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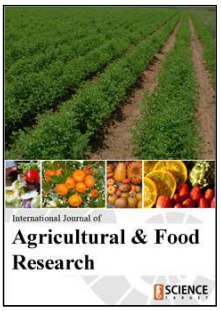

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Socio-Economic Determinants of Groundnut Production in Ndhiwa Sub-County, Kenya

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Abstract. Groundnut (*Arachis hypogea* L.) is a major oilseed crop and has economic and nutritive benefits for rural farmers. Although the adoption of new technologies and increased contact with extension agents as one way of increasing production has improved production, productivity of groundnut remains low. This study used the ex-post facto research design with the aim of analyzing the socio-economic determinants of groundnut production in Kenya. Using purposive, multistage and simple random sampling techniques, data on farmer characteristics was obtained from 323 farmers involved in groundnut production during the 2014 main cropping season. Multiple regression analysis was used to study the behaviour and effects of independent variables on the dependent variable and test hypotheses. The results were that gender of household head, number of years a household head had been farming, household head's previous income from groundnut and land size were significant factors in groundnut production. Based on the findings, the study recommends that interventions that target female headed households and improvement of farmers' traditional knowledge on production should be put in place to improve production.

Keywords. *socio-economic, groundnut, production*

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1. Introduction

Groundnut is the 13th most important food crop. Grown on 26.4 million hectares with a total production of 37.1 million metric tons and 4th largest oil seed crop in the world. The production of groundnut is concentrated in Asia and Africa where the crop is grown mostly by smallholder farmers under rain-fed conditions with limited inputs (Food and Agricultural Organization, 2011). Groundnut seeds (kernels) contain 40-50% fat, 20-50% protein and 10-20% carbohydrates. Groundnut kernels are consumed directly raw, roasted, or boiled. The oil is also extracted and used as culinary oil. It is also used as animal feed (oil pressing, seeds, green materials and straw) and industrial raw material (oil cakes and fertilizer) (Food and Agriculture Organization, 2006).

In East Africa, groundnut production is characterized by low productivity, low-input cultivation and limited market access (Carr, 2001). It is widely grown by small-scale farmers as main crops, relay crops or inter-crops and production is rain fed (Mutegi, Hendriks and Jones, 2012). In Kenya, production of various oil crops has been improving over the years both in terms of area under production and output, with soya beans, sunflower and seed cotton recording high increases in production between the 2010 and 2012 cropping seasons. However, for groundnuts, despite the 18% increase in areas under production outputs only increased by 6% (Ministry of Agriculture, 2012).

Ndhiwa is one of the sub-counties in Homabay in South Western Kenya and lies in the lower midland (LM3) agro-ecological zone. It is situated at

an altitude of 1200 – 1400m above sea level. The mean rainfall is about 1300mm received in a bimodal pattern. The sub-county has three types of soils: black cotton soil (vertisols), silt loam, and clay loam (luvisols) with drainage being poor in some of the soils. The vegetation is mainly savanna type with thick bushes and open grass. Despite a major groundnut producing zone, no research was found that focused on socio-economic determinants of groundnut production. However, most research on groundnut was in areas such as technology improvement, pest and disease control (especially groundnut rosette virus), value addition, and contamination of aflatoxin. Even with improved technologies, farmers were not able to realize the potential yield. The gap between potential farm yield and the actual yield realized by farmers is mainly attributed to management practices, which depends on socio-economic characteristics of the farmer. Studies in other areas have shown that socio-economic factors have an influence on production of various crops such as bananas, groundnuts, cotton, coffee and maize. The study therefore aimed at investigating how socio-economic factors determine groundnut production in Kenya.

Crop productivity or yield is a function of environment, plant, management and socio-economic factors and their interactions; and maximum yield in a given environment is possible only when all these factors are at optimum levels (Nand et al., 2010). Studies have been done on the influence of socio-economic factors on production. Joel (2005) found that acreage is among the factors that had positive relationship with banana output. Southavilay et al*.,* 2010 found that some socio-economic factors such as farm size and maize farming experiences, had a significant effect on maize production. This implies that if any one of these factors were changed (increased/decreased), it could have an effect on maize production volume.

Margaret (2013), found that land size greatly affected coffee production. Peter et al. (2013), using the double log model to study socio-economic determinants of output of groundnuts, found that all the coefficients studied except that of family size had a positive coefficient. The coefficients of farm size, farmer's experience, and age were positive and significant at 1%. This implies that increases in the usage of these coefficients would result in an increase production; while the coefficient of family size, which was negative, implies that an increase in family size would result in a reduction in production.

