International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 14 No. 1 April 2019, pp. 122-130

An Exploration of Factors Affecting Groundnut Production in Central Tanzania: Empirical Evidence from Kongwa District, Dodoma Region

Hija. W. Mwatawala and Patricia. P. Kyaruzi*

[1]Institute of Rural Development Planning
P. O. Box 138, Dodoma- Tanzania.
Phone: +255 754471304

Abstract - Agriculture is mainstay for most rural communities in developing countries such as Tanzania. The current study was undertaken to explore factors affecting development of groundnut farming in central Tanzania. The study adopted a cross sectional research design. Both random and purposive sampling procedures were used to get appropriate respondents. Household survey, focus group discussions, key informants interview and documentary review were employed during data collection. Statistical Package for Social Sciences (SPSS) Version 20 was used in analysing both descriptive and inferential statistics. The findings revealed that the majority of farmers were male, belong to active age group and are married and have adequate education to engage in farming activities. The mean area under groundnut cultivation was 3.4 acres while the mean yield was 330.9 kg/acre. Additionally, household size, education level, area under groundnut cultivation and cost of seeds significantly ($p<0.05$) affected groundnuts production in study area. Other factors included in the regression model were insignificant ($p>0.05$). The study concludes that majority of farmers are men, married and attained reasonable level of education to engage in groundnuts farming. Also, most of them fall under active age group such that they can perform successfully most of farming activities. Additionally, the observed yield is lower than the country's average. Furthermore, cost of seeds, cultivated area, education level and household size all significantly influenced groundnuts production in study area. On the other hand, poor farming practices and pests and diseases despite not being significant predictors of groundnuts yield but they denote negative relationships. The study recommends establishment of farmers' organization to in order access easily credits/inputs and improve marketing conditions in favour of farmers. Also, there should be an increase in wider coverage of extension services in order to improve productivity.

Keywords - Demographic Characteristics, Groundnut, determinants, smallholder farmers, Central Tanzania.

I. INTRODUCTION

1.1 Background Information

Agriculture remains one of the dominant sectors in Tanzania in terms of its contribution to gross domestic product (GDP), generation of employment and export earnings. In 2010 the sector contributed nearly 28% to national gross domestic product (GDP) and approximately 28% of the country's export earnings [1]. In addition, about 87% of the rural income earned from agricultural activities. The importance of agriculture also reflected in food security as over 70% of Tanzania's population depends on subsistence agriculture for food production. The agricultural sector plays an important role in the Tanzanian economy and has the potential to advance the country's objectives of economic growth and poverty reduction. Agriculture in Tanzania employs about 75% of its population and has consumption linkages with other sectors [2]. Smallholder farming dominates agricultural production, and a large proportion is for subsistence. Since, agriculture is a major economic activity for rural population, the success in

Corresponding Author: Hija. W. Mwatawala

poverty reduction depends on performance of the agricultural sector.

Both cash and food crops are cultivated on those areas which favour agricultural production activities. Large scale farmers mostly involved in cash crops production like sisal, cotton, tea, coffee, pyrethrum and sugarcane, which are supported by mechanization. Small scale farmers cultivate on the average farm sizes of between 1.0 ha and 3.0 ha by applying traditional techniques (URT, 2008) [3] using hand hoes and being dependant on rain fed agriculture. Furthermore, agriculture accounts for about three quarters of merchandize exports [4]. The main traditional agriculture exports include tobacco, tea, sisal, cashew nuts, cloves, and coffee [5].

