of the study area. These institutions and or organisations included DALDO office-Urambo district, Tumbi Agricultural Research and Training Institute, Sokoine National Agricultural Library (SNAL). The Internet was also used as a source of some information.

3.6 Data Analysis

The data was compiled, coded and inspected for accuracy. The analysis of quantitative and qualitative data from the survey was done using the OLS regression analysis, partial budget analysis using Marginal Rate of Returns (MRT); descriptive statistics such as frequency, multiple responses analysis, cross tabulation, and independent-samples t-test statistics.

Specific objectives were analyzed through testing the following hypotheses:

(i) There is no significant relative profitability of growing groundnut and tobacco which are competing for resources use in the study area. A partial budget analysis using Marginal Rate of Return (MRT), Gross Margin analysis per acre and independent-samples t-test statistic were used to evaluate the relative profitability of the farming enterprises (i.e. tobacco and groundnut). This also aimed at estimating the cost of production and returns to various inputs used in tobacco and groundnut farming**.** Gross margin analysis was crucial in establishing whether or not the two crops provide the same economic benefits. The following empirical model was used.

$$GM = TR - TVC \qquad \text{(iii)}$$

Where;

- GM = Gross Margin for each crop (Tshs/ha)
- TR = Total Revenue from sale of each crop (Tshs/acre). This is given by multiplying the quantity produced by the unit price
- TVC = Total Variable Costs on production of each crop (These include labour and inputs). This is given by multiplying the quantity of resources by their corresponding unit price.

Other hypotheses were

(ii) There is no significant difference on the mean contribution of household's between tobacco and groundnut enterprises. To compare the mean contribution of tobacco and groundnut enterprises to the household's income the Independent sample t-test was run using SPSS computer program. This was run on the following assumptions: first that the dependent variable is normally distributed, and secondly, the two groups

(i.e. tobacco and groundnut farmers) have approximately equal variance on the dependent variable and that the two groups are independent of one another.

(iii) The outputs of tobacco and groundnut are not influenced by the main factors of production namely, the size of the land cultivated, labour, seeds, and fertilizer). Tobacco and groundnut outputs were regressed against the independent variables, including the size of the land cultivated, labour, seeds, and fertilizers. The log linear production functions of tobacco and groundnuts are presented by the equations (xi) and (xiii), respectively. These equations estimated the responsiveness of the tobacco and groundnut outputs to the main factors of production. According to the microeconomic theory, a production function is a model that is used to formalize the relationship between inputs and outputs as specified in the general form illustrated below.

$$Y_i = f(x_i) \quad \text{(iv)}$$

Where;

Y_i represents the output

Xi represents the variable inputs

Equation (iv) may also be written as shown in equation (v) below

$$Y_i = f\{L, K, C\ldots\} \quad \text{(v)}$$

Where;

L represents labour expended in production,

K represents the size of land used in production

C represents the cost of other inputs applied such as fertilizer, pesticides and seeds

The objective of any producer is to maximize profit either by increasing the quantity of output (Y_i) produced or by reducing the cost of producing it. The production function can be expressed using specific functional forms such as Cobb-Douglas, translog and the constant elasticity of supply (CES) which are used to estimate the parameters within the function. Farrell (1957) disaggregated economic efficiency into technical efficiency and price or allocative efficiency. Allocative efficiency occurs if the marginal physical product is equal to the ratio of the corresponding product prices. In a perfectly competitive market, allocative inefficiency is the failure of a farm to meet the conditions for profit maximization. Before considering the Cobb-Douglas, coming next is the description of an examination of the condition for profit maximization.

Given the output price (P_y), the marginal value product (MVP) of y_i can be computed as shown in equation (vi) below;

$$MVP=MPP*P_y \quad \text{(vi)}$$

Where;

MPP represents marginal physical product

MVP represents marginal value product

From the production function, a profit function (π) can be generated as shown in the following equation (vii).

$$\pi = TVP-TVC \quad \text{(vii)}$$

Where;

Π represents profit

TVP represents a total value of the product

TVC represents a total variable cost

Applying the first order condition (FOC) to equation (vii) we get equation (viii).

$\partial\pi / \partial x_i$ =MVP-MFC=0 (viii)

Where;

MVP represents marginal value of the product

MFC represent marginal factor cost.

Thus, profit maximization is achieved when MVP equals to the MFC as shown in equation (x). This point represents the optimum use of inputs.

MVP= (MPP*Py) =MVC=P_x (ix)

Having discussed the conditions for profit maximization let us look at Cobb-Douglas production function. The analysis of Cobb-Douglas production function was used to estimate the responsiveness of tobacco and groundnut outputs to the main factors of production by estimating the production elasticity of the inputs. The empirical models for tobacco and groundnut enterprises were specified.

In the case of tobacco, the empirical model was specified as follows:

$$Q_i = A_1^{\alpha_1} L_2^{\alpha_2} L_3^{\alpha_3} L_4^{\alpha_4} K_1^{\beta_1} K_2^{\beta_2} K_3^{\beta_3} \quad \text{(x)}$$

$$InQ_i = \alpha_0 + \alpha_1 InA_1 + \alpha_2 InL_2 + \alpha_3 InL_3 + \alpha_4 InL_4 + \beta_1 InK_1 + \beta_2 InK_2 + \beta_3 InK_3 + \varepsilon_i \quad \text{(xi)}$$

Where:

Q_i is the total output of tobacco of the i^{th} farm (Kg)

α_0 is the constant term of the regression

A_1 is the size of land cultivated for tobacco (acres)

L_2 is the family labour used in the tobacco production (man-days)

L_3 is the hired labour used in the tobacco production (man-days)

L_4 is the contract labour used in the tobacco production (man-days)

α_1 is elasticity of production with respect to the size of land cultivated

α_2 is elasticity of production with respect to family labour

α_3 is elasticity of production with respect to hired labour

α_4 is elasticity of production with respect to contract labour

K_1 is the amount of fertilizers used in tobacco production process (bags)

K_2 is the amount of tobacco seeds used in the production (gm)

K_3 is the amount of pesticides used in tobacco production (Litres)

β_1 is elasticity of production with respect to fertilizers used in production

β_2 is elasticity of production with respect to seed used in production

β_3 is elasticity of production with respect to pesticides used in production

ε_i is the error term

For groundnut the model was specified as follows:

$$Q_i = A_1^{\beta_1} L_2^{\beta_2} L_3^{\beta_3} K_4^{\beta_4} \quad \text{(xii)}$$

$$InQ_i = \beta_0 + \beta_1 InA_1 + \beta_2 InL_2 + \beta_3 InL_3 + \beta_4 InK_4 + \varepsilon_i \quad \text{(xiii)}$$

Where:

Q_i is the total output of groundnut of the i^{th} farm (Kg)

β_0 is the constant term of the regression

A_1 is the size of land cultivated for groundnut (acres)

L_2 is the family labour used in the groundnut production (man-days)

L_3 is the hired labour used in the groundnut production (man-days)

K_4 is the amount of seeds used in groundnut production process (kg)

β_1 is elasticity of production with respect to the size of the land cultivated

β_2 is elasticity of production with respect to family labour

β_3 is elasticity of production with respect to hired labour

β_4 is elasticity of production with respect to seed used in production

ε_i is the error term

Through this model, the study results were expected to reveal that farmers needed to use more than one factor to have positive influence in the production of groundnuts as opposed to the production of tobacco.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

This chapter presents practical findings and discussion for the data obtained from the study. The chapter starts with the presentation of the socio-economic characteristics of the respondents. This is followed by a discussion of the practical results of the constraints of production and marketing of tobacco and groundnut, suggestions of possible solutions to farmers in addressing the constraints. Lastly, the chapter presents the results and discussion inv view of the hypotheses of the study.

4.2 Socio-economic Characteristics of the Respondents

The socio-economic profile of the respondents examined were age, sex, marital status, household sizes, household farm manpower, education of the respondents, and sources of income. Like other household demographic and surveillance surveys, this study considered the household to be composed of people who live together in one house. In the case where the man was not around, the woman became the *defacto* household head.

4.2.1 Age of the respondents

The mean ages of tobacco and groundnut growers were found to be 38 and 42 years respectively (Table 1). Since age has an influence on experience and decision-making, it was therefore expected that farmers involved in the growing of these two crops were in a position to make proper decision in entering or allocating their scarce resources. The study results also show that older farmers tend to involve themselves more in groundnut farming than their young counterparts. This can be associated with the fact that groundnut farming

is less labour intensive as opposed to tobacco. Similar results were also observed by Mathania (2007) in her study of "Analysis of production and marketing potential for Paprika as an alternative crop to tobacco in Urambo district" in which it was revealed that 38 percent of the paprika respondents were above the age of 55 years while only 18 percent of the tobacco respondents were above the age of 55 years. This trend was a result of the fact that paprika is less labour intensive as opposed to tobacco. On the other hand, young farmers prefer tobacco production with the perception that the crop is more profitable than are other cash crops which are grown in the area. This also can be explained by the fact that young farmers are more enthusiastic in development than older farmers.

