Institutional and Social Economic Factors Affecting Productivity of Maize in Kenya: A Case of Transzoia & Machakos Counties.

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ABSTRACT

Maize is the global leading cereal in terms of production, planted on over 184 million hectares globally with 1,016 million metric tonnes. Kenya has the potential to be self-reliant and can produce surplus to export to other countries. Specifically, the country has the comparative advantage of producing maize compared to other maize producing countries particularly her neighbours, but her maize production is not adequate to feed the population and the imports of maize to bridge the deficit is undermining the achievement of the national agenda under the Kenya Vision 2030. The purpose for this study was to investigate institutional and social economic factors affecting the realization of optimum productivity of maize in Kenya, case of Transzoia and Machakos counties**.** The study adopted descriptive survey design which was used to obtain information to describe the existing phenomena. The target population was farmers in the two counties. The examining system utilized was the multistage stratified arbitrary inspecting strategy. Data collection was done through the use of questionnaire, focus group discussion and interview schedule. The study found that maize productivity is affected positively by the land of size, amount of seed planted, amount of fertilizer used and amount of pesticide used. The study revealed that amount of manure and human labour used were statistically insignificance hence they can excluded in the model. The study also found that credit access in Machakos County had positive influence on maize productivity and was significant at 5% level. The results indicated that a unit increase in the access to credit maize productivity by 13.046 units. The other variables that had positive significant influence on maize productivity include farming experience, extension services, group membership, education level of the farmer, size of the family and household income. This study concludes that the government should ensure that the farmers get farm inputs in time and at good price in order to enable them produce more crops. The government should also seal the corruption that is in the sector by having specific anticorruption measures. This will grow the economy and therefore address the issue of unemployment. On addition the government should put more money on the sector of agriculture to ensure there is an easy working channel by the farmers to improve maize production and also consider to revise the Land tenure system.

KEYWORDS: Input-production factors, Comparative Advantage, Technical Efficiency

1. INTRODUCTION

Maize is the global leading cereal in terms of production, with 1,016 million metric tonnes (MMT) produced on 184 million hectares (Mha) globally (FAOSTAT, 2013).Globally maize is produced across all the continents with a total production of 1,016 million metric tons in 184 million hectares of land. Most of the population in the world feed on maize. 4.5 billion People which is equivalent to 30 % of the total population 94 developing countries use maize for consumption. Of the 22 nations on the planet where maize frames the most noteworthy level of calorie allow in the national diet, 16 are in Africa.

1.1 Maize production in Kenya

Kenya has a land area of 575,000 km2 and a wide range of ecological and climatic conditions. Only 19% of the total area is classified as high and medium potential; another 9% is arable, but subject to periodic drought. Most of the remaining area is suitable for grazing,

or is desert. Population density on arable land varies from 340 per km2 in the high- potential areas in the west, to a national average figure of 195 per km2. Population density is highest in areas of abundant rainfall, but a large majority of people live in medium to low-potential zones receiving less than 1250 mm rainfall per year. At the turn of the century, the high-potential areas in Kenya were settled by Europeans who established large, commercial farms. A major change since independence and the Swynnerton Plan has been the decline of large-scale farming. In 1958, large farms produced 80% of marketed output; now they account for less than half and only a quarter of total agricultural production. Large mixed farms produce maize, wheat, barley, and livestock products. Estates produce 30% of coffee and 65% of the tea as well as other horticultural crops (World Bank 1989a). Small farms are defined as less than 8 ha but are usually (75% in 1979) less than 2 ha. In 1974, three- quarters of small holdings were concentrated in the medium- and lower-potential areas of Eastern, Central, and Nyanza Provinces (1974-5, 1978-9 Integrated Rural Surveys, ODA 1982).

The largest sector in the Kenyan economy is the agriculture sector. Agriculture contributes the highest percentage of the GDP. One of the most crop produced in the agriculture sector is the maize which is the most staple food used in Kenya. Maize accounts for 40% the diets consumed in Kenya and 90% of the Kenyan population consume maize. For over 50 years Kenya has been growing maize and thus it has become dominant staple food. In the 1940s institutionalized maize research began in Kenya. Maize is grown in almost all the agro ecological zones in the country and currently occupies a quarter of the cropped area. Small farm maize production increased from 61% in 1976/77 to 81% in 1981/82 (Akello, 1986). Most of the maize produced on small holdings is consumed on-farm; approximately 20% of total small- scale production is sold. In contrast, large farms sell 75% of their maize production that they produce on 3% of the national maize area. According to Blackie (1989), the area planted with maize increased from 1.2 million ha in the late 1960s to 1.8 million ha in the late 1980s (ERS, USDA 1989), and production increased from 1.5 to 2.8 million MT.

