EVALUATION OF RESPONSE OF TOBACCO GROWERS IN TESO DISTRICT-KENYA TO GLOBAL FIGHT AGAINST TOBACCO

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DECLARATION AND APPROVAL

DECLARATION

I declare that this thesis is my original work and has not been submitted in this or any other university for the award of any degree.

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KM17/3017/11

APPROVAL

This thesis has been submitted to the graduate school with our approval as university supervisors.

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DEDICATION

I dedicate this work to my parents Mr. and Mrs. Richard Mbaye for their unconditional love and support. My rock, Always!

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ABSTRACT

The World Health Organisation Framework Convention on Tobacco Control reiterates the global effort toward tobacco control. The treaty seeks to decrease both the supply and demand of tobacco related products by reducing their production and consumption through legislation. Kenya, a party to the treaty, has put legislation in place to the same effect. However, not enough evaluation has been done to explain whether the passage of this legislation has trickled down to the extent that changes have occurred in the farm enterprise mix and the types of alternative farm enterprises replacing tobacco. This study was carried out in Teso district to evaluate tobacco farmers' responses in light of the global efforts towards tobacco control where the farmers' awareness of tobacco effects, the types and level of alternative enterprises replacing tobacco and what influences the choice of an alternative enterprise were investigated. Both primary and secondary data were collected, multistage sampling procedure was used, and a sample of 150 farmers selected. Data was analysed using descriptive statistics, Gross Margin Analysis and Multinomial logit model. The results showed that farmers are reducing the acreage under tobacco and moving to other alternative crops. This shift is influenced positively and significantly by land size, access to extension services and distance to the market. However, total asset value negatively and significantly influenced farmers from shifting from tobacco. Further, the study revealed that there are a number of alternatives, especially high value crops, with better returns compared to tobacco. This means that more incentives and support are necessary drivers towards transitioning farmers from tobacco to other enterprises. The government and relevant stakeholders should thus formulate and implement effective policies aimed at reducing tobacco demand and supply identifying suitable alternatives to tobacco as well as creating awareness and providing financial and technical support to the farmers.

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LIST OF ABBREVIATIONS

AEZ	Agro-Ecological Zone
BAT (K)	British American Tobacco Kenya
FCTC	Framework Convention on Tobacco Control
GMA	Gross Margin Analysis
GoK	Government of Kenya
Ksh	Kenya Shilling
MNL	Multinomial logit
MoA	Ministry of Agriculture
MTK	Mastermind Tobacco Kenya
NACADA	National Authority for Campaign against Alcohol and Drug Abuse
RoK	Republic of Kenya
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

This chapter introduces the topic of study. It starts with Kenya in a broad sense and later focuses on the tobacco growing areas and narrows down to the area of interest. The background information outlines the trends that exist in the tobacco industry together with the challenges and remedial action taken. The problem is also presented and articulated within the chapter. This is together with the objectives that the study sought to achieve, the justification and the scope and limitation. Finally, the key terms vital to the study are defined.

1.1 Background of the study

Tobacco is grown in a number of African countries with suitable ecological conditions. It is only about 25 countries, in the continent, that do not grow tobacco (WHO, 2012). The intensity and percentage of arable land under tobacco production, however, varies from country to country. In Kenya, tobacco is grown mostly in four regions (Nyanza, Western, Central and Eastern). Most production, (80 percent), takes place in South Nyanza mainly in Kuria, Homa Bay and Migori districts. Approximately 35,000 small-scale farmers grow tobacco in Kenya. In total, approximately 45,000 hectares of land is devoted to the crop, representing 0.19 percent of total arable land (Patel *et al*., 2007). There has been steady growth since the 1990s in the number of farmers that are contracted to grow tobacco, with the latest being 15 percent increase between 2001 and 2008. This is in spite of the Tobacco Bill enacted in 2007. The increase is attributed particularly to the efforts of British American Tobacco Company, which has been expanding, to other areas with potential for growing tobacco. The increase comes at the expense of land that would be used to produce other cash and/or food crops. It has been shown that tobacco has a negative impact on food security (WHO, 2008). The sector is confronted by food insecurity concerns, occupational and environmental health hazards (Kibwage *et al*., 2005). The negative health, social and environmental impacts associated with tobacco growing are well documented (KTSA, 2008; WHO, 2008a; Kibwage *et al*., 2009).

Agriculture is the key source of food and employment for the largest percentage of the population in Teso district (GoK, 2008). Agricultural production, especially among households is mostly subsistence. The main crops grown in the district are millet, cassava, sweet potatoes, maize, sorghum, beans, bananas and a number of vegetables. In addition to food crops, the population also grows cash crops with tobacco being the principal crop (GoK,

2008). Tobacco is solely the only short season cash crop apart from tradable food crops like maize that dictate the economic position of full time small-scale farmers in the district (Ekisa, 2010). Lagat *et al*. (2006) found that area allocation of farming enterprises by farmers at the regional level (Eastern, Nyanza and Western) tobacco enterprise had the highest share of farming area, more so in Teso. This could be the reason for the high food poverty incidences in the district at 49.4 percent (GoK, 2008), making the area food insecure.

Environmental challenges at the moment are mainly due to destruction of forests and vegetative cover. One of the environmental degradation threats facing the district is unplanned tobacco farming leading to deforestation and severe soil erosion. The cutting of trees has been aggravated by the introduction of tobacco growing in the late 1970s because tobacco curing requires a lot of wood fuel (GoK, 2008; Ekisa, 2010). The type of tobacco grown in Teso is mainly fire-cured and to enhance availability of firewood, tobacco companies provide eucalyptus tree seedlings to farmers. Scientific research (ICRAF, 2003; Jagger and Pender, 2003) have however shown that this type of tree puts a lot of demand on water and nutrients resulting to loss of soil fertility and reduction of water table. This has led to further reduction in food crop production, hence, increased poverty levels.

Tobacco farming is a labour intensive and tedious activity compared to its returns/profits. The farmers indicate that the cost of producing tobacco is high and when loans are deducted from total sales, they are left with little earnings as compared to the high labour and time inputs. Furthermore, they have no control on prices of inputs and output (Ochola and Kosura, 2007). There is generally lack of protective devices required during the production and preliminary processing of tobacco leaves. These include, gum boots, nose masks, overall (coats), and gloves among others (Lagat *et al*., 2006). This poses an occupational and consequently health hazard to the handlers of tobacco.

Some of the health hazards include Green Tobacco Sickness (GTS) and respiratory illnesses (Kibwage *et al*., 2007; Ochola and Kosura, 2007; WHO, 2008a). During the harvesting and curing period, there occurs a serious shortage of storage facilities and most farmers use their own houses to store the leaves. This action is a health hazard. Children and women are more vulnerable than men are to tobacco-related health risks since they spend a lot of time in tobacco farming (Kibwage *et al*., 2007).

There is a worldwide effort against tobacco growing and consumption. The World Health Organisation Framework Convention on Tobacco Control (WHO FCTC) aims at

reducing tobacco production and ultimately reducing the consumption because of the health problems, not only for the consumers, but also for the producers (WHO, 2005; 2008a). Article 17[1] of the convention urges parties to find profitable alternatives based on the agro-climatological factors and geography. This worldwide campaign against tobacco production poses a great challenge to all stakeholders whose livelihood depends on the crop. As a result suitable alternatives to tobacco farming are sought by governments and other interested parties in order to sustain the livelihood which otherwise depend on tobacco growing.

Kenya being a party to the WHO FCTC, has committed itself to educate the farmers on the dangers of tobacco growing and to shift into other economically viable alternatives. This does not mean a drastic change to other crops, but rather a progressive change to ensure that farmers adapt to the new requirements.

1.2 Statement of the problem

Since ratifying the WHO FCTC, Kenya has supported the current global lobby on the reduction of production and consumption of tobacco through national legislation. The legislation intends, in part, to reduce tobacco production and consequently cigarette manufacture. The effect of such a policy is that farmers, who depend on tobacco production for their livelihoods will therefore, more likely switch to alternative farm enterprises. However, it has not been empirically evaluated whether the passage of this legislation has trickled down to the extent that changes have occurred in the farm enterprise mix. It is also of interest to establish the types and competitiveness of alternative farm enterprises replacing tobacco particularly in Teso district along with the factors influencing their choice. Because farmers have been growing tobacco for close to four decades, it is not well understood if they are aware of any effects of the crop on their health. This study sought to address this knowledge gap.

1.3 Objectives

The general objective of this study was to contribute to informed policy implementation of tobacco control by evaluating the response of tobacco growers to the global fight against tobacco in Teso district.

[1] The WHO FCTC treaty has different tobacco demand and supply reduction strategies contained in different articles. Article 17 specifies the provision of support for economically viable alternative activities.

Specific objectives

1. To determine farmers' awareness of the effects of tobacco production
2. To determine the types and level of alternative enterprises replacing tobacco
3. To determine the factors influencing the choice of an alternative enterprise.

1.4 Research questions

1. What is the farmers' awareness of the effects of tobacco production?
2. What are the types and level of alternative enterprises replacing tobacco?
3. What are the socio-economic and institutional factors that affect the choice of an alternative crop?

1.5 Justification of the study

The WHO FCTC requires the scaling down of tobacco production. This study sought to evaluate farmers' response by examining the type and level of alternative enterprises replacing tobacco. Farmers need to be fully aware of the effects, positive or negative, of tobacco farming. In this way, the farmers will have full knowledge of the enterprise and therefore make informed decisions on the types of alternative enterprises that will positively influence their farming endeavour. By determining the type of alternative enterprises replacing tobacco, the study will expose the best alternative enterprises that may in fact be better replacements to tobacco. Teso district having 80 percent of its land being arable, farmers should have more and maybe better alternative enterprises than tobacco that might raise rural income, self-sustenance and long term development plan as part of the country's vision 2030.

1.6 Scope and limitation of the study

This study focused only on tobacco farmers in the district and considered alternatives that the farmers had actually engaged into, thereby missing on the other potential alternatives that could replace tobacco but not tried by the farmers. The fact that the study was carried out in one district is another limitation as the agro-ecological conditions, socio-economic factors vary across the country, making the recommendations not applicable to other tobacco growing areas.

The data captured was mainly on the alternatives and the awareness levels of effects of tobacco. This means the environmental and health effects of tobacco was not statistically determined or evaluated, making it difficult to make recommendations bordering on the two. The study was limited in identifying the farmers who had sustainably abandoned or reduced tobacco production as measured by acreage under tobacco cultivation, as tobacco is an annual crop where those captured as having reduced that year, may increase the acreage the following year. Farmers were also required to recall past information and thus the accuracy of the information was limited considering poor/no records are kept with regards to their farming activities.

1.7 Definition of terms

Alternative enterprise: any on-farm activity (crop or livestock) that is undertaken as a replacement to tobacco production or makes use of the land that was previously under tobacco (in case of a crop).

Tobacco farmer: a person who engages or previously engaged tobacco farming within the time of interest.

Household: is defined as families who are living together and answerable to one person as a head and share living together.

Livelihoods: refers to means of living, especially of earning money to feed oneself in terms of agricultural crops and animals on the same land resource arrangement.

Smallholder farmers: those farmers having less than or equal to two hectares of land.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews and critiques literature that is related to this study. In the second subsection below, literature mainly focuses on the WHO FCTC treaty and the situation in Kenya in response to it. Section 2.3 deals with studies that have shown the viability of other alternatives to tobacco while section 2.4 reviews the studies that have indicated both the socio-economic and institutional factors that influence the choice of enterprises engaged in. In section 2.5 and 2.6 studies that highlighted diversification from tobacco are discussed and approaches used previously with their weaknesses are also highlighted. Finally, in section 2.7, a theoretical framework is established from previous studies and how these relationships may be connecting in section 2.8 in the conceptual framework.

2.1 Tobacco conventions and control efforts

The World Health Organization Framework Convention on Tobacco Control (WHO FCTC) was developed in response to the globalization of the tobacco epidemic (WHO, 2005). It is a treaty that seeks to reaffirm the right of all people to the highest standard of health through developing a regulatory strategy to address addictive substances. However, unlike previous drug control treaties, WHO FCTC asserts the importance of demand reduction strategies as well as supply issues.

The success of effective tobacco control has however been marred with conflict of interest from the tobacco industry. The tobacco industry has been aggressive in fighting tobacco control measures both globally and in Kenya (WHO, 2008b; 2012a). The tobacco industry and its resistance to enforcement of tobacco control, its influence within political circles, its resources that far outweigh those of tobacco control advocates and its front groups is also another obstacle to control efforts. Patel *et al.* (2007) findings indicate longstanding, high-level political links and support enjoyed by BAT in Kenya. The Kenyan government being BAT (K)'s shareholder with 20 percent holding implies a hint at tobacco industry interference of tobacco control legislation due to vested interests. Thus, this may affect/undermine passage of laws controlling tobacco production and usage in Kenya.