Using the modified Cobb- Douglas production function and regression analysis, Khuda, Ishtiq and Asif *(*2005) found that education plays a vital role in attaining higher productivity levels among cotton farmers. Using qualitative and quantitative data analysis methods, Sulo et al. (2012) found that annual income of household and household size showed a positive and very significant relationship with women's adoption of agricultural technologies.

2. Methods

This study analyzed the socio-economic factors that affect groundnut production using multiple regression analysis.

Theoretical Framework

Production is defined as the creation of goods and services from inputs or resources, such as labor, machines and other capital equipment, land and raw materials. Production theory explains the relationship between inputs and outputs, which is the transformation of factor inputs into outputs (Thomas and Maurice, 2008). The economic model commonly used to determine the relationship between the various factors and output in agriculture is the production function model. The production function of any farmer is determined by resource availability of the farmer. Agricultural production resources consist of land, labor and capital as the basic factors of production.

The CD production function was the specific model used to study the behavior and effects of independent variables on the dependent variable. Economists are satisfied that CD production function is a suitable function. Shepard (1998) stated that the CD production function is the

most common form used in applied studies because it is simple to estimate and is consistent with economic theory of production in agriculture. Bravo-Ureta and Pinheiro (1993) noted that the main reason for using the Cobb-Douglas functional form is its wide use in efficiency studies and that there are more flexible functional forms of the function.

The study used the OLS method to estimate the model parameters. The OLS estimators possess characteristics of good estimators, which are (a) linear, (b) unbiased, and (c) best estimator's property. Koutsoyiannis (1977) mentioned the importance of the OLS methods including the fact that: (a) the parameters obtained by OLS have some optimal properties (b) the computational procedure of OLS is fairly simple compared with other econometric techniques and the data requirements are not excessive, and (c) the mechanics of least squares are simple to understand. Multiple regression analysis was used to develop the production function for groundnut production and measure efficiency of resource use. The simplified form of production function is given by: $Q = f(L_{\alpha}K, L)$, Where: Q – Output, L_{α} – Land, K- Capital, and L- Labor force used to produce the same output.

The production function was defined as a mathematical equation that shows the maximum output that can be realized from a given combination of inputs. The mathematical form of the CD production function that was employed is given as $Q = AL^{\alpha}K^{\beta}$ where Q is the output, A is the technology, and K is capital employed in the production process; α, β are elasticities. Thus the implicit model used in the study was specified based on the general CD production function as: $Q = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, \ldots X_n)$.

The explicit form of the model for the analysis was given as:

$Y= A + \alpha_1X_1 + \alpha_2 X_2 + \alpha_3X_3 + \alpha_4X_4 + \alpha_5X_5 + \alpha_6X_6 + \alpha_7X_7 + e$, where Y= output of groundnut in Kg of dry shelled. $X_1 \ldots\ldots X_7$ are the socio-economic factors whose data was collected and included: age, gender, household size, years of education, years of experience in farming, household income, and area under groundnut. A is a constant term, and e is an error term to capture the effects of exogenous and endogenous variables not included in the model. $\alpha_1 \ldots\ldots \alpha_7$ are the regression coefficients of the variable inputs that were estimated using the OLS technique. The *apriori* expectation was that the regression coefficients would be positive.

To enable the estimation using the OLS technique, the CD production function was transformed into a model that satisfies the Classical Linear Regression Model. This enabled the application of the usual assumption of OLS, that of Best Linear Unbiased Estimator. The model was transformed into the linear production function by applying the logarithms and the variables regressed against the output of groundnut in the year twenty fourteen.

The modified CD production function was stated as:

$\text{Log } Y= \text{Log } A + \alpha_1 \text{Log } X_1 + \alpha_2 \text{Log } X_2 + \alpha_3 \text{Log } X_3 + \alpha_4 \text{Log } X_4 + \alpha_5 \text{Log } X_5 + \alpha_6 \text{Log } X_6 + \alpha_7 \text{Log } X_7 + e$

The study employed an ex-post-facto survey design. This type of design involves data collection after a naturally occurring event (Fraenkel & Wallen, 2000). It involves the collection of information from a sample that has been drawn from a population that has received a natural treatment not designed by the researcher (Fraenkel & Wallen, 2000). The introduction of new technologies and provision of extension services to groundnut farmers was provided by the government of Kenya. This study attempted to investigate the socio-economic factors in relation to adoption of such new technologies in retrospect (after the fact).