Kenya has a comparative advantage in growing its own maize, but as transport costs are half the other food price, it is normally not worth exporting or importing maize grain. Preliminary indications for the current year (1992/93) were that the country was moving strongly into a deficit position and required large and growing imports without a major upward shift in domestic production. This trend since then has kept on worsening and the worse deficit was experienced in the year 2017.

In June 2008, Kenya Vision 2030 was propelled as the long haul improvement outline for the country. Its point is to change Kenya into a "recently industrializing, middle income nation giving a high caliber of life to every one of its residents in a perfect and secure condition". The Vision recognized horticulture as one of the key columns to convey the 10 percent yearly financial development rate visualized under the economic. To achieve this requires transformation of the sector through among other things: transforming key institutions; increasing productivity; and increasing area under irrigation. In order to achieve its goal, the government also launched the Agricultural Sector Development Strategy (ASDS) 2010-2020 in 2010 which aimed to position the agricultural sector as a key driver for achieving the 10% GDP growth targeted by the Vision. The overriding goal of the ASDS is to, among other aims; to achieve a progressive reduction in poverty and food insecurity in Kenya. To reduce food insecurity meant to increase maize

production and other staple food.In 2014, the national maize production slightly decreased by 2.2 percent from 39.9 million bags achieved in 2013 to 39.0 million bags (90 Kgs) and then increased to 42.5 million bags in 2015. The marginal decline and increase is attributed to variations in weather patterns and increases and reductions respectively in incidences of Maize Lethal Necrosis disease (MLND). Similarly, it is worth noting that the area under production decreased marginally from 2.12 million ha in 2013 to 2.1 million ha in 2014.

For some time Kenya has been producing less maize than the population requires. This is because in Kenya population has been growing geometrically while maize production grows arithmetically. Between 2010 and 2015 the maize deficit witnessed in Kenya was 2.0 million metric tonnes (Nyangito, 2003). The country imported maize from other countries. This hindered development because money that was supposed to be used for development was used to import maize. What this meant is that, the country had to import the deficit from other countries. Since the population in Kenya is increasing at a higher rate, maize productivity in country should also be increased. This has motivated researcher to investigate factors that can lead to increased maize production in different parts of the country.

1.3 Statement of the problem

The national nourishment security in Kenya is frequently pegged on accessibility and sufficient supplies of maize to take care of local demand. Maize creation has kept on declining since the presentation of rural changes which came about because of Structural Adjustment Programs (SAPs). The national maize generation levels have been declining from a record-breaking high of more than 34 million packs to around 25 million out of 2008.This has prompted deficits in maize generation and poor advertising frameworks which have added to financial stagnation and exacerbating levels of neediness in Kenya (United States Agency for International Development, 2011). Given all these development, Kenya has consistently produced less maize over the years than required to feed the population. With maize consumption per capita at 125kg, the country had a maize deficit of between 1.5 million and over 2.0 million metric tonnes during the period 2010 to 2016

Kenya has the potential to be self-reliant in food production and even have enough to export to other countries. Specifically, the country has the comparative advantage of producing maize compared to other maize producing countries particularly her neighbours, but her maize production is not adequate to feed the population and the imports of maize to bridge the deficit is undermining the achievement of the national agenda under the Kenya Vision 2030.

Despite of this decline empirical works on maize production is limited and knowledge of farmer's production situations remains inadequate particularly in Transzoia and Machakos Counties. Due to this underproduction of maize there was need to research on the

basic ways that can be used to improve maize productivity. There was therefore need to study the situation a basis for understanding the factors that affect maize productivity and come up with concrete recommendations for actions to address this situation.

1.4 Objective of the study

The objective of this study was to analyze maize productivity in Machakos and Transzoia counties. Specifically the study evaluated the institutional roles and social economic factors in productivity of maize Transzoia and Machakos County. Understanding the role of these factors will help farmers in this two counties and Kenta at large to embrace them hence increase maize productivity. This study will be limited in to Machakos and Transzoia counties.