Table 1: Age of the respondents

Age	N	Minimum	Maximum	Mean
Tobacco	60	23	73	38
Groundnut	61	17	75	42

4.2.2 Sex and marital status

Sex distribution of household heads and their marital status are shown in Table 2 where the majority of the farmers were males (74.4%). This suggests that farming is still dominated by males in the study area. The same trend was observed by Fawole *et al.* (2007) in his study of Sustainable Food crop Production through Multiple Cropping Patterns among farmers in South Western Nigeria. In another study, Mathania (2007) also observed the same trend whereby involvement of female in the farming of both crops was very lower that of males. This can be explained by the fact that in Urambo district in particular, and in Africa in general, men still have a control over most of the production resources. However, when looking at females alone the results show that more females were engaged in groundnut farming than those engaged in tobacco farming. This could probably be because groundnut farming is less labour intensive than is tobacco farming. Also, the initial capital for groundnut production can be met by females even though they have less access to

production resources. About 90% of the respondents were married. Marriage provides additional farm labour for the farmers. The higher percentage of the interviewed farmers being married couples is a reflection of stability of the family and the society at large. The implication of this is that most of the developmental innovations can be easily adopted by the society.

Table 2: Sex distribution of household heads and their marital status

Variables	Groundnuts	Tobacco	Total %
Sex			
Male	4	47	74.4
Female	18	13	25.6
Marital status			
Single	1	2	2.5
Married	52	57	90.0
Widowed	5	1	5.0
Divorced	3	0	2.5

4.2.3 Household size and manpower

The study revealed an average household size of 7 and 6 members for farmers in tobacco and groundnut production respectively, of which only an average of 4 for both enterprises work in the farm (Table 3). The high average of the household size for tobacco farmers might be associated with the fact that most of them were in contract labours. None of the households for groundnut farming was in contract labour.

Table 3: Household family size and manpower

Variable	Groundnut	Tobacco
Household size		
Minimum	1	1
Maximum	12	15
Mean	6	7
Household manpower		
Minimum	1	1
Maximum	10	11
Mean	4	4

4.2.4 Education of the respondents

This study revealed that 73.3% of tobacco farmers and 59% of groundnut farmers had attained primary school education, while 13.3% and 11.5% of tobacco and groundnut farmers respectively had attained secondary school education. On the other hand, 11.7% of tobacco farmers and 23% of groundnut farmers had no formal education. Generally, this study shows that tobacco farmers were more educated than their groundnut counterparts. This trend could be associated with the reality that tobacco farmers have higher income which enables them to meet the education costs as opposed to groundnut farmers Also, regular contacts of tobacco farmers with extension officers is an eye opener to the former in seeing the importance of education. On the other hand, the low level of education attained by most groundnut farmers suggests that some of the technical information used in farming might not be well understood, hence contributing to poor performance.

Table 4: Education status of the respondents

Variable	**Tobacco**		**Groundnut**	
Education status	**N**	**%**	**N**	**%**
Non formal education	7	11.7	14	23.0
Adult education	1	1.7	4	6.6
Primary education	44	73.3	36	59.0
Secondary education	8	13.3	7	11.5
Total	**60**	**100.0**	**61**	**100.0**

4.2.5 Mode of land acquisition for tobacco and groundnut farmers

Tables 5 and 6 show different modes of acquisition of land used for farming activities. The major three modes identified in ascending order include purchase, allocation by the village government, and inheritance. According to the study results, there is a range of land

acquisition modes which is an important income-determining factor. Everyone is supposed to posses land according to ones ability to acquire it.

Table 5: Mode of land acquisition for tobacco farmers

Tobacco	Frequency	Percent
Inherited	13	21.7
Purchase	25	41.7
Hired	2	3.3
Village government	20	33.3
Total	**60**	**100.0**

However, this is of course an elastic phenomenon as ones popularity seems to have considerable influence on matters of land allocation especially for one to be allocated land by the village government. The fairer allocation of land by the village government seems highly important. This implies that there is some utility value which is currently attached to land in the study area; this is unlike in the past when land was given for free. Other modes include hiring and free of charge.

Table 6: Multiple responses ranking of modes of land acquisition for groundnut farmers

Modes	Rank	Count	Percent
Groundnut			
Inherited	3	15	22.7
Purchase	1	24	36.4
Hired	5	1	1.5
Village government	2	21	31.8
Free of charge	4	5	7.6
Total		**66**	**100.0**

4.2.6 Experiences of farmers in tobacco and groundnut farming

Table 7 presents different categories of farmers' experiences in tobacco and groundnut farming. The study reveals that 38.3 percent of the interviewed tobacco farmers have an experience of 11 to 15 years in tobacco farming, while a larger percentage of groundnut farmers (34.4) have experience of 6 to 10 years in the farming activity. The variation in the farming experience might result from the fact that tobacco has been in around as a traditional cash crop for quite a longer period of time than has been the case for groundnut-the crop which is currently being promoted as one of the alternative cash crops. This suggests that a large proportion of tobacco farmers have more experience in farming than is the case with groundnut farmers. Experience, taken as one of the factors of production, can probably explain the higher performance in tobacco farming than that of groundnut farming.

Table 7: Experiences of farmers in tobacco and groundnut farming

Variable	Tobacco		Groundnut	
	N	**%**	**N**	**%**
Experience				
1 to 5 years	8	13.3	11	18.0
6 to 10 years	17	28.3	21	34.4
11 to 15 years	23	38.3	14	23.0
Above 15 years	12	20.0	15	24.6
Total	**60**	**100.0**	**61**	**100.0**

4.2.7 Other major sources of income

Other sources of income for groundnut farmers are shown in Fig.1. Apart from groundnut, other sources of income include sunflower, maize, cattle, goat, chicken, salaried employment, and off-season small businesses. Among these sources, maize is the leading source (12%) followed by chicken (5%) and small off-farm businesses (5%).

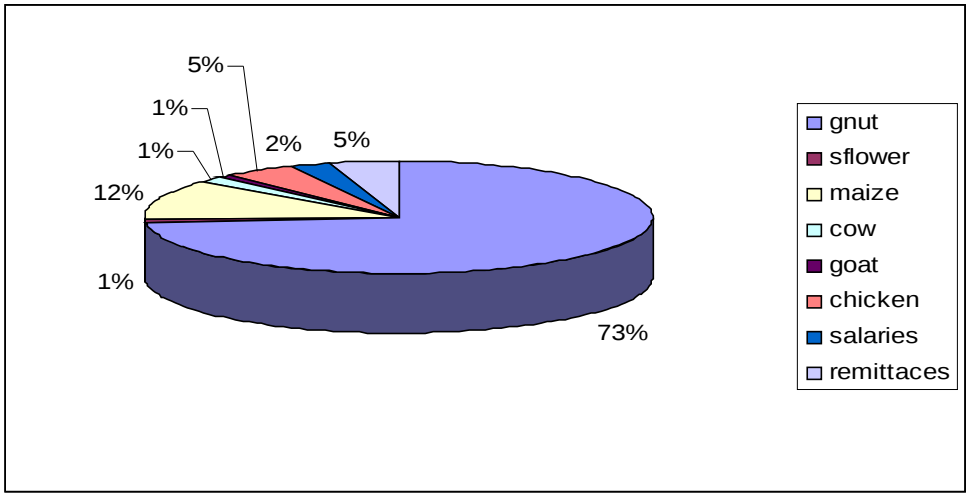

Figure 1: Other major sources of income for groundnut farmers

Tobacco farmers like their counterpart groundnut (gnut) farmers are also engaged in other farm and off-farm activities for income generation. Other major sources of income for tobacco farmers are shown in Fig. 2. This trend might be attributed to the fact that both tobacco and groundnut farming do not provide enough financial security for farmers to an extent of relying on them as a major source of income. Instead, tobacco and groundnut farmers keep livestock and use other food crops such as maize or sunflower (sflower) to supplement financial needs.

