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PROFITABILITY OF GROUNDNUT-BASED CROPPING SYSTEMS AMONG FARMERS IN HONG LOCAL GOVERNMENT AREA OF ADAMAWA STATE, NIGERIA

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ABSTRACT

Groundnut is an important cash crop and a good source of vegetable oil to resource-poor farmers. The study examined the Profitability of Groundnut–based Cropping Systems among farmers in Hong Local Government Area of Adamawa State, Nigeria. Specifically, the socio-economic characteristics of the farmers were described, their cropping systems identified, and the profitability of groundnut-based cropping systems determined. Multi-stage random sampling was used in selecting one hundred and twenty respondents used for the study. Data collected were analyzed using descriptive statistics, gross margin and profitability ratios. The result of the analysis revealed that majority (60%) of the farmers were female, having an average household size of 8 people and had some level of formal education. Two groundnut-based cropping systems were identified, namely; groundnut/sorghum and sole groundnut cropping systems. The analysis of cost and returns revealed a total variable cost of ₦18,931.68/ha in groundnut/sorghum enterprise, while that of sole groundnut enterprise was ₦20,244.40/ha. On the returns from production, the total revenue from groundnut/sorghum production was ₦66,273.950/ha while that of sole groundnut enterprise was ₦77,319.40/ha. The profit from groundnut/sorghum production was ₦47,324.27/ha, while that of sole groundnut production was ₦57,075.00/ha indicating the later to be more profitable than the former. Sole groundnut production had higher profitability index, higher rate of return on investment and higher rate of return on variable cost than groundnut/sorghum production. Based on the findings the study recommended that farmers cultivate groundnut solely. Government and donor agencies should encourage groundnut breeding researches so as to raise the productivity of existing groundnut seeds.

KEYWORDS: Groundnut, Production**,** Cropping System, Profitability

INTRODUCTION

Groundnut (*Arachis hypogaea L*) also known as earthnuts, peanuts, gobber peas, pinders, manilanuts is a member of the genus Arachis in the family *Leguminosae* which has replaced the traditional bambaranut (*Vigna subterranean*) in many areas of the country (Beghin *et al.,*2003). It is ranked 13th most important food crop in the World and also the World's 4th most important source of vegetable protein (26%), and the second largest source of vegetable oil (45%), the largest being the soya bean (International Crop Research Institute for the Semi-Arid Tropics, ICRISAT, 2001). The Food and Agriculture Organization (FAO, 2004) reported that groundnut is grown on 26.4 million hectares of land worldwide with a total productivity of 36.1 million metric tons and an average productivity of 1.4 metric tons/ha.

Nigeria is blessed with large expanse of land with tremendous potential resources and favourable climate for producing food and other raw materials for export and domestic industries. Groundnut yields in the country are however generally low, averaging about 800 kg/ha less than one-third the potential yield of 3000 kg/ha (Zekeri and Tijjani, 2013). Similarly, Okolo and Utoh (1999) estimated that Nigeria's cultivated area under groundnut production is about 1.0 to 2.50 million hectares annually and yield in the range of 500-3,000 kg/ha.

The low yield of groundnut in the country has been attributed to a combination of factors, such as unreliable rains, little technology available to small scale farmers, poor seed varieties, increased cultivation on marginal lands and non-supportive small farm policies (ICRISAT, 2001). Furthermore, the decline in groundnut production in Nigeria can also be attributed to the discovery of petroleum in the southern part of Nigeria, groundnut rosette epidemic, drought and lack of organized inputs and marketing (Misari *et al.,*1988 and Ntare, 2005). This situation has led to inadequate supply of the product to meet the ever increasing demand brought about by increase in population and the over-reliance on small holder-farmers who employ traditional methods of production and use low yield variety (Ani *et*

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al., 2013). The resultant effect therefore, is wide food deficit, increased food importation and increased food prices.