Ndhiwa Sub-County was chosen due to its importance as one of the major groundnut producing zones in Kenya and in Homa Bay County. Groundnut production was chosen due its importance as a cash crop in the Sub-County and the challenges it has faced in terms of declining production. Administratively, the Sub-County is divided into six divisions, including Riana, Ndhiwa, Nyarongi, Kobama, Pala, and Kobodo with a population of 172,212 people according to 2009 population census. There are 33,410 farm families according to Republic of Kenya (2011).

However, groundnut was grown by small-scale farmers in four divisions as secondary crops, relay crops or inter-crops of maize or sorghum and production was rain-fed. According to the MOA (2015), in the 2014 main season, a total of 21,820 farm families planted groundnuts in 5,590 hectares, yielding a total of 3,913 MT of shelled nuts valued at KES. 391.13 Million.

The target population for this study was 21,820, which was the total number of farm families in the four divisions according to Republic of Kenya (2015). Ndhiwa Sub-County was purposely selected because it was one of the groundnut- rich producing zones in Kenya and it has had several interventions to boost production of the crop. Due to the different characteristics of respondents, the Sub-County was stratified into administrative divisions. Four divisions Ndhiwa, Kobama, Pala, and Nyarongi were selected since they are major groundnut producing zones in the Sub-County based on the Republic of Kenya (2013) report. Using the Olive and Mugenda (2003) sample size formula, a total of 323 respondents were proportionately allocated to the four divisions.

The questionnaire was used to collect primary data on socio-economic characteristics of respondents (independent variables) and data on yield of groundnuts (dependent variable).

The data was collected between the months of May and August in the year twenty fifteen.

A total of 323 questionnaires were produced and administered. Secondary data was collected from review of project documents, annual reports, baseline data, and other relevant literature.

A correlation matrix was developed to help weed out variables that tend to explain the same effect. Those that were highly correlated were dropped, and the variables considered critical for analysis were picked. The units of analysis was the household and divisions in the Sub-County.

The socio-economic characteristics were subjected to descriptive statistical analysis such as frequencies, percentages, averages, and cross tabulation. The data was summarized using descriptive statistics. For the numeric independent variables, the mean, maximum, minimum and standard deviation values were calculated. The Cobb Douglas Production function and regression analysis was used to analyze the data to determine input – output relationships. All continuous variables were regressed in linear logarithmic form and categorical variables in linear form. Hypotheses were tested at the 0.05 significance level using regression analysis by applying the t-test statistic used with n-1 degrees of freedom and "*p*" values to observe the significance levels.

3. Results and Discussions

Groundnut Production for the Year 2014

Production for the year 2014 was the dependent variable. The average area under groundnuts was 0.87 acres (0.35 hectares) with the lowest being 0.25 acres (0.1 hectares) and the highest 7 acres (2.8 hectares). Production averaged 263.58 Kg/acre (659 Kg/hectare). On average, the households earned a gross income of KES 13,531 for 0.87 acres (0.35 hectares) under groundnuts during the 2014 main season. The lowest gross income was KES 2,100 and the highest was KES 171,000. Table 1 shows the findings for groundnut production of the year 2014 main season.

Table 1

Groundnut Production in the Year 2014

Statistic	Area in Acres	Quantity- Kg of dry Shelled	Gross Income in KES
Mean	.87	264	13,532
Median	.75	190	10,000
Mode	.50	100	10,000
Std. Deviation	.68	315	16,848
Minimum	.25	40	2,100
Maximum	7.00	2,850	171,000

Source: Field Data, 2015

The table showed that the earnings compare well that from all other crops that the household grew

combined which earned a minimum of KES 280, a maximum of KES 390,000 and an average of KES 28,433.

Analysis across divisions showed that Ndhiwa had the highest mean gross income at KES 16,825 while Nyarongi had the lowest at KES 10,512. Kobama recorded a mean of KES 12,539 while Pala had KES 12,847. It's only in Ndhiwa where the mean was higher than the Sub-County mean. Pala had both the lowest and the highest gross incomes at KES 2,100 and KES 171,000 respectively. The mean quantity produced was lowest in Nyarongi at 201 kilograms and highest in Ndhiwa where 338 kilograms was reported. Production in Kobama division averaged 257 kilograms and Pala 231 kilograms. Summary of production is shown in appendix II.

