Factors Influencing Maize Production in Rural Kenya: Case of Kisii County

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Abstract

Agricultural Sector in Kenya is the backbone of the country's economy and the source of livelihood for majority of the rural population. The sector contributes about 26 percent of the country's GDP, employs about 75 percent of the population and is a major source of food to Kenya's growing population. Maize is an important cereal crop, holding a key position in Kenyan agriculture. Incidentally, Kenya has consistently produced less maize over the years than required to feed the population. With per capita maize consumption at 125kg, the country experienced a maize deficit of between 1.5 million and over 2.0 million metric tonnes during the period 2010 to 2015. For arid and semi arid lands, the challenge towards enhanced maize production has been harsh weather conditions. Proposed efforts to mitigate against such harsh weather conditions include, use of irrigation, transplanted maize (Zea mays) and adoption of drought resistant maize varieties. Kisii County however, is no exception to declining maize production over the years. This is despite the county enjoying favourable climatic conditions that favour agriculture. This study was carried to determine the factors influencing maize production in Kisii county. The study was motivated by an understanding that factors influencing maize production in arid and semi arid lands are already known while the same remain unclear in areas with suitable climatic conditions such as Kisii county which still experience declining trends in maize production. The target population was all farmers in Kisii county. A sample of 300 farmers from ten (10) wards was selected. The study used a multiple linear regression model to measure the relative effects of the various factors influencing maize production. Findings show that the key factors influencing maize production are land tenure system that is practiced, lack of use of high yielding maize varieties, household income, Number of extension visits and Acreage devoted to maize cultivation. Consequently, the study recommends change of land tenure system among members of the community to avoid wasting cultivable land through subdivisions. Further, the study recommends that farmers be encouraged to practice intensive farming and the county government to increase extension services so as to educate farmers on better farming practices.

Key Words: Maize Productivity, Land tenure

Background

Agriculture is the backbone of Kenya's economy and source of livelihood for the majority of rural population. The sector plays a critical role in the Nation's economic growth and development process. This role is reflected in employment creation (75% of population is employed in agriculture), Foreign exchange earnings (sector accounts for two thirds of total domestic export), overall contribution to GDP standing at 26% and major source of food. The sector also provides raw materials to the manufacturing sector thereby stimulating indirect growth in non farm incomes and employment (Republic of Kenya, 2002). Kenyan planners have identified growth of agricultural incomes as key to a successful development strategy. This is because growth in agriculture and enhanced incomes for the rural people will directly and positively impact on rural poverty.

Kenya's agricultural sector is dominated by production of few crops, six (6) of which (Maize, Wheat, Sugarcane, Coffee, Tea, and Cotton) account for 68% of agricultural GDP and 17.5% of Kenya's overall GDP. On other hand, Kenya's agricultural related activities (Transportation, Trading and Processing) account for between 20 and 30 percent of total GDP. In sum therefore, agriculture and related activities account for up to half of all economic activity in the country (Nyangito, H.O.et al, 2003). This implies that the achievement of Kenya's major development goals such as The BIG FOUR agenda, Vision 2030, Agricultural sector development strategy, 2010-2020, Strategy for Revitalizing Agriculture, 2004-2014, Status of newly industrialized country by 2020 (Republic of Kenya, 1997), Poverty alleviation as outlined in Poverty Eradication plan (Republic of Kenya, 1999) and Poverty Reduction Strategy Paper (Republic of Kenya, 2000) will to a large extent depend on the development of agricultural sector. All these signals the efforts of the government of Kenya to ensure food security for all. Over the years in Kenya, agricultural policy has focused on enhancing maize productions so as to ensure the country is food secure. Food security in Kenya is synonymous with self sufficiency in maize production (Nyoro et al, 2007).

Maize is a staple food to a large proportion of people in rural Kenya. Nearly all agricultural households in Kenya do plant maize. Small scale production dominates maize production since about 80% of maize is supplied by smallholders. In the years following attainment of independence, Kenya was self-sufficient in Maize production. Maize production exceeded demand and hence there was surplus for export. Beginning 1980s however, the trend took a reverse order such that demand exceeded supply for the staple crop (Maize). This is explained by rapid population growth among other actors. Over the years, growth rate of maize output has remained at 2% per year while population growth stands at 3%. Specifically, maize has a per capita consumption of 98 kilograms translating to between 30 and 34 million, 90 kilogram bags of maize annually. The country however, produces an average of 28 million, 90 kilogram bags annually (Kimeli, 2013). In 2017, maize deficit in Kenya stood at 12 million; 90 kilogram bags. Nyoro et al, 2007, projected that by the year 2020, there will be 1.2 million tonnes of maize deficit. The deficit is usually bridged by imports using the scarce foreign currency.