WHO (2008b) identified various forms of tobacco industry interference such as manoeuvring to hijack the political and legislative process; exaggerating the economic importance of the industry; manipulating public opinion to gain the appearance of

respectability; fabricating support through front groups; discrediting proven science; and intimidating governments with litigation or the threat of litigation. However, since the enactment of the Tobacco bill in Kenya in 2007, a number of control measures such as smoke-free legislation, health warnings and ban of advertisement of cigarettes and other tobacco products consistent with WHO FCTC recommendations have been put in place (Maina *et al*., 2012).

2.2 Alternatives to tobacco growing

Despite the negative economic, social and environmental impacts associated with tobacco production (Geist, 1999; Kibwage *et al*., 2007; Ochola and Kosura, 2007; Patel *et al*., 2007; WHO, 2008a; Geist *et al*., 2009; Kibwage *et al*., 2009), evidence suggests that land under tobacco has rapidly grown even to other areas like the Rift Valley region that were previously not under tobacco (Kibwage *et al*., 2009). This rapid growth is at the expense of food crops whose role is vital to food security. This in essence undermines WHO FCTC efforts to reduce tobacco production and therefore consumption. Most research carried out in tobacco growing regions reveal that switching from tobacco to other enterprises is profitable. Research has shown that there are abundant opportunities to shift from tobacco farming to other crops.

Kibwage *et al.* (2009) looked at the potential of diversification from tobacco to bamboo in South Nyanza districts of Kuria, Suba, Homa Bay and Migori. The study revealed that 120 farmers in each district accepted to switch to the crop, planted the trees, and were trained on production of artefacts for sale. Further, findings showed that tobacco farming seemed to have added little or no difference to their livelihood when compared to non-tobacco households in the region.

Field experiments conducted by the *tobacco-to-bamboo* project have shown that bamboo can do well in soil, agro-climatic and topographical conditions similar to those of tobacco and will fetch 4-5 times more in terms of income. The market potential for bamboo products is huge because most of those sold in the formal retail market in Kenya are imported entirely from China, India and Thailand. Besides numerous economic advantages of bamboo, social and environmental problems associated with tobacco farming can be reduced through bamboo production (Kibwage *et al*., 2009). Magati *et al*. (2012) using the cost benefit analysis found that bamboo farming is financially and economically beneficial to tobacco farming since the incremental benefits are positive. The Net Present Value for bamboo

farmers was higher than that of tobacco farmers asserting that bamboo can provide an alternative livelihood to tobacco farming.

Ochola and Kosura (2007) studied the potential of diversification from tobacco to; pineapple, pepper, soya beans, watermelons or passion fruit. The study showed that tobacco had the lowest returns per acre compared to other crops in one production cycle. In eastern province in 1999, for example, mangoes were 37 times more profitable, whereas papaya and cotton each similarly dwarfed farmers' earnings from tobacco (Patel *et al.,* 2007). Therefore, it can fairly be assumed that tobacco farmers and their families are not necessarily better off than non-tobacco growers. A study conducted by Lagat *et al*. (2006) however revealed that tobacco as a cash crop in areas that have limited cash crop alternatives in Kenya, especially in Western and Eastern parts of Kenya, is by far the most viable and profitable.

In a study by Akhter (2011) of three most concentrated tobacco growing areas in Bangladesh, potato + maize + lentil + coriander and potato + French bean + melon were found to be the prominent rabi (winter) crops combinations practised. The study showed, that about 80 percent more human labour is required in tobacco production and tobacco growers have to pay 21 percent higher wages per man-days compared to rabi crops (combination) cultivation. The study also showed that the total cost (full cost) per hectare of tobacco production was more than 119 percent higher compared to rabi crops (combination) cultivation practised by the farmers. Moreover, the Nayakrishi farmers achieved remarkable net profit from rabi crops (combination) cultivation than tobacco both on full and cash cost basis respectively. They obtained more return, of 1.42 Taka from per Taka investment, by cultivating rabi crops combinations during this season compared to tobacco production.

2.3 Effects of socio-economic and institutional factors on choice

Most studies analysing the choice of any activity, product or policy concur that a number of socio-economic and institutional factors play an important role in shaping the choice(s) individuals make. A study by Mendieta (2011) in the US used a rank-ordered logit model (ROLM) to explore factors affecting farmers' perceptions about the potential for other crops/livestock to replace tobacco production. Results suggested that hay is one of the on-farm enterprises perceived as having the highest potential to replace tobacco among burley tobacco farmers. Age, education, farm size and farm cash receipts were found to affect farmers' perceptions about the potential for different alternative enterprises to replace

tobacco. However, the study focused at the perceived alternatives and not the actual alternatives to replace tobacco.

Pundo and Fraser (2006) used multinomial logit to analyse the factors that influence household choice of cooking fuel between firewood, charcoal and kerosene in rural Kisumu. They found that the level of education of both the husband and wife played a vital role in determining the households' choice of cooking fuel. Adong (2010) using the multinomial logit model also revealed that the asset endowments particularly education, livestock units, labour, gender and district locations are crucial factors conditioning household's choices to livelihood strategies.

Land area, capital goods, land ownership, age, education level, off-farm work and labour availability are considered determinants of diversification in current literature. A number of studies have found demographic factors such as age, number of household members, education, experience, net worth, as well as farm characteristics such as farm size, seasonality of farm labour requirements as influencing the choice of farm enterprises farmers engage in. In addition to these factors, Rahman (2008) using a bivariate probit analysis concluded that infrastructure development plays an important role in determining the choice of crops by Bangladeshi farmers.

According to Beach *et al*. (2008), household and farmer characteristics are significant determinants of efforts to shift to non-tobacco enterprises. Of these, farmer education was the most consistent and important, predicting reduced probability of growing tobacco and increased probability of working off farm and attempting to identify non-tobacco alternatives. This is consistent with the hypothesis that farmers who are better educated would be among the first to explore alternative non-tobacco enterprises.

Dilruba *et al*. (2012) identified the determinants and constraints to livelihood diversification among different livelihood groups in the state of West Bengal. The study used the livelihood diversification index and showed that household-head experience (age), educational level, social status, training, asset position, access to credit, rural infrastructure, agro-climatic condition and the overall level of economic development of a region are the main driving force towards livelihood diversification in the state. Chavez (2010) also observed similar factors in Argentina.

Awareness and perception of the problem and potential benefits of taking action is another important determinant of the decision to continue, reduce or abandon tobacco cultivation. Hasssan and Nhemacena (2008) using the Multinomial logit model found out that farmers' awareness and perceptions of soil erosion problems positively and significantly affected their decisions to adopt soil conservation measures. Maddison (2006) found that farmers' awareness of changes in climate attributes (temperature and precipitation) is important for adaptation decision making. Therefore, it is expected that farmers who notice and are aware of the negative health, environmental and social effects of tobacco production would take up measures or alternative enterprises that help them reduce losses or take advantage of the opportunities associated with these changes.

Availability of technical information on new farming activities or practices is also necessary for adoption by farmers (Kasem and Thapa, 2011). The presence of extension services and training facilitates the adoption of alternative activities (Kibwage *et al*., 2009; Chavez *et al*., 2012). Lack of credit or inadequate access to it may also limit the adoption of other alternatives to tobacco (Ochola and Kosura, 2007; Kasem and Thapa, 2011). In developing countries, credit market for instance is often missing due to imperfections such as high transaction costs in provision and as such, it will often be a function of household factors such as land size and educational level (Nkonya *et al*., 2004). Market accessibility in terms of purchasing inputs and selling outputs is also vital when considering an alternative enterprise.

2.4 Tobacco diversification

Literature shows a wide variety of reasons for diversification, but all of them can be summarized in two main reasons, namely risk reduction and improvement of income. The economically viable and sustainable alternatives to tobacco production need to be capable of acting on improving aspects of farmers' way of life. This means that the profitability of productive activities is one important aspect to be considered, but it is not sufficient to generate the aimed quality of life (Schneider *et al*., 2012). This implies that to accept tobacco production diversification by smallholder farmers may not occur only or exclusively based on economic and financial reasons. Farmers that produce tobacco may be willing to diversify or even reduce their production based on health issues, work conditions or, simply, because they realize that even being profitable, it is in general a harmful activity made under stressful and painful conditions.

According to Schneider *et al*. (2012), strategies to livelihoods diversification that aim to implement economically viable and sustainable alternatives to tobacco production may be considered as initiatives, actions, activities and policies that aim to change and to transform cultural and economic aspects of tobacco growers. The cultural strategies aims at changing and transforming the understanding of farmers' cognitive schemes that attach them to beliefs and representations they are subjected to throughout their long tradition as tobacco growers, or by the marketing ideology of tobacco agribusiness companies. The economic strategies comprise a broad set of initiatives and actions that seek to provide viable and specific alternatives (capable of generating and maintaining the level of income) to farmers so they feel stimulated and encouraged to reduce or abandon the cultivation of tobacco.

Nsiku and Botha (2007) concurred that diversification is one of the solutions to tobacco farmers who are faced with the problem of high-income volatility in Malawi. In contrast, by evaluating the possibility of diversification and alternative crops to tobacco in the European Union, Bittner *et al*. (2009) found that the growing of possible alternative crops is limited significantly by the unfavourable situation of these regions such as climate, soils and biological factors like pests and diseases. With regards to the possibilities of diversification, the special characters of the alternatives and eco-social role of the sector have to be underlined and many economic and social points of views have to be taken into consideration.

2.5 Previous approaches

Studies evaluating the economic potential for other on-farm enterprises to replace tobacco have considered farmer perceptions about the potential for these enterprises to replace it (Beach *et al.*, 2008; Hassan and Nhemachena, 2008; Chavez, 2013). Additionally, these studies have overlooked the role of tobacco farmers' resources and skills in transitioning from tobacco production into other on-farm enterprises. Budget analysis could demonstrate the economic feasibility of alternatives to tobacco, but farmer age, education and experience might dissuade them from considering other agricultural enterprises. Additionally, barriers such as market access and capital investment are not reflected in a budget analysis but might be taken into account by farmers when evaluating the potential for other on-farm enterprises to replace tobacco.

Gross margin analysis is one of the simplest and common techniques used to determine profitability. This is because it involves determination of costs of each farmer on a

per unit/area basis on the specific enterprise as well as the revenue earned for each farmer considering the differences in prices. It is preferred since other methods such as total revenue or value of farm production include fixed costs of the whole farm and thus tend to underestimate the profit of each enterprise. Gross margins, however, should only be compared with figures from farms with similar characteristics and production systems (Firth, 2002).

The analytical approaches that are commonly used in diversification decisions study involving multiple choices are the multinomial logit (MNL) and multinomial probit (MNP) models. Both the MNL and MNP are important for analyzing farmer diversification decisions as these are usually made jointly. Hassan and Nhemachena (2008) used the MNL to analyse the farmers' adaptation to climate change in Africa. MNL logit model is used to analyze the determinants of farmers' decisions because it is widely used in adoption decision studies involving multiple choices and is easier to compute than its alternative, the MNP (Hassan and Nhemachena, 2008).

The advantage of using a MNL model is its computational simplicity in calculating the choice probabilities that are expressible in analytical form (Tse, 1987). This model provides a convenient closed form for underlying choice probabilities, with no need of multivariate integration, making it simple to compute choice situations characterized by many alternatives. Global concavity of the likelihood function is another aspect that makes the MNL very interesting to use (Hausman and McFadden, 1984). However, MNL imposes the Independence of Irrelevant Alternatives (IIA) assumption, which states that the ratio of the probabilities of choosing any two alternatives is independent of the attributes of any other alternative in the choice set (Hausman and McFadden, 1984; Tse, 1987).

The other alternative to avoid this assumption is the use of MNP. A test of the 'covariance' probit specification versus the 'independent' probit specification, which is very similar to the logit specification, can be used to test the IIA. The main drawback of using the MNP is the requirement that multivariate normal integrals must be evaluated to estimate the unknown parameters. This complexity makes the MNP model an inconvenient specification test for the MNL model (Hausman and McFadden, 1984). Cramer (2003) says it is more flexible, as it naturally allows for correlation among the random elements, but analytically it is much less tractable and this has limited its practical use.

2.6 Theoretical framework

Economic choice theory suggests that individuals are rational, and if faced with the decision to choose between two alternatives, will prefer the option that provides the maximum level of utility. Therefore, farmers are expected, given a choice of alternative crop enterprises to make a decision on an enterprise to shift into so that they maximise their utility. Therefore, the choice of a crop alternative that a tobacco farmer chooses is a utility maximisation problem. However, with the campaigns and education targeted at the farmers for them to reduce tobacco production, it is expected that the farmers would have understood the negative effects and known that the utility from tobacco is less compared to other crops. The messages that enlighten them on the health, environmental and social ills of tobacco if received as measure of the awareness of the farmers, are expected to help them in making a decision. Producers' uncertainty about future income from tobacco may induce them to look for alternative crop/livestock enterprises to replace tobacco.

