



## **ANALYSIS OF RESOURCE USE EFFICIENCY OF MILLET PRODUCTION IN DUKKU LOCAL GOVERNMENT AREA OF GOMBE STATE, NIGERIA**

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### **ABSTRACT**

The study analyzed the resource use efficiency of millet production in Dukku Local Government Area of Gombe State, Nigeria. A multistage sampling technique was used to select 120 millet farmers from 10 wards. The data were collected using structured questionnaire and analyzed using descriptive statistics, regression analysis and farm budgeting technique. The result revealed that the mean age of millet farmers was 41 years, 96.67% of millet farmers were married, with the majority (58.33%) having family size ranging from 1 – 15 persons and that 41.66% of millet producers had acquired formal education. The results further showed that most of millet producers were full time with an average of 24 years of experience. The result reveals that, majority (77%) of millet producers acquired their land through inheritance, having an average farm size of 4.75 ha. The result further reveals that land, herbicide and fertilizer were significant ( $P < 0.05$ ); while years of experience was significant ( $P < 0.01$ ), and the coefficient of multiple determination ( $R^2$ ) was 0.944; meaning that 94.4% variation in millet output was explained by the explanatory variables included in the regression model. The technical efficiency ratio of labour was  $< 1$  meaning that labour was over-utilised. The ratio of farm size, seed and fertilizer were  $> 1$ , implying that these factors were under-utilised. The study concluded that factors of millet production were not efficiently allocated; therefore, adjustments in the level of these factors are needed to achieve optimum efficiency in both output and profit.

**Keywords:** Coefficient, Dukku, Efficiency, Resources, Millet, Production.

### **INTRODUCTION**

Millet is an important cereal crop which was first domesticated as a food in the tropical region of East Africa at least 4,000 years ago. It is used as food grain in India and Africa and has grown over the centuries, with an estimated 64 million acre of pearl millet being grown in Africa and India (Jefferson, 2009). But in current decades, area and production of millet was decline may be because of less remuneration or competitive crops, that is, paddy has higher remuneration. The reports showed that in spite of paddy crops finger millets have higher remuneration and nutrient wise millets crops have highly nutritious then paddy (Kumar and Sandeep, 2005). However, gradually Africa is becoming the world's leading producer of millet (ICRISAT, 2009). In the quarter century since the early 1970s, African millet harvests increased by 22 percent, where as other regions registered substantial production declines. According to ICRISAT (2009), the harsh environment of the Sahelian region presents special problems to increasing millet yields. While crop improvement research can partially help increase drought and heat tolerance, over forth-fifth of the potential yield grains from overcoming these draw backs must come from improved natural resources management (ICRISAT, 2009).



According to Jefferson (2009), Millet is mostly produced in the arid and semi-arid region of Nigeria; areas with moderately low rainfall and dry weather. This however, made the consumption of the crop skewed to the Northern and middle parts of the country. Numerically, the demand and consumption of millet in Nigeria showed a steady growth from 518,000 metric tonnes in 1960 to a projection of 3,100,000 metric tonnes in 2010. Millet production depends upon farm resources influenced by many factors, land, labour, water, capital, management practice and climatic conditions which all form an integral part of the production process. The total set of resources used in agriculture is far from constant. Quantity and proportions of resources are frequently adjusted in response to economic and other conditions, such form of resources or factors of production could be classified as land, labour, capital, management, free variables such as air, rainfall, heat and light (Upton, 1979). However, for the farmer to be efficiently productive, he must be in a position to analyse these factors of production. In order to arrive at reasonable decision, farmers may take decisions on the type of crop to grow, type and level of fertilizer and other inputs to be used, size and location of the farm, planting time and modes of management required (John, 2002).