Groundnut (*Arachis hypogaea L.*) is an annual legume which bears variety of names, such as peanut, earthnut and goobers [6]. This crop originated from Latin America and introduced to African continent from Brazil by the Portuguese in the 16th century [7]. It is the 13th worldwide most important food-crop, fourth most important source of edible oil and third most important source of vegetable protein [8]. The crop mainly grown for oilseed, food, and animal feed [9]. Groundnut seeds also known as kernels are high in fat and classified as oilseeds. A large proportion of the world's groundnuts harvest used for making peanut oil [6]. The fat content ranges from 44-56% and is mainly mono and polyunsaturated fat, most of which made up of oleic acid (40-60%) and linoleic acid [10]. Also, groundnuts are a good source of protein. The protein content ranges from 22-30% of calories [11], making peanuts a rich plant-based protein source. The most abundant proteins in groundnuts, arachin and conarachin, can be severely allergenic to some people, causing life-threatening reactions [12]. Additionally, groundnut seeds are low in carbohydrates 13-16 % of total weight [10]. Being low in carbohydrates and high in protein, fat, and fibers, groundnuts have incredibly low glycemic index, which is a measure of how quickly carbohydrates enter the bloodstream after a meal. This makes them particularly suitable for people with diabetes [6]. Furthermore, groundnuts are an excellent source of numerous vitamins and minerals. These include biotin, copper, niacin, folate, manganese, vitamin E, thiamin, phosphorus, and magnesium [13].

The kernels are eaten raw, roasted or boiled and the groundnut vines are used as fodder for cattle [14], [15]. The crop is used for producing industrial materials, such as oil-cakes and fertilizer. Extracted oil from the kernel used as culinary oil and other crop extracts are used as animal feeds [16]. Almost every part of the crop used in some way. The multiple uses of the groundnut plant make it an important food and cash crop for domestic consumption and export in a lot of developing and developed countries

Groundnut cultivated in about 117 countries. Globally, grown on almost 27.9 million hectares with total production of 47.1 million tons and an average yield of 1,685.6 kg/ha in 2017 [17]. China (17,150,121 tons) India (9,179,000 tons) United States (3,281,110 tons), Nigeria (2,420,000 tons), Sudan (1,641,011 tons), Burma (1,582,693 tons), Argentina (1,031,082 tons), Tanzania (978,867 tons), Senegal (915,000 tons) and Chad (870,094 tons) are the major groundnut growing countries [17]. In 2017, Tanzania accounted for 3.9% of the global area for groundnut cultivation and produced 2.1% of global production [17]. The most important growing regions in Tanzania include Mtwara, Tabora, Shinyanga, Kigoma, Dodoma and Mwanza.

In Tanzania the production of groundnuts is mostly done by way of smallholder farming [18]., 1992). Since groundnut is one of the key sources of getting major ingredients of household nutritional foods; women are mostly found as paying more laboring in producing the crop. But again, being one of the major raw materials for providing edible oils in the country; the crop is dominated by cottonseeds and sunflower production. Generally speaking, groundnut is largely used as food crop and is consumed directly. On the other hand, a large number of farmers cultivate it as cash-crop in order to earn income [18], and most of it is mainly marketed by way of informal markets.

Conversely, yields in Tanzania are also lower compared with other African countries. For example, in 2017, groundnut yield in shell was 909.2 kg/ha in Tanzania compared with 3,209.7 kg/ha in Egypt, 2,956 kg/acre in Mauritius, 2,774.4kg/ha in Algeria, 2,541.5kg/ha in Morocco and 2,409.1kg/ha in Kenya [17]. In 2013 Tanzania recorded the highest (1,510.1kg/ha) average yield in history [17]. Since, then the yields started to decline up to the last cultivation season. However, factors associated with these trends in Tanzania are scantly well documented.

It is generally agreed that poor farmers that rely on subsistence agriculture act rationally and use the resources at their disposal as efficiently as possible [19]. However, because of their limited resource base, the productivity of these farmers is low in comparison to their commercialized counterparts. When it comes to groundnuts it is still apparent that the production of this crop is limited more by agro and socio-economic factors. To some greater extent,

these are negatively inducing and/or influencing household producer-behaviour [20]. Consequently, if such factors are not seriously addressed; the groundnut production in the district might ultimately become compromised. Therefore, this study aimed at analyzing the status of groundnuts production among smallholder farmers and assessing factors influencing groundnuts production in Kongwa District, Tanzania.