Statement of the Problem

As seen in the background, maize is a staple crop in Kenya whose sufficient availability is equivalent to food security in the country. Recent national debate has centred on national priority areas (BIG FOUR Agenda) which include food security for the nation. To achieve a food secure nation, the national government has put in place strategies which include but not limited to

irrigation targeting mainly the arid and semi arid land (ASAL) and areas where maize is grown on large scale such as Bura and Kitale. Past studies (Nyoro et al, 2007, Onono et al, 2013, Mbithi, 2000 and Ombuki 2005) have estimated a production function for the determinants of maize output. Nyoro et al, 2007 for instance attributed low supply for maize to lack of productivity enhancing technologies, High incidence of pests and diseases, erratic climatic conditions, and difficulties in accessing credit. Other studies (Onono, 2013, Mbithi, 2000 and Ombuki, 2005) have associated decline in maize production to policy shifts (liberalization) and prices for inputs and output.

Past studies have thus have not examined the role of land tenure as proxied by the number of sons in the household and adoption of high yielding maize varieties on maize production in a productive, agriculturally conducive and densely populated environment such as Kisii county. This study has included these factors in the model estimating the relative effects of determinants of maize production in Kisii county.

Purpose of the study

The purpose of this study was to investigate factors influencing maize production in KisiiCounty.

The Objectives of the Study

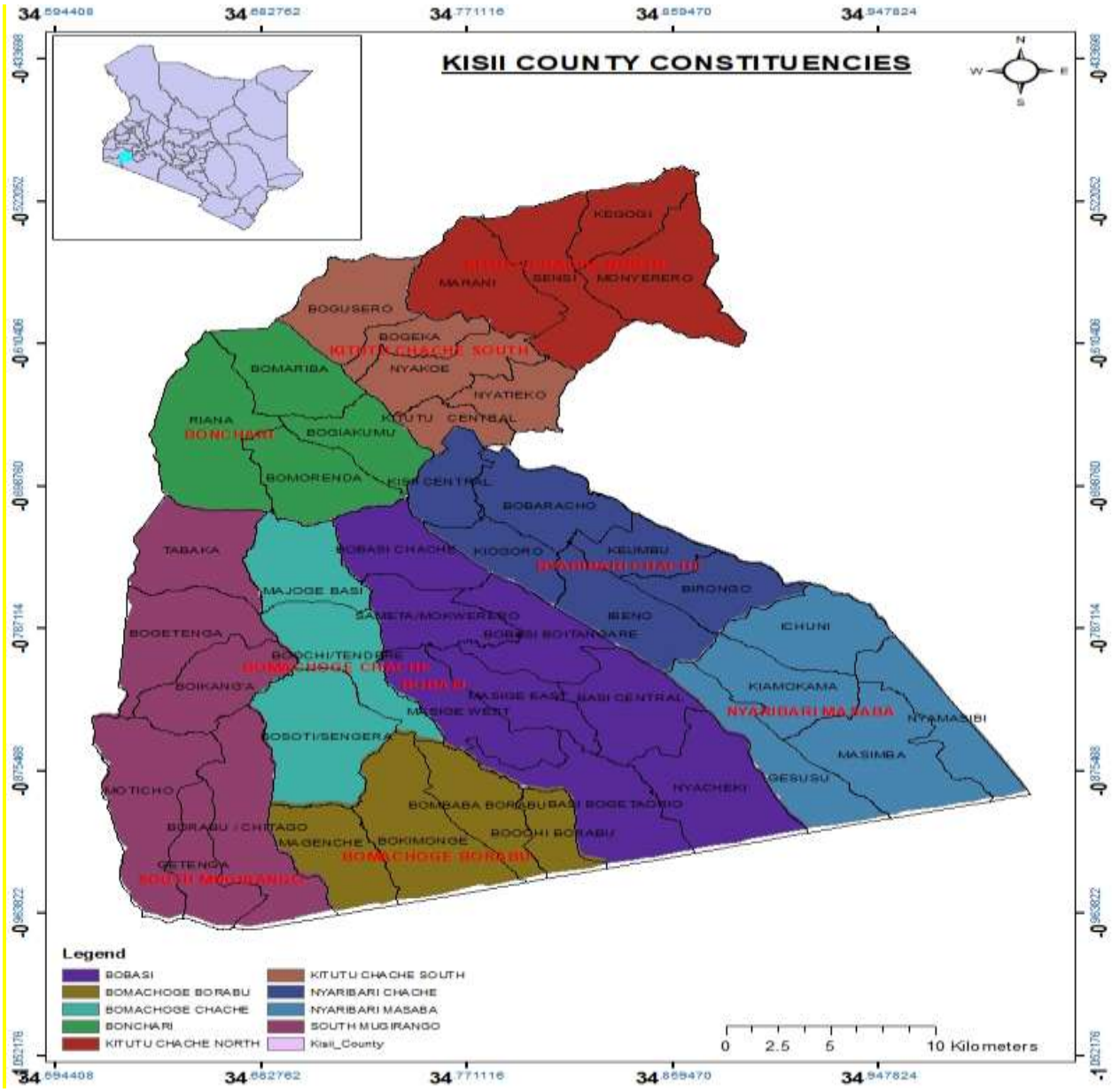
The study was guided by the following objectives:

(i) To identify factors influencing Maize production in Kisii County,
(ii) To measure the relative effects of the factors identified in (i) and
(iii) To recommend policy in light of (ii) above.

Methodology

Study Area

Kisii county covers a total of 1,332.7 kilometres square and is composed of nine (9) constituencies and 45 wards. The county experiences a highland equatorial climate and has two rainfall seasons. The long rains commence on February lasting to June while the short rains start in September to December. Most farmers thus plant maize in the two seasons. This is not only due to rainfall availability but also due to the fact that farmers have small farms and thus the amount of maize they produce cannot sustain them for a whole year. Adequate rainfall plus favourable temperatures allows growing of a variety of crops besides practicing dairy farming. The county is bordered by Nyamira, Bomet, Kisumu and Narok counties.



Research Design

The study employed a cross-section research design whereby data were collected at one point in time. Specifically, data was collected in the month of March 2018 immediately after the February harvest season. This design was preferred because of its ability to meet the study objectives.

Sampling Procedures and Sample size

Kisii county has 45 wards out of which 10 wards (at least one from each constituency) were randomly selected. It is only from Bobasi constituency that two wards were picked because it has the highest number of wards. The selected wards and the number of small holder farmers selected from each ward were as shown in table 1.

Table 1: Constituencies, Total Wards, Sampled Wards and Number of sampled farmers

Constituency	Total Wards	Name of Sampled Ward (s)	Number of smallholders sampled
NyaribariMasaba	5	Nyamasibi	30
NyaribariChache	6	Birongo	30
Bobasi	8	BobasiChache	30
		Nyacheki	30
South Mugirango	6	Tabaka	30
BomachogeBorabu	4	Bokimonge	30
BomachogeChache	3	MajogeBasi	30
KititutuChache South	5	Nyakoe	30
KititutuChache North	4	Sensi	30
Bonchari	4	Bomorenda	30
TOTAL			300

From each sampled ward, thirty (30) small holder farmers were randomly picked giving a sample size of 300 small holders.

Data Collection Instrument

A pre-structured questionnaire was used to collect data from the sample. The questionnaires were designed in such a way that enabled gathering of information on maize production and its determinants. Specifically, the information sought included the following: Age of the household, Farmer experience in farming, Number of sons in the household (Land tenure), Household income, Level of education, Cost of labour, Number of extension visits, Adoption of high yielding maize variety and Acreage devoted to maize cultivation.