So generally, a household's choice to shift from tobacco farming can be considered a function of the expected utility derived from the adopted enterprise. The utility function can be stated as; in (Allison and Christakis, 1994; Layton, 2000).

$$U_{ij}=V_{ij}+\varepsilon_{ij} \quad \text{for } j \epsilon J_i \qquad 1$$

where U_{ij} is household *i*'s utility for adopting a given alternative enterprise *'j'*, V_{ij} is the deterministic component of utility for household *i* associated with adopting the alternative enterprise, and ε_{ij} is the error term associated with choosing the alternative (Train, 2003). The error term captures the factors that affect utility but cannot be observed, e.g. moods and other hidden perspectives.

However, a tobacco farmer must consider the available alternatives to replace tobacco. The potential of alternatives to replace tobacco can be evaluated by the utility the farmer gets from tobacco (U_{iT}) and the utility from the alternatives (U_{ij}).The difference between the two utilities (ϑ_j) can be represented as;

$$U_{ij}>U_{iT} \text{ or } \vartheta_j=U_{ij}-U_{iT} \qquad 2$$

Given a farmer is faced with several potential alternatives to replace tobacco, the factors that will influence this decision include the attributes of the alternative, farmer characteristics, size of the farm, access to credit and other inputs, and institutional factors,

notably contract farming. The random utility model assumes that household *i* will choose a given alternative if the perceived utility from its adoption exceeds that of non-adoption (Train, 2003). The randomness is captured by the error term. A tobacco farmer will chose one alternative (j) to replace tobacco only if the utility he/she gets from there is greater than from choosing another alternative (k) to replace it;

$$\begin{aligned} \vartheta_j &> \vartheta_k \\ U_{ij} - U_{iT} &> U_{ik} - U_{iT} \\ U_{ij} &> U_{ik} \\ \text{for all } j &\neq k \end{aligned} \qquad 3$$

Due to the complexity of human behaviour, we cannot observe utility levels, even cardinally. However, the chosen alternative among several can be observed and a probability can be attached for making such a choice. Therefore, the decision to adopt or use a particular alternative or not should include a probabilistic dimension.

A farmer chooses an alternative whose utility is maximum among the alternatives. But given that we observe farmers who have actually reduced the area under cultivation for tobacco, and then we assume the chosen alternative has higher utility than tobacco and also than other available alternatives. The choice of alternatives varies from farmer to farmer depending on several factors among them environmental.

2.7 Conceptual framework

Figure 1 shows the conceptual framework. The decision to take up alternatives to tobacco farming is dependent on a number of factors. Smallholder farmers have different socio-economic characteristics such as education, age, household size, land ownership, farming income, and household size, which greatly affect decision-making. Institutional factors that affect the probability of farmers to go into other alternative enterprises include farmers' access to extension services, markets, government together with policies and regulations. Attributes of the alternative enterprises are said to affect the choice of an alternative enterprise to tobacco cultivation with regard to labour and capital requirement and suitability to the area. The choice of the alternative thus has an effect on the outcome, either increased income, improved food security and reduced vulnerability.

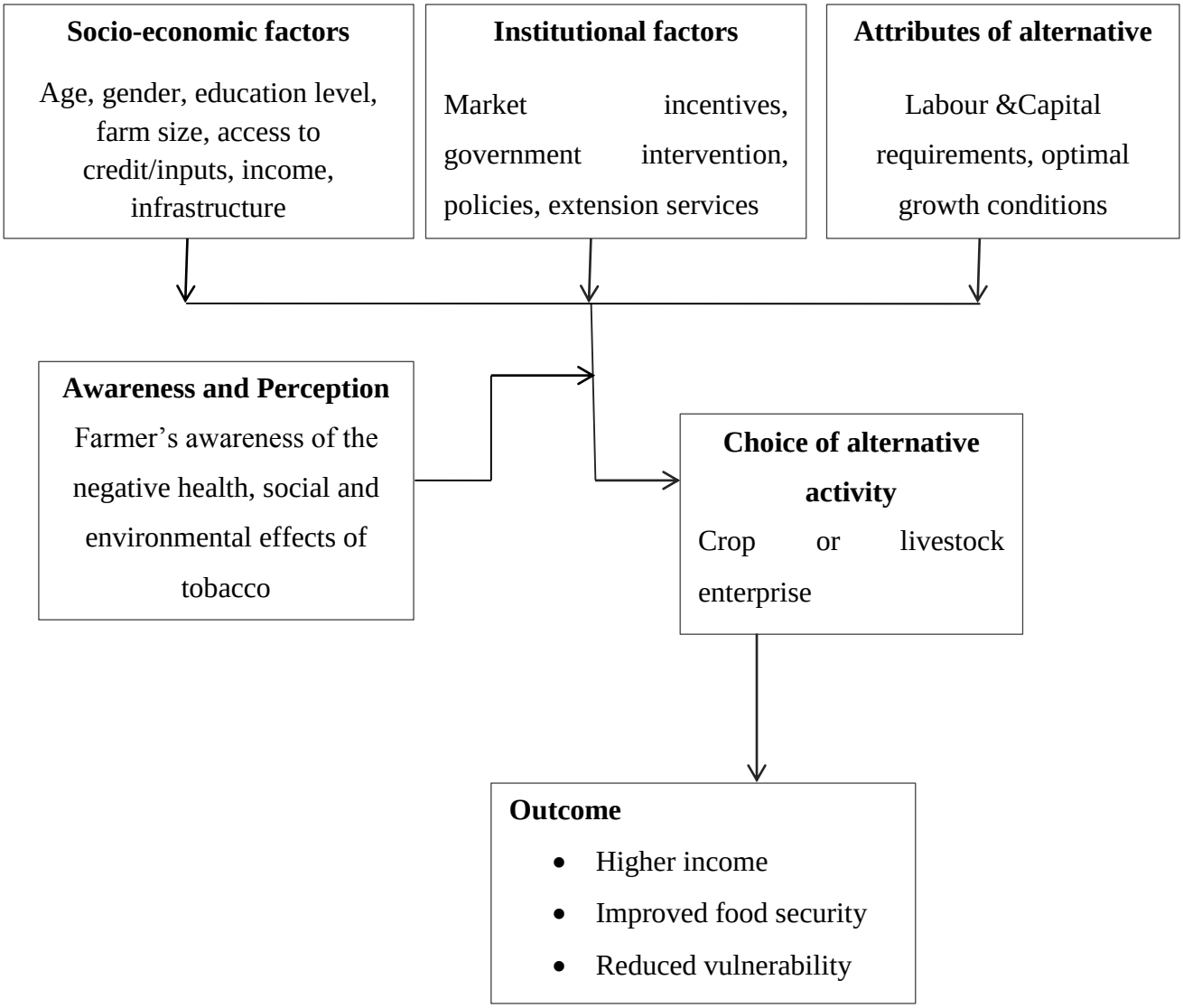


Figure 1: **Conceptual Framework**

Source: Author's own conceptualisation

CHAPTER THREE

RESEARCH METHODOLOGY

The chapter describes the study area giving its characteristics. It outlines the sampling procedures, the data that were used in the study, how they were collected and the methods that were used in the analysis for each of the objectives.

3.1 Study area

Teso district as shown in Figure 2 is located in Busia county Western Kenya and covers an area of approximately 559 square kilometres. It is bordered by Bungoma county in the north and east and Republic of Uganda in the West. The district has four (4) administrative divisions namely; Amagoro, Angurai, Amukura and Chakol. The district has thirty (30) locations and eighty-two (82) sub locations. With a population of 338,833 (2009 Census) and population density average of 385 per square kilometre, absolute poverty stands at 59.5 percent, food poverty at 49.4 percent while hardcore poverty at 24.6 percent (GoK, 2008).

Over 88 percent of the districts land lies within the AEZs LM 1 and LM 2 (MoA, 2007). The altitude ranges from 1000-1500 metres above sea level. The district experiences bi-modal rainfall with a long rainy season running from late February/early March to June/July, and a shorter rainy season running from August to November. However, the short dry period around July does not always occur. The most reliable dry period is between December and mid-February. Mean annual rainfall totals are usually within the range of 1000-1500mm, although rainfall patterns are highly erratic and unpredictable from season to season. The district also experiences mean minimum and maximum temperatures of 15^{o}C and 30^{o}C respectively.

Agriculture is the main source of livelihood with border trade and *boda boda*[2] trade also accounting for livelihood sustenance. Teso south district has approximately 28,000 households with 65-70 percent heavily relying on farming/agriculture. In most parts, land is highly suitable for food production and cash crops. Major crops in the district include cassava, maize, sorghum, finger millet, maize, groundnuts among others whilst sugarcane and tobacco are the dominant cash crops. With regards to livestock, since the late 1990s, the district has gradually been restocking their cattle herds following a trypanosomiasis outbreak

[2] A motorcycle or bicycle taxi

(RoK, 2005; Gill, 2010). However, cattle stocks are not at the levels they once were and increasingly households are turning towards keeping smaller animals due to increasing land pressure (Gill, 2010).

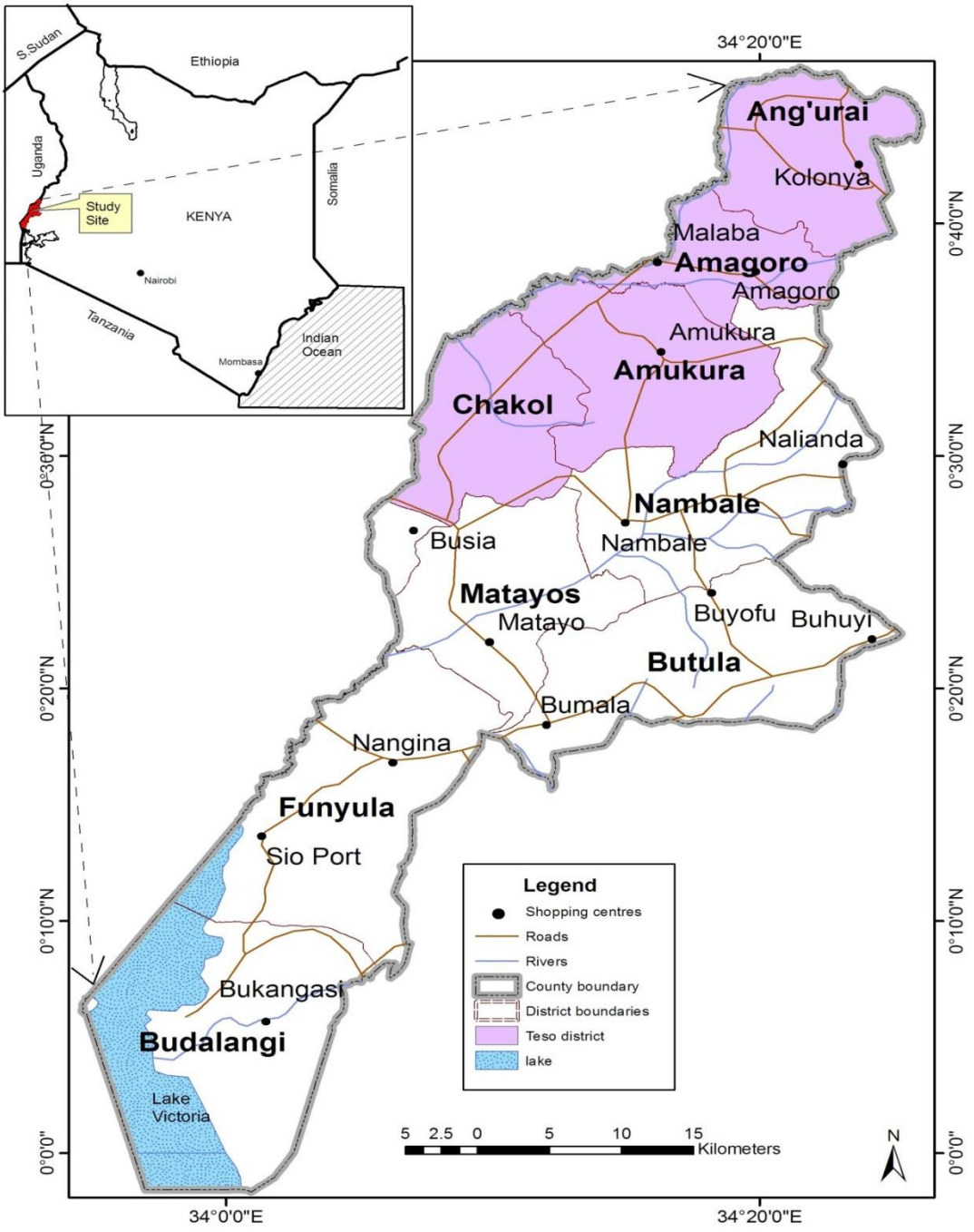


Figure 2: Map of study area
Source: *www.wri.org*

3.2 Data types and sources

This study used both primary data and secondary data. Primary data was collected using a structured questionnaire and observation. The data collected included mainly household characteristics and farm characteristics. Secondary data from the Ministry of Agriculture in the district and the tobacco companies operating in the area was used.