II. Research Methodology

2.1 Study area

This study was carried out at Kongwa District in Dodoma Region. This area selected due to the facts that Kongwa has suitable climatic conditions for growing groundnut and is among the top producers in Tanzania. Kongwa was the centre of the Tanganyika groundnut scheme, which was run by the Overseas Food Corporation (OFC) until the project was brought to an end in 1951 [21]. Kongwa District is one of the seven districts of the Dodoma Region of Tanzania. It is bordered to the north by Manyara Region, to the east by Morogoro Region, to the south by Mpwapwa District, and to the west by Chamwino District. Geographically the District is located at latitude 6° 05' 00" South and longitude 36° 35' 00" East.

2.2 Sampling procedure and data collection

The selection of a sample from the population is commonly used in almost all disciplines because of limitations of covering the whole population [22]. Sampling theory provides an opportunity to minimize cost and to achieve acceptable results [23], [24]. Best and Kahn (2006) [25] argues that a sample is a small proportion of a population selected for observation and analysis, the characteristics of which can enable the researchers to make certain inferences about the population from which the sample is drawn. They maintain that there is no sample size that is the best; any sample can be acceptable depending on the nature of the study. However, a good sample should be that which reflects an actual profile of population from which it is drawn. The sample size of this study was 136 plus nine key

Simple random sampling was used to select groundnuts producer from the list of farmers provided by Village Executive Officers. Purposive sampling was used to obtain key informants. Key informants were selected basing on their positions and ability to provide the necessary information from the district, ward, and village levels. Besides, the study employed purposive sampling technique because it was interested in interviewing respondents who were knowledgeable, experienced and who could provide accurate information concerning the research topic.

A pilot survey to pre-test data collection instruments and to gain familiarization with the study areas was conducted in three villages namely Ugogoni, Ibwaga and Chimotolo. Using a closed and open-ended administered questionnaire, data were then collected on demographic characteristics, acreage under groundnuts production, groundnuts yields and factors influencing groundnuts production in study area. Also, few focus group discussions were conducted with groups of 6-8 farmers. Additionally, documentary review was used to gather secondary data while face to face interviews were used to obtain extra data from key informants.

2.3 Analytical Framework

Data collected were analyzed using descriptive statistics such as mean, frequencies and percentages. Also, a multiple linear regression was used to establish relationship between the independent variables (Age, Household size, Sex of farmer, Education level, cost of seeds, pests and diseases, Poor farming practices, Access to reliable market information, area under groundnut cultivation) and the dependent variable (Groundnuts yield) by use of the following regression model:

$$Y= \alpha + \beta_1 \chi_1 + \beta_2 \chi_2 + \beta_3 \chi_3 + \ldots \chi_9 + \epsilon$$

Where:-

Y = Yield of Groundnuts (Kg/acre)

χ_1 =Sex of farmer

χ_2 = Age of farmer

$\chi 3$ = Education of the farmer measured as the number of years a farmer spent in school

$\chi 4$ = Household size (Number of persons aged 18-60 years in a household)

$\chi 5$ = Access to reliable market information

$\chi 6$= Poor farming practices

χ_7= Cost of seeds (TZS/kg)

χ_8= Pests and diseases

χ_9= Acreage under groundnut cultivation

α = Constant term.

β_1- β_9 = Regression coefficient

ϵ =Error term

The effects of multicollinearity were tested using Variance Inflation Factor (VIF). Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated [26]. In this situation, the coefficient estimates

may change erratically in response to small changes in the model or the data. The variance inflation factor (VIF) test is regarded as one of the most rigorous diagnostic tests for multicollinearity in the regression model [27]. Multicollinearity is a problem if the VIF is greater than 10 [28]. The VIF test shows that all the variance inflation factors are smaller than 3, except household size which was 5.499 indicating that there is no serious multicollinearity problem, therefore, all variables were included in the model. Table 1 indicates summary of independent variables that were included in the regression model.