In Adamawa State, groundnut is cultivated in all the 21 Local Government Areas of the State. Its production comes under different cropping systems, most commonly as mixed cropping or sole cropping and is due largely for risk minimization, stable income and adaptability to a particular season. Out of 26,100 hectares of land put under groundnut production in the State in 1994, 75% were in mixtures while 25% were sole cropped (Adamawa Agricultural Development Programme, ADADP, 1996). Okuneye (1995) and Maurice *et al.*(2013) submitted that food crop farmers may be seen as efficient under the family food survival strategy, they are however, inefficient under profit maximization and cost minimization objectives as they produce sub-optimal mixtures of enterprise, allocate farm resources inefficiently, and under-utilize resources of land, inorganic fertilizers and family labour. Farmers' efficiency in resource allocation is reflected not only in the returns, but also in the sustainability of the production systems. By determining the profitability of groundnut-based production systems, it would be possible to know how efficient the farmers are in allocating their resources. Efficient farms are more likely to generate higher incomes and ensure continuous food supply, hence, stand a better chance of surviving and prospering.

Increase in productivity gains have in general decreased food costs and improved food security, particularly for vulnerable sections of the society (Sani and Haruna, 2010). While groundnut production in Nigeria is considered a profitable venture (Adinya *et al*. 2010; Taru *et al*. 2010; Ekunwe *et al*. 2013), groundnut farmers need to be more efficient in their production activities and be also responsive to market indicators, so that scarce resources are utilized efficiently to increase productivity as well as profitability. To this end, this study was undertaken to describe the socio-economic characteristics of the farmers, identify their different cropping systems, examine the influence of inputs on output, and determine the profitability of groundnut-based cropping systems.

MATERIALS AND METHODS

Study Area

Adamawa State is located in the North-eastern part of Nigeria and lies between Latitude 7.00^{o}N and 11.00^{o}N of the equator and Longitude 11.00^{o}E and 14.00^{o}E of the Greenwich meridian. The State has a population of 3,161,374 people comprising of 1,580,333 males and 1,581,041 females (NPC, 2006). The total land area of the State is approximately 38,741km^2, with about 22,604 km^2 being arable (Adebayo, 1999).

Hong Local Government Area is one of the 21 Local Government areas of the State located in the central senatorial district and lies between Latitude $10^{0}13'$N and Longitude $12^{0}55'$E (Adebayo, 1999). The Local Government has a total land area of about 2,376.66km^2 and a population of 169,126 (NPC, 2006). The dominant soil groups in the area are luvisols, regosols, cambisols, vertisols and lithosols derived from basement complex, while few other places are on sandstones, shales and alluvium. Major economic activity in the area is farming. Food crops grown include; maize, sorghum and cassava, while cash crops such as groundnuts, cowpea, cotton and sugar cane are produced in large quantities. Some Livestock reared in the area are cattle, sheep, pigs and goats. The major ethnic group of the inhabitants is Kilba, while Margi, Higgi, Bura, Fulani and Hausa are the minority ethnic groups. The Local Government has seven (7) districts namely; Pella, Gaya, Uba, Dugwaba, Kulinyi, Hildi and Hong.

The mean annual rainfall pattern shows that the amounts range from 700mm to 1000mm (Adebayo, 1999). The temperature characteristic in the area is typical of the West African Savannah climate characterized by high temperature almost throughout the year due to high solar radiation which is relatively evenly distributed throughout the year. Maximum temperature can reach 40^{0}C particularly April, while minimum temperature can be as low as 18^{0}C between December and January. Mean monthly temperature ranges from 26.7^{0}C to 27.8^{0}C.

Sampling Method

A multi-stage random sampling procedure was used in selecting respondents for the study. First stage sampling involved the random selection of four (4) out of the seven (7) districts in the Local Government Area. The selected districts include; Pella, Gaya, Hildi and Dugwaba. From each sampled district, second stage sampling involved the random selection of three (3) villages making a total of twelve (12) villages. The sampling frame for this study consisted of 672 groundnut farmers in the 12 villages. Simple random sampling was used in selecting 120 farmers in the selected villages as shown in Appendix 1.

Analytical Technique

The analytical techniques employed were multiple regression analysis to examine the influence of production inputs on groundnut-based output and descriptive statistics which involved the use of means, percentages and frequency distributions to analyse the cost and returns associated with groundnut-based cropping system in the area.