2. LITERATURE REVIEW

2.1 Theoretical literature

This section discusses the main theoretical arguments on the allocative efficiency that are thought to be of value addition to this study.

2.1.1 The theory of Allocative efficiency

Allocative effectiveness is a proportion of how an undertaking uses creation inputs in a perfect world in the right blend to extend benefits (Inoni, 2007). Since assets are rare, a general public must choose how to utilize those assets for its most extreme advantage. At the point when assets are utilized to create one service or good those assets wind up inaccessible for some other reason. Most investigations have been utilizing picks up got by fluctuation of the information proportions in view of suspicions about the future value structure of items such as maize yield and factor markets. Producers are value takers and accepted to have idealize advertise data; all information sources are of a similar quality from all makers in the market. Allocative proficiency estimates the separation between the farm and the purpose of maximum gainfulness, given market costs of inputs and yields. At the end of the day, the allocative effectiveness indicates whether the utilization of various production factors ensures the fulfillment of most production with a specific market cost.

2.1.2 Profit-maximizing Hypothesis

This theory assumes that producers have one aim of maximizing profits. Firms pick the level of output which equates marginal revenue of producing an extra unit to its marginal cost. The firm determines the price for both output and input and the quantities of output and input. The choice is constrained by the technology available and the budget. The firm produces technically feasible output. Application of the profit maximization hypothesis in maize production is criticized because many maize farmers produce for food security and not profit maximization (Nyoro et.al, 2004). However, the hypothesis provided a good starting point for analyzing farmers' production behavior. This study borrowed from the fundamental result of this theory.

2.2 Empirical literature

Karanja, et al., 1998, utilized a Tobit model and two phase minimum squares to display maize profitability and appropriation of advancements. They presumed that maize profitability expanded with manure utilize, vicinity to traversable streets, instruction, expansion and the nearness of a male in the family unit. Intra-zonal variety was higher than the mean between zonal and along these lines a sign of awesome efficiency development, if the level of profitability of the lower half of the ranchers could be hoisted in any event to the mean level inside each zone. Maize showcase changes have prompted a decline in maize costs and negative consequences for maize efficiency in all agro-local zones. Besides there is decrease in government inclusion and use on horticulture, bringing about low venture and support for ranchers (Oluoch, 2011). This has prompted wasteful maize creation and promoting frameworks which have added to financial stagnation and declining levels of destitution in Kenya (USAID, 2011). These seeds might not have been attempted on the homesteads in the region and the augmentation staffs might not have been comfortable with them.

Nyoro (2000) utilized the parametric and non-parametric measurements to research the Allocative effectiveness of melon creation in Owerri West Local Government in Nigeria. The results indicated size of the family, input prices and size of the land are huge determinants of yield. Production was likewise decidedly impacted by size of land, amount of labour, and manure, capital and quality of seed planted. All the more along these lines, calculated allocative proficiency esteems demonstrated that land (1.14), compost (17.44) and seed (1.76) inputs were underutilized while labour (0.64) and capital (0.83) inputs were over used.

A study by Belay and Abebaw (2001) on production of maize used a stochastic frontier function to explain technical efficiency in UK. The study explained technical efficiency by use of managerial and farm characteristics. The Mean technical efficiency across regions was 67 percent. Correlation between irrigation of the potato crop was very high followed by the correlation between potato crop production and technical efficiency. This showed that to increase maize production in UK then farmers were supposed to use irrigation. Farming experience in maize production and small-scale farming were negatively correlated with technical efficiency.

Nyangito, 2003) examined allocative efficiency among pumpkin farmers in Nigeria using a stochastic frontier approach. The study found that the farming experience had a positive effect on allocative efficiency. The author observed that farmers' wealth of experience in pumpkin farming made them able to allocate their resources more efficiently. According to Nyangito, 2003 the augmentation benefit needs to put more exertion in encouraging ranchers where to source credit from. This can be accomplished by the augmentation staff working together with the loaning organizations and including them in taking care of agriculturists' issues. This is pushed for by the National Agricultural Extension Policy (NAEP) as of now being utilized by the expansion benefit (MOARD, 2001a; MOARD, 2001b; MOARD, 2002).

Chukwuji, et al., (2006) utilized two-step approach to analyze technical efficiency in maize farms of in India. The mean technical efficiency was 83.3 percent, meaning that farmers could increase maize production by 17 percent by use of present technology. Large-scale farmers were less efficient than Small and medium-scale-farmers. According to this study technology was critical in maize production. The study recommended that to increase maize production farmers should embrace modern technology.