Table 1: **Summary of Independent Variables Included in Regression Model**

Variable	Description	Expected significance
Sex	Categorical: (Dummy variable: 1 if a male and 0 if a female)	+/-
Age	Continuous: Number of years	+/-
Education	Continuous: Number of years of schooling	+
Household size	Continuous: Number of family members aged 18-60 years	+
Poor farming practices	Categorical: (Dummy: 1 = if yes 0 = if otherwise)	-
Cost of seeds	Continuous: TZS per Kg	-
Access to reliable market information	Categorical: (Dummy: 1 = if yes 0 = if otherwise)	+/-
Pests and diseases	Categorical: Dummy variable: 1 if yes and 0 if no	-
Area under groundnut cultivation	Continuous: acre	+

III. Results And Discussion

3.1 Demographic Characteristics of Respondents

The characteristics studied were age, sex, education level and marital status of respondents. The findings are presented in Table 2.

Most of the respondents fall in the age category of 21-35 years which account 30.1% of the total respondents followed by age group 36-59 years (66.9%). These two age groups of are still active and productive. According to Regnard (2006) [29], the total accumulation of wealthy is highly dependent on age of an individual, whereby a direct relationship is experienced. Similarly, age determines individual maturity and ability to make reasonable decisions. In addition, Mlambiti (1994) [30] supplements that age structure can be used to facilitate an understanding about labour potential of a specific population. Furthermore, due to its importance, Wiredu et al. (2010) [31] states that age of youth and adult farmers can be used as a proxy for economic production.

About 67.6% of total respondents interviewed were male while female account 32.4%. Findings show that, male were the most people who engaged in groundnuts production in the area of study. This is probably because, in farming communities in Tanzania men are in charge of family activities involving cash transactions while women are in charge of taking care of their homes and children and therefore, spending most of the times at home. However, FAO (2000) [32] observed that in developing countries like Tanzania, women contribute about 75% of the total labour force.

The marital status of farmers revealed that married farmers accounted for 69.9% and the rest were singles. This implies that most of household have potential of undertaking farm activities due to readily available labour force. It is expected a household of married farmers tends to have large household size which in one way or another can be utilized in farming activities.

The study was interested to look on education of farmers since past literatures show that education contributed 50% of variation in the total agricultural output in Tanzania [33].

The study found that 36.8% of farmers had primary education, followed by 35.3 % who had attained secondary school education. This implies that groundnuts farmers in the study area have satisfactory basic knowledge that can be used to improve groundnuts production. This literacy level of the farmers is inspiring since it has influence on all facets of agricultural development. Additionally, Weir and Knight (2004) [34] narrated that primary education stand as externalities which enhance production.

Table 2: Characteristics of Respondents (N=136)

Characteristic	Category	Frequency	Percent
Age	21-35 years (Youth age)	41	30.1
	36-60 years (Adult age)	91	66.9
	Above 60 years (Old age)	4	2.9
Sex	Male	92	67.6
	Female	44	32.4
Marital status	Married	95	69.9
	Single	41	30.1
Education level	Not attended formal education	26	19.1
	Primary school	50	36.8
	Secondary school	48	35.3
	Collage	12	8.9

3.2 Nature and Process of Groundnut Production in the Study Area

The findings in Table 3 indicate that mean acreage of groundnuts farm was 3.4 acres. Additional results on groundnut farming are presented in Table 3 which reveals that, groundnuts' farms of 64.0 % respondents ranged between 2-3 acres, 24.3 % of respondents fall on the range of 3.1-4 acres and 10.3 % of respondents had farm size between 4.1 to 5 acres (Table 4). Only 1.4% had above 5 acres.

Results in Table 3 disclose that on average, 330.9 kg per acre harvested by each groundnut-growing household. This mean is higher than that reported by Mangasini et al. (2014) [35] and Bucheyeki et al. (2010) [36]. Moreover, the yield in current study is lower than the average yield of 363.6 kg for Tanzania reported by FAOSTAT (2017) [17]. Table 5 indicates distribution of groundnuts yields in the study area. The majority (47.1 %) of farmers produced from 250 to 300 kg/acre, followed by those produced between 351 to 400 kg/acre.

Furthermore, the findings in Table 3 showed that the mean price of groundnut seeds in study area was TZS 2718.4 per kg. Also, the study estimated household size, which indicates number of people who are able to provide labour in farming activities including groundnuts farming. The findings revealed that the average household size in study area was 4.1. This implies that most households endowed with reasonable number of people who can engage in farming activities.