The empirical double-logarithm function applied in the input-output relationship in groundnut-based cropping system was specified as:

$$\ln Y_{ij} = \ln\beta_0 + \beta_1 \ln X_{ij} + \beta_2 \ln X_{2ij} + \beta_3 \ln X_{3ij} + \beta_4 \ln X_{4ij} + \beta_5 \ln X_{5ij} + \beta_6 \ln X_{6ij} + \beta_7 \ln X_{7ij} + \beta_8 \ln X_{8ij} + V_i \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Where:
Y = Total output (kg-grain-equivalent weight)
X_1 = Farm size (Ha)
X_2 =Quantity of seed (Kg)
X_3 = Hired labour (man days)

X_4 = Family labour (man days)
X_5 = Fertilizer (Kg)
X_6 = Herbicides (litres)
X_7 = Farming experience (years)
X_8 = Education (years in formal schooling)
V_i = Error term

The cost and returns associated with groundnut-based cropping systems in the area were computed using the gross margin and profitability (π) analysis. Profitability ratio such as profitability index (PI), rate of return on investment (RRI), rate of return on variable cost (RRVC), as well as operating ratio (OR) as used by Azeez *et al*. (2014) were used in determining the profitability of groundnut-based cropping systems in the study area.

The gross margin is given as:

$$GM = \Sigma Q_y P_y - \Sigma X_i P_{xi} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where:
GM = Gross margin (₦/ha)
Q_y = Output of groundnut-based cropping systems (Kg)
P_y = Unit price of the output (₦)
Q_yP_y = Total revenue (TR) (₦/ha)
X_i = Quantity of the i^{th} input used (Kg/ha)
P_{xi} = Price per Kg of the i^{th} input (₦/kg)
X_iP_{xi} = Total variable cost (TVC) associated with the i^{th} input per hectare
Σ = Summation sign

The profit is given as:

$$\pi = GM - X_iP_{xi} - TFC \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Where:
π = Profit (₦/ha)
TFC= Total Fixed Cost (₦/ha)

The straight line method was used in calculating the annual depreciation values of fixed assets used in production. It is given by:

$$\text{Annual Depreciation (₦)} = \frac{\text{Purchase value – Scrap value}}{\text{Number of years of useful life}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$PI = \pi / TR \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

$$RRI = (\pi/TC) \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

$$RRVC = \frac{(TR - TFC)}{TVC} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

$$OR = TVC / TR \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

RESULTS AND DISCUSSION

Socio-economic characteristics is an economic and sociological combination of total measure of a person's economic and social position relative to others, based on experience, sex, age, marital status, household size, education, among others. These characteristics as they relate to the respondents are presented in Table 1. About 61% of the farmers were female, while male constituted only 39% indicating that female farmers are mostly involved in groundnut production in the area. Their age distribution shows that 88% were within the age bracket of 21-49 years, while 11.7% have attained the age of 50 years and above. The mean age of the farmers is 33 years, indicating that majority of them are young, energetic and within the economically active age. This therefore, connotes that given the right set of inputs the farmers have the potential of raising their production levels. This is synonymous with the findings of Adinya *et al.* (2010) who reported a positive relationship between farmers' age and their production levels.

The distribution of the marital status revealed that about 44% were single, while 52% were married. The supply of farmer labour is expected to be more among the married farmers than the unmarried ones. The household size of majority (65%) of the farmers ranged between 6-10 members with a mean household size of 8 persons which is relatively large. In rural communities large family size guarantees cheap and high supply of family labour, hence reducing the cost associated with hiring of labour for important farm

operations. Their farming experience shows that majority (93%) of them had over 6 years of experience in farming with a mean farming experience of 13 years. Thus, the farmers are well experienced in farming and are therefore, expected to be more efficient in their agricultural production, have better knowledge of climatic conditions and market situations that would help them in operating at the region of profit maximization. The distribution of their farm size shows that majority (78%) of them cultivate between 1.1–2.0 hectares with a mean farm size of 1.13 hectares. This indicates that they are all small-scale farmers. Their source of production capital was predominantly personal savings (about 76%), while friends and relatives were the source of production capital for 22.5% of the respondents.