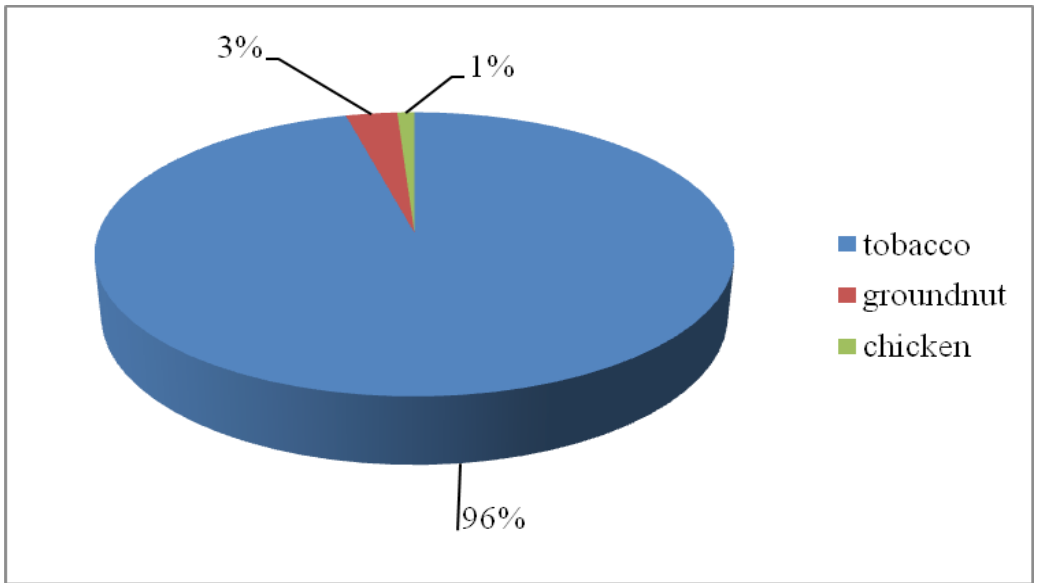

Figure 2: Other major sources of income for tobacco farmers

4.3 Reasons for Growing Tobacco or Groundnut

The frequencies of the counts of the multiple responses of tobacco and groundnut farmers were ranked to identify their reasons for either growing tobacco or groundnut. According to Table 8, farmers grow tobacco because it is more profitable as opposed to other cash crops in the study area. This might be associated with the fact that tobacco is the only cash crop which has been promoted as a cash crop for several years in the study area. There are many private companies dealing with tobacco production, and each of which promoting the crop. Tobacco came first in order of importance as a reliable source of income. This reason may be attributed to the fact that the market for tobacco in the study area is more reliable than is the case for the markets of other cash crop.

The ease with which one accesses production inputs and advice from other fellow farmers was identified as the third reason for farmers to opt for tobacco production. This might have been the product of production inputs credits offered by tobacco companies in the study area as well as the dominance of tobacco farming as a cash crop for the past several years. Other reasons given by the farmers include the ease with which one can access

credits and fertilizers for food crops. Farmers in the study area tend to use fertilizer which is meant for tobacco production for food crop production.

Unlike the tobacco farmers, groundnut farmers ranked source of income and multipurpose usage of groundnut as the first reasons for growing the crop. This is due to the fact that groundnut has a short term return compared to tobacco. Also groundnut is a major source of cooking oil in the study area. Low cost of groundnut production was probably the second reason, and which is associated with the fact that farmers use local seed varieties that are available in their area.

Table 8: Multiple response ranking of reasons for growing tobacco and groundnut among farmers

Reasons	Rank	Count	Percent
Tobacco			
Source of income	2	25	28.4
It is more profitable than others	1	50	56.8
Advise from other farmers	3	4	4.5
Easy to access credits	4	3	3.4
Source of fertilizer for food crops	5	2	2.3
Easily to get inputs for production	3	4	4.5
Total		**88**	**100.0**
Groundnut			
Highly paying	1	21	25.6
Low production costs	2	18	22.0
Multiple uses (food & cash)	1	21	25.6
It is a food crop	4	6	7.3
Less labour intensive	3	16	19.5
Total		**82**	**100.0**

Also most of the farmers reported of not using use fertilizers and pesticides in the production of groundnuts. Other reasons reported for the preference on groundnut production include the fact that the crop is less labour intensive and its use as a food crop. Generally, both crops tobacco and groundnut were grown as major sources of income. Also most of the farmers reported of not using use fertilizers and pesticides in the production of groundnuts. Other reasons reported for the preference on groundnut production includes the fact that the crop is less labour intensive and its use as a food crop. Generally, both crops tobacco and groundnut were grown as major sources of income.

4.4 Market Information and Linkage

The majority of tobacco farmers (71.7%) had information and were linked to the market, while only 42.6% of groundnut farmers seemed to have market information. This might be attributed by the existence of private companies in the study area which are mostly dealing with tobacco production and marketing. More than a half (57.4%) of groundnut farmers had no information about the market of groundnut suggesting that the majority of groundnut farmers did not consider groundnut as a cash crop rather they considered groundnut as a food crop. Also having the biggest percentage of tobacco farmers linked and being informed about the market might be attributed to the existence of non-governmental organizations dealing with tobacco production in the area. These non-governmental organizations, among other roles, provide technical support and market information to their respective farmers.

Table 9: Responses of tobacco and groundnut farmers on market information

Variable	Tobacco		Groundnut	
	N	%	N	%
Information about the crop market				
Yes	43	71.7	26	42.6
No	17	28.3	35	57.4
Total	**60**	**100.0**	**61**	**100.0**

4.5 Sources of Crop Price Information

The pricing methods used by the two farming systems are different. For groundnut farming, the final price to the farmer is known after the production is undertaken. Furthermore, it is the forces of demand and supply which determine the price for the crop. Tobacco, on the other hand, uses a fixed pricing method. Table 10 presents the various sources of tobacco and groundnut price information. The study reveals that 22 percent of the respondents on tobacco farming got price information by visiting the local tobacco market, 21 percent through private companies, 18 percent through local cooperative unions, 16 percent through extension officers, 14 percent through neighbours and 14 percent through friends. As for the groundnut farming on the other hand,, 33 percent of the interviewed groundnut farmers reported to have been getting price information through neighbours, this is closely followed by visits to the local market (30%), then through friends (25%) and lastly through private organizations (1%). The results imply that it is tobacco farmers who have reliable sources of price information (i.e. through local cooperative unions). This gives tobacco farmers a better chance of securing good prices for their products than is the case with their groundnut counterparts. If we consider price as an incentive and motivation to farmers, groundnut farmers are more disadvantaged because their price information sources are limited and not well organized.

Table 10: Sources for tobacco and groundnut price information

Sources	Rank	Count	Percent
Tobacco			
Visits to the local markets	1	22	21.0
Through neighbours	5	14	13.3
Through friends	5	14	13.3
Extension officers	4	16	15.2
Private companies	2	21	20.0
Local cooperative Unions	3	18	17.1
Total		**105**	**100.0**
Groundnut			
Visits to the local markets	2	30	33.7
Through neighbours	1	33	37.1
Through friends	3	25	28.1
Private organizations	4	1	1.1
Total		**89**	**100.0**

4.6 Agricultural Training

About 53.3% of tobacco farmers had attended agricultural training which may be attributed to the intervention activities of non-governmental organizations and the presence of TORITA (Tobacco Research Institute of Tanzania), which is a government institution dealing with tobacco research. For groundnut farmers, 60.7% of the respondents had not received any agricultural training suggesting poor farming practices being practiced in the study area. Therefore in order to make groundnut farming a promising and profitable enterprise, training and extension services are highly needed.

Table 11: Responses of tobacco and groundnut farmers on agricultural training

Variable	Tobacco		Groundnut	
	N	**%**	**N**	**%**
Agricultural training				
Yes	32	53.3	24	39.3
No	28	46.7	37	60.7
Total	**60**	**100.0**	**61**	**100.0**

4.7 Response on the Yield Increase Trend of Tobacco and Groundnut for the two Consecutive Cropping Seasons in the Study Area

The results of the comparison of the crop yields for both tobacco and groundnut for two consecutive seasons (2006/2007) are shown in Table 12 below. The results suggest that there was an increase in tobacco yield in the cropping season (2007/2008) compared to the cropping season (2006/2007). For groundnut, the results on the comparison of the crop yields in the two cropping seasons suggest a decrease in the crop yield. The observed increase in tobacco yield as opposed to groundnut was due to the efforts of non-government organizations and TORITA on rural community capacity building. Also, the use of improved varieties, fertilizers and pesticides by tobacco farmers, is attributed to crop an increase in crop yields. On the other hand, the notion that groundnut production does not need fertilizers application has contributed much to the low yield in groundnut.

Table 12: Response on the yield increase trend of tobacco and groundnut for the two consecutive cropping seasons in the study area

Variable	Tobacco		Groundnut	
	N	%	N	%
Was yield increased than last season?				
Yes	33	55	29	47.5
No	27	45	31	50.8
Total	**60**	**100.0**	**60**	**98.3**

4.7.1 Reasons influencing the trend of tobacco and groundnut yield

According to farmers' observation, the increase in tobacco yield was associated with the following reasons: The first reason is good farm management practices; the next is favourable weather condition particularly rainfall availability. Other reasons given in the order of preference include: availability of extension services, expansion of crop acreage, timely availability of inputs, adequate labour force, and improvement of soil fertility. As for groundnut farming, the respondents identified availability of rainfall and good farm

management as the major reasons for the increase in the crop yield. Other reasons include expansion of farm size followed closely with the availability of extension services, and lastly soil fertility improvement, availability of inputs, and a decrease in pest and disease incidences.