Table 3: Data on groundnut farming

Variable	N	Minimum	Maximum	Mean
Cultivated area (Acre)	136	2.0	6.0	3.4
Quantity harvested (Kg/acre)	136	252.4	570.0	330.9
Price of seed per kg	136	2400.0	3000.0	2718.4
Household size (People aged 18-60 years)	136	1	8	4.1

Table 4: Distribution of Acreage under Groundnuts Production

Acreage	Frequency	Percent
2-3	87	64.0
3.1 - 4	33	24.3
4.1 – 5	14	10.3
Above 5	2	1.4
Total	136	100.0

Table 5: Distribution of Groundnuts' Yield

Total yield (kg/acre)	Frequency	Percent
250 -300	64	47.1
301-350	15	11.0
351-400	44	32.4
Above 400	13	9.6
Total	136	100.0

3.3 Factors influencing groundnut production in the study area

Table 6 presents a summary of the regression results for socio-economic factors influencing groundnut production in the study area. The overall fit of the model (F-test = 96.164 and P-value = 0.000) was statistically significant, which means the model has explanatory power to predict variations in the groundnut yield. Moreover, the adjusted R-square value indicates that 86.4 % of the variation in groundnut yield is explained by the changes in the variables included in the model.

Results show that the cultivated land size statistically significantly ($p<0.05$) affected the yield of groundnuts. Moreover, the coefficient is positive ($\beta = 22.347$) indicating a positive association between cultivated land size and groundnut yield. For every one acre increase in cultivated land size, yield increases by 2,234.7 kg. This means that the area of land cultivated is mostly associated with production per unit of area when other factors are kept constant. These findings support the study hypothesis and imply that cultivated land size is a good predictor of the quantity of harvested groundnut. These findings are similar with Onaiah et al. (2007) [37], Mangasini et al. (2014) [35] and Ngeywo et al. (2015) [38].

Farmers' household size is also a good predictor as findings showed it is statistically significantly ($p<0.05$) influenced groundnuts yield. With a $\beta = 12.629$ indicating that increase in household size will lead to an increase of 1,262.9 kg of groundnuts. While conducting interviews and during focus group discussions with groundnut farmers it was reported that the household was their major source of labour. According to Doss (1999) [39] and Mendola (2007) [40] smallholder farming (or farming under the peasant system), the household is the major source of labour. Therefore, the larger the household size, the greater the labour force, and, in turn, the larger the area of land able to be cultivated. With a larger area of land under cultivation, one would expect higher yields.

Level of education significantly ($p<0.05$) influenced groundnuts yield in the study area. With a $\beta = 2.021$ indicating that an increase in the number of year farmer spent in school could lead to an increase of 202.1 kg of groundnuts. These findings are contrary to Mangasini et al. (2014) [35] and Appleton and Balihuta (1996) [41] who found that farmer's education was not a significant variable in their studies. However, according to Weir (1999) [42], education may have both cognitive and non-cognitive effects upon labour productivity. Cognitive outputs of schooling include the transmission of specific information as well as the formation of general skills and proficiencies. Education also produces non-cognitive changes in attitudes, beliefs and habits. Increasing literacy and numeracy may help farmers to acquire and understand information and to calculate appropriate input quantities in a modernizing or rapidly changing environment. Improved attitudes, beliefs and habits may lead to greater willingness to accept risk, adopt innovations, save for investment and generally to embrace productive practices.

Cost of seeds was another strong predictor of the groundnut yield. The findings were statistically significant at $\beta = -0.025$, t-value = -2.162 and p-value = 0.033. The negative coefficient suggests that the cost of seeds negatively impacts groundnut yield. For every one thousand

TZS increase in the price of seeds, yield drops by 25 kg. When seed becomes more costly, fewer farmers are able to afford the costs involved in growing groundnut. Hence, the cost of seeds generally reduces the number of farmers, which, in turn, reduces the size of land cultivated other variables remaining constant. These findings support the study's hypothesis related to the cost of seed (See Table 1). This is consistent with Mangasini et al. (2014) [35] who reported that price of seeds and pesticides significantly affected negatively groundnuts yield in western Tanzania.