3.3 Sampling techniques

This study sampled farmers who were growing tobacco. A multi-stage sampling procedure was used. The district was purposively selected as it is the poorest of all that engage in tobacco production in the region. It has also experienced environmental degradation due to tobacco cultivation. The reason why the district's food poverty index is high given the favourable climatic conditions for food production could be an indication of the implication that tobacco production brings about food insecurity. Amukura and Chakol divisions were purposively selected and simple random sampling was used to select the locations and sub-locations. The respondents were obtained using systematic random sampling from a source list obtained from the tobacco companies.

3.4 Sample size

The sample size was determined using formula by Anderson *et al*. (2007).

$$n=\frac{pqZ^2}{E^2} \qquad 4$$

Where n = sample size, p = proportion of the population containing the major interest, q = 1-p, z= confidence level ($\alpha = 0.05$), E = acceptable/allowable error. Since the proportion of the population is not known, p=0.5, q = 1-0.5= 0.5, Z = 1.96 and E =0.08. This resulted to a sample of 150 respondents.

3.5 Methods of data analysis

Objective one

To evaluate farmers' awareness of the effects of tobacco production, descriptive statistics was used. This included frequencies, means, variances, dispersion and graphic representation of the results in charts and graphs.

Objective two

Gross margins analysis was used. Gross margin was calculated as;

$$GM_{ij}=p_j Y_j - \sum r_I X_I \quad 5$$

Where, GM is gross margin of enterprise j for farmer i; p_j is the output price of enterprise j; Y_j is the output of enterprise j, r_I is price of input I and X_I is the amount of input I used. The use of GM analysis depends on assumptions. In this case, land was not treated as an input because it is a fixed input shared by several farm enterprises. Both hired and family labour were considered and assumed to have equal productivity. All farmers were also assumed to have used same production technology and prices used were those prevailing during production season for each of the farm enterprises for each of the farmers (Kibet *et al*., 2011).

Objective three

Discrete choice analysis was used. Given the recent international advances to reduce tobacco production and consumption, many campaigns have been made by national governments and agencies to sensitise farmers on both the health and environmental dangers of tobacco. Farmers are able to respond by diversifying or venturing into different crop enterprises. Long (1997) says that the MNL model can be thought of as simultaneously estimating binary logits for all possible comparisons among the outcome categories, and in our case the enterprise chosen. The estimates from binary logits provide consistent estimates of the parameters of MNL.

Let *A* be a random variable representing the alternative enterprise chosen by any farming household *i*. Following Long (1997), we use the subscript i because each person faces a different set of crops that they can grow depending on the weather pattern in that area. We assume that each farmer faces a set of discrete, mutually exclusive choices of alternative enterprises. These enterprises are assumed to depend on a number of climate attributes, socioeconomic characteristics and other factors *x*. The probability of choosing alternative A_i among the J number of alternative enterprises and the set of explanatory variables x is derived as (Greene, 2012):

$$\text{Prob}\,(A_i=j)=\frac{e^{\beta_j' x_i}}{\sum_{k=0}^{j} e^{\beta_k' x_i}},\ j=0,1\ldots J \quad 6$$

Where j are the alternatives that range from none to J and β is a vector of coefficients on each of the independent variables x. k is the number of categories into which the farmer responses may fall. Equation (6) above can be normalized to remove indeterminacy in the model by assuming that β= 0 and the probabilities can be estimated as:

$$\text{Prob}\,(A_i=j|x_i)=\frac{e^{\beta_j' x_i}}{1+\sum_{k=0}^{j} e^{\beta_k' x_i}},\ j=0,2\ldots J, B_0=0 \qquad 7$$

and according to Hassan and Nhemachena (2008), equation (7) can yield the alternative enterprises (J) J-log odds ratio as;

$$\ln\left(\frac{P_{ij}}{p_{ik}}\right)=x'\left(\beta_j-\beta_k\right)=x'\beta_j,\ \text{if } k=0 \qquad 8$$

The dependent variable is therefore the log of one alternative enterprise relative to the base enterprise. However, interpreting the coefficients can be misleading. The marginal effects or quasi-elasticities, which indicate the percentage point change in p upon a 1percent increase in x are used instead. Over all states, the probabilities sum to 1, and the derivatives and quasi-elasticities to 0. Like the derivatives, quasi-elasticities are invariant to the choice of the reference state, and they may change in sign and size when they are evaluated at different points (Cramer, 2003).

The elasticities are computed as;

$$\delta_j=\frac{\partial P_j}{\partial x_i}=P_j\left[\beta_j-\sum_{k=0}^{J} P_k\beta_k\right]=P_j(\beta_j-\bar{\beta}) \qquad 9$$

Where;

δ_j is the elasticity associated with alternative j, that is the change from the base enterprise to enterprise j. It is simply the coefficient associated with enterprise j minus the average of the coefficient, multiplied by the probability associated with enterprise j.

It was hypothesised that the tobacco farmers who have reduced the area under tobacco cultivation have diversified into other enterprises, which will be listed according to the share they occupy, and the main ones used are the choice of an enterprise by the farmer/household.

The log-likelihood can be derived by defining, for each individual, d_{ij} = 1 if alternative j is chosen by individual i, and 0 if not, for the J + 1 possible outcomes. Then, for each i, one and only one of the d_{ij}'s is 1. The log-likelihood is a generalization of that for the binomial probit or logit model (Greene, 2012):

$$\ln L = \sum_{i=1}^{n} \sum_{j=0}^{J} d_{ij} \ln \text{Prob}\,(Y_i = j | x_i) \qquad 10$$

and the derivatives take the simple form as;

$$\frac{\partial \ln L}{\partial x_j} = \sum_{i=1}^{n} (d_{ij} - P_{ij}) x_i \text{ for } j=1,\ldots,J \qquad 11$$

n being sample size.

Because the goal of the WHO FCTC globally is to have the area under tobacco reduced to possibly zero, truncated regression was used to determine what factors influence the area reduced. Left truncation was done for those who had not reduced the are under tobacco cultivation at zero. This is given by; (Cameron and Trivedi, 2005).

$$Y_i^* = \beta' X_i + \varepsilon_i \qquad 12$$

Where Y_i^* is a vector of the latent variable that is not observed for values less than zero.

X_i represents vector of the independent variables,

β' is vector of the unknown parameters,

ε_i is vector of the error terms; distributed normally with mean 0 and variance σ^2

i=1, 2, 3. . .n represents the number of observations.

If Y_i is the observed variable representing farmers who had abandoned or reduced acreage under tobacco, its value is truncated from below at L= 0. With truncation from below we observe only;

$$y = y^* \text{ if } y* > L \qquad 13$$

For example, only farmers who had abandoned or reduced acreage under tobacco are considered (L = 0).

3.6 Empirical model

The multinomial logit model was used to determine the factors influencing the choice of an alternative enterprise to tobacco cultivation. The variables used in the model and their expectations are presented in Table 1 and the model was specified as;

$$\text{Prob}\,(A_i=j)=\frac{e^{\beta_j' x_i}}{\sum_{k=0}^{j} e^{\beta_k' x_i}},\ j=0,1\ldots J$$

$$\text{choice}=\beta_0+\beta_1\text{age}+\beta_2\text{gender}+\beta_3\text{hsize}+\beta_4\text{fsize}+\beta_5\text{totalassetval}+\beta_6\text{accrdt}$$

$$+\beta_7\text{exprience}+\beta_8\text{distmkt}+\beta_9\text{accextn}$$

The truncated regression model was also used to determine what factors influence the area under tobacco that is reduced and the model was specified as;

$$Y_i^* = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n + \varepsilon$$

$$area\ reduced(Y_i^*) = \alpha + \beta_1\text{accextn} + \beta_2\text{accrdt} + \beta_3\text{distmkt} + \beta_4\text{lsize} + \beta_5\text{totalassetval} + \beta_6\text{accmkt} + \beta_7\text{gmperacr}$$

Age (**age**): This refers to the age of the household head in years. It is measured as a continuous variable and is expected to affect the choice of a farmer to reduce/abandon tobacco production. Old people are said to be conservative about the future so will tend to stick to what they have been doing, usually risk averters. Young people on the other hand are more receptive to new practices and in this case are also believed to be more aware of the negative effects of tobacco production to motivate abandonment or acreage reduction. Therefore, in this study age is expected to either positively or negatively affect the farmers' choice to reduce/abandon tobacco production.

Gender (**gender**): This was measured as a dummy variable taking the value of 1 for male headed household and 0 otherwise. It was expected to affect the the choice of a farmer to reduce/abandon tobacco production. Female headed households may lack more

information and production assets such as land that restricts them from making decisions on whether to reduce abandon tobacco or not. The male-headed household more often control the decisions related to household land utilisation especially for commercial crops like tobacco. Therefore, gender will either, positively or negatively, influence the choice to reduce/abandon tobacco production.

Table 1: **Description of variables used in Multinomial logit and truncated regression models**

Variable Code	Variable	Measurement of the variables	
Dependent variable			
Choice	Choice of alternative enterprise	Enterprise a farmer engages in on land otherwise used for tobacco production	
Independent variables			**Expected sign**
age	Age in years	Age of the tobacco farmer (continuous)	+/-
gender	Gender	Gender of the farmer(Dummy 1 =Male, 0= Female)	+/-
hsize	Household size	Size of the household (continuous)	+/-
lsize	Land size	Size of the farm available in acres (Continuous)	+/-
totalassetval	Total asset value	Value of household assets	+
accrdt	Credit access for the alternative crop	Credit access by household (Dummy 1=access 0 = otherwise)	+
distmkt	Distance to market for alternative crop	Distance to the near markets in kilometres (continuous)	-
experience	Farmer experience n growing tobacco	Years a farmer has been growing tobacco(continuous)	+
awnhlth	Awareness of health effect of tobacco	Farmer awareness of tobacco effects (Dummy 1=awareness 0=otherwise)	+
accextn	Access to extension services	Extension services access by household(Dummy1=access 0 = otherwise)	+
gmperacr	Gross margin per acre per enterprise	Gross margin per acre per enterprise(continuous)	+

Household size (**hsize**): This is a continuous variable measured by number of family members and expected to affect the household head willingness to participate either positively or negatively. This is because as total family size is the source of labour and since tobacco production is labour intensive larger household might prefer its cultivation. A larger household size could also have ore sources of income or access to information or credit

thereby facilitating reduction or abandoning of tobacco to other alternative enterprises.

Landsize (**lsize**): Land is an indicator of wealth and social status within a community. It was expected to have either a positive or negative effect whether farmers reduce or abandon tobacco production. Farmers with more cultivable land were expected to participate in tobacco cultivation because they have other land that could be taken up by other enterprises. On the other hand, those with small parcels of land would opt to grow other crops especially for subsistence. Farmers with larger land are also considered wealth so it is perceived they will be able to afford credit and undertake other enterprise which are not grown under contract like tobacco.

Total asset value (**totalassetval**): Assets such as farm implements are considered wealth and will facilitate production and uptake of various enterprises. The more assets a household owns the re likely more likely they are to engage in other enterprises other than tobacco. Assets like radios and television also provide information and thus can create awareness of other alternatives, how to grow them and where and how to market the produce. Thus, it was hypothesised that total asset value positively influences the reduction or abandonment of tobacco.

Access to credit (**accrdt**): It is a dummy variable, which takes the value 1 if the farm household has access to credit and 0 otherwise. Having an advantage of access to credit is an important for farmers to finance their farm production and increase the productivity. This gives freedom to the farmer and positively influences what to choose to grow other than tobacco which is under contract farming.

Distance to market (**distmkt**): The further the markets are from the producers the more likely they are to grow tobacco. This is because tobacco has a ready market as provided under contract farming and the contractor arranges for collection points which ease the distance to the market. In this case, distance to market negatively influenced farmers to reduce or abandon tobacco cultivation.

Access to extension service (**accextn**): It is dummy variable which takes the value 1 if the farmers have access to extension service and 0 otherwise. Extension service here refers to advice, training, information, demonstration and distribution of agricultural input. Thus, in this study, access to extension services is one of the institutional characteristics hypothesized to positively influence farmer’s decision reduce/abandon tobacco and opt for other

alternatives.

Experience (**experience**): Measured by the number of years a farmer has engaged in tobacco production, was hypothesized to negatively influence the shifting to other alternatives. More experience also connotes age and as mentioned earlier older farmers are conservative and will stick to what they know. In the same breadth, a farmer with more experience in tobacco growing will prefer to continue growing it other than learn a new skill on how to produce an alternative skill.

Awareness of health effects of tobacco (**awnhlth**): Having information and being aware of the health hazards of tobacco is very important for a house hold head to decide whether or not to grow tobacco or not. It was hypothesized that farmers who are aware of the health effects of tobacco growing are expected to abandon the growing of tobacco compare to those who do not.