Kosura (2008) also conducted a study on Kansas farms in the USA. The study applied a DEA & Tobit methodology used by many other authors to measure technical, allocative, scale and overall efficiencies and their determinants. According to her findings, off-farm income had a positive effect on allocative efficiency. Education of the household head has also been found to significantly affect allocative efficiency.

According to a study by Hazell and Peter (2009) in India, farmers' years of schooling was found to have a positive effect on allocative efficiency; suggesting that the more years a farmer had spent in school the more able he was to efficiently allocate his farm resources. Oluoch (2011) uncovered that little scale ranchers in Western Province need attention to enhanced rural practices and specialized ability in light of the fact that the augmentation staff to agriculturist proportion is high. They likewise needed fund, experienced high financing costs on layaway offices and vulnerability of the correct seed to use because of flooding of the market by many seed organizations.

3. METHODOLOGY

3.1 Research design

Descriptive survey design will be used in this study. The descriptive design assists the researcher in collecting data from a relatively larger number of cases at a particular time. The descriptive survey design helps answer the questions like who, what, where and how on describing the phenomenon on study. This design will be appropriate for the study because it enable data collection from the sample on the factors inhibiting maize production and come up with mitigating measures.

3.2 Theoretical model

This study adopted the theory of Production which is specified as follows:

$Y=f(L, S, F\ldots)$ …..... (1)

Where Y is output, L is amount of labor; S is quantity of seeds used.

The production function of any farmer depends on the availability of resources. A production may be defined as a Cobb-Douglas production function is given by:

$$Y = AL^{\alpha_1} K^{\alpha_2} \text{ ---------- } (2)$$

Where: Where α_1 and α_2 are the output elasticities.

3.3 Model specification

To achieve the objective of institutional roles in productivity of maize technical efficiency was estimated. The technical efficiency was estimated using the stochastic production frontier, which is specified as follow:

$$Y_i = f(x_i, \beta)e^{vt}TE_i(i = 1,2 \dots n) \dots \dots \dots \dots \dots (3)$$

Where:

Y_i is the output of i[th] household

x_i is the vector of inputs used in the production

$f(x_i, \beta)$ is the production frontier

$e^{vt}$is the measures of random shocks and

TE_i is the technical efficiency of the household

The value of technical efficiency varies between zero and one. When the technical efficiency is exactly equal to one, the actual output achieves its potential level. On the other hand, if technical efficiency is less than one, it implies the presence of technical inefficiency

Rewriting equation 3.6 so as to derive the expression for technical efficiency yields the following:

$$TE = \frac{Y_i}{f(x_i, \beta)e^{vt}} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (4)$$

To determine the relationship between institutional and socio-economic factors influencing maize productivity and their levels of production efficiency, different explanatory Variables derived from the literature review were considered. The factors included: age, access to credit; access to market; education level household head, access to extension services, work experience in maize production; gender of the farmer, group membership, family size, and family income.

Tobit regression model was used to model the factors that affect the efficiency of maize farmers in Transzoia and Machakos County.

The Tobit model was presented in linear form as:

$Ln(PROB) = \beta_0 + \beta_1 Z_i + \varepsilon$………………………………………………… (5)

Where Z_i is a vector of explanatory variables given as :

$Z_i = f(CRED, DIST, ES, WE, GEND, GSHIP, AGE, EDU, HHS, INC)$………….. (6)

Where

CRED= access to credit

DIST=Distance to the market

EDU= Education level

ES= access to extension services

WE= Work experience

GEND=gender of the farmer

GSHIP=Group membership

AGE=Age of the farmer

HHS= Family size

INC= Income of the household head

Inserting equation 6 in to equation 5 yields equation 7

$$Ln(PROB) = \beta_0 + \beta_1 CRED + \beta_2 DIST + \beta_3 EDU + \beta_4 ES + \beta_5 WE + \beta_6 GEND + \beta_7 GSHIP + \beta_8 AGE + \beta_9 HHS + \beta_{10} INC + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (7)$$

The likelihood ratio greater than 1 indicates that the event is more likely in the first group, while the likelihood ratio less than 1 indicates that the event is less likely in the first group.