Data Analysis

The study employed descriptive statistical methods in order to analyze the data collected**.** SPSS version (17.0) was employed to generate various descriptive statistics. Like other past studies (Mosley, 1994; Seleka, 1999; Mbithi, 2000; Ombuki 2005), a log linear production model was used in this study to estimate the determinants of maize production. The model is preferred for simplicity reasons and for direct estimation of elasticitiicies. It was specified to capture land tenure and adoption of high yielding maize variety which had been ignored by past studies. The model is as shown in equation (1):

$$InY = \beta_0 + \beta_1 InX_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 In X_4 + \beta_5 InX_5 + \beta_6 In X_6 + \ldots\ldots\ldots + \beta_{10} In X_{10} + \varepsilon \ldots\ldots (1)$$

Where

Y =Total number of 90 Kg bags produced in the season

X_1= Age of the household head

X_2 = Number of years of experience in farming

X_3 = Land tenure (proxied by the number of sons in household)

X_4 = Acreage devoted to maize cultivation during the season

X_5 = Household heads level of education

X_6 =visits by extension officers with X_6= 1 If farmers is visited by extension officer and 0 if otherwise
X_7 = cost of Labour
X_8 = family Income
X_9 = Access to credit with X_9= 1 If farmers accessed credit and 0 if otherwise
X_{10}= Adoption of high yield maize variety; with X10= 1 If farmer planted high yield maize variety and 0 if otherwise.
ε = disturbance term or error term which is normally indicated as zero mean and variance
B_1 , β_2 …β_{10} were parameters which were estimated.
Variables X_1, X_2, X_4, X_5, X_6, X_8, X_9 and X_{10} were all expected to positively influence maize production while variables X_3 and X_7 were expected to have a negative influence on Maize output. Land tenure (proxied by the number of sons in the household) was postulated to affect maize production negatively in the sense that the more the sons in the household the more the land is subdivided among sons thereby reducing the amount of cultivable land available and hence reduced maize output. This implies that the more the number of sons in the household the less the maize output is produced.

Results and Discussion

Characteristics of Study Sample

The socioeconomic characteristics of the sample is as shown in table 2.

Table 2: Socioeconomic Characteristics of the Sample

Characteristic		1	2	3	4	5	6	7	8	9	10
Average age of household head		33.4	44.2	31.3	43.0	28.9	37.4	36.4	41.2	32.7	38.4
Gender of household head	Male	25 (83)	28 (93)	21(70)	24(80)	23 (77)	26(87)	18(60)	20(67)	22(73)	26(87)
	Female	5 (17)	2 (7)	9 (30)	6 (20)	7 (23)	4 (13)	12(40)	10(33)	8 (27)	4 (13)
Household heads level of Education	Primary	10(33)	11(37)	4 (13)	7(23)	9(30)	13(43)	11(37)	8(27)	8(27)	3(10)
	Secondary	12(40)	17(57)	21(70)	14 (47)	13(43)	16(53)	15 (50)	13(43)	11(37)	17(57)
	College	8 (27)	2 (6)	3 (10)	4 (13)	6(20)	0 (0)	2 (6.5)	6(20)	7(23)	7(23)
	University	0 (0)	0 (0)	2 (7)	5 (17)	2(7)	1 (4)	2(6.5)	3(10)	4(13)	3(10)
Household heads main occupation	Farming	18(60)	24(80)	28(93)	26(87)	22(73)	23(77)	26(87)	25(83)	27(90)	26(87)
	Salaried Employment	12(40)	6(20)	2(7)	4(13)	8(27)	7(23)	4(13)	5(17)	3(10)	4(13)
Household average land size (Acres)		2.3	1.8	5.4	4.8	5.9	6.3	7.4	4.8	4.7	3.9

Source: Survey data (2018). Figures in parenthesis are percentages

Key: 1. Nyamasibi ward, 2. Birongo ward, 3. BobasiChache ward, 4. Nyacheki ward, 5. Bokimonge ward, 6. Tabaka ward,7. MajogeBasi ward, 8. Nyakoe ward, 9. Sensi ward, 10. Bomorenda ward

From table 2 it is clear that on average households across the selected wards own land size in the range of 1.8 acres to 7.4 acres. The small holder farmers despite owning such small land sizes have to make decision with regard to the size of their land to devote to the cultivation of various crops. Majority of the sampled farmers across the wards attained mainly primary and secondary levels of education. The males dominate household heads in all the sampled wards while the average age for the household head ranges between 32 to 44 years.

Factors Influencing Maize Production in Kisii County.