From these reasons identified by farmers, it can be observed that farmers in both farming enterprises perceive reliability of rainfall, good farm management and availability of inputs in their area as major factors which influence production. Therefore, there is a need for the government to ensure that extension services are available to rural farmers to enhance agronomic practices. In addition, there should also be a well established system which will enable farmers in the rural areas to access enough inputs at the right time.

Table 13: Reasons for increase and decrease in tobacco yield

Reasons	Rank	Count	Percent
Increase			
Good farm management practices	1	18	29.5
Expansion of grown land	4	8	13.1
Availability of extension services	3	10	16.4
Availability of inputs on time	5	7	11.5
Enough labour forces	6	4	6.6
Favourable weather condition	2	12	19.7
Fallow land (improved soil fertility)	7	2	3.3
Total		**61**	**100.0**
Decrease			
Low input supply	2	7	19.4

Poor mgt of seedling in the nursery	3	5	13.9
Low labour forces	5	3	8.3
Climate change	1	15	41.7
Incidence of pests and diseases	6	2	5.6
Lack of experiences	4	4	11.1
Total		**36**	**100.0**

On the other hand, tobacco farmers identified climate change as a major reason for the decrease in tobacco yield. According to farmers, rainfall intensity and distribution are no longer reliable and have become a challenge in their area. This shows that farmers do not have strategies to counteract the impact of climate change. The impact of climate change was and is still a big threat for sustainable crop production in the area. This is due to the fact that deforestation is still underway for the purposes of collecting fire wood for tobacco curing. The current practice advocated by most tobacco companies that a farmer has to plant 1 acre of forest annually seems to have no impact on environmental conservation. As Mangora (2005) observes, tobacco farming has significantly reduced biomass and caused a change in vegetation structure. This illustrates the potential loss in ecological function of the woodlands. The author also, observes that land clearing for tobacco planting accounts for the annual deforestation of 3.5% while on average a farmer requires 23 m^3 of stacked wood per season for curing only, and which adds to another 3% of deforestation. Shifting cultivation is no longer sustainable given the shortened fallow periods of 4 years. Improved barn structures, alternative sources of fuel such as coal, tree planting, mixed cropping and

cash crops that are environmental friendly are recommended for ecological restoration, and hence, the reduction of climate change impact on crop production. This climatic problem is followed by low input supply (19.4%), poor management of seedlings in the nursery (13.9%), lack of experience (11.1%), low labour force (8.3%) and incidence of pests and diseases (5.6%).

Groundnut farmers on the other hand also identified climate change as the major cause of a decrease in groundnut yield; this is in line with what tobacco farmers reported regarding a decline in tobacco production. Other reasons identified include low soil fertility which is followed by low input supply especially improved groundnut seed varieties.

Table 14: Reasons for increase and decrease in groundnut yield

Reasons	Rank	Count	Percent
Increase			
Good farm management practices	2	14	31.8
Availability of rainfall	1	16	36.4
Soil fertility improvement	5	2	4.5
Availability of extension services	4	4	9.1
Expansion of farm size	3	6	13.6
Decrease in pests and diseases	6	1	2.3
Availability of inputs	6	1	2.3
Total		**44**	**100.0**
Decrease			
Climate change (lack of rainfall)	1	17	62.0
Low soil fertility	2	6	12.0
Small farm size	4	2	4.0
Lack of inputs	3	5	10.0
Diseases and pests	2	6	12
Total		**36**	**100.0**

The incidence of pests and diseases was also identified as one of reasons which significantly reduce groundnut yields. These results suggest that serious measures need to be taken to rescue farmers in both enterprises from the effect of climate change.

4.8 Constraints to Tobacco and Groundnut Production in the Study Area

Major constraints of tobacco and groundnut production were ranked by farmers in the study area (Table 15). For tobacco production, high price of inputs was ranked as the first constraint followed by incidence of pests and diseases. Most of tobacco varieties grown are very susceptible to pests and diseases which are reported by farmers as second important production constraint. Lack of labour force is ranked third among the limiting factors in tobacco production; this is particularly because tobacco production is a labour intensive enterprise.

Similar observations were made by Mathania (2007) who found that climate change especially unpredictable and unreliable rainfall was ranked as the forth constraint for tobacco production. This situation might have been aggravated by deforestation which has been taking place in the study area as a result of tobacco farming which requires the cutting of fire wood for tobacco curing purposes. Lack of fire wood is another identified constraint which, in turn, is a noticeable phenomenon resulting from deforestation.

Therefore in order to get enough fire wood someone has to travel some miles away from his plot, and sometimes labour is needed to collect firewood. Loss of tobacco during curing process was another constraint for which farmers attributed to lack of expertise in curing and poor curing building structure which are mostly thatched with grasses. Other constraints identified by farmers in tobacco production include low soil fertility, centralized markets and low capital.

Table 15: Constraints ranking for tobacco and groundnut production

Constraints	Rank	Count	Percent
Tobacco			
Incidence of pests and diseases	2	24	18.9
Lack of labour forces	3	17	13.4
High prices of inputs	1	37	29.1
Loss of tobacco through curing	6	11	8.7
Centralized market	7	3	2.4
Climate change (Unreliable rainfall)	4	15	11.8
Low soil fertility	7	3	2.4
Low capital	7	3	2.4
Lack of firewood for curing	5	14	11.0
Total		**127**	**100.0**
Groundnut			
Lack of inputs (improved seed)	3	14	14.1
Pests and diseases	1	33	33.3
Poor farming practices	4	11	11.1
Climate change	2	16	16.2
Low soil fertility	5	8	8.1
Low capital	7	6	6.1
Inaccessibility to credits	8	3	3.0
Poor infrastructures	9	1	1.0
Unstable and unreliable market	6	7	7.0
Total		**99**	**100.0**

As for groundnuts, pests and diseases such as rosette, leaf spot and groundnut rust were reported to be the major constraint in the production of the crop in the study area.. The constraint which was ranked second in groundnut production includes climate change. Sibuga's (1992) study reported similar findings with adverse weather conditions, particularly unreliable rainfall singled out as a major constraint in groundnut production. Another study by Kafiriti (1990) has also reported timely harvesting of groundnuts, lack of improved seeds, poor agronomic practices and pests and diseases as being the major constraints in groundnut production. The respondents also ranked lack of production inputs such as improved seed varieties, fertilizers and pesticides to be the third most important constraints in the production of groundnuts.

The lack of good quality seed varieties which are high yielding and tolerant to diseases has resulted into poor performance of groundnut farming. The available local varieties are susceptible to pests and diseases. In addition, poor farming practices were also identified by farmers as a constraint for groundnut production. This trend is attributed to the fact that in the study area extension services especially for groundnut production are not provided. In the study area, the many extension officers who are available deal with tobacco farming and only a few deal with food crops such as maize and cassava. Other widely reported constraints include low soil fertility, unreliable market, low capital, inaccessibility to credit, and poor infrastructures.

4.9 Suggested Solutions to Farmers' Production Constraints

The results in Table 16 show profiles of solutions of tobacco and groundnut production constraints as suggested by farmers.

Table 16: Solutions ranking for tobacco and groundnut production

Solutions	Rank	Count	Percent
Tobacco			
Provision subsides on inputs	1	32	27.8
Availability of credits	3	19	16.5
Mechanization	6	8	7.0
Availability of inputs on time	2	24	20.9
Improvement of extension services	5	15	13.0
Establishment of agric. Financial inst	4	16	13.9
Irrigation farming	7	1	0.9
Total		**115**	**100.0**
Groundnut			
Provision of credit	2	21	21.2
Good farming practices	4	13	13.1
Establishment of irrigation scheme	6	3	3.0
Input availability (seed & fertilizers)	1	32	32.3
Improvement of infrastructures	7	2	2.0
Market information and linkage	6	3	3.0
Availability of extension services	3	15	15.2
Market reliability	5	7	7.1
Establishment of primary cooper	6	3	3.0

Total	**99**	**100.0**

The main solutions for tobacco production constraints suggested by farmers include provision of subsides on inputs by the government (27.5%), availability of inputs on time (20.9%), availability of credits (16.5%), establishment of agricultural financial institutions (13.9%), improvement of extension services (13%), use of animal power and tractorization (7%) and practicing of irrigation farming (0.9%).

Groundnut farmers suggested for the availability of inputs such as improved seed varieties and fertilizers (32.3%), provision of credits (21.2%), availability of extension services (15.2%), good farming practices (13.1%), market reliability (7.1%), market information and linkage (3%), establishment of primary cooperatives (3%) and improvement of infrastructures (2%).