Table 1: Socio-economic Characteristics of the Respondents

Variables	Frequency	Percentages (%)	Mean
Gender			
Male	47	39.17	
Female	73	60.83	
Age (years)			
21-30	21	17.50	
31-40	34	28.33	33.4 yrs
41-50	51	42.50	
51>	14	11.67	
Marital Status			
Single	53	44.17	
Married	62	51.67	
Widow(er)	02	1.67	
Divorced	03	2.50	
Household size			
< 5	11	9.17	
6-10	78	65.00	8
11-15	30	25.00	
16-20	01	0.83	
Farming Experience (yrs)			
≤ 5	08	6.67	
6-10	58	48.33	
11-15	14	11.67	
16-20	19	15.83	13 yrs
> 20	21	17.50	
Farm size (ha)			
≤ 1.0	19	15.83	
1.1 – 2.0	94	78.33	1.13 ha
2.1- 3.0	05	4.17	
≥ 3.1	02	1.67	
Income Source			
Personal Savings	91	75.83	
Friends & Relatives	27	22.50	
Cooperatives	02	1.67	

Source: Field survey, 2012

Groundnut-based Cropping Systems

Cropping systems are the yearly sequence and spatial arrangement of crops on a farm during a given period of time with the objective of obtaining maximum return from each crop without compromising the soil fertility (Panda, 2007). The objective of any cropping system is efficient allocation of all production resources, maintaining stability in production and obtaining higher net returns. The distribution of the cropping systems is presented in Table 2. The distribution shows that two groundnut-based cropping systems abound in the area, namely; sole groundnut and groundnut/sorghum enterprises. Majority (61%) of the farmers intercropped sorghum with groundnut while only about 39% cultivate sole groundnut. The reasons why majority of farmers in the area practiced groundnut/sorghum combination could be attributed to the desire to increase yield and income, better utilization of scarce resources, risk minimization in the event of failure of one crop and greater scope for self-sufficiency in meeting the needs of animals for feeds and fodders.

Table 2: Distribution of respondents by Cropping Systems

Cropping system	Frequency	Percentages (%)
Sole Groundnut	47	39.17
Groundnut/Sorghum	73	60.83

Source: Field Survey, 2012

Multiple Regression Analysis Result

The results of the multiple regression analysis are presented in Table 3. The double-logarithm function gave the best fit; hence, was selected as the lead equation based on the number of significant variables, plausible magnitude of the regression coefficients, magnitude of the coefficient of determination (r^2) and correctness of signs of the coefficients. Other functional forms tried were the linear, exponential and semi-logarithm functions. The production estimates indicated the relative importance of factor inputs in groundnut-based cropping system.

From the results, all the coefficients of the explanatory variables had the expected positive sign, an indication that more output would be obtained from the use of additional quantities of these inputs *ceteris paribus.* The coefficient of determination (R^2) is estimated at 0.81 indicating that 81% of the variation in the output levels of these farmers were explained by the variables used in the model. This is an indication that the data have fitted well into the model.

The coefficient of farm size was estimated at 0.14 and statistically significant at 1% level, implying that a 1% increase in the hectares of land put into groundnut-based cropping systems will bring about increase in output by 0.14%. This is attributed to the relative importance of land in crop production and corroborates the findings of Wakili (2012) who obtained a significant relationship between farm size and output.

The coefficients of both family and hired labour were positive and statistically significant at 5% and 10% respectively. This indicates that a 1% increase in mandays of family and hired labour would induce an increase in output by 0.07% and 0.09% respectively. This is in conformity with previous work by Ani *et al.* (2013) who found a positive and significant relationship between family/hired labour and farm output.

Herbicide had a positive coefficient and statistically different from zero at 5%, indicating that a 1% increase in the litres of herbicides applied on groundnut-based farms would bring about a 0.14% increase in output. The use of herbicides besides reducing the expenditure on weeding also reduces the drudgery and fatigue associated with farming, thus helping farmers who are not constrained by land to increase their scale of production.

Formal education had a positive coefficient and significantly different from zero at 5% implying that as farmers acquire more years of formal schooling, groundnut-based output increases. This agrees with the findings of Amaza *et al*. (2006) and Uaiene and Arndt (2009) who asserted that more years of formal education is imperative for better understanding and adoption of new technology by farmers which would move them closer to the frontier.

The coefficients of seeds, inorganic fertilizers and farming experience were however not significant, implying that these variables do not significantly increase output of farmers in groundnut-based cropping systems.