Furthermore, sex of farmer (β=-4.406, t-value =-0.973 and p-value =0.332), age of farmer (β=-0.120, t-value =-0.325 and p-value =0.746), access to reliable market information (β=4.644, t-value =-0.983 and p-value =0.327), poor farming practices (β=-0.605, t-value =-0.117 and p-value =0.907) and pests and diseases (β=-2.284, t-value =-0.465 and p-value =0.634) significantly ($p<0.05$) did not influence groundnuts production in the study area. However, all these variables agreed with the predicted signs in Table 1. For instance, results from Singh et al. (2008) [43] revealed that, pest and diseases affected negatively crop production. Additionally, Ngeywo et al. (2015) [38] reported insignificant ($p>0.05$) effects of age and sex in coffee production in Kenya.

Table 6: Regression results on factors affecting groundnut production

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	251.791	43.477		5.791	.000		
Sex of farmer	-4.406	4.529	-0.033	-0.973	0.332	0.860	1.163
Age of farmer	0.120	0.369	0.017	0.325	0.746	0.350	2.857
Household size	12.629	2.380	0.461	5.306	.000	0.133	5.499
Education level	2.021	0.688	0.166	2.936	.004	0.350	2.857
Farm size under groundnuts production	22.347	3.930	0.272	5.686	.000	0.442	2.262
Access to reliable market information	4.644	4.724	0.039	0.983	0.327	0.646	1.547
Pests and diseases	-2.284	4.914	-0.019	-0.456	0.643	0.634	1.578
Poor farming practices	-0.605	5.187	-0.005	-0.117	0.907	0.521	1.921
Cost of seeds	.-0.025	0.011	.-0.126	-2.162	0.033	0.298	2.361

IV. Conclusion And Recommendations

The study concludes that majority of farmers are men, married and attained reasonable level of education to engage in groundnuts farming. Also, most of them fall under active age group such that they can perform successfully most of farming activities. Additionally, the observed yield is lower than the country's average. Furthermore, cost of seeds, cultivated area, education level and household size all significantly influenced groundnuts production in study area. On the other hand, poor farming practices and pests and diseases despite not being significant predictors of groundnuts yield but they denote negative relationships.

The study recommends that extension services should be extended in order to assist farmers in improving their farming practices so that yield can be improved in coming years. Also, formation of farmer managed co-operatives among smallholder groundnut growers should be encouraged. These can be either agricultural marketing co-operatives (AMCOs) or savings and credit co-operative societies (SACCOS). Co-operatives will assist in production, collection, storage, marketing and processing of produce. Moreover, SACCOS can assist in providing loans aimed at meeting the costs of inputs such as seeds and pesticides with affordable interest rates to smallholder farmers.

REFERENCES

[1] United Republic of Tanzania (URT). (2017). Poverty and Human Development Report

[2] United Republic of Tanzania (URT). (2012). Poverty and Human Development Report

[3] United Republic of Tanzania (URT). (2008). Poverty and Human Development Report

[4] Sanga, H (2008). Global food losses and food waste, extent, causes and prevention, by J. Gustavsson, C. Cederberg, U. Sonesson (Swedish Institute for Food, and Biotechnology) and R. van Otterdijk and A. Meybeck (FAO). Rome.

[5] United Republic of Tanzania (URT). (2014). Poverty and Human Development Report

[6] Arnarson, A. (2015). Peanuts 101: Nutrition Facts and Health Benefits. Accessed on [https://www.healthline.com/nutrition/foods/peanuts] 10/1/2019.

[7] Hamidu, B. M., Kuli, S. G., & Mohammed, I. (2007). Profitability analysis of groundnut (Arachis hypogaea L.) – Processing among women entrepreneurs in Bauchi Metropolis. Management Network Journal, 3(6), 389-395.