4.10 Trend of Tobacco and Groundnut Market Prices for the Past Five Years

Table 17 shows the responses of tobacco and groundnut farmers on the increase and decrease of tobacco and groundnut market prices for the past five years. The majority of the respondents that is 86.7% of tobacco farmers and 59% of groundnut farmers reported of there being an increasing trend in market prices. The observed trend of tobacco and groundnut market prices is attributed to the presence of organized and free market systems. However, the increase in market prices offered by different buyers does not reflect the production cost. As Rweyemamu and Kimaro (2006) observe, although liberalization opened up markets by formally allowing private leaf dealers to invest in the marketing of

tobacco, operational arrangements have not provided adequate incentives to tobacco growers in terms of pre-harvest services and efficient marketing in general.

Table 17: Responses on the increases and decrease of tobacco and groundnut market prices for the past five years

Variable	Tobacco		Groundnut	
	N	%	N	%
Price trend				
Increasing	52	86.7	36	59.0
Decreasing	8	13.3	25	41.0
Total	**60**	**100.0**	**61**	**100.0**

4.10.1 Tobacco and groundnut market prices fluctuation

A number of reasons for the increase and decrease of tobacco and groundnut marketing prices were given by farmers. From the results, the main reasons for the increase in tobacco market price include high cost of production (47.3%), competition among tobacco companies (20.3%), market reliability (13.5%), good tobacco quality (12.2%), and high standard of living (6.8%). Mixing of tobacco of different grades and lack of expertise in tobacco management (from production to selling) were mentioned to be the two main reasons which led to the decrease in tobacco prices (Table 18). Groundnut farmers mentioned: low supply of groundnut in the market (54.7%), the presence of many buyers (22.6%), the expansion of external markets (18.9%), and good quality of groundnut (3.8%) to account for the increase in price.

Table 18: Reasons for increase and decrease in tobacco market prices

Reasons	Rank	Count	Percent
Increase			
High standard of living	5	5	6.8
High costs of production	1	35	47.3
Market reliability	3	10	13.5
Good tobacco quality	4	9	12.2
Competition among tobacco Companies	2	15	20.3
Total		**74**	**100.0**
Decrease			
Mixing of tobacco of different grades	1	9	75.0
Lack of expertise in tobacco mgt	2	3	25.0
Total		**12**	**100.0**

The reasons for the decrease in groundnut price were: instability of groundnut market (47.1%), high supply of groundnut in the market (32.4%) and buyers' control over the buying price (20.6%). However, the general trend with regards to the fluctuation of groundnut prices was determined largely by the forces of supply and demand (Table 19).

Table 19: Reasons for increase and decrease in groundnut market prices

Reasons	Rank	Count	Percent
Increase			
Low supply of nut in the market	1	29	54.7
Presence of many buyers	2	12	22.6
Expansion of external markets	3	10	18.9
Good quality of groundnut	4	2	3.8
Total		**53**	**100.0**
Decrease			
Instability of groundnut market	1	16	47.1
Price determination by buyers	3	7	20.6
High supply of nut in the market	2	11	32.4
Total		**34**	**100.0**

4.11 Constraints of Tobacco and Groundnut Marketing in the Study Area

Marketing constraints for tobacco and groundnut were identified and ranked by farmers in the study area (Table 20). Low price was ranked as the main marketing problem in tobacco

farming. Farmers explained that the market price offered did not reflect the cost of production. Poor infrastructures leading to high cost of transport of the produce from the production point to the market place was ranked second. The mixing of tobacco grades at the market was another problem which was ranked third. This tendency was probably caused by buyers with the intension of buying the produce at a cheap price. Whereas, the tendency has had a negative effect to farmers, it has had a positive effect to the buyers. Selling on credit and having many tobacco grades were ranked as forth constraint. Many tobacco grades which were set by tobacco companies have been impacting farmers negatively. Other constraints widely cited and ranked next in importance include corruption by classifiers, unbalanced weighing scales, lack of storage facilities and centralized tobacco market.

As for groundnut, unreliable and instability of the market was identified and ranked as the first constraint in the marketing of the crop. This trend might be attributed to the lack of primary cooperatives dealing with groundnut marketing. Groundnut farmers depend mostly on the local market and the few middlemen and traders who come in the study area irregularly. Price fluctuation came next in the ranking, and was associated with erratic availability of traders in the study area. Other constraints identified by groundnut farmers were unbalanced weighing scales, high transport cost and poor infrastructure.

Table 20: Constraints ranking for tobacco and groundnut marketing

Constraints	Rank	Count	Percent
Tobacco			
Low prices	1	38	40.9
Mixing of tobacco grades	3	8	8.6

Selling at debt	4	7	7.5
Centralized market	6	5	5.4
Corruption by classifiers	5	6	6.5
Weighing scale	5	6	6.5
Many tobacco grades	4	7	7.5
Poor infrastructures	2	10	10.8
Lack of godown	5	6	6.5
Total		**93**	**100.0**
Groundnut			
Price fluctuation	2	24	2.3
High transport costs	4	4	4.5
Unreliability & instability of market	1	37	42.0
Weighing scale	3	20	22.7
Poor infrastructure	5	3	3.4
Total		**88**	**100.0**

4.12 Farmers' suggested solutions to the marketing constraints of the two Crops

Accordingly, farmers suggested profiles of solutions for tobacco and groundnut marketing constraints as follows: as for tobacco production it was suggested that market price should reflect the cost of production (25.7%), farmers' be involved in price setting (24.3%), to have few tobacco grades (14.7%), good infrastructures (14.7%), transparency in tobacco grading (12.5%), proper grading by farmers (5.9%) and liberalization of the tobacco marketing (2.2%). As for groundnut production farmers suggested the following that the market should be reliable (59.5%), farmers be involved in price determination (17.9%), the establishment of primary cooperatives (9.5%), accessibility to extension services (7.1%), and improvement of infrastructures (6.0%).

Table 21: Multiple response ranking of farmers' suggested solutions for tobacco and groundnut marketing

Solutions	Rank	Count	Percent
Tobacco			
Few tobacco grades	3	20	14.7
Proper grading	5	8	5.9

Market price should reflect the cost of production	1	35	25.7
Free market	6	3	2.2
Farmers' invol. in price setting	2	33	24.3
Good infrastructures	3	20	14.7
Transparency system in grading	4	17	12.5
Total		**136**	**100.0**
Groundnut			
Market reliability	1	50	59.5
Access to extension services	4	6	7.1
Establishment of Primary cooperatives	3	8	9.5
Improvement of infrastructures	5	5	6.0
Farmers' involvement in price determination	2	15	17.9
Total		**84**	**100.0**

4.13 Profitability Analysis for Tobacco and Groundnut Farming

The profitability analysis was done by comparing the two gross margins (i.e. gross margins of tobacco and groundnut). Independent-samples t-test was used to test the significant difference in the two gross margins at 95% confidence interval. Calculating the difference between total revenues obtained in the previous cropping season (2007/2008) and the total variable costs incurred in the production and marketing processes were done to get the two gross margins. For tobacco, variable costs incurred include land preparation, farm husbandry, fertilizers, chemicals, transport, burning, curing of tobacco and storage costs. For groundnuts, these involved land preparation, farm husbandry, fertilizers, transport and storage.

The results in Table 22 show that a gross margin per acre for groundnut was lower than that of tobacco by 569 231.90 Tshs. Furthermore, the independent sample t –test was used to compare the two gross margins to find out whether or not there are no significant difference in profitability yielded by tobacco and groundnut farmers. The analysis (Appendix 2) addressed the hypothesis that tobacco and groundnut farmers do not differ in their profitability, the t statistic under the assumption of unequal variance has a value of 2.756, and the degree of freedom has a value of 76.698 with an associated significance

level of 0.007. This suggests that there is enough evidence to reject the null hypothesis in favour of the alternative hypothesis, that is, there is a significant difference between the two profitability from tobacco and groundnut farmers with the P-value <0.007.

Table 22: Gross margins of tobacco and groundnuts

Parameters	Tobacco	Groundnut
Total Revenue (TR)	2 143 488.00	340 507.40
Total variable Costs (TVC)	1 343 502.00	109 753.30
Gross Margins (GM)	799 986.00	230 754.10

However, the low gross margin for groundnut production can be attributed to the usage of local groundnut seeds which are low yielding and more susceptible to pests and diseases as well as low usage of fertilizers and pesticides. The results also show that the market of groundnut was unreliable due to the fact that farmers sold their produce at low prices and which did not reflect the production cost. Furthermore, the partial budget analysis was also carried out to find out the marginal rate of returns (MRT). In the light of the negative marginal rate of return (-9.61%) which can be yielded by a shift from groundnut to tobacco (Table 23), farmers' choice would appear irrational. However, considering the fact that the availability of labour and capital which were reported to be inadequate to sustain tobacco farming, the opportunity cost of groundnut is to be ignored, which in turn makes groundnut farming more profitable than is the case with tobacco farming.