Groundnut Production Function

To estimate the groundnut production function, the linearized form of the CD production function was used. Regression was performed with quantity of groundnut produced in 2014 as the dependent variable and farmer characteristics, production characteristics and institutional factors as independent variables. The model was summarized as:

$$Y= -212.55 + 0.3X_1 + 6\ X_2 + 15.4X_3 + 30.8\ X_4 + 0.1X_5 + 288X_6 + 30.0\ X_7$$

The summary of the regression coefficients is given in appendix I.

The model was subjected to statistical tests and the results are displayed in Table 2.

The regression shows an adjusted R^2 (Coefficient of determination) of 51.1%.This means that 51.1% of the variation in groundnut yield can be explained by the independent variables in the model. The R of 72.8% (the Pearson Correlation Coefficient) shows that the correlation between the dependent and independent variables is high. The model F- value of 26.853 is significant at 5% (p-value = 0.000) which implies that the independent variables significantly explained the variation in the dependent variable at the 5% level.

Table 2

Summary of Statistical Tests for the Regression Model

R	.728
R square	.530
Adjusted R Square	.511
Std. Error of the Estimate	220.08108
Durbin-Watson	2.024
Mean Variance Inflation Factor	1.5164
F – value 26.853 with *p* value 0.000	

Dependent variable – Groundnut production; Independent variable – Socio-economic factors

Source: Field Data, 2015

The independent variables in the model were tested for muliticollinearity, and they showed no serious level of muliticollinearity as supported by the mean VIF of 1.516, which is less than 10 (Edriss, 2003). This is further confirmed by the tolerance of 0.7384, which is greater than 0.05. The Durbin Watson Coefficient of 2.024 is within the critical values of $1.5 < d < 2.5$, implying that there was no serial correlation in the multiple regression data. The effects of socio-economic factors on production are discussed below.

Gender of Household Head

Table 3 gives the gender of Household Head by division. Table 3 shows that majority of the households (74 percent) were male headed. 26 percent were found to be female headed. The finding on head of household is in line with African culture where males head households. The head of households were the ones who make major decisions that affect production.

Table 3

Gender of Household Head by Division

Division		Gender of Household Head by Division		Total
		Male	Female	
Ndhiwa	% within Division of household	75.8%	24.2%	100.0%
		72*	23*	95*
Nyarongi	% within Division of household	77.8%	22.2%	100.0%
		49*	14*	63*
Kobama	% within Division of household	72.9%	27.1%	100.0%
		56*	24*	80*
Pala	% within Division of household	70.0%	30.0%	100.0%
		238*	84*	323*
Total	% of Total	74.0%	26.0%	100.0%