The resources used in crop production may either be stock or flow resources or both. Stock resources are those factors which are used up entirely in the production process. When not entirely used up they can be stored for a later period. Flow resources on the other hand embody flow services; such services if not used when they are given off will not be available for a later use, example is the services of a brain. Some factors embody both stock and flow services, include the use of machinery whose depreciation is a function of both use and time. However, efficiency of resources use is seen as the ability to derive maximum output per unit level of input over time. The types of efficiency relevant in millet production includes; economic, allocative/technical and or price efficiency. The technical efficiency is measured by relating the level of output achieved to the level of input used (Upton, 1979). Technical efficiency is the ratio of total output to total input. A farm is said to be technically efficient if it yields the maximum possible output unit of variable resources, for a perfect efficiency; the ratio of the total output to total inputs is said to be unity. However, this ratio decreases with increase in the amount of inputs used per unit of output. Although the technical efficiency has been known to be a necessary condition, for the over-all efficiency of a farm, it is not a sufficient in resources use, price relationship have to be employed to denote maximum profit (Heady, 1982). This study is expected to provide valuable benchmark information to these new entrants on resource productivity and profitability in millet production so as to enable them considers its production as a viable option. As for farmers who are already cultivating the crop, the study will go a long way in providing information on ways of boosting production. This could be achieved through proper formulation of sound micro and macro-economic farm policies, which requires prior knowledge to their formulation and understanding of the input prices and output relationship in millet production in the study area. However, the study was made to provide answers to the following research questions; (i) what are the socio-economic characteristics of millet farmers? (ii) what is the resource used efficiency of millet production? The specific objectives of the study therefore, were to; (i) describe the socio-economic characteristic of millet farmers in the study area; (ii) ascertain the resource use efficiency in millet production in the study area.

## **MATERIALS AND METHODS**

### **The Study Area**

The study was conducted in Dukku Local Government Area Gombe State, Nigeria. Located on longitude 15° 15' east and Latitude 11° 0' north, its headquarters are in the town of



Dukku with the Gongola river flows through the west and north of the area. It has an area of 3,815 km<sup>2</sup> and a population of 207,190 based on the national census of 2006. Dukku Local Government area is boarded by Kwami and Funakaye LGAs to the east; Nafada LGA to the north; and Bauchi State to the south-west. The area has mean annual temperature of 13°C – 31°C in January and 09.0°C – 28.5°C in August, with the amount of annual rainfall received of 800 mm – 900 mm in 4 – 5 months duration, which is sufficient for arable crop production (GSADP, 2011). The area is predominantly natural growing trees with grasses of the sahelian zone. Majority of the inhabitants the study area are subsistence farmers, producing mostly sorghum, millet, maize, cowpea, bambaranuts, sweet potatoes, and a wide variety of vegetables such as tomato, pepper, onion, melon and sugarcane. Also, two major cash crops; groundnut and cotton were produced. Other occupations of the pheasants in the area include hunting, carving as well as livestock production which contributed immensely to the economy of the State (GSADP, 2011).

### **Sampling Procedure and Sample Size**

A multi-stage sampling technique was used to select 120 millet farmers in the study area. In stage I, Dukku Local Government Area was purposively selected. In Stage II, the study area was then delineated into ten farming districts; *Waziri North, Waziri South, Gombe Abba, Kunde, Zange, Hashidu, Jamari, Tale, Zaune and Malala* out of which five were purposively selected for the study because they were notable and predominant areas for millet production. In Stage III, two villages each were then purposively selected. In stage IV, a total of 120 millet producers were selected using simple random simple random sampling technique proportionate to the number of farmers in each village. This ensured that every member of the population had equal, fair and independent chance of being selected (Ali and Denga, 1983).

A sample is a representation of the population of study (Otokiti, 2005). In determining the sample size appropriate for this study, the Barlett *et al.* (2001), model as modified by Alamu and Olukosi (2010) was used, where 10% was suggested when the population is above 1,000. The study sought to define sample size of millet farmers under mono-cropping system such that at least 95% level of confidence was obtained as probable error of using a sample did not exceed 0.05. According to this model, the appropriate sample size for a population of (1,203) millet farmers in the study area was ninety (120). A proportional allocation technique was then used to determine the number of sample from each village.