These results are in line with those in the study by Rweyemamu and Kimaro (2006) whose analysis revealed that although tobacco production is potentially a profitable enterprise

relative to the international market, smallholders are paid less than the actual value of their product. The overall effect is a net taxation of tobacco production at the farm level. Thus the existing marketing arrangements have made it appear uncompetitive with low resource allocation efficiency. Therefore, although groundnut farmers receive low returns relative to tobacco farmers, this does not mean that groundnut farming is not profitable because its gross margin is still positive.

Table 23: Partial budget analysis of tobacco and groundnut farming

Items	**Tobacco**	**Groundnut**
Gross Farm Benefits		
1. Average yield (Kg/acre)	1 308.37	633.16
2. Output price (Tshs/kg)	1 551.00	532.00
3. Gross Margin Gate Benefit (TR) (1*2)	2 029 277.22	336 841.10
Variable Input Costs (Tshs/acre)		
4. Costs of labour (Tshs)	1 017 500.00	159 877
5. Costs of fertilizers (Tshs)	664 880.00	0
6. Costs of pesticides (Tshs)	35 759.30	0
7. Costs of seeds (Tshs)	0	14 227.05
8. Total Variable costs (TVC) (4+5+6+7)	1 718 139.30	174 104.05
Net Benefit		
9. Net benefit (kg/acre) (3-8)	311 137.92	162 737.05
10. Change in the net benefit with a shift		
From groundnut to tobacco (b-c)		-148 400.87
11. Change in TVC with a shift from		
Groundnut to tobacco (d-e)		1 544 035.25
12. Marginal Rate of Return (%) (10/11*100)		-9.61

4.14 Cobb-Douglas Production Function of Tobacco and Groundnut

4.14.1 Input elasticity

The determination of the elasticity was crucial for the sake of estimating responsiveness of output to inputs. Most of the inputs on the Cobb-Douglas model are statistically significant and have the expected signs. Evaluated at the sample mean, the output elasticities with respect to the inputs which included family labour, hired labour, contract labour, fertilizer, size of the land, pesticides and seeds for the translog were estimated. The results of Cobb-Douglas production function for tobacco and groundnuts and which were analysed with SSPS computer program using OLS regression method are summarized in equation (xiv) and (xv), respectively.

$$Q_{iT} = 4.355 + 0.391A_1 + 0.124L_2 - 0.021L_3 + 0.04L_4 + 0.196K_1 + 0.1K_2 + 0.538K_3 + \varepsilon_i$$

(xiv)

Se	0.715	0.140	0.142	0.067	0.140	0.099	0.105	0.154
t	(0.000)	(0.007)	(0.388)	(0.762)	(0.976)	(0.052)	(0.343)	(0.001)

R square = 65.7%

Total partial coefficient = 1.332

$$Q_{iG} = 4.577 + 0.757A_1 + 0.044L_2 + 0.392L_3 - 0.138K_4 + \varepsilon_i \qquad \text{(xv)}$$

Se	1.179	0.301	0.206	0.178	0.184
t	(0.000)	(0.015)	(0.830)	(0.032)	(0.456)

R square =62.9%

Total partial coefficients = 1.055

The results reveal that the constant value of groundnut is larger than that of tobacco. Traditional theory of production stipulates that the larger the value of the constant term the

more technically efficient the farmers are. However, the results also indicate that in groundnut production, 1% increase in land size is associated with 0.757% increase in output while in tobacco production, similar increase in land size is associated with only 0.391% increase in output. This means that an increase in land size for groundnut had more influence in the production of the crop than it had for the production of tobacco. The results also indicate that for groundnut, 1% increase in hired labour is associated with 0.392% increase in output while for tobacco, similar increase in hired labour is associated with a decrease of 0.21% in output. This means that hired labour in groundnut had more influence in the production of the crop than it had for the production of tobacco. The findings also conform to similar findings by Kipkoech *et al.* (2007), who reported that labour was significant in most of soil fertility improvement technologies in groundnut production. This was because external inputs are seldom used and therefore, the output of groundnut depends more on application of labour in the production system. In groundnut production labour determines how well farm operations such as land preparation, planting, weeding and harvesting are done. Therefore farmers could be advised to allocate more hired labour for groundnut production than for tobacco production.

The estimated coefficients for both fertilizer and seeds inputs are positive and significant for tobacco, which confirms the expected positive relationship between fertilizer and seeds inputs and the production of the crop. Unlike in tobacco production, a 1% increase in seed input in groundnut production is associated with a decrease of 0.138% in output. This could be attributed to the fact that most groundnut farmers use local seed varieties, which have shown to have doubtful performance. Generally, the study shows that tobacco yield has the highest responsiveness to seed, followed by land size, fertilizer, family labour, pesticides and contract labour. Whilst for groundnut, the yield for the crop has the highest

responsive to land size, followed by hired labour, and family labour. The contribution of land size in both farming (i.e. tobacco and groundnut) revealed a significant different from zero at 5 percent level, indicating the importance of land among other variables.

The summation of the partial elasticities of production with respect to every input for homogenous function (all resources varying in the same proportion) is 1.332 for tobacco and 1.055 for groundnut. This represents the returns-to-scale coefficient, also known as function coefficient or total output elasticity. If all factor inputs are varied by the same proportion, the function coefficient indicates the percentage by which output will be increased. In this case, the production function can be used to estimate the magnitude of returns to scale. Constant return to scale holds if the sum of all partial elasticities is equal to one. If this sum is less than one, the function has a decreasing return to scale and if the sum is more than one the function has an increasing return to scale. In this study, an increasing return to scale exists in both farming systems, therefore, an increase in all inputs by one percent increases tobacco and groundnut outputs by more than one percent. However, by comparing the two cropping enterprises, if all factor inputs are varied by the same proportion, the percentage by which output would increase is bigger in tobacco than it is in groundnut.

4.14.2 Marginal value product

In order to assess the condition of producers' profit maximization, Marginal Physical Product (MPP), Marginal Value Product (MVP) and input prices were also estimated. Tables 24 and 25 show MPP, MVP and the factor prices of tobacco and groundnut production, respectively.

Table 24: Marginal value products and unit factor prices for tobacco

Variables	APP (Kg/acre)	Input elasticities	MPP (kg/acre)	MVP (Tshs)	Unit Factor price (Tshs)
Labour	5.57	0.143	0.8	1 236.07	2 500.00
Fertilizers	93.93	0.196	18.42	28 574.31	25 000.00
Pesticides	633.01	0.1	63.44	98 392.92	15 000.00
Seeds	141.85	0.538	76.32	118 367.30	*

* Tobacco seeds are given to farmers free of charge

For profit maximization, the MVP is supposed to be equal with the respective unit factor prices. If that condition is satisfied, any additional use of input factor which is equal to its MVP would be irrational and would lead to losses. The results in the above table do not satisfy this condition. Instead, for fertilizer, pesticides and seed, the MVP are greater than their respective unit factor prices. This indicates that tobacco production has not reached the optimal use of inputs and could probably benefit by increasing the amount of fertilizer, pesticides and seeds used in production. On the other hand, MVP for labour is smaller than its respective unit price factor, indicating that more labour has been used in tobacco production which is not leading to any profit. This is also supported by the results revealed by OLS regression analysis whereby input elasticity of hired labour has a negative influence on the tobacco output. A 1% increase in hired labour input in tobacco is associated with a decrease of 0.021% in the output of tobacco.

Table 25: Marginal value products and unit factor prices for groundnut

Variables	APP	Input	MPP	MVP	Unit Factor

	(Kg/acre)	elasticities	(kg/acre)	(Tshs)	price (Tshs)
Labour	10.7	0.436	4.67	2 482.50	1 500.00
Seeds	17.34	-0.138	-2.39	-1 273.00	500.00

For groundnut, the MVP for labour is greater than the factor price, implying that groundnut production has not reached the optimal use of labour input. Therefore, groundnut farmers can benefit by employing more labour in their enterprise. This study also shows that farmers have incurred big losses by using local seed varieties. This dictates the need for farmers to use improved and high yielding groundnut seed varieties for increased yield and income. This argument is consistent with the findings of Kipkoech *et al.* (2007), who reported that the use of organic or inorganic fertilizers in groundnut fields improves the profitability and labour allocative efficiency.

By comparing the two marginal value products of tobacco and groundnut, there is a larger potential for improving farmers' incomes and hence profit maximization through increasing groundnut production which is yet to be exploited. This is due to the fact that only one factor is yet to be used to its optimal for the production of groundnut, while in tobacco farming three of these are yet to be used efficiently to realise maximum profit. However, these factors must be used in conjunction with an increased access to improved groundnut varieties (with better disease resistance, yield performance and market acceptability) under improved crop husbandry techniques.