[8] Taru, V. B., Kyagya, I. Z., & Mshelia, S. I. (2010). Profitability of groundnut production in Michika Local Government Area of Adamawa State, Nigeria. Journal of Agricultural Science, 1(1), 25-29.

[9] Upadhyaya, H. D., Reddy, L. J., Gowda, C. L. L., & Singh, S. (2006). Identification of diverse groundnut germplasm: Sources of early maturity in a core collection. Field Crops Research, 97(2-3), 261-271.

[10] McKevith, B. (2005). Nutritional Aspects of Oilseeds. British Nutrition Foundation Nutrition Bulletin, Vol 30, Issue 1, 13–26 pp.

[11] Jonnala, R. S; R. S., Dunford, N. T and Chenault, K. (2005). Nutritional Composition of Genetically Modified Peanut Varieties. Journal of Food Science—Vol. 70, Nr. 4, Pages S254-S256

[12] Latif, S; Pfannstiel, J; Makkar, H. P and Becker, K. (2013). Amino acid composition, antinutrients and allergens in the peanut protein fraction obtained by an aqueous enzymatic process. Food Chemistry. 2013 Jan 1;136(1):213-7. doi: 10.1016/j.foodchem.2012.07.120

[13] United States Department of Agriculture (USDA). (2018). USDA Food Composition Databases. Accessed at [www. https://ndb.nal.usda.gov/ndb/] on 23/12/2018

[14] Pompeu, A. S. (1980). Groundnut production, utilization, research problems and further research needs in Brazil. In Proceedings of the International Workshop on Groundnut. ICRISAT Center, Patancheru, India, 13-17 October 1980 (pp. 244-246). International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, A.P., India.

[15] Hong, N. X., Mehan, V. K., Ly, N. T., & Vinh, M. T. (1994). Status of groundnut bacterial wilt research in Vietnam. In V. K. Mehan & D. McDonald (Eds.).

[16] Nigam, S. N. and Lenné, J. M. (1996). Groundnut in ICRISAT Programmes. Grain Legumes, 14, 25-27.

[17] FAOSTAT. (2017). Peanuts Production Statistics Worldwide.

[18] Sibuga, K. P., Kafiriti, E. M., & Mwenda, F. F. (1992). A review of groundnut agronomy in Tanzania: Current status and existing gaps. In Proceedings of the Fifth Regional Groundnut Workshop for Southern Africa, Lilongwe, Malawi, 1992 (pp. 47-52). ICRISAT.

[19] Mbote, P. K. (2010). Gender issues in land tenure under customary law. Environmental Law Research Center, University of Nairobi.

[20] FAO. (2010). Gender and land rights: Understanding complexities; adjusting policies. Economic and Social Development Department. Retrieved from http://www.fao.org/economic/es-policybriefs/briefs-detail/en/?no_cache=1&uid=40497 [Site visited 27/12/2018].

[21] United Republic of Tanzania. (URT). (2016). Poverty and Human Development Report

[22] Barnett, M. (1991). The Economics of Hybrid Organizations. Journal of Institutional and Theoretical Economics, Vol.3, pp 345-376.

[23] Casley, M. & Kumar, M. (1988). Are Horticultural Exports a Replicable Success Story? Evidence from Kenya and Côte D'ivoire. Washington: IFPRI Publisher.

[24] Kinnear, D. & Taylor, T. (1987). The Rise of Kenyan Supermarkets and the Evolution of their Horticulture Product Procurement Systems. Development Policy Review, 22(6), 669-699.

[25] Best J. W., & Kahn J. V. (2006). Research in education (10th ed.). Boston: Pearson Education, Inc.

[26] Hollar, D. L. (2010). The Predictive Ability of Thwarted Belongingness and Perceived Burdensomeness versus Culture-Specific Indicators of Suicidality. A Dissertation Submitted in Partial Fullfilment of the Requirements for the Degree of Doctor of Philosophy, Florida State University, Florida, USA. 68pp Illinois Press.