Gross margin per acre (**gmperacr**): Alternative enterprises have to yield better returns compared to tobacco. It therefore follows that enterprises with higher gross margins per acre compared to tobacco will be more enticing to farmers. The hypothesis was therefore that gross margin per acre positively influence the reduction and abandonment of tobacco.

3.7 Data analysis

Data collected was coded and analysed using Statistical Package for Social Science (SPSS) version 16.0 and Stata version 12 (StataCorp, 2011), was used to estimate the multinomial logit model.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter discusses the main findings of the study. It starts with presenting the descriptive statistics of the socio-economic characteristics, the awareness of the farmers to different aspects of tobacco. Gross margin analysis, returns to labour and capital results are also presented and discussed. Empirical results are presented in section 4.4. Discussions that refer to other studies and probable explanations for the observed results are given.

4.1 Descriptive analysis

4.1.1 Socio-economic characteristics of the farmers

The results of socio-economic characteristics of tobacco farmers in the district are presented in Table 2 and Table 3. Table 2 describes continuous variables while Table 3 describes discrete variables.

Table 2: Socio-economic characteristics of the farmers (Continuous)

Variable		Mean	t-value	p- value	Std Dev	Min	Max
Age	Reducers	44.7	-0.67	0.50	13.13	21	85
	Non-reducers	42.97			13.48	20	70
Household size	Reducers	5.59	0.13	0.90	1.45	1	9
	Non-reducers	5.63			2.14	1	10
Experience (Years)	Reducers	4.77	0.60	0.55	4.31	1	33
	Non-reducers	5.33			5.63	1	26
Land size	Reducers	2.77	0.89	0.37	1.94	0.5	10
	Non-reducers	2.88			1.65	0.5	7

Since there were two groups, those who reduced or abandoned tobacco production (reducers), and those who did not (non-reducers) a comparison of means was done using the student t-test for continuous variables at 5 percent confidence level. The results shows that all

the variables tested had $p>0.05$ indicating that there was no significant difference between the reducers and non-reducers in terms of age, household size, farm size and years of experience.

The results in Table 2 show that most farmers were relatively young as indicated by the mean age in each category. The youngest farmer among the reducers was 21 years old while the oldest farmer was 85 years old. Among non-reducers, the youngest farmer was 21 years old and oldest farmer was 70 years old. The mean age of the reducers was about 45 years while that for non- reducers was 43 years. In terms of experience, the average for both reducers and non-reducers was about 5 years. The least length of experience for both categories was 1 year because tobacco is an annual crop and thus farmers were contracted each year and may not renew the contract for the subsequent year. The longest time of experience was 33 years and 26 years for reducers and non-reducers respectively.

The farmer with small household size in both categories had 1 person while those with large household size had 9 people for reducers and 10 people for non-reducers. The households with 1 person were either unmarried person or widowed. The average household size for both categories was about 5 persons In some studies, large households have been found to positively affect uptake of new agricultural technologies through provision of sufficient labour (Ashenafi, 2007; Kibet *et al*., 2011a). However, the case of Teso may be different due to the high labour requirements of tobacco that may dissuade participation in the crop.

The smallest land size among the farmers in both categories was 0.5 acres while the farmer with the largest size of land for reducers had 10 acres and non-reducers had 7 acres. The average land size for all farmers in the area was approximately 3 acres indicating that a majority of farmers are smallholders. Large farm sizes have been found to influence positively the uptake of more alternative agricultural practices (Ashenafi, 2007; Kibet *et al*., 2011a).

With regards to gender, male farmers dominated their female counterparts in both categories (Table 3). About 96 percent of those who reduced or abandoned tobacco production were male while 3 percent were female whereas all the non-reducers were male. Generally, male headed households were the majority with 97 percent while female headed households were only 3 percent. This difference can be attributed to the fact that women in the area, like in most of the Kenyan communities, have neither rights to own agricultural

production resources (especially land) nor power to make major decisions regarding agricultural production. The findings concur with that of WVK (2002) and Kibet (2010). The high labour requirement in tobacco production was also evidenced by the lack of any female among the non-reducers given that most female headed households were widowed. Kuboja et al. (2011) also had similar findings.

Table 3: Socio-economic characteristics of the farmers (Discrete)

	Reducers		Non-reducers		χ^2-value	Total	
	N=120		N=30			150	
Characteristics	**No.**	**Percent**	**No.**	**Percent**		**No.**	**Percent**
Gender							
Male	116	96.67	30	100		146	97.33
Female	4	3.33	0	0	1.03	4	2.69
Division							
Amukura	60	50	20	66.67		80	53.33
Chakol	60	50	10	33.33	2.68	70	46.67
Education							
None	13	10.83	5	16.67		18	12
Primary	92	76.67	22	73.33		114	76
Secondary	14	11.67	3	10		17	11.33
Tertiary	1	0.83	0	0	1.03	1	0.67

About 0.67 percent of farmers attained tertiary education. Among the reducers, 10 percent never went to school, 76 percent attained primary school education and 11 percent attained secondary school education. The non- reducers on the other hand, 16 percent never went to school, 73 percent primary and 10 percent secondary education. The bulk of farmers having only attained primary or no education at all indicates the low levels of literacy in the district (Lagat *et al*., 2006) and also the inability of parents to take their children to secondary school which could be due to high poverty incidences of 59.5 percent (GoK,2008).

4.2 Awareness of effects of tobacco production

Table 4 shows the results of farmers' awareness of effects of tobacco production that was viewed in three aspects: health awareness, environmental awareness and awareness of tobacco control mechanisms in place.

Table 4: Awareness and perception with regards to tobacco effects and control

	Reducers		Non-reducers		χ^2-value	Total	
	N=120		N=30			150	
Characteristics	**No.**	**Percent**	**No.**	**Percent**		**No.**	**Percent**
Awareness health							
No	28	23.33	10	33.33		38	25.33
Yes	92	76.67	20	66.67	1.269	112	74.67
Awareness environment							
No	54	45	16	53.33		70	46.67
Yes	66	55	14	46.67	0.670	80	53.33
Awareness control initiatives							
No	57	47.50	16	53.33		73	48.67
Yes	63	52.50	14	47.67	0.327	77	51.33
Perception							
Strongly disagree	12	10	6	20		18	12
Disagree	25	20.83	9	30		34	22.67
Neutral/Undecided	37	30.83	5	16.67		42	28
Agree	26	21.67	4	13.33		30	20
Strongly agree	20	16.67	6	20.00	5.597	26	17.33

In terms of awareness of health effects of tobacco growing, 75 percent of the farmers were aware of the effects. However, of the reducers, 77 percent were aware of the effects and as such, it can be said that their decision to abandon or reduce the area under tobacco cultivation was influenced by their awareness. Environmentally, more farmers were aware of the negative effects of tobacco production (53 percent) compared to those not aware (47 percent). Among the reducers a good number, (52 percent) were aware of tobacco control initiatives in place compared to 47 percent of non-reducers. As studies have found out, awareness has a contribution to decision making in agricultural enterprises (Hassan and Nhemachena, 2008; Maddison, 2007).

Figure 3(a) shows the physical health effects listed as being aware of by the farmers who handled tobacco. The health effects were however not medically diagnosed illnesses. Results in Figure 3(a) suggest 39 percent were aware of lung cancer, 36 percent were aware

of chest problems/pains,10 percent coughing, 8 percent eye problems with fatigue/tiredness and loss of appetite each having slightly above 2 percent.

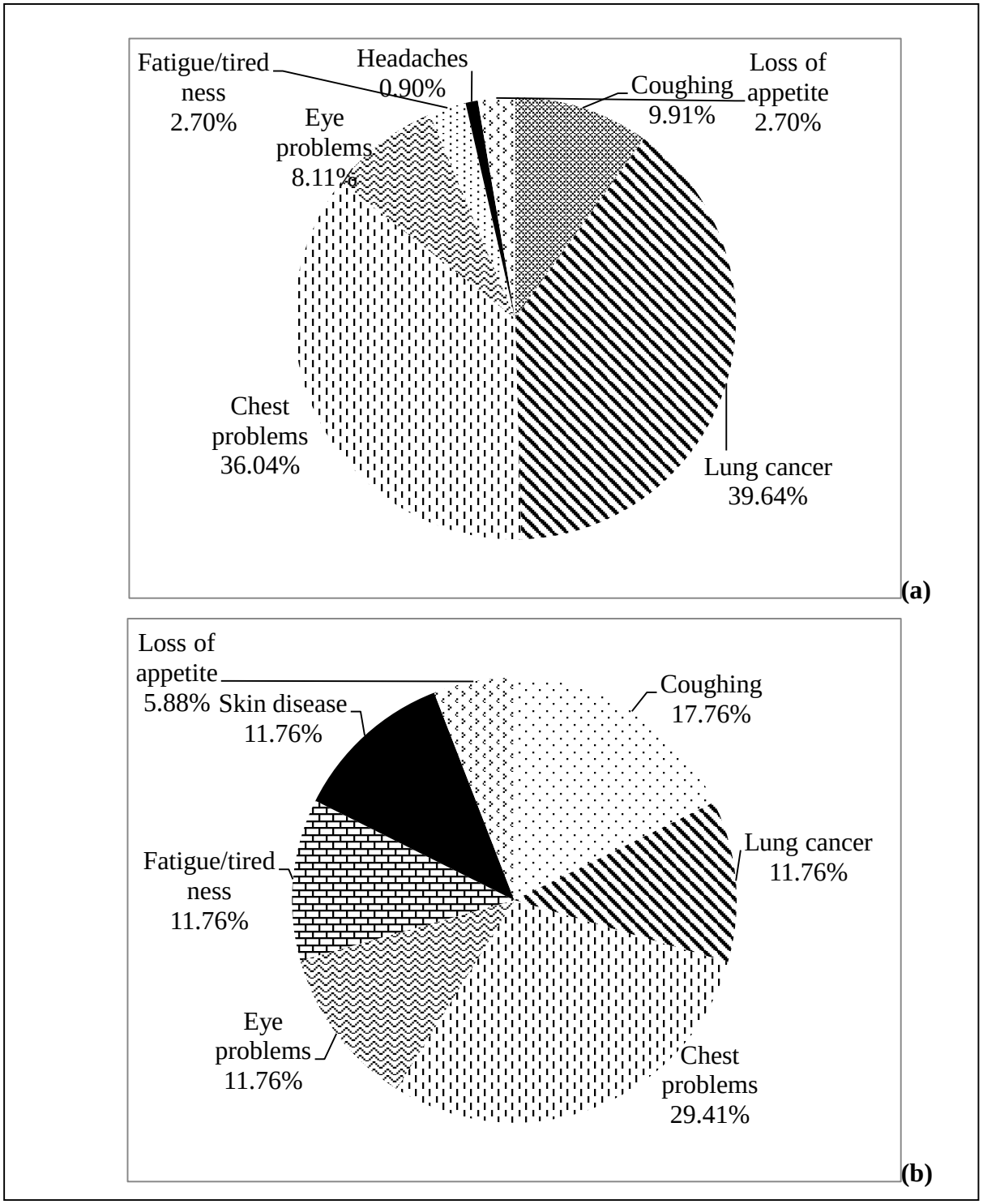
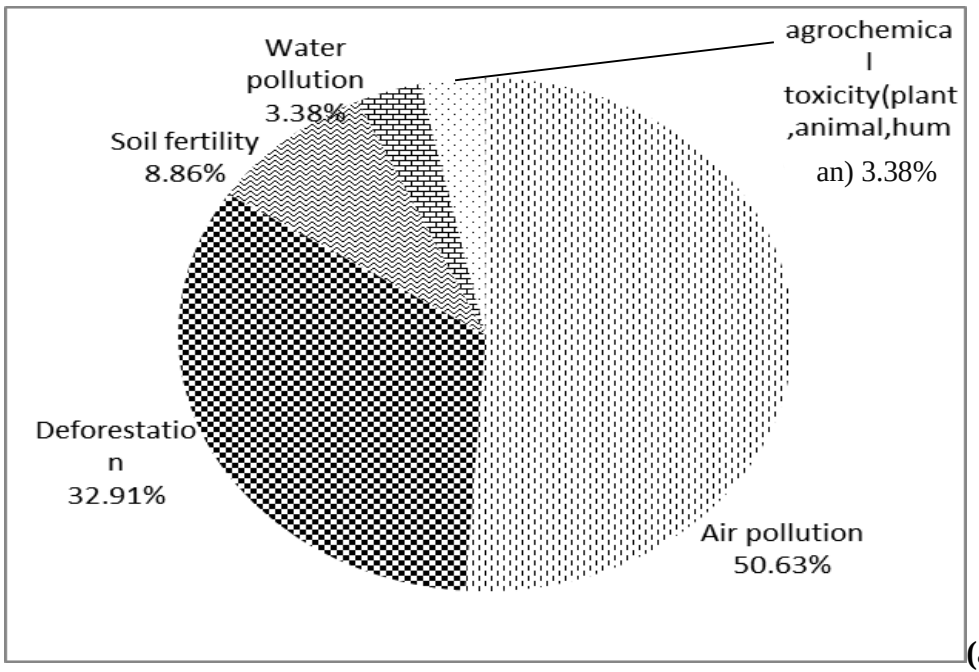