Table 3: Result of Multiple Regression Analysis of Influence of Inputs on Groundnut-based Output in Hong Local Government Area of Adamawa State

Variables	Parameter	Coefficient	Std. Error	t-ratio
Constant		0.3031	0.0846	3.5846***
Farm size (ha)		0.1438	0.0544	2.6427***
Quantity of seed (kg)		0.0953	0.0813	1.1736
Hired labour (Man days)		0.0867	0.0473	1.8327*
Family labour (man days)		0.0744	0.0368	2.0239**
Fertilizer (kg)		0.1027	0.1189	0.8637
Herbicides(ltr)		0.1436	0.06572	2.1853**
Farming experience		0.0203	0.0145	1.4027
Education		0.0673	0.0331	2.0332**
R^2		0.8113		
Adjusted R^2		0.741		

Source: Field survey, 2012

*** Significant at 1%, ** Significant at 5%, *Significant at 10%

Profitability of Groundnut-based Cropping Systems

The results of the gross margin and profitability ratio are presented in Table 4. The total variable cost in groundnut/sorghum cropping system was estimated at ₦18,931.68/ha while that of sole groundnut was estimated at ₦20,244.40/ha. Cost of hired labour and herbicides accounted for 47.11% and 17.87% respectively of the total variable cost in groundnut/sorghum production, while cost of hired labour and groundnut seed accounted for 47.69% and 19.11% respectively of the total variable cost in sole groundnut production. Consequently, the fixed inputs

constitutes mainly hoes and cutlasses. The annual depreciation value for these assets in groundnut/sorghum production was ₦986.30/ha, while that of sole groundnut enterprise was ₦723.00/ha. On the returns from production, total revenue from groundnut/sorghum enterprise was ₦66, 273.950/ha while that of sole groundnut enterprise was ₦77,319.40/ha indicating that the later brings in more revenue than the former. The gross margin and profit (π) from groundnut/sorghum enterprise was estimated at ₦47,324.27/ha and ₦46, 355.97/ha respectively, while that of sole groundnut enterprise was estimated at ₦57,075.00/ha and ₦56,352.00/ha respectively. This shows that fixed cost in groundnut-based cropping systems in the study area is negligible, and this is attributed to the subsistence nature of farming practiced by the farmers. This result is similar to the one obtained by Taru *et al.* (2008) who obtained a net income of ₦40,097.63/ha in Adamawa State.

The profitability index (PI) analysis indicates that groundnut/sorghum enterprise has PI of 0.70, indicating that for every ₦10.00 earned, about N7.00 acrue to an average farmer as profit after accounting for all cost; while for sole groundnut enterprise a PI of 0.73 was estimated, an indication that for every ₦10.00 earned, about ₦7.30 acrue to an average farmer as profit after accounting for all cost.

The rate of return on investment (RRI) analysis shows that groundnut/sorghum enterprise has RRI of 232%, while sole groundnut enterprise has RRI of 260%. This implies that an average farmer earns ₦232 profit for every naira invested in groundnut/sorghum production, while ₦260 is earned for every naira invested in sole groundnut production.

The rate of return on variable cost (RRVC) indicates that groundnut/sorghum enterprise has RRVC of 345%, while sole groundnut enterprise has RRVC of 378%. This implies that for every ₦1 cost incurred on variable inputs in groundnut/sorghum production ₦345 is generated. On the other hand, for every ₦1 cost incurred on variable inputs in sole groundnut production ₦378 is generated. Similarly, operating ratio (OR) indices of 0.29 and 0.26 were estimated for groundnut/sorghum and sole groundnut enterprises respectively. This implies that for every ₦10 spent on total variable cost in groundnut/sorghum production a revenue of ₦2.90 is earned; while a revenue of ₦2.60 is earned for every ₦10 spent on total variable cost in sole groundnut production.

It is evident in all the analysis that groundnut-based cropping systems in Adamawa State is profitable although sole groundnut is more profitable than groundnut/sorghum combination given the existing resources and the current level of technology.