From the reviewed theories and empirical works, the following factors were identified as influencing maize production; Age of the farmer, Farmer experience in farming, Number of sons in the household (A proxy for land tenure), Household income, Household education level, Cost of labour, Number of extension visits, Adoption of high yielding maize variety, and Acreage devoted to maize cultivation. Collected data for these variables together with the amount of maize produced by each sampled household in February 2018 harvest season was used to estimate the model specified inequation (1). The results are as shown in table 3.

Table 3: Model Estimation Results

Variable	Coefficient	Standard error	t-values
Constant	1.256	0.090	13.96
Age	-0.101	0.150	- 0.67
Farmer Experience	0.081	0.253	0.32
Land Tenure	-0.320	0.065	-4.92
Household income	0.051	0.001	51.0
Household education level	0.042	0.511	0.08
Cost of labour	0.070	0.113	0.62
No of extension visits	0.124	0.040	3.10
Adoption of HYV	0.201	0.010	20.1
Acreage	0.321	0.090	3.57
Access to Credit	0.113	0.102	1.108
			$R^2 = 0.71$

The coefficient of determination (R^2) was 0.71 meaning that the factors captured in the model explained 71 % of the fluctuations in maize production in Kisii County leaving only 29% of the fluctuation in maize production unexplained. The model thus fitted the data well. From the estimation results shown in table 3, the following observations can be made. First, five (5) variables are significant in influencing maize production in Kisii County. These variables are; Land tenure, Household income, Number of extension visits, Adoption of high yielding maize variety, and Acreage devoted to maize cultivation. All the five variables had coefficients with the expected signs.

Land tenure was proxied by the number of sons in the household. Among the Kisii community, it is the sons that inherit land from the parents. Daughters are expected to be married, hence are not meant to inherit land from parents. This is despite the provisions in the new constitution of Kenya which allows all children to equal inheritance from parents. Collected data showed that on the average, each household had three (3) sons. This means that each household's current land size will be divided among the three sons thereby reducing amount of cultivable land available. The implication here is that maize production will continue reducing as generations change. Worse still is the fact that once each son has been allocated his portion of land , he creates his homestead compound and the footpath leading to his compound thereby reducing cultivable land cultivable land area even more. A compound usually occupies about an eight (1/8) of an acre while a standard foot path is between 2 t0 5 feet wide.

Adoption of high yielding maize variety has a positive influence on maize production as expected. Majority (60%)of the farmers interviewed indicated that they have not adopted the high yielding maize variety despite being aware of it because they cannot afford.

Second, five factors proved insignificant in influencing maize production. These are; Age of the household, Household experience in farming, Household head's level of education, Cost of labour and Access to credit. Three of these variables (Household experience in farming, Household head's

level of education and Access to credit) have their coefficients with expected signs while coefficients of two of the variable (Age of the household and Cost of labour) have signs different from what was expected.

Age of the household head was expected to have a positive influence on production. However, estimated results in table 3 show the reverse to be true. This could linked to the fact that more the age of the farmer, the less efficient in production the farmer becomes due to old age, The cost of labour variable was expected to have a negative influence on maize production such that the higher the cost of labour the less the production. Estimated results however, show labour cost to have a positive influence to production. This could be due to that fact that majority of the small holder farmers tend to use family labour that is not priced.

The coefficient of access to credit has a positive sign as per expectation but it is insignificant. This can be attributed to reasons. First, maize farmers in Kisii are not organized into cooperatives as tea and coffee farmers. Lack of such organization limits credit access for maize farmers. Second, any farmer who manages to access credit will most likely divert the credit away from the farm to alternative uses (Ombuki, 2004).

Recommendations for Policy

Based on the findings, this study puts forward the following recommendations for policy. First, the County government should discourage establishment of a homestead compound for each son of the household and encourage living together in one compound for all members. In this way, waste of land through so many homestead compounds will be avoided thereby releasing more land for cultivation. This is the same model that is practiced in Zambia whereby they talk of the village land (Where people live) and the Farm land (strictly for farming).

Second, The County government should engage more agricultural extension officers to frequently visit farmers to offer advice on better and improved farming methods. It must be noted that the previous change in policy by the national government from supply driven extension to demand driven extension is undesirable since majority of the farmers are unable to travel to urban centers to seek extension services.

Three, both County and National governments should ensure that the high yielding maize variety is not only available in rural Kenya but also affordable through price subsidization.

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