Figure 3(a) and (b): Awareness of health effects of tobacco

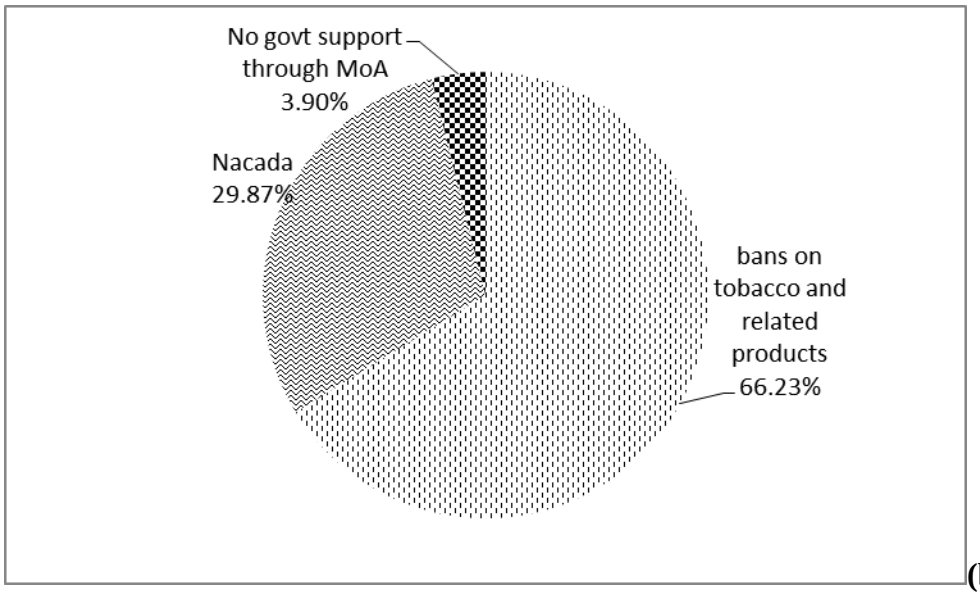
Figure 3(b) shows similar health effects that the farmers also listed as being aware of. These are serious health concerns arising from producers. Indeed documented evidence suggests that effects such as headaches, fatigue, loss of appetite and skin disorder have been known

and associated symptoms of Green tobacco sickness (GTS) an illness among tobacco farmers who are poisoned by nicotine absorption through the skin during cultivation and harvesting (Kibwage *et al.*, 2007; Otanez, 2008; WHO, 2008).

Figure 4(a) and (b) shows the results about awareness of environmental effects of tobacco growing and initiatives that have been used to control tobacco production and consumption.



(a)



(b)

Figure 4: Awareness (a) Environmental effects (b) Control initiatives

Of the environmental hazards pointed out, 51 percent were aware of air pollution especially during curing of the tobacco and during agrochemical usage. Since a lot of firewood is needed for curing, the hazard of deforestation was listed by 33 percent of growers. This finding concurs with Maitima *et al.* (2005) and Ekisa (2010). Though the farmers did not seem to have high levels of education, it was easy for 9 percent to notice soil infertility which they attributed to tobacco stripping the land of nutrients. Scientific evidence supports this observation since Geist (1999) and Lecours *et al*. (2011) concur that tobacco requires a lot more nutrients than other crops and as result make the land infertile thus, more fertilizer has to be used for crops grown on the same land.

Water pollution and agrochemical toxicity to plants, animals, humans both accounted for approximately 4 percent each. This finding is not surprising because of the low literacy levels. The details of such effects are not obvious to them. Promoting the creation and dissemination of documentary films about tobacco, using more visual mode of delivery as well as practical methods to demonstrate the importance of the messages being passed on, especially in non-literate populations , was found to be a best practice to create awareness and give technical advice (Lagat *et al*., 2006; Otanez, 2008).

As shown in Figure 4b, 66 percent were aware of bans on tobacco and related products. These included banning of promotion and advertisement of cigarettes and tobacco products. Various other bans, in addition to this, are in place including a ban on sponsorship by tobacco related brands or companies (WHO, 2005; Wanyonyi and Kimosop, 2012). Thirty percent were aware of NACADA and 4 percent of no government support of tobacco as a crop through Ministry of Agriculture as is the case with other crops where they get information, training and extension services. NACADA has put measures in place to reduce tobacco usage such as public education and awareness especially on the harmful health effects of tobacco usage together with liaising with other stakeholders to control drug and substance abuse, tobacco being inclusive.

Perceptions about tobacco control, which were measured on a likert scale of 5, was varied among the reducers and non-reducers. About 10 percent of farmers strongly disagreed to measures being taken to control tobacco production and marketing with about 30 percent being indifferent on these measures. Of the non-reducers, equal proportion (20 percent) strongly agreed and disagreed to these measures while a higher proportion of the reducers agreed to the control measure more than those that disagreed. This is expected as most

reducers could have been recipients of the messages on reduction and hence agree on the measures.

The Chi square results revealed that there were no differences among the reducers and non-reducers in relation to gender, education level, awareness and perception. This can be because of the homogeneity of the households as they share same systems of production and are exposed to similar environment such as weather and institutional factors.

4.3 Types and level of alternative enterprises replacing tobacco

To identify the alternative enterprises replacing tobacco, Gross Margin Analysis (GMA) was used in estimating returns over variable costs for different enterprises on the farms and the competitiveness of the enterprises.

4.3.1 Gross Margin Analysis

Table 5 shows the average gross margin for the various enterprises undertaken. The average gross margin per acre was calculated by summing up the gross margin per farmer for an individual enterprise and dividing it by the number of farmers engaged in the specific enterprise. However, some enterprises such as soyabeans, groundnuts and beans were not included because they were not commonly practised.

Table 5: Average Gross Margin for each farm enterprise

Enterprise	Average GM (KES/Acre)
Kales	38,906.95
Sugarcane	32,425.33
Rice	17,600.91
Millet	16,700.42
Tomatoes	12,130.83
Maize	10,458.1
Pepper	8,865
Sorghum	8,731.67
Cassava	7,727.75

Kales had the highest gross margin of Ksh. 38,900 per acre. Sugarcane is an upcoming enterprise which ranked second after kales with a gross margin of Kshs 32,425. Though rice has its own limitations, the gross margin associated with it was Ksh. 17,600 and was ranked as the third alternative to tobacco. Millet exhibited a modest gross margin of Kshs. 16,700, favourably comparing with rice as an alternative crop. The traditional crops (maize, sorghum and cassava) had lower margins of Ksh. 10,000 and less per acre. This indicates the futility of spending resources on some of the traditional crops, which seem to be mostly meant for subsistence.

4.3.2 Returns to labour and capital

From the results of the positive GM values for all the enterprises, they do not necessarily mean that farm production was profitable. A further measure of returns to labour and capital was used to determine profitability. Estimates for whole farm gross incomes (from individual enterprise gross margins) showed income from farm production to be quite low. This may be attributed to the fact that a relatively large share of farmland is under low-value subsistence crops. Productivity levels of these crops are also low due to low input use, leading to low returns to land, labour and capital.

Returns to labour and capital were used to determine profitability of the farm enterprises. Labour included both family and hired labour and was assumed to have equal productivity. Capital was considered the same as total variable costs (labour and input costs) involved in production of a particular farm enterprise. Returns to labour was then calculated by dividing the gross margin per acre by the labour costs per acre for each of the farm enterprise and the results are summarized in Table 6.

Kales appear to be the best alternative crop to tobacco. The return to farmers' capital was highest at 7.63 units of capital and the highest return to labour of 12.23 units of GM per acre. This may be due to the fact that it had lower variable costs (Ksh.3,915) and lower labour requirements (Ksh.6,710) compared to the other enterprises. Kuyiah (2006) also found that kales ranked highest in terms of GM in Vihiga though its availability during long rains faced stiff competition from local vegetables. Pepper also had relatively high returns compared to the rest of the crops whereas tomatoes had a fairly high returns to labour (2.01), but low returns to capital (1.64).

Table 6: Returns to labour and capital

Enterprise	Average GM (Ksh./Acre)	Labour costs (Ksh./Acre)	Total Variable Costs (TVC) (Ksh./Acre)	Returns to labour (GM/Acre)	Return to Capital (GM/TVC)
Kales	38,906.95	3,915.28	6,709.72	12.23	7.63
Sugarcane	32,425.33	19,491.33	34,368	2.44	1.56
Rice	17,600.91	11,221.82	14,153.64	2.24	1.79
Millet	16,700.42	9,910.97	14,852.36	2.46	2.09
Tomatoes	12,130.83	8,165	9,556.67	2.01	1.64
Maize	10,458.1	8,256.77	12,046.8	1.87	1.40
Pepper	8,865	3,097.5	4,260	2.55	2.11
Sorghum	8,731.67	10,076.67	10,268.33	0.84	0.81
Cassava	7,727.75	7,820.86	8,955.11	1.24	1.05

Kuyiah (2006) argued that kales, pepper and tomatoes can be classified as high value crops which eventually translates to higher gross margin levels. Other studies have identified especially horticultural crops to being among better alternatives to tobacco and enhancing sustainable livelihoods among the rural poor (Ochola and Kosura, 2007; Akhter, 2011).

Staple crops such as maize, cassava and sorghum had the least returns to labour and capital and this could be because of low productivity levels and low input use. The other reason could be the unavailability of market. Sugarcane, rice and millet expressed better margins in comparison to the other crops because of the extension services offered. Rice (especially the rainfed variety) and millet were among the crops promoted in the district through the MoA and thus farmers who engage in these enterprises are likely to be equipped with knowledge on production and how to negotiate and find better markets for their produce. The performance of sugarcane could be attributed to contract farming where the farmer is provided with inputs as loan, extension service offered, and market guaranteed.

The GM for tobacco was not included in the analysis. However, from related studies it can be deduced that tobacco is not profitable in comparison to a majority of enterprises above that have the potential to replace it. Lagat *et al*. (2006) found that the gross margin per acre of tobacco in Amukura, Teso to be Ksh. 17,326.21 and the annual profitability of tobacco in

terms of gross margin per acre to be Ksh. 19,556.11. Ochola and Kosura (2007) found that the average gross margin per acre for tobacco was Ksh. 37,119 and that it gave the lowest profitability in comparison to the other enterprises. The large GM differential between the two studies could be attributed to the different places they were each conducted thus faced with different prevailing socioeconomic and institutional conditions. Tobacco is an annual crop that takes 9 months before harvesting and there is the pre-processing period of drying and curing. This therefore implies that the gross margin per acre of other short cycle enterprises actually exceed that of tobacco as they can be grown and harvested twice or thrice per annum in both the long rains and short rains seasons which surpasses that of tobacco.

4.4 Econometric results

4.4.1 Results of multinomial logit model

Multinomial logit model was estimated to determine the factors that influence farmers to choose different enterprises among them tobacco. Table 7 shows the results of the model.

Table 7: Multinomial logit model estimates for factors affecting selected enterprises

Variables	Marginal Effects (ME)				
	Maize	Cassava	Millet and sorghum	vegetables	Rice and Sugarcane
total asset value	0.000**	0.000*	-0.000**	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
household size	0.011	-0.009	-0.012	-0.010	0.011
	(0.037)	(0.027)	(0.025)	(0.027)	(0.027)
distance to	0.009	-0.015	0.006**	-0.010	0.008***
market	(0.010)	(0.012)	(0.003)	(0.010)	(0.003)
access to	-0.214	0.061	0.116	0.184	0.229
extension	(18.065)	(3.551)	(5.591)	(2.366)	(3.807)
health	0.067	-0.008	0.072	-0.036	-0.064
awareness	(0.107)	(0.073)	(0.082)	(0.071)	(0.069)
experience	0.013	-0.016	0.019**	0.003	-0.021
	(0.015)	(0.016)	(0.007)	(0.007)	(0.018)
gender	-0.144	0.003	0.038	0.013	0.062
	(0.341)	(0.155)	(0.222)	(0.184)	(0.526)
age	-0.039	0.030	0.032	0.031	-0.050
	(0.038)	(0.024)	(0.026)	(0.024)	(0.031)
land size	-0.143*	-0.060	0.249***	-0.067	0.045
	(0.079)	(0.044)	(0.093)	(0.047)	(0.062)
LR Chi (45) =74.32					
P-value= 0.0039					

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The reference for the model was the farmers who have not reduced tobacco production in the reference years. The model fits the data well as indicated by the Log-likelihood Ratio (LR) which is significant at $\alpha = 0.01$. The pseudo R-squared is good though it may not be a very good measure of fit in multinomial cases (Greene, 2012). The results include six crop enterprises chosen by farmers. These are tobacco (reference), maize, cassava, rice and sugarcane, vegetables and millet and sorghum. The grouping mainly followed the use and economic importance as well as the agronomic requirement. For example, rice and sugarcane were grouped together because of their high water requirements while cassava is the main staple in the area, followed by maize and millet and sorghum.