3.6 Data collection and Data analysis

The researcher used questionnaires and interview schedules. In order to collect data for the study, the researcher used questionnaires to get information the selected farmers in Transzoia and Machakos Counties. The questionnaire had both open and closed ended questions. The data was subjected to analysis using inferential statistics and correlation analysis, which was used to test the

hypothesis. Frequency and percentages were used in the analysis and presented in a tabular form to enhance interpretation of data. The frequencies and percentages were used to determine the factors influencing maize production by small scale farmers.

4. EMPIRICAL FINDINGS

4.1Institutional and socio-economic factors

This section presents the discussion of various indicators of institutional and socio economic factors that affect maize productivity in Machakos and Transzoia Counties. Tobit regression of socioeconomic and institutional factors against predicted technical efficiency scores was employed.

4.1.1 Source of technology

The farmers were asked to state the source of the technology they used in the entire process of maize production. The results were reported in table 1for both counties.

Table 1 Source of technology

	Machakos County		Transzoia County	
Source of technology	frequency	percentage	frequency	percentage
Government Extension experts	10	9.9	56	56
Group members	46	45.5	24	24
NGO	9	8.9	6	6
Other farmers	9	8.9	8	8
Demonstration plot sites	17	16.8	5	5
FFS	10	9.9	1	1
Total	101	100	100	100

Table 1 shows the source of technology for different farmers. Majority of Machakos farmers (45.5%) obtained technology from group members. 9.9 % of the total farmers in Machakos County obtained their technology from government extension officers 8.9 % of the farmers obtained technology from other farmers who were not in groups. In Transzoia county 56% of the farmers obtained technology from government extension officers and 24% of the respondents from group members. The results show that in Machakos county farmers had no access to extension services which may be the main reason for low maize productivity. In Transzoia County many farmers had access to extension services and this increased their maize productivity.

4.1.2 Challenges faced by farmers

Farmers face different challenges when producing maize. Table 2 shows different challenges faced by different farmers in Machakos and Transzoia County.

Table 2 Challenges faced by farmers

	Machakos County		Transzoia County	
Challenges	frequency	percentage	frequency	percentage
Ecological	14	13.9	26	26
Economical	27	26.7	23	23
Institutional	29	28.9	20	20

Social cultural	31	30.7	31	31
Total	101	100	100	100

Table 2 shows that most farmers in Machakos County faced institutional challenges (28.9%).The institutional challenges included poor pricing, poor transportation, corruption, cartels and lack of information from the Government. On the other hand, few farmers faced ecological challenges (123.9%). In Transzoia County many farmers faced social cultural challenges representing 31% of the total respondents. 23 % of the farmers in Transzoia County faced economic challenges in Transzoia County.

4.1.3 Institutional factors

Farmers were asked to state some institutional factors that affect maize productivity in both counties. Table 3 shows some of the institutional factors that affected maize productivity in Machakos and Transzoia County.

Table 3 Institutional factors

	Machakos County		Transzoia County	
Institutional factors	frequency	percentage	frequency	percentage
Lack of extensive services	25	25	30	30
Poor land subdivision	11	11	10	10
Poor maize varieties	10	10	7	6.9
Ineffective pesticide	14	14	8	8
Lack of field officers	8	8	10	9.9
Lack of water for irrigation	6	5.9	9	10
Corruption/cartels	25	24.9	26	25.9
Total	100	100	100	100

Lack of extensive services and corruption was the main course of low maize productivity in both Machakos and Transzoia County. The other challenge that contributed to 10% and 14% of low maize productivity in Machakos County was poor maize varieties and ineffective pesticide respectively. In Transzoia County there was a problem of poor land subdivision which made 10 % of the farmer to under produce maize in that region.

4.1.4 Extension service roles

Farmers were asked to indicate if extension services play a significant role in influencing maize productivity in their farm. The findings are shown in Table 4.

Table 4 Extension service roles

	Machakos County		**Transzoia County**	
Extension service roles	**frequency**	**percentage**	**frequency**	**percentage**
Strongly agree	52	51.5	60	60
Agree	19	18.8	24	24
Uncertain	16	15.8	8	8
Disagree	10	9.9	5	5

Strongly disagree	4	4	3	3
Total	101	100	100	100

Table 4 shows that 52 % of the farmers strongly agreed that extension service prayed a role in enhancing maize productivity in Machakos County. 19% of the famers agreed while 16 % of the respondents were uncertain about the role of extension services. 10% of the farmers disagreed while 4 % strongly disagreed on the same issue. In Transzoia County 60 % of the farmers strongly agreed that extension service prayed a role in enhancing maize productivity in Transzoia County. 24% of the famers agreed while 8 % of the respondents were uncertain about the role of extension services. 5 % of the farmers disagreed while 3 % strongly disagreed on the same issue.