Note * Denotes frequencies
Source: Field data 2015

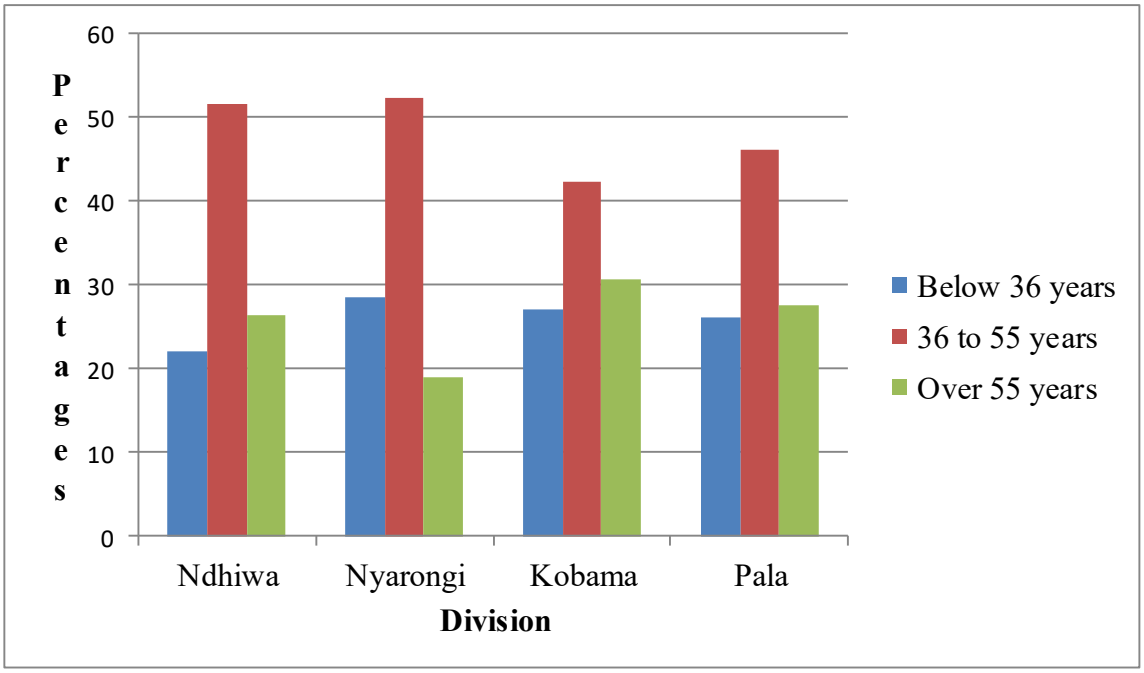

Figure 1: Age of Household Head in Years by Division

This variable had a coefficient of – 0.080. Since it was coded as 0= Male and 1 = Female, it implies that the production of groundnut will be lower in female headed households compared to male headed households. Male headed households are more likely to have access to more resources for the production process than female headed households. The coefficient was tested at $p< 0.05$ and produced a statistically significant result (t-value = -1.972, p-value = 0.049). The null hypothesis that there was no statistically significant relationship between gender of household head and groundnut production was rejected, and the alternative hypothesis that there was a statistically significant relationship between gender of household head and groundnut production was accepted. This finding disagreed with that of

Mangasini et al., 2013 who found that the influence of gender on groundnut production in the Tabora region was not statistically significant. The variation could be perhaps due to the different cultures between the study areas.

Age of Head of Household in Years

Figure 1 shows proportions of household heads as per age categories. Majority of the household heads were found to be middle age, aged between 36 and 55 years. The mean age was 46 years.

Figure 1 shows that the number of household heads in the age group of 36 to 55 years was highest in all the four divisions. Kobama division had the highest proportion of household heads over 55 years of age while Nyarongi had the highest population of household heads in the youth category that is below 36 years.

The finding on average age was consistent with that of Asekenye, 2012 who found that the mean age of household heads among groundnut farmers in Kenya was 45 years.

With a significant number of farmers being middle age, the future of groundnut farming in the study area can be said to be guaranteed. Interventions should be targeted at this age group.

The age of head of household had a positive influence on production with a coefficient of 0.01, implying that an increase in age by one year would result in a 1% increase in groundnut production, holding other factors constant. The coefficient for age with beta value = 0.32, t-value = 0.16, and p-value = 0.872 was not statistically significant at $p< 0.05$. The null hypothesis that there is no statistically significant relationship between age of household head and groundnut production was not rejected, and the alternative hypothesis that there is a statistically significant relationship between age of household head and groundnut production was rejected. This agreed with the expectations of the study on the sign of the coefficient of the variable. The older the farmer, the more experience in farming and probably the fewer resource allocation mistakes in production.

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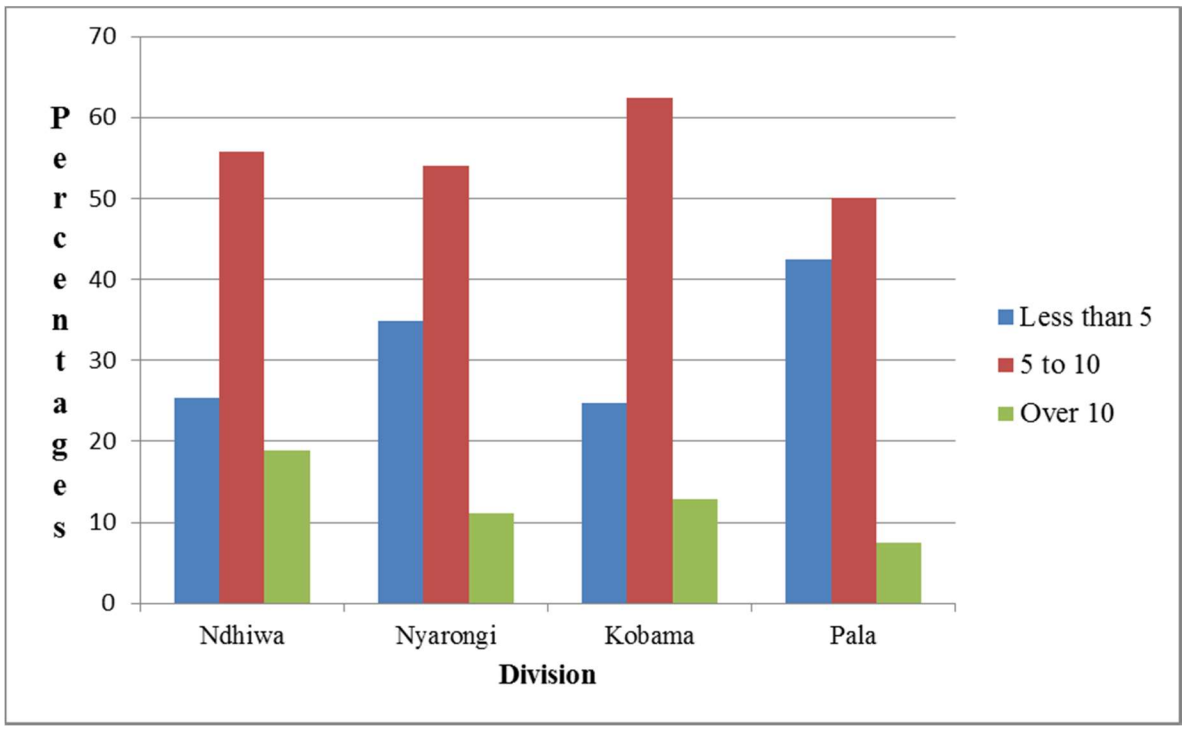