Total asset value which was calculated as the sum of the value of all the assets that the farmer owned, inclusive radio, TV and farm implements, influenced farmers to continue growing tobacco, though this was very negligible. Despite significance, the value is so negligible that when rounded to three decimal places, the effect is zero. However, the negative signs and significant for maize, cassava, millet and sorghum indicates that the farmers endowed with more assets would more likely avoid growing any of the three staples compared to growing tobacco.

Household characteristics that included household size, age and gender of the household head, were not significant in determining what enterprise a farmer chose. The effect of these characteristics in adoption of new agricultural technologies or practices is inconsistent with literature. Though the signs on these coefficients were as expected, they were insignificant, and suggest that the household characteristics have little effect on the farmers' decision on the choice of enterprise (Kalineza *et al*., 1999).

Distance to the market of an alternative crop to tobacco was significant for sorghum and millet at 95 percent confidence level. The marginal effect for rice and cane was significant at $\alpha = 0.01$. The longer the distance to the market for an alternative, the higher was the probability of them growing sorghum and millet compared to continuing with tobacco. With an increase in distance to market by 10 percent, the probability of growing millet and sorghum increases by 6 percent. Given millet and sorghum are the second staple (Salasya *et al*., 2008; Gill, 2010) and they are less bulky crops, farmers far away from the market may resort to them after abandoning tobacco. Distance to market was also positive for growing of rice and cane with a slightly higher marginal effect and significant at 99 percent confidence level.

Given the bulkiness of sugarcane in marketing, the result is quite surprising. However, bearing in mind that the selling points for raw sugarcane are well distributed throughout the area through contracted farming that provides transportation from the farm to the millers, the likelihood of growing cane being positive is plausible as distance to market increased for other crops.

Experience, measured in years, increases the probability of tobacco farmers opting for millet and sorghum. Farmers with an extra year of experience are about 2 percent more likely to go for millet and sorghum instead of tobacco. Experience in growing tobacco could have made these farmers realize some of the problems that are associated with tobacco growing and hence the likelihood of them going for millet and sorghum. Millet and sorghum are also more attractive to old farmers who do not like trying out new crops given that it is a traditional crop in the area (Gill, 2010).

Land size was another major factor that influenced the choice of the enterprise that a farmer went into away from tobacco. For millet and sorghum, land size had a positive relationship and significant at 1 percent significance level. With increase in land size by an acre, the probability of farmers preferring to grow millet and sorghum instead of tobacco increased by about 25 percent. This implies that large farm may enable households to allot their land to multiple cereal crops than small holders (Rehima *et al*., 2013). However, for maize, land size had a negative significant at 10 percent significance level. With an increase in land by one acre, the probability of farmers preferring to grow maize instead of tobacco decreased by about 14 percent. This could be because maize is considered a staple and subsistence crop without much economic value compared to tobacco.

Previous studies indicated that land size positively affected type of crop, variety or agricultural enterprise that farmers engaged (Rahman, 2008; Hassan and Nhemachena, 2008; Ojo *et al*., 2013). Land is one of the most important factors in crop production and therefore farmers with bigger land have the flexibility to grow and try different crops while those with small pieces of land have limited options per given agricultural season. The increased probability of growing millet and sorghum as land size increases could have more to do with the cultural attachment to the crops, as they are favourite for *ugali*[3] and beer brewing among the Teso community (Salasya *et al*., 2008, Gill, 2010).

[3] Dish of maize flour cooked with water to a dough like consistency

4.4.2 Choice of enterprise for reducers

A second estimation was done that used only the farmers that have reduced the area under tobacco production. In this model (Table 8), the reference or base category was cassava, which is among the most common crops in the area. It also requires less investment with generally low management levels but can still do well. In estimating this model, the factors that influence the choice of an enterprise for farmers who have decided to reduce were determined. The difference with the first estimation is mainly in the inclusion of farmers who had not reduced the area under tobacco cultivation and hence the inclusion of tobacco among the alternatives. In this estimation, the actual alternatives are used instead of the perceived or preferred alternatives. The Marginal effects are presented in Table 8 whereas the coefficients are presented in appendix 3.

Table 8: Dependent variable - Choice of enterprise

Variables	**Marginal Effects (ME)**			
	Maize	**Millet and Sorghum**	**Vegetables**	**Rice and Sugarcane**
log total asset value	0.285**	-0.102	0.167	-0.143
	(0.127)	(0.113)	(0.109)	(0.113)
household size	-0.014	-0.024	-0.008	0.004
	(0.028)	(0.026)	(0.028)	(0.026)
distance to market	-0.015	0.007**	-0.009	0.008***
	(0.012)	(0.003)	(0.010)	(0.003)
access to extension	-0.004	0.010	0.145**	0.204***
	(0.084)	(0.068)	(0.061)	(0.058)
health awareness	-0.019	0.080	-0.046	-0.068
	(0.073)	(0.093)	(0.072)	(0.073)
experience	-0.018	0.014*	0.006	-0.025
	(0.016)	(0.007)	(0.007)	(0.018)
gender	0.011	0.013	0.035	0.068
	(0.144)	(0.206)	(0.176)	(0.480)
age	0.021	0.045*	0.022	-0.028
	(0.023)	(0.025)	(0.024)	(0.028)
land size	-0.106*	0.047	-0.071	0.045
	(0.056)	(0.038)	(0.051)	(0.042)
LR= 68. 37				
P-value= 0.000				

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Using the log-likelihood ratio, the model indicates that it is well fit at α=0.01. Generally, this means that the model has strong explanatory power. The variables included are jointly significant.

Total asset value influenced positively the growing of maize away from cassava. With an increase of 10 percent in the total asset value, the likelihood of a farmer who has reduced growing tobacco to opt for growing maize increased by about 28.5 percent. The assets that were considered included among them agricultural implements like ploughs. Maize production, compared to cassava requires some level of investment and use of implements like ploughs for tilling, axes for land clearing, are common and this means farmers who owned these implements would opt for maize growing without major problems. Dilruba *et al*. (2012) obtained similar findings with regards to asset position.

The model results also indicate that distance to market was another variable that was significantly influencing the choice of an enterprise after the farmer decides to reduce tobacco production. Millet, sorghum, rice, and cane were more likely to be the crops substituted after reducing area under tobacco as the distance to market increased for the farmer. Millet and sorghum could be preferred for being less bulky while for cane benefits from availability of market through contracting millers. This means as the distance to market for the preferred alternative increased, farmers were more likely to grow crops in these two categories (millet and sorghum and rice and sugarcane).

Provision of advisory services through government extension service was another factor that determined what enterprise the farmer engaged after reducing the area under tobacco cultivation. Advisory services are important in encouraging adoption of new technologies and encouraging farmers to diversify into other non-traditional crops (Kibet *et al*., 2011a; Rehima *et al*., 2013). Farmers who had access to extension service were more likely to go into vegetables, rice, and sugarcane. Those who had access to extension had about 15 percent higher likelihood of growing vegetables and about 20 percent higher likelihood growing either rice or sugarcane. These are crops that require good technical advice and management. It is, therefore, possible that the farmers who had no access to extension service did not consider growing them as they could have lacked the technical information needed in the management of these crops.

Experience in tobacco growing, measured in years, had a significant influence on the choice of an enterprise at 90 percent confidence level. With a one-year increase in experience

in growing tobacco, the preference for millet and sorghum compared to cassava increases by about 1.4 percent. This could still be explained by the importance of the cereals in the community. In addition, experience is linked to age and thus the older farmers preferred the traditional crops that they are conversant with.

The age of the farmer was also significant in influencing the choice of an enterprise. Aged farmers tended to prefer millet and sorghum to cassava, with an additional year increasing the probability of opting for cassava by about 4.5 percent. Studies, Mendietta (2011) and Dilruba *et al*. (2012) have indicated that aged farmers are less risky takers and hence after abandoning tobacco, prefer the more traditional millet and sorghum compared to these other crops.

4.4.3 Factors influencing the land area reduced

Truncated regression model was estimated to determine the factors that influenced tobacco acreage reduction.

Table 9: Truncated regression model coefficient estimates for tobacco acreage reduction

Variables	Coefficient
gmperacre	-0.000
	(0.000)
access to extension	0.595*
	(0.360)
access to market	-0.022
	(0.450)
distance to market	-0.019*
	(0.011)
land size	0.642***
	(0.175)
access to credit	0.460**
	(0.224)
log total asset value	-0.492
	(0.464)
Constant	6.212
	(5.384)
Wald Chi (7)= 51.90	
P-value= 0.000	
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

From the model results in Table 9, access to extension about alternative crops has a positive influence on area that is abandoned or reduced for tobacco. Farmers who have access to

extension services on average reduced 0.595 acres more than those without access to extension services.

Contact with extension service does not only result in the farmers having more alternatives but also reducing the area under tobacco. These farmers could have been more aware of the global fight against tobacco and hence started to shift to other crops thereby reducing area under tobacco. Access to extension services equipped farmers with more knowledge and skills hence enabling them to engage in other enterprises (Hassan and Nhemachena, 2008).

The results indicate that distance to market to an alternative crop significantly (at 90 percent confidence level) influences the size (in acres) of tobacco that is abandoned. For an increase by 1 kilometre in distance to market, the land area reduced by about 0.019 acres. In other words, for every reduction in distance to market by 1 kilometre, the acreage reduced increased by 0.019 acres. This could possibly be because proximity of markets is a big determinant for profit and marketing margins for farmers. Farmers going into traditional crops like cassava, maize, millet and sorghum could be doing so because they do not need any market as they are mostly subsistence crops and farmers would tend to grow more of them.

With tobacco, the farmers are assured of the market because contracting companies collect the produce at the farm gate. This means alternatives with close proximity to the market would more likely incite the farmers to reduce more the area under tobacco since they would be assured of market for produce from alternative crops.

Land size significantly (at 99 percent confidence level) influences the size (in acres) of tobacco that is abandoned. This implies farmers who have larger land sizes on average reduced 0.642 acres more than those with relatively small land. The more land a farmer has the more likely they are to reduce the acreage under tobacco and go into other alternatives. This suggests that the farmers with larger farms have the flexibility in their decision-making and more opportunity to venture into other enterprises within the farm. More land holdings is considered as a proxy for wealth or an asset that facilitates production. Thus the more land a household has the more wealthy they are and the more the likelihood of enterprise diversification

Access to credit is significant at 5 percent. This shows that credit access played an important role in influencing the acreage under tobacco. Farmers who have access to credit services on average reduced 0.46 acres more than those without access to credit services. The findings suggest that access to credit enables households to increase their productivity through acquisition of needed inputs for a particular enterprise. Given the fact that tobacco is grown under contract and the contractor extends credit to the farmers, switching to an alternative enterprise has to be fuelled by incentives or benefits akin to those that the farmer receives while growing tobacco.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

Conclusions in relation to the objectives are given in this chapter. Recommendations that link with the objectives that were set at the beginning are also presented. Recommendations relate to policy issues that can be implemented to help better enforce tobacco laws that affect tobacco production and to also identify best alternatives for farmers and help them make the transition.

5.1 Conclusion

This study established that farmers are aware of the negative effects of tobacco and the tobacco control measures put in place. There is evidence that farmers respond to the negative aspects related to tobacco growing by resorting to other crop enterprises as alternatives to tobacco. There are a varied number of enterprises in Teso district like kales, tomatoes, millet and sugarcane. Several of these have better gross margins than tobacco on per acre basis and even on per acre per annum basis considering they can be grown in two or three cycles per year unlike tobacco.

However, the alternative enterprises, with the exception of sugarcane, which is majorly grown under contract farming, still have a lot of potential to increase further farm incomes if only proper utilization of the scarce resources and capacity building is observed. Several socioeconomic and institutional factors were also found to influence a farmers' choice of alternative enterprise. Factors such as experience, land size, access to extension, access to credit, distance to market had a positive effect in influencing farmers' choice of alternative enterprise and thus helped the farmers to abandon or reduce acreage under tobacco whereas total asset value of the household had a significant but negative influence.

5.2 Recommendations

This study recommends that more farmers should reduce the acreage of tobacco given the available alternatives to tobacco and the various legislation on tobacco demand and supply which will in turn affects their livelihoods, not to mention the negative health, environmental and social costs associated with tobacco. This gradually may lead to total abandonment of tobacco in the area. All relevant stakeholders should undertake sensitization programs for farmers in order to make them aware of the problems associated with tobacco

farming and to assist them in the shift to the production of alternative crops with higher returns. Alternative enterprises should be encouraged and promoted because they are the more profitable farm enterprises with a higher potential to increase farm incomes even under conditions of resource constrain in comparison to tobacco. This study has identified alternative crops to tobacco in Teso and would suggests the formulation and implementation of policies by the county government.