4.15 Income Differences between the Two Crops Farming

The independent sample t-test was used to compare the two incomes from tobacco and groundnut farming to test whether or not there is any difference in the household's income contributed by the two crops. Descriptive statistics given in Table 26 show that income from tobacco farming has a mean income of 2 135 988.33 while for groundnut farming a

mean income of 358 648.36 was recorded. This means that income generated from tobacco was 1 777 339.97 higher than the income from groundnut. The analysis shown in Appendix 3 in which the hypothesis that tobacco and groundnut farming do not differ in their household's income contribution shows that the t-statistic under the assumption of unequal variance has a value of 6.384, and the degree of freedom has a value of 70.618 with an associated significance level of 0.000. According to the test and the pre-specified level of significance there is evidence to reject the null hypothesis in favour of the alternative hypothesis, that is, there is a significance difference between the income generated from tobacco and that generated from groundnut farming with the P-value <0.000. Other studies (e.g. Mkanta and Chimtembo, 2000) have found out that the average net income from tobacco farming was $ 564 per household for the year 1999, (lowest earnings were $ 51, while the highest were $ 2809). On the other hand, contribution of groundnut produced in dry and wetter areas had an average contribution of Tshs 2113 and 3621 respectively (Yanda *et al.*, 2000). These figures have comparable implication on the income contribution to the households by the two crops, even though tobacco still remains a bigger contributor to the households' income than is the case with groundnuts.

Table 26: T-test income for tobacco and groundnuts farmers

Variable	Farming Enterprises	N	Mean	Std. Dev	Std. Error mean
Income	Tobacco	60	2 135 988.33	2 056 884.75	265 542.67934
	Groundnut	61	358 648.36	653 638.77	83 689.86811

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study aimed at undertaking a comparative economic analysis of tobacco and groundnut farming in Urambo district. Specifically, the attention was devoted to comparing the profitability of groundnut to that of tobacco farming, to assess the contribution of tobacco and groundnut enterprises to the household income and finally to examine the factors influencing the production of tobacco and groundnut in the study area. The analysis of quantitative and qualitative data collected from the survey was done using Cobb-Douglas production function, gross margin analysis and descriptive statistics such as frequency, multiple responses analysis, cross tabulation and independent-samples t-test statistics.

Based on the results from this study, the null hypothesis that there is no significant difference in profitability received by farmers from the two farming enterprises was rejected in favour of the alternative hypothesis. In other words, the study found out that tobacco farming is a more profitable enterprise than groundnut farming in the study area. This is because tobacco farming had a gross margin of 569 231.90 higher than that of groundnut farming. Furthermore, the partial budget analysis of tobacco and groundnut farming, which was done reveals a negative Marginal Rate of Return (-9.61%) which can result from a shift from groundnut to tobacco, implying that farmers' choice would appear irrational. However, considering the inadequacy of labour force and capital which are needed to sustain tobacco farming, the opportunity cost of groundnut is to be ignored making groundnut farming more profitable than tobacco farming.

Following the independent-samples t-test at a significance level of 0.05, there was enough evidence to reject the null hypothesis in favour of the alternative hypothesis which stated

that there is a significant difference between income generated from tobacco and that generated from groundnut farming with the P-value < 0.000. This implies that the income generated from tobacco was higher than the income generated from groundnut.

Furthermore, this study shows that some of the production inputs in the study area have negative relationship with the output for tobacco and groundnut production. As for tobacco farming, hired labour reveals a negative relationship with the output although it had a positive relationship for groundnut farming. Therefore, this study suggests that farmers could accrue more profit from hired labour in groundnut farming. But due to the use of local groundnut seed varieties which have questionable yield, farmers have been making losses in the production of this crop. This was reflected in the study by the negative response of seeds in the groundnut output. Therefore, there is a need to make sure that groundnut improved seed varieties are available in the study area. Hence, the null hypothesis was rejected in favour of the alternative hypothesis which stated that there is a significant responsive to production inputs on tobacco and groundnut outputs. This study also observed that the absence of organized groundnut marketing through the marketing boards or local cooperative unions left farmers in the groundnut production without assured market outlets and prices. For the time being, the domestic market is not big enough to meet the supply of groundnut.

5.2 Recommendations

5.2.1 Policy recommendations

Given the extensive production and marketing constraints, the following recommendations are put forward in order to improve crop production:

a) Implement a sustainable and strong input (such as improved seeds, fertilizer and pesticides) distribution system. Proper input distribution system across space and time would ensure their availability to farmers. With this in place, farmers are expected to cope with the cropping seasons. This can be achieved through government support at all levels from local, district to regional in input distribution. However, special attention should be paid on groundnut seed quality control, which can be attained by introducing multiplication of improved groundnut seed varieties in the area (i.e. community seed multiplication).

b) Encourage the creation of a sustainable rural credit system (credit for input distributors and for farmers). Credit is necessary in promoting technical innovations and timely availability of necessary inputs. The government should tackle the problems of borrowing rates on credit and loans to spur agricultural development.

c) Put in place a marketing program that would support groundnut crop intensification activities in Urambo district. A well and proper established agricultural marketing system plays a fundamental role in the management of risks associated with demand and supply shocks by facilitating adjustment in production flows across space and in storage over time, thereby reducing the price variability faced by consumers and producers.

5.2.2 Production recommendations

Based on the findings of this study, the following recommendations are made to ensure sustainable and profitable production of tobacco and groundnut:

a) Groundnut farmers need to get organized through farmers association. Farmers' organizations offer the opportunity for accessing markets by smallholder farmers

and increase their bargaining power. Equipping farmers with necessary skills such as consumer survey and product chain analysis can help to correct the past mistakes. This can be done through training.

b) Tobacco Local Cooperative Unions should facilitate the strengthening of farmers' capacity to get organized and provide the needed services to their members. These local cooperative unions should ensure that the selling prices of tobacco are reflecting the production costs.

5.2.3 Areas for further research

- Because climate change has been observed as the major constraint for both tobacco and groundnut production, there is a need to undertake a study on impact assessment of climate change and strategies adopted by farmers to counteract its effects in their faming systems.

- Economic analysis of groundnut production in Tanzania; supply response and policy considerations

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APPENDICES

Appendix 1: Farmers' questionnaire for "a comparative economic analysis of tobacco and groundnut farming in Urambo district, Tabora region" study

Questionnaire No: Date of interview:

Interviewer's name:……Name of Respondent:…..…… Occupation:.....

Division:…….Ward:…….Village:……

HOUSEHOLD IDENTIFICATION VARIABLES

1. Name of household head
2. Age……..(Years)
3. Sex
   1= Male
   2= Female
4. Marital status of household head
   1= Married
   2= Single
   3= Divorced
   4= Widowed
   5= Others (specify)
5. Family size

	Categories of family composition	Total number	Total number of those who are working in farm
1	Adult males btn 15-60yrs		
2	Adult females btn 15-60yrs		
3	Children btn 10-15yrs		
4	Children below 10yrs		
	Total		

6. Level of education
   1= None

2= Adult education

3= Primary education

4= Secondary education

5= Others (specify)

7. Have you attended any farmer's course?

1= Yes

2= No

8. If YES, where did you attend?

……

……

9. What type of course(s) did you attend?

……

…….

10. For how long did you attend the above course (s)?

……

…….

A. FARM ACTIVITIES

11. Do you own this land?

1= Yes

2= No

12. If No, who owns it……

13. If YES, how did you acquire this land?

1= Inherited

2= Bought

3= Hired

4= Given by the village government

5= Accessed as free land

6= Others (specify)

14. What is the size of you're your farm……..hectares
15. Area under tobacco……Hectares
16. Area under groundnut……hectares
17. Who persuaded you to cultivate groundnuts?
    1= Neighbour
    2= Extension officers
    3= Relatives
    4= Politician
    5= Others (specify)

18. Who persuaded you to cultivate tobacco?
    1= Neighbour
    2= Extension officers
    3= Relatives
    4= Politician
    5= Others (specify)

19. When did you start tobacco cultivation?.....
20. When did you start groundnut cultivation?.....
21. Why did you choose to grow tobacco?