[27] Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). Regression diagnostics: Identifying influential data and sources of collinearity. New York: John Wiley. Size on

Coffee Production: A Case of Kisii County, Kenya. Asian Journal of Agricultural Extension, Economics & Sociology 5(3): XX-XX, 2015; Article no.AJAEES.2015.045

[28] Wooldridge, J. M. (2001). Econometric analysis of cross section and panel data. Cambridge, Massachusetts: MIT Press Ltd. World Bank. (2001). Smallholder irrigation

[29] Regnard, G. (2006). A SAM Approach to Modeling. Journal of Policy Modeling. 10(3), 327- 352.

[30] Mlambiti, M. E. (1994). Introduction to rural economy for East African students. Mzumbe Book Project. Morogoro, Tanzania. 167pp.

[31] Wiredu, A. N; Gyasi, K. O; Marfo, K. A; Asuming-Brempong,S; Haleegoah, J; Asuming-Boakye, A and Nsiah, B.F (2010). Impact of improved varieties on the yield of rice producing households in Ghana. Paper presented at Second Africa Rice Congress, Bamako, Mali, 22–26 March 2010: Innovation and Partnerships to Realize Africa's Rice Potential

[32] FAO. (2000).Production Yearbook Vol. 54, Food and Agriculture Organisation of the United Nations, Rome

[33] Amani, H., Acharya, S., & Babbie, E. (1989). Agricultural Market Reforms in Tanzania. Market Reforms and Parastatal Restructuring in Tanzania: University of Dar es Salaam.

[34] Weir, S. and Knight, J. (2004). Externality Effects of Education: Dynamics of the Adoption and Diffusion of an Innovation in Rural Ethiopia. Economic Development and Cultural Change, October 2004.

[35] Mangasini A. Katundu; Mwanahawa L. Mhina; Arbogast G. Mbeiyererwa and Neema P. Kumburu (2014). "Socio-Economic Factors Limiting Smallholder Groundnut Production in Tabora Region". Research Report 14/1, Dar es Salaam, REPOA

[36] Bucheyeki, T, L; Shenkalwa, M. E; Mapunda, T; Matata, W. L. (2010).On-farm evaluation of promising groundnuts varieties for adaptation and adoption in Tanzania. In: African Journal of Agricultural Research Vol. 3 (8), pp. 531-536

[37] Onaiah, M. O., Enya, V. E., Agba, O. A., & Odey, S. O. (2007). Analysis of the effects of farm size, labour and capital resources on sweet potato output in the Central and Northern Senatorial Districts of Cross River State. Journal of Agriculture, Forestry and the Social Sciences, 5(1). Retrieved from http://www.ajol.info/index.php/joafss/article/ view/45946/0 [Site visited on 20/1/2019].

[38] Ngeywo, J; Basweti, E and Shitandi, A. (2015) Influence of Gender, Age, Marital Status and Farm Size on Coffee Production: A Case of Kisii County, Kenya. Asian Journal of Agricultural Extension, Economics & Sociology 5(3): XX-XX, 2015; Article no.AJAEES.2015.045 ISSN: 2320-70

[39] Doss, C. R. (1999). Twenty-five years of research on women farmers in Africa: Lessons and implications for agricultural research institutions with an annotated bibliography.

[40] Mendola, M. (2007).Farm Household Production Theories: A Review of "Institutional" and "Behavioral" Responses. Asian Development Review, vol. 24, no. 1, pp. 49-68.

[41] Appleton, S & Balihuta, A. (1996) Education and agricultural productivity: Evidence from Uganda. Journal of International Development, 8(3), 415- 444.

[42] Weir, S. (1999).The effects of education on farmer productivity in Rural Ethiopia. Centre for the Study of African Economies, Department of Economics, University of Oxford. Oxford. Retrieved from http://www.csae.ox.ac.uk/workingpapers/pdfs/9907text .PDF [Site visited on 10/01/2019].

[43] Singh, A., Vasishtb, A. K., Kumara, R., & Dasc, D. K. (2008). Adoption of integrated pest management practices in paddy and cotton : A case study in Haryana and Punjab. Agricultural Economics Research Review , 21, 221-226.