Since extension services are important in helping most tobacco farmers to acquire the skills, knowledge and information necessary to transition to other crops. This can be done in partnership with the institutions promoting the production of the alternative crops in the region. Enhancing farmers' technical know-how and improving the marketing infrastructure for alternative crops.

Regarding credit access, the study recommends the development of a viable and sustainable financial system to service the agricultural sector. This could be achieved through the use of social networks, exploiting social capital. The Agricultural Finance Corporation (AFC) can be restructured taking cognizance of these issues.

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Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

APPENDICES

APPENDIX 1: QUESTIONNAIRE

Introduction

This survey has the objective of evaluating the response of tobacco growers to global fight against tobacco in Teso district, Busia County. Respondents have been chosen randomly to participate in this survey and their voluntary participation will be highly appreciated. Information collected will be treated with strict confidentiality and will be analyzed only for academic purposes.

Section A: Household Level

1. Demographics

	(Write here below)	*(Code)*
1. Division (**div)**		
2. Location (**locatn)**		
3. Sub-location (**subloc**)		
4. Name of numerator (**enu)**		
5. Farmers' name (**name)**		

2. Do you own land? (1=*yes; 2=no*)

Parcel **(prcl)**	Acreage **(acr)**	How did you acquire the land **(acqsn)**? *1=inherited,2= bought,3= leased/hired*	What is the land tenure **(ldtnr)**? *1=freehold with title, 2=freehold with title, 3=rented/leased, 4=communal, 5=other, specify*

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

3. Household characteristics

Household member	B01, Relation to HHD ***(code b1)***	B02, Age	B03, Gender *1=male* *2=female*	B04, Marital status **(code b2)**	B05, Highest level of education completed ***(*code b3)**	B06, Main occupation **(code b4)**	B07,Farm labour participation **(code b5)**
1	head						

Relationship to head (code b1)	**Marital status (code b2)**	**Education level (code b3)**	**Main occupation (code b4)**	**Farm labour participation (code b5)**
1=Spouse 2=Son/daughter 3=Parent 4=brother/sister 5=Son/daughter in-law 6=Grand child 7= Other relative 8=Hired worker 9= parent-in-law	1 Married, Single Spouse 2 Single 3 Divorced 4 Widowed 5 Separated 6 Married, More than one spouse	0= none 1= primary school 2= secondary school 3= Tertiary	1=Farming (crop + livestock) 2=Salaried employment 3=Self-employed off-farm 4=Casual labourer on/off-farm 5=School/college child 6=Herds boy/girl 7= Non-school child 8=Other, specify	1= Full time 2=Part-time 3=Not a worker

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Section B: Household Farm Assets

4. HOUSEHOLD PRODUCTION ASSETS/IMPLEMENTS

Please tell us about the type and number of assets in working condition owned by the household.

	Asset name	Quantity	Current per unit value (shillings)	Total value (shillings)
CODES	**ASSET**	**QTY**	**VALUE**	**TOTAL**
C01	Houses			
C02	Water tanks			
C03	Ox-ploughs			
C04	Ox-cart			
C05	Sickle			
C06	Panga and axe			
C08	Spade/Shovel			
C09	Hoes			
C 10	Sprayer/pump			
C 11	Wheel barrow			
C 12	Bicycle			
C 13	Motorbike			
C 15	Radio/radio cassette			
C 16	Mobile phone			
C 17	Television			
C 18	Storage shed			
C 19	Land			
C 20	Other (specify)			

*For land, in quantity column, write the acres (size)

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Section C: Awareness

5. How long have you been growing tobacco? (*write the years)*	
6. Are you aware of any health effects of tobacco? *(1=Yes; 2=No)*	

5.1 If yes to 5, list the effects you know

a.

b.

c.

7. Are you aware of any environmental effects of tobacco? *(1=Yes; 2=No)*	

6.1 If yes to 6, list the effects you know.

a.

b.

c.

8. Have you ever had a health problem(s) from tobacco growing? *(1=Yes; 2=No)*	

7.1 If yes, what problem(s)?

a.

b.

c.

9. Has any of the family members had a health problem(s) from tobacco growing? *(1=Yes; 2=No)*	

8.1 If yes, what problem(s)?

a.

b.

10. What is your perception/attitude towards tobacco control? *5=strongly agree, 4=agree, 3=neutral/undecided, 2=disagree, 1=strongly disagree*	

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Section D: Alternatives to Tobacco

11.	Is there a year you reduced the area under tobacco cultivation or completely stopped growing since 2008? *(1= Yes; 2=No)*	
12.	If yes to 10, what year (s) and what was the reason?	
Year	**Reason reduced or did not grow tobacco (***two reasons per year max)*	
a. 2008		
b. 2009		
c. 2010		
d. 2011		
e. 2012		

13. What enterprise did you go into the years you did not grow tobacco? *(List the enterprises in order of size for crops)*

	Year did not grow tobacco *(refer to 11 above)*	**Enterprise went into** *(List max. of 3)*	**Total acreage?**		**Enterprise with highest GM** *(Kindly rank; 1=highest…)*	**Total output?** (*Quantity)*	Unit
			Size	**Unit**			
E1.							
E2.							
E3.							
E4.							

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Access to Credit and Extension Services

Enumerators, kindly list all the enterprises the farmer has ever gone into as a replacement for tobacco in column one and ask questions…

Enterprise *(Refer to enterprises in 12 above)*	Did you receive extension advice for the alternative? 1=Yes; 2=No	Advice was on? *(code ES1)Write all that applies separated by commas.*	Did this extension advice influence your take up of the enterprise? 1=Yes; 2=No	Did you have access to credit for this enterprise? (*1=No; 2=Informal source; 3= Formal source)*	Did availability of credit influence your choice of this enterprise? *1=Yes; 2=No*	Rank the enterprises in order of their potential to permanently replace tobacco.*1=highest potential….*
ENTER	**ES01**	**ES02**	**ES03**	**ES04**	**ES05**	**ES06**

ES02
1=Production
2=Post harvest and storage
3=Marketing

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Labor use in Alternative Crop Enterprises ***(****Enumerator, ask the below questions concerning the alternative crop enterprises)*

Crop enterprise	Activity		Labor type *(1=family; 2=hired*)	Cost of 1 man day (8 hours)	Quantity *(manday)*	Unit *(1=Hours; 2=Days; 3=Months)*	Total cost *(put total as told by farmer for this activity)*
LABCROP	**LABACT**		**LA02**		**LA03**	**LA04**	
	Land preparation	1					
	Planting	2					
	Fertiliser/chemical application	3					
	Weeding	4					
	Harvesting	5					
	Transporting field to homestead	6					
	Shelling and Packing	7					
	Transporting to point of sale	8					
	Other1:	9					
	Other2:	10					
	LABACT						
	Land preparation	1					
	Planting	2					
	Fertiliser/chemical application	3					
	Weeding	4					
	Harvesting	5					
	Transporting from the field to homestead	6					
	Shelling and Packing	7					
	Transporting to point of sale	8					
	Other1:	9					
	Other2:	10					

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Crop enterprise	Activity		Labor type *(1=family; 2=hired*)		Quantity (i.e man-hours spent)	Unit *(1=Hours; 2=Days; 3=Months)*	
LABCROP	**LABACT**		**LA02**		**LA03**	**LA04**	
	Land preparation	1					
	Planting	2					
	Fertiliser/chemical application	3					
	Weeding	4					
	Harvesting	5					
	Transporting from the field to homestead	6					
	Shelling and Packing	7					
	Transporting to point of sale	8					
	Other1:	9					
	Other2:	10					
	Other3:	11					
	LABACT						
	Land preparation	1					
	Planting	2					
	Fertiliser/chemical application	3					
	Weeding	4					
	Harvesting	5					
	Transporting from the field to homestead	6					
	Shelling and Packing	7					
	Transporting to point of sale	8					
	Other1:	9					
	Other2:	10					
	Other3:	11					

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Input expenditure in crop production ***(****Enumerator, ask the below questions concerning the alternative crop enterprises the farmer went into)*

Crop enterprise	Acreage	Input type		Cost per unit	Unit	Total quantity	
CROPENTER		**INPUT**		**INP01**	**INP02**	**INP03**	
			1				
			2				
			3				
			4				
			5				
			6				
			7				
			8				
			9				
			10				
			11				
Total							
CROPENTER	Acreage	**INPUT**					
			1				
			2				
			3				
			4				
			5				
			6				
			7				
			8				
			9				
			10				
			11				
Total							

Inputs: Seeds, seedlings, fertilizers, agrochemicals (herbicides, pesticides, and fungicides), manure and others (*specify*)

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Labor use information in livestock production ***(****Enumerator, ask the below questions concerning the alternative livestock enterprises the farmer went into)*

Livestock type	Total livestock numbers	Activity/input type		Cost per unit	Unit*	Total quantity	Labor type (*1=Family; 2=Hired)*	Output	Unit
LIVESTCK		**LIVACT**		**LIV01**	**LIV02**	**LIV03**			
			1						
			2						
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						
Total									
			1						
			2						
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						
Total									

Activities: Herding, feeding, dipping, vaccination, shed cleaning and others (*specify*)

*****Unit e.g. herding is per day, dipping is per animal, feeding is per animal etc.

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

Access to markets for alternatives

Enterprise	Do you access market for this crop/livestock? *(1=Yes; 2=No)*	Do buyers come to the homestead or you take to market? *(1= They come to homestead; 2= I take to market place/depot; 3=both)*	How far is the market from your homestead?	
			Distance	Unit*(1=Meters; 2=Kilometers)*

Interview Start Time_____:____ Interview End Time____:_____ Questionnaire S/N:___ ___ ___

If you were to completely stop growing tobacco or reduce acreage in favour of an alternative enterprise, what will be your reason(s) for the same?(in order of major to minor reason)

i.	Health and environmental reasons	
ii.	Market	
iii.	Access to credit	
iv.	Access to extension	
v.	More income than tobacco	
vi.	Government regulation	

APPENDIX 2

Factors affecting enterprise chosen instead of tobacco

Variables	Coefficients				
	maize	**cassava**	**Millet&Sorghum**	**vegetables**	**Rice and Sugarcane**
Logtav	-0.000	-0.000	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
hhsize	-0.353	-0.467	-0.489	-0.489	-0.268
	(0.622)	(0.661)	(0.658)	(0.678)	(0.692)
dstmkt	-0.068*	-0.222*	-0.025	-0.187	-0.000
	(0.038)	(0.131)	(0.033)	(0.117)	(0.032)
accextn	14.217	15.464	16.021	17.121	17.665
	(1,352.66)	(1,352.66)	(1,352.66)	(1,352.66)	(1,352.66)
awnhlth	1.354	1.115	1.788	0.787	0.462
	(1.541)	(1.653)	(1.735)	(1.695)	(1.734)
time	-0.064	-0.231	0.067	-0.087	-0.322
	(0.157)	(0.219)	(0.166)	(0.169)	(0.274)
gender	-1.480	-1.114	-0.674	-0.908	-0.335
	(5.702)	(5.771)	(5.970)	(5.869)	(8.645)
age	0.085	0.445	0.453	0.483	-0.346
	(0.706)	(0.729)	(0.745)	(0.744)	(0.790)
lsize	0.398	0.181	3.154*	0.214	1.452
	(1.364)	(1.417)	(1.697)	(1.454)	(1.587)
Constant	5.425	4.564	1.635	3.504	4.031
	(6.634)	(6.810)	(6.970)	(6.938)	(9.385)
LR Chi (45) =74.32					
P-value= 0.0039					

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

APPENDIX 3

Factors that influence the choice of an enterprise

Variables	Coefficients			
	Maize	**Millet and sorghum**	**vegetables**	**riceandcane**
logtav	-3.217**	-3.692**	-0.919	-4.268**
	(1.448)	(1.718)	(1.690)	(1.894)
hhsize	0.228	-0.066	0.028	0.152
	(0.303)	(0.363)	(0.398)	(0.407)
dstmkt	0.169	0.208	0.049	0.237*
	(0.131)	(0.132)	(0.160)	(0.132)
accextn	-0.903	0.206	1.655	2.371*
	(1.054)	(1.171)	(1.123)	(1.217)
awnhlth	0.346	0.828	-0.315	-0.525
	(0.807)	(1.115)	(1.023)	(1.101)
time	0.215	0.260	0.189	-0.105
	(0.171)	(0.176)	(0.179)	(0.273)
gender	-0.418	0.049	0.323	0.685
	(1.580)	(1.970)	(2.015)	(5.868)
age	-0.342	0.157	0.032	-0.466
	(0.271)	(0.319)	(0.333)	(0.413)
lsize	1.224**	1.453**	0.255	1.500*
	(0.620)	(0.688)	(0.762)	(0.771)
Constant	37.060**	39.568**	9.007	47.903**
	(16.293)	(19.385)	(18.922)	(21.964)
LR= 68. 37				
P-value= 0.000				

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1