    ……

    ……

22. Why did you choose to grow groundnut?

    ……

    ……

23. Harvest crops grown in cropping season 2007/2008

Crop	Area cultivated(ha)	Yield(kg)	Amount sold(kg)	Price/kg	Total Revenue(Tshs)
Groundnut					
Tobacco					

24. Besides groundnut, what other cash crop do you grow?

……

……

25. What are the most critical problems in tobacco production?

……

……

26. How do you think these problems (in question 25 above) can be solved?

……

……

27. What are the most critical problems in groundnut production?

……

……

28. How do you think these problems (in question 27 above) can be solved?

……

……

B. FARM RESOURCES, INPUT AVAILABILITY AND USES

I. Land availability and use

29. What is the total area owned by the family?.....(ha)
30. How did you acquire this land?
31. Give actual area(ha) allocated to the different enterprises last season for the following crops:

II. Labour availability and use

32. What are the main sources of your labour forces?

1= Family

2= Hired

3= Contract

4= Combination of the above

33. Give the number, age and sex of household members who were available for the farming activities in 2006/2007 cropping season

Age group	**Males**	**Females**	**Total**
Below 10 years			
Between 10-14Yrs			
Between 15-18yrs			
Between 19-50yrs			
Above 50yrs			

34. Indicate labour use for tobacco enterprise in the cropping season 2006/2007

Activities	**Family labour (Man-days)**	**Hired labour (Man-days)**	**Contract labour (Man-days)**	**Total payment (Tshs)**	
				Cash	**In kind**
Land preparation					
Cultivation					
Construction of barns					
Preparation seedlings beds (Nurseries)					
Sowing					
Watering of nurseries					
Making ridges and transplanting of seedlings					
Weeding					
Fertilizer application					
Pesticide application					
Harvesting					
Burning					
Sorting and grading					
Packaging					
Transport to the market					
Others (specify)					

Note: One Man-day = 8 hours

35. Indicate labour use for groundnut enterprise in the cropping season 2006/2007

Activities	**Family labour**	**Hired labour**	**Contract labour**	**Total payment (Tshs)**

	(Man-days)	(Man-days)	(Man-days)	Cash	In kind
Land preparation					
Cultivation					
sowing					
Weeding					
Fertilizer application					
Pesticide application					
Harvesting					
Shelling					
Sorting and grading					
Packaging					
Transport to the market					
Others (specify)					

Note: One Man-day = 8 hours

III. Farm input information

36. Indicate inputs, unit prices and total cost used for tobacco production

Inputs			Quantity	Unit price	Total cost
Fertilizers	Inorganic	SA			
		Urea			
		NPK			
		TSP			
		CAN			
		Others (specify)			
	Organic	Compost			
		FYM			
		Cow's manure			
		Goat's manure			
		Others (specify)			
Pesticides					

37. Indicate inputs, unit prices and total cost used for groundnut production

Inputs	Quantity	Unit price	Total Cost

Fertilizers	Inorganic	SA			
		Urea			
		NPK			
		TSP			
		CAN			
		Others (specify)			
	Organic	Compost			
		FYM			
		Cow's manure			
		Goat's manure			
		Others (specify)			
Pesticides					

C. INVESTMENT AND EQUIPMENT COSTS

38. Indicate the number, acquisition price, year of acquisition and expected life span of the following items:

Item	**Number**	**Lifespan**	**Acquisition**	
			Original price	**Year of acquisition**
Fork Jembe				
Hoe				
Panga				
Sprayer				
Bicycle				
Others (specify)				

D. YIELD, CONSUMPTION AND MARKETING OF TOBACCO

39. What was the yield of tobacco in the cropping season 2006/2007?.....(kg)
40. Has the yield of tobacco increased as compared to the last five years?

    1= Yes

    2= No

41. If the answer (in question 39 above) is YES, what was the most important reason for the increase?

    ……

    …….

42. If the answer (in question 39 above) is NO, what was the most important reason for the decrease?

……

……

43. Do you know different buyers of tobacco in your area?

1= Yes

2= No

44. If YES, mention them

……

……

45. How do you collect information on market prices of tobacco?

1= Direct visit to the market

2= Cross checking with fellow farmers

3= Hear from Friends

4= From extension officers

5= From NGOs

6= Others (specify)

46. What has been the price trend of tobacco for the last five years?

1= Increasing

2= Decreasing

47. From question 45 above, if it is increasing, what are the reasons for the increase?

……

……

48. From question 45 above, if it is decreasing, what are the reasons for the decrease?

……

……

49. What is the most problem in tobacco marketing?

……

……

50. How do you think this problem of marketing can be solved?

……

……

E. YIELD, CONSUMPTION AND MARKETING OF GROUNDNUT

51. What was the yield of groundnut in the cropping season 2006/2007?.....(kg)
52. Has the yield of groundnut increased as compared to the last five years?

    1= Yes

    2= No

53. If the answer (in question 39 above) is YES, what was the most important reason for the increase?

……

……

54. If the answer (in question 39 above) is NO, what was the most important reason for the decrease?

……

……

55. Do you know different buyers of groundnut in your area?

    1= Yes

    2= No

56. If YES, mention them

……

……

57. How do you collect information on market prices of groundnut?

1= Direct visit to the market
2= Cross checking with fellow farmers
3= Hear from Friends
4= from extension officers
5= From NGOs
6= others (specify)

58. What has been the price trend of groundnut for the last five years?
1= Increasing
2= Decreasing

59. From question 45 above, if it is increasing, what are the reasons for the increase?
……
……

60. From question 45 above, if it is decreasing, what are the reasons for the decrease?
……
……

61. What is the most problem in groundnut marketing?
……
……

62. How do you think this problem of marketing can be solved?
……
……

F. INFLOW OF INCOME

63. How much money did you get in 2006/2007 by different sources of income?

Sources of income	**Amount sold (kg/bags/unit)**	**Money obtained (Tshs)**
(a). Sales of crops		
Tobacco		
Groundnuts		
Sunflower		
Maize		
Sub total		
(b). Livestock sales		
Cattle		
Goats		
Sheep		
Chicken/Poultry		
Su total		
©. Nonagricultural income		
Informal sectors		
Salary		
Remittances		
Sub total		
Grand total		

Appendix 2: Calculation of Marginal Value Products (MVP)

A production function is a model which is used to formalize the relationship between outputs and inputs used in production process. This relationship can be expressed in several forms such as; linear functional forms, polynomial functional forms and Cobb-Douglas functional forms. Cobb-Douglas functional form can be modified into the transcendental and translog functional forms. In this case, both tobacco and groundnut production adopted translog functional forms.

The Marginal Physical Product (MPP) of an input is the additional output that can be produced by employing one more unit of input while holding all other inputs constant. This was derived from the first derivative of the tobacco and groundnut production functions equation (xiv) and (xv), respectively.

The Average Physical Product (APP) is a measure of efficiency. The APP depends on the level of other inputs employed. The elasticity of supply of an input measures how an output responds to changes in inputs. This was derived by dividing the MPP by the APP (i.e. MPP/APP).

The Total Value Product (TVP) is derived by multiplying TPP by the output price (P_y). Given the output price (P_y) (On average the outputs price of tobacco and groundnut were 1,550Tshs per kg and 530Tshs per kg), their Marginal Value Products (MVP) can be computed by multiplying ($MPP*P_y$). The Marginal Value Products for tobacco and groundnuts are given in the table below;

(**a). Marginal Value Products for tobacco**

Variables	APP (Kg/acre)	Input elasticities	MPP (kg/acre)	MVP (Tshs)	Unit Factor price (Tshs)
Labour	5.57	0.143	0.8	1,236.07	2,500.00
Fertilizers	93.93	0.196	18.42	28,574.31	25,000.00
Pesticides	633.01	0.1	63.44	98,392.92	15,000.00
Seeds	141.85	0.538	76.32	118,367.30	*

(b). Marginal Value Products for groundnut

Variables	APP (Kg/acre)	Input elasticities	MPP (kg/acre)	MVP (Tshs)	Unit Factor price (Tshs)
Labour	10.7	0.436	4.67	2,482.50	1,500.00
Seeds	17.34	-0.138	-2.39	-1,273.00	500.00

Appendix 3: Independent samples t- test gross margins for tobacco and groundnut farming

(i) Group Statistics

	farming enterprise	N	Mean	Std. Deviation	Std. Error Mean
gross margin of tobacco and groundnut farmers	tobacco	60	792486.6667	1619517.82398	209078.85204
	groundnut	61	173732.7869	639252.24083	81847.86241

(ii) Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
gross margin of tobacco and groundnut farmers	Equal variances assumed	20.132	.000	2.773	119	.006	618753.8798	223165.82169	176863.26383	1060644.49573
	Equal variances not assumed			2.756	76.698	.007	618753.8798	224528.48138	171632.42496	1065875.33461

Appendix 4: Independent samples t- test income for tobacco and groundnut farming.

(i) Group Statistics

	farming enterprise	N	Mean	Std. Deviation	Std. Error Mean
income from tobacco and groundnut enterprises	tobacco	60	2135988.3333	2056884.74955	265542.67934
	groundnut	61	358648.3607	653638.76530	83689.86811

(ii) Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
income from tobacco and groundnut enterprises	Equal variances assumed	23.117	.000	6.427	119	.000	1777339.9727	276530.21441	1229782.52930	2324897.41606
	Equal variances not assumed			6.384	70.618	.000	1777339.9727	278418.58518	1222137.01373	2332542.93162