Table 4: Costs and Returns in Groundnut-based Cropping Systems

	Groundnut/sorghum			**Sole groundnut**		
Items	**Cost (₦)/Ha**	**% of Total Cost**	**Revenue (₦)/Ha**	**Cost (₦)/Ha**	**% of Total Cost**	**Revenue (₦)/Ha**
Revenue						
Groundnut			60, 309.85			77, 319.40
Sorghum			5, 964.10			-
Total Revenue (TR)			**66, 273.95**			**77,319.40**
Variable Cost						
Hired labour	8,918.61	47.11		9, 653.70	47.69	
Groundnut seed	3,193.09	16.87		3, 869.40	19.11	
Sorghum seed	175.35	0.93		-	-	
Herbicides	3,382.48	17.87		2, 309.30	11.41	
Inorganic fertilizers	751.38	3.97		1,709.40	8.44	
Herbicide spray	475.52	2.51		455.50	2.25	
Shelling of nuts	283.46	1.50		459.20	2.27	
Storage	1,380.20	7.29		1,328.50	6.56	
Transport	371.59	1.96		459.40	2.27	
Total Variable Cost (TVC)	**18, 931.68**	100.0		**20, 244.40**	100.0	
Fixed Cost						
Depreciation of farm tools (hoes & cutlasses)	986.30			723.00		
Total Fixed Cost (TFC)	**986.30**			**723.00**		
Total Cost (TVC + TFC)	**19, 917.98**			**20, 967.40**		

Gross Margin (TR – TVC)	47,324.27	57, 075.00
Profit (GM – TFC)	46, 355.97	56, 352.00
Profitability Index (PI)	0.70	0.73
Rate of Return on Investment (RRI)	232%	260%
Rate of Return on Variable Cost (RRVC)	345%	378%
Operating Ratio (OR)	0.29	0.26

Source: Field survey, 2012

CONCLUSION

In conclusion, female farmers are mostly involved in groundnut production in the area with an average age of 33 years. Their farm size ranged from 1.1–2.0 hectares with a mean farm size of about one hectare, an indication that they are all small-scale farmers. Two groundnut-based cropping systems were identified in the study area, namely; sole groundnut and groundnut/sorghum enterprises. Majority (61%) of the farmers intercropped sorghum with groundnut, while only 39% cultivated sole groundnut. The analysis of cost and returns revealed that both groundnut/sorghum production and sole groundnut production were profitable but the later brings in more profit per hectare than the former, given the existing resources and the current level of technology. This shows that the farmers stand to gain more with sole groundnut production than when groundnut is intercropped with sorghum despite the potential gains of mixed cropping.

Recommendations

Based on the findings, the following recommendations are proffered.

1. Farmers are advised to cultivate groundnut solely instead of intercropping it with a secondary crop as this guarantees higher profit per unit area of land cultivated.
2. Government and donor agencies should encourage and support crop breeding researches so as to raise the productivity of existing groundnut seeds. Also, the outcome of such researches should get to the farmers instead of remaining in the libraries and archives.

REFERENCES

Adamawa Agricultural Development Programme, ADADP., 1996. Crop Production Recommendation for Adamawa State.

Adebayo, A. A., 1999. Climate I and II. Adebayo, A.A. and Tukur, A.L (eds.), Adamawa State in Map. Department of Geography, Federal University of Technology, Yola. Paraclete publishers, Yola. 20-26

Adinya, I. B., Enun, E. E and Ijoma, J. U., 2010. Exploring Profitability Potential in Groundnut (*Arachis hypogaea*) Production through Agro-forestry Practices: A Case study in Nigeria. The Journal of Animal and Plant Sciences, 20, (2): 123-131.

Amaza, P. S., Bila, Y and Iheanacho, A. C., 2006. Identification of Factors that Influence Technical Efficiency of Food Crop Production in West Africa: Empirical Evidence from Borno State, Nigeria. Journal of Agriculture and Rural Development in the Tropics, 107, (2): 139-147.

Ani, D. P., Umeh, J. C and Weye, E. A., 2013. Profitability and Economic Efficiency of Groundnut Production in Benue State, Nigeria. African Journal of Food, Agriculture, Nutrition and Development. 13, (4): 8091- 8105.

Azeez, F., Ajayi, C. A., Olarewaju, T. O., Nosiru, M. O and Farinola, L. A., 2014. The Utilization Pattern And Economic Evaluation of Fuelwood Enterprise: A case study of Ibadan Metropolis, Oyo State, Nigeria. International Journal of Agriculture, Forestry and Fisheries. 2, (6): 91-95.