4.1.5 Farmers were asked to indicate if adoption of new technology plays a significant role in influencing the maize productivity. The findings are shown in Table 5.

Table 5 Role of technology

	Machakos County		**Transzoia County**	
Technology role	**frequency**	**percentage**	**frequency**	**percentage**
Strongly agree	36	35.6	58	58
Agree	26	25.7	24	24
Uncertain	2	2	10	10
Disagree	24	23.8	6	6
Strongly disagree	13	12.9	2	2
Total	101	100	100	100

Table 5 shows that 36 % of the farmers strongly agreed that technology prayed a role in enhancing maize productivity in Machakos County. 26 % of the famers agreed while 2 % of the respondents were uncertain about the role of technology. 24 % of the farmers disagreed while 13 % strongly disagreed on the same issue. In Transzoia County 58 % of the farmers strongly agreed that technology prayed a role in enhancing maize productivity in Transzoia County. 24% of the famers agreed while 10 % of the respondents were uncertain about the role of technology. 6 % of the farmers disagreed while 2 % strongly disagreed on the role of technology on maize productivity.

4.2 Tobit regression of socioeconomic and institutional factors

The results in Table 6 indicated that the estimates from a Tobit regression of socioeconomic and institutional factors against predicted technical efficiency scores.

Table 6 Tobit regression for Machakos County

Dependent Variable: Maize productivity		
Method: Tobit regression		

Included observations: 101				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Access to credit	13.046	2.113	6.123	0.000
Distance to market	-2.955	1.021	-2.894	0.003
Farming experience	20.771	8.7702	2.37	0.020
Extension services	14.015	33.411	0.42	0.676
Group membership	294.639	89.457	3.89	0.001
Age of the farmer	-2.313	2.758	-0.84	0.404
Education level	21.262	9.223	2.31	0.003
Family size	36.815	28.685	1.28	0.203
Household income	0.912	0.126	7.582	0.004
Constant	215.931	338.387	0.64	0.525
LR chi2(10)	27.04			
Prob>chi2	0.0026			
Pseudo R2	0.382			

Credit access in Machakos County had positive influence on maize productivity and was significant at 5% level. The results indicated that a unit increase in the access to credit maize productivity by 13.046 units. The other variables that had positive significant influence on maize productivity include farming experience, extension services, group membership, education level of the farmer, size of the family and household income. Farmer who was in group increased maize productivity by 294.6 units holding other factors constant. Increase in farming experience by one unit increases maize productivity by 20.771 units.

This revealed that access to extension services help maize farmers to obtain information on different good agricultural practices such as land preparation, planting, weeding, fertilizers application pests and diseases control methods and insights on innovative farming techniques that guarantee higher productivity of maize crop. The results were supported by Ntabakirabose (2017) observed that farmers who get adequate extension contacts are able to access modern agricultural technology for input mobilization, input use and disease control, which enable them to increase maize productivity.

The regression results also show that maize productivity responded negatively to the distance between the farmer and the market. Increase in distance by one unit reduces the maize productivity by 2.955 units. Also increase in age of the famer by one year will reduce the maize productivity by 2.313 units holding other factors constant.

The pseudo R2 was 38.2% which is higher than 20% hence it was the best a turn signal indicating that the explanatory variables for the model were able to explain 38.2 % of the variations in maize productivity.

Table 7 Tobit regression for Transzoia County

Dependent Variable: Maize productivity		
Method: Tobit regression		
Included observations: 100		

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Access to credit	1377.368	600.993	2.29	0.024
Distance to market	-34.348	134.959	-0.25	0.800
Farming experience	32.8822	64.375	-0.51	0.611
Extension services	442.738	170.858	2.6	0.012
Group membership	-90.576	596.101	-0.15	0.880
Age of the farmer	22.591	10.333	2.187	0.002
Education level	179.826	89.213	2.01	0.013
Family size	266.206	138.538	1.92	0.058
Household income	0.043	0.010	4.10	0.000
Constant	9177.974	2317.938	3.96	0.000
LR chi2(10)	37.68			
Prob>chi2	0.0000			
Pseudo R2	0.282			

Credit access in Transzoia County had positive influence on maize productivity and was significant at 5% level. The results indicated that a unit increase in the access to credit maize productivity by 1377.368 units. The other variables that had positive significant influence on maize productivity include extension services, age of the farmer, farming experience education level of the farmer, size of the family and household income. Increase in farming experience by one unit increases maize productivity by 32.882 units.