Figure 2: Household Size by Division

Household Size

The number of people who lived in the household for a period of one year was used as a proxy to measure household size. Figure 2 shows the household sizes in the study area.

Figure 2 reveals that the proportion of households with over 10 persons was the lowest across all the divisions. Majority of the households had between 5 to 10 persons. The mean household size was 7 across all the divisions. Family members are critical source of labor in the rural areas.

Household size was measured in terms of the number of persons who lived in the household for a period of 12 months in the 2014 calendar year. It had a coefficient of 0.012, indicating a positive relationship with groundnut production. Despite the positive relationship, it was not statistically significant at $p< 0.05$ with beta = 19.996, t-value = 0.278, and p-value = 0.781. The null hypothesis that there is no statistically significant relationship between household size head and groundnut production was not rejected, and the alternative hypothesis that there is a statistically significant relationship between household size and groundnut production was rejected. Although not statistically significant, the study found that family labor was a major source of labor for groundnut production. The non-statistical significance result may be due to the fact that the individual contribution to household labor supply was not quantified during the study. This finding, though not statistically significant, agrees with the *apriori* expectation of positive contribution of household size to groundnut production.

Household Head Years of Formal Education

Across divisions, it was found that the number of people with post - secondary education was low with none of the household heads in Nyarongi division having post-secondary education. Kobama division had the highest number of household heads with post-secondary education at 11 percent while Nyarongi had the highest number of household heads with primary education at 75 percent. The proportion of household heads with no formal education at all was considerably highest in Pala at 29 percent followed by Kobama at 18 percent and Ndhiwa at 17 percent. Despite Nyarongi division having had no head of household with post-secondary education, it reported the least number with no education. Farmers with higher levels of formal education are more likely to be knowledgeable and able to adopt technologies and make sound production decisions. Any intervention that relies on education levels is therefore more likely to succeed in Kobama division (Table 4).

Table 4

Household Head Number of Years of Formal Education by Division

Division		Number of Years of Formal Education				
		1to 8 (Primary)	9 to 12 (Secondary)	Over 12 (Post-Secondary)	None	Total
Ndhiwa	% within division	68.4%	12.6%	2.2%	16.8%	100%
	of household	65*	12*	2*	16*	95*
Nyarongi	% within division	74.6%	19.0%	0%	6.4%	100%
	of household	47*	12*	0*	4*	63*
Kobama	% within division	47.1%	24.7%	10.6%	17.6%	100%
	of household	40*	21*	9*	15*	85*
Pala	% within division	46.2%	18.8%	6.2%	28.8%	100%
	of household	37*	15*	5*	23*	80*
Total	% of total	58.5%	18.6%	5.0%	18.0%	100%
		189*	60*	16*	58*	323*

Note * Denotes frequencies
Source: Field data, 2015

Table 5

Gross Income in KES from one acre Under Groundnut in the 2013 Main Season by Division

Statistic	Division				Ndhiwa Sub-County
	Ndhiwa	Nyarongi	Kobama	Pala	
Mean	13,393	8,561	10,837	9,344	10,775
Median	9,000	8,000	8,000	4,900	7,600
Mode	6,000	8,000	8,000	4,000	8,000
Standard deviation	16,412	3,688	10,334	16,377	13,356
Minimum	1,250	2,160	2,000	1,500	1,250
Maximum	140,000	21,250	57,600	105,000	140,000

Source: Field data, 2015

There was a positive relationship between years of formal education and groundnut production since education had a coefficient of 0.019. This implies that one more year spent in school would increase production by 1.9%, holding other factors constant. The increased yield would result from better management practices for the farm enterprise.