Beghin, J. Diop, N., Mathew, H. and Sewadah, M., 2003. The Impact of Groundnut Trade Liberalization: Implication for the Doha Round" Mimeo, selected paper presented at the AAEA Annual meetings, Montreal.

Ekunwe, P. A., Emokaro, C. O. and Aigba, G. A., 2013. Socio-economic Determinants of Output of Groundnut Production in Etsako West Local Government Area of Edo State, Nigeria. Albanian Journal of Agricultural Science, 12 (1): 111-116.

Food and Agriculture Organization, FAO., 2004. Food and Agriculture Organization Production Year Book. 15, (10): 22. Rome, Italy.

International Crop Research Institute for the Semi-Arid Tropics, ICRISAT., 2001. Future Challenges and Opportunities for Agricultural Research and Development in the Semi-Arid Tropics.

International Crop Research Institute for the Semi-Arid Tropics Annual Report, Patancheru, India. 39-41.

Maurice, D. C., Onu, J. I., Adebayo, E. F and Garba, A., 2013. Optimal Production Plan and Resource Allocation in Food Crop Production among Small-Scale Farmers in Some Selected Local Government Areas of Adamawa State, Nigeria. Journal of Technology and Educational Research. 6, (2): 47-57.

Misari, S. M., Boye-Goni, S and Kaigama, B. K., 1988. Groundnut Improvement, Production, Management and Utilization in Nigeria: Problems and Prospects. First ICRISAT Regional Groundnut meeting for West Africa. Niamey, Niger. 61-64.

National Population Commission, NPC., 2006. National Population Census, Federal Republic of Nigeria Official Gazette, 94, (4): Lagos, Nigeria.

Ntare, B. R., 2005. Groundnut Pyramids in Nigeria. Can they be Reviewed? *http://www.icrisat.org.pyramidsht*

Okolo, T. O and Utoh, N. O., 1999. Groundnut Seed Multiplication and Constraints; FAO's Experience. In: Aliyu, A. and Nwafor, G. O. (eds.), Proceedings of National Workshop on Groundnut Rehabilitation in Nigeria. FAO/FDA, Kano, Nigeria. 11th -12th May, 14-22.

Okuneye, P. A., 1995. Nigeria Agriculture on the run. University of Agriculture, Abeokuta Inaugural Lecture Series, Wallingford, England. 26-48.

Panda, S. C., 2007. Farm Management and agricultural Marketing, Kalyani Publishers, New Delhim-110002.

Sani, M. H and Haruna, U., 2010. Farm Planning Model for Sustainable Vegetable Crop Production in the Eastern Part of Kogi State, Nigeria. Nigeria Journal of Agronomy. 9, 17-22

Taru, V. B., Kyagya, I. Z., Mshelia, S. I and Adebayo, E. F., 2008. Economic Efficiency of Resource Use in Groundnut Production in Adamawa State of Nigeria. World Journal of Agricultural Science, 896-900.

Taru, V. B., Kyagya, I. Z and 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.

Uaiene, R. W and Arndt, C., 2009. Farm House-Hold Technical Efficiency in Mozambique. A paper presented at the International Association of Agricultural Economist Conference. Beijing, China, 16-22 August.

Wakili, A. M., 2012. Technical Efficiency of Sorghum Production in Hong Local Government Area of Adamawa State, Nigeria. Russian Journal of Agricultural and Socio-Economic Sciences, No.6/2012. 10-15

Zekeri, M and Tijjani, I., 2013. Resource Use Efficiency of Groundnut Production in Ringim Local Governmemt Area of Gigawa State, Nigeria. *Agrosearch.* 13, (2): 42-50.

Appendix 1

Sample Selection in the 12 selected Villages in the Area

S/N	Villages	No. of sample
1	Dzumah	10
2	Pella	12
3	Hong	15
4	Dziga Yerima	10
5	Kwarhi C	8
6	Kumo	10
7	Munga	9
8	Uding	10
9	Zhediniyi	8
10	Pilefu	7
11	Dzakwa	11
12	Fadama Rake	10
	Total	120

Source: Field survey, 2012