The result also reveals that an increase in the distance between the farmer and the market by one kilometer will reduce maize productivity by 34.35 units. Therefore the farmers situated near the markets had more maize productivity than those located far from the areas. This is because a farmer located far from the market incurs more costs to transport farm inputs from the market all the way to the farm. The pseudo R2 was 28.2% which is higher than 20% hence it was the best a turn signal indicating that the explanatory variables for the model were able to explain 28.2 % of the variations in maize productivity.

5. Summary, conclusions and policy implications

The study revealed that the variables that had positive significant influence on maize productivity include farming experience, extension services, group membership, education level of the farmer, size of the family and household income. The regression results also showed that maize productivity responded negatively to the distance between the farmer and the market. Increase in distance by one unit reduces the maize productivity by 2.955 units. Also increase in age of the famer by one year will reduce the maize productivity by 2.313 units holding other factors constant. Access to extension services helps maize farmers to obtain information on different good agricultural practices such as land preparation, planting; weeding, fertilizers application pests and diseases control methods and insights on innovative farming techniques that guarantee higher productivity of maize crop. Activities such as further

education help the farmers to increase rate of maize production. It can be deduced that the quantity of maize produced brings along with diverse effects to the wellbeing and the economy of the country. In both counties the challenges of corruption topped the list, this calls for the Government to strengthen the in agricultural sector through the consideration of specific anticorruption policies intended to seal the areas considered corrupt. The problem of poverty will be eradicated. Creates employment opportunities and enhances food security in the country. The agricultural sector should develop new technologies that will help reduce soil erosion and conserve water and soils. This will ensure crops are produced in large quantities and there is a stable food in terms of mass production of crops.

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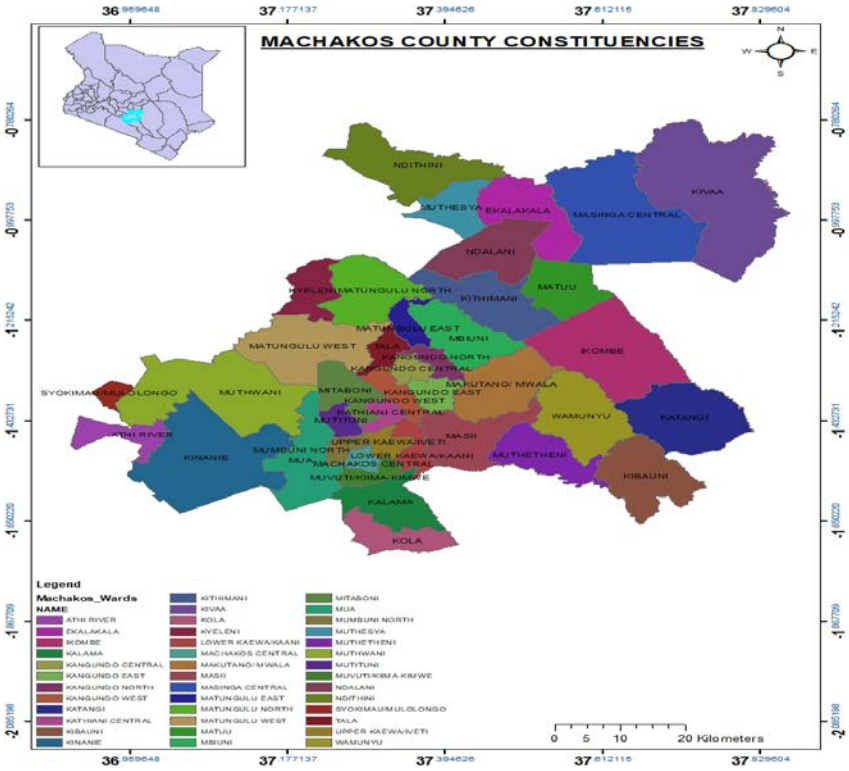
ANNEX III Machakos County Constituencies



ANNEX IV Transzoia County Map