Despite having a positive coefficient, it was not statistically significant at $p< 0.05$, with t-value = 0.386 and p-value =0.700. Therefore, the null hypothesis that there is no statistically significant relationship between education level of household head and groundnut production was not rejected, and the alternative hypothesis that there is a statistically significant relationship between education level of household head and groundnut production was rejected. The in- significance of education level implies that farmers learn production through doing the work, which does not necessarily depend on level of formal education. This finding agreed with Mangasini et al., 2013; Fasoranti, 2005; Joel, 2005; and Southavilay et al., 2013 who found that education level had a positive but not statistically significant relationship with output of groundnut, agricultural production, bananas, and maize respectively.

Experience in Farming

The number of years the farmer has engaged in groundnut production is a proxy used to show experience in groundnut farming. The average years of experience in groundnut farming was found to be 9 years across all the four divisions with a majority (63 percent) of the households having engaged in groundnut farming for more than 10 years. Kobama division had the highest number of famers with over 10 years' experience at 69 percent followed by Pala at and Ndhiwa both at 63 percent and Nyarongi at 56 percent. Households with 5 to 10 years' experience were found mainly in Nyarongi at 40% followed by Pala at 28 percent. Ndhiwa and Kobama had 22 percent. The long years in groundnut farming implies that farmers in the study area have good knowledge of groundnut farming. Their long stay in the groundnut production enterprise indicates that they usually had good returns that keep them in the groundnut enterprise for a long period of time.

Experience had a positive coefficient of 0.219 showing that other factors constant, the output of groundnut in the study area increases as the number of years in farming increases. With a t-value = 2.263 and p-value = 0.024, the null hypothesis that there is no statistically significant relationship between experience in farming and groundnut production was rejected and the alternative hypothesis that there is a statistically significant relationship between experience in farming and groundnut production was not rejected. This finding was consistent with that of Southavilay et al. *(*2013) who found a positive significant relationship between experience in farming and maize production. Similarly, Adah et al. (2007) stated that the greater the years of farming experience, the greater the farmer's ability to manage general and specific factors that affect the business. Hence, the farmer will be in a better position to invest wisely.

This finding was expected since as the farmer cultivates groundnuts year in year out, he/she is aware of his/her mistakes and accomplishments. He/she interacts with other farmers on the challenges and achievements and is able to accumulate knowledge on groundnut production through training, learning by doing and sharing techniques with other farmers. It means that farmers with more years of farming experiences in farming tend to be more efficient in groundnut production and therefore harvest more, other factors constant.

Previous Year's Income from Groundnuts

The respondents were asked to state the gross income from groundnuts production in the previous year's main season and the amount recorded in KES. Table 5 shows the gross income from groundnut sale during the 2013 main season.

The mean gross income from groundnut farming was KES 10,775 per acre, the minimum income KES 1,250 and the maximum KES 140,000 with a standard deviation of 13,356. This wide income variation was mainly attributed to the scale of operation with growers with small areas under groundnuts harvesting low volumes and hence low gross incomes from sale and those with larger areas under groundnut harvesting more as a result of economies of scale and hence earn more income. Ndhiwa division had the highest mean, median and maximum incomes. Nyarongi division had the lowest maximum income, highest minimum income and the lowest standard deviation. The mean income for Pala and Nyarongi were lower than the Sub-County mean.

The income from the preceding year (2013) was measured in terms of KES and, its effect on groundnut production was assessed. It had a coefficient of 0.86, indicating a positive effect on groundnut production. The coefficient was highly significant (tested at $p< 0.05$) with t-value = 27.372, p-value = 0.000, and beta = 0.1. Thus, the null hypothesis that the previous year's income from groundnut does not significantly affect the production of groundnut was rejected, and the alternative hypothesis that the previous year's income from groundnut production significantly affects groundnut production was accepted. This finding was expected since good incomes from the previous season would motivate farmers to either invest more on groundnut farming or increase the area for groundnuts in the following crop year, both of which would result in increased yields. This finding agrees with the economic principle of supply, where other factors constant, the supply increases with an increase in price of a commodity since the sellers perceive more profits and increase production. The finding agreed with that of Mangasini et al., 2013, who found a positive and significant effect of the previous year's price of groundnut on yield in the subsequent year.

Area under Groundnut

The area under groundnut for the 2014 main season was captured in acres. Groundnut was mainly grown in small scale with majority of the households reporting 0.2 hectares under groundnut in the year 2014. A significant number had 0.4 hectares under groundnut. The average area under groundnut during the 2014 main season was 0.35 hectares. This finding agreed with that of Mutegi et al 2012 who found that groundnut is widely grown and used by small scale farmers both as food and as a major source of small-holder farm income in Western Kenya. All the divisions had a minimum area of 0.1 hectares under groundnut. The maximum area varied across divisions with Ndhiwa reporting 2.8 hectares, Nyarongi 0.8 hectares, Kobama 1.2 hectares and Pala 0.6 hectares. On average Pala reported the highest at 0.5 hectares and Nyarongi the lowest at 0.3 hectares, while both Ndhiwa and Kobama had an average of 0.4 hectares under groundnuts.

Though land was not a constraint to groundnut production (as evidenced by the finding that not all land owned was put under groundnut) the actual area under groundnut had a positive effect on groundnut production with a coefficient of 0.621. The coefficient was significant at $p< 0.05$ with t-value= 14.135 and p-value = 0.000. With this finding, the null hypothesis that area under groundnut does not significantly affect the pro-

duction of groundnut was rejected, and the alternative hypothesis that area under groundnut significantly affects groundnut production was accepted. The finding supports the *apriori* expectation of the study on the influence of area under crop on production, and it implies that area under groundnut is a good predictor of the quantity of groundnut harvested, holding other factors constant in the short run.

4. Conclusion and Recommendations

Age and gender of head of household head, household size, level of formal education, experience in farming, previous year's income from groundnut, and area under groundnut all had a positive relationship with groundnut production. However, only gender, experience in farming, previous year's income from groundnut and area under groundnut were significant at $p<0.05$ level of significance and therefore influences production significantly.

Based on the findings, the study recommends interventions that target female headed households, improve on farmers' traditional knowledge of production and increase area under production as interventions to improve groundnut production.

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Appendices

Appendix I:

Regression Results- Coefficients of Independent Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	-212.458	85.794		-2.476	.014	-381.272	-43.644		
Gender of Head of Household	-57.557	29.182	-.080	-1.972	.049	-114.977	-.136	.915	1.093
Age of Head of Household in Years	.320	1.979	.01	.16	.872	-3.573	4.213	.720	1.389
Household Size	6.066	21.813	.012	.278	.781	-36.855	48.987	.770	1.299
Household Head Years of Formal Education	15.372	39.848	.019	.386	.700	-63.035	93.779	.641	1.560
Experience in farming	30.771	13.600	.219	2.263	.024	4.014	57.528	.320	3.129
Previous Year's Income from Groundnut	.10	.0000	.860	27.372	.000	.090	.011	.462	2.165
Area Under Groundnut	288.222	20.390	.621	14.135	.000	248.101	328.343	.788	1.269

a. Dependent Variable: Quantity of groundnut produced in 2014 in Kg of dry shelled
Source: Field data 2015

Appendix II:

Production of Groundnut for the 2014 Main Season by Division

Division	Statistics	Area in acres	Quantity –Kg of dry shelled	Gross income in KES
Ndhiwa	N	95	95	95
	Mean	1.18	338	16,825
	Median	1.00	250	12,000
	Mode	0.50	200	10,000
	Std. Deviation	0.99	355	17,737
	Minimum	0.25	50	2,500
	Maximum	7.00	2,400	120,000
Nyarongi	N	63	63	63
	Mean	0.77	201	10,512
	Median	0.50	175	9,000
	Mode	0.50	150	4,000
	Std. Deviation	0.36	101	5,366
	Minimum	0.25	50	2,500
	Maximum	2.00	510	28,560
Kobama	N	85	85	85
	Mean	0.84	257	12,540
	Median	0.75	180	9,600
	Mode	0.50	150	10,000
	Std. Deviation	0.55	219	10,962
	Minimum	0.25	45	2,250
	Maximum	3.00	1,400	70,000
Pala	N	85	80	85
	Mean	0.64	231	12,848
	Median	0.50	100	6,580
	Mode	0.50	60	3,000
	Std. Deviation	0.36	428	24,630
	Minimum	0.25	40	2,100
	Maximum	2.00	2,850	171,000

Source: Field data 2015