### **Method of Data Collection**

Data for the purpose of this study were basically collected from the primary sources using structured questionnaires; this was supported with personal interview in situations where the respondents did not understand the questions. Both the Reconnaissance and Diagnostic Survey methods were used through the distribution of the questionnaires. A well-structured questionnaire was developed and used to collect information aimed at achieving specific objectives of the study.

### **Method of Data Analysis**

The statistical tools used for data analysis include; simple descriptive statistics, regression analysis and efficiency index model. The descriptive statistics such as frequency distribution, percentage and means were used to describe the socio-economic characteristics of millet producers in the study area. Moreover, to further determine the cause and effect relationships between inputs and outputs, the multiple regression models were used. Also, to ascertain the technical efficiency of the resources used for millet production in the study area; the efficiency index model was used.



The multiple regression models were used to estimate the factors that determine the output of millet production in the study area. The regression model is a tool that predicts the value of dependent variable given the values of the independents variables and measures the degree, cause and effect relationship between the dependent and independent variables; hence, the coefficient of determination ( $R^2$ ) shows the level of variation in the dependent variable (Y), which is explained by variation in  $X_i$  (the independent variables) (Oloyide and Heady, 1982). The model in its general form is specified as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, U_i) \quad \dots(1)$$

where;

Y = output of millet (tons);  $X_1$  = age of the respondents (years);  $X_2$  = household size; (number of person);  $X_3$  = education (dummy);  $X_4$  = experience (years);  $X_5$  = land area (ha);  $X_6$  = labour (man/day);  $X_7$  = fertilizer (kg);  $X_8$  = pesticide (lt);  $U_i$  = error term.

To ensure the selection of appropriate models, the study applied three different functional forms. They were the linear, semi-log and double log. According to Rahman (2014), the functional regression models were fitted and expressed in the explicit forms as:

The linear function:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + u_i \quad \dots (2)$$

The semi-log function:

$$Y_i = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + u_i \quad \dots(3)$$

The double-log function (Cobb-Douglas):

$$\ln Y_i = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + u_i \quad \dots(4)$$

where;

Y = dependent variable;  $b_0$  = constant;  $b_1 - b_8$  = estimated regression coefficients;  $X_1 - X_8$  = independent variables;  $U_i$  = error term.

The functional form producing the best fit was chosen as the lead equation based on the following criteria; the number of estimators that are statistically significant, the value of F-statistic, magnitude of coefficient of multiple determination ( $R^2$ ) as indicated by F-value, the significance of the coefficients as given by the t-values and the direction (+ or – signs) of the estimated parameters which also formed the assumed *a priori* expectations for this study (Gujurati, 1988).

The efficiency index model determines the efficiency of resources use which is regarded as the ability to derive maximum output per unit level of resources; it is the key to effectively address the challenges of achieving food security and poverty. The types of efficiency relevant in the agricultural production process include economic efficiency, allocative/technical efficiency and price efficiency. The technical efficiency which used in this study; is measured by relating the level of output achieved to the level of input used (Upton, 1979). Technical efficiency is the ratio of total output to total input. A farm is said to be technically efficient if it yields the maximum possible output per unit level of the variable resources; for a perfect efficiency from the ratio of the total output to total inputs is said to be unity. However, this ratio decreases with the increase in the amount of inputs used per unit of output. The technical efficiency is therefore specified as;

$$r = MVP/MFC \quad \dots (5)$$

where;

r = is the efficiency ratio; MVP = Marginal value product (₦); MFC = Prevailing market price of each unit of a particular resource (₦) but;

$$MVP = b_i \cdot P_y \quad \dots (6)$$



where;

MVP = Marginal Value Product of each resource (₦);  $b_i$  = regression coefficient;  $Y_i$  = the geometric means of millet output (tons);  $X_i$  = the geometric means of resource ( $X_i$ );  $P_y$  = Unit price of millet output (₦).

The ratio of efficiency ( $r$ ) further explains the effect of the individual resources used on the output, expressed in terms of return to scale. The return to scale means percentage change in the inputs of all resources employed. It represents the sum of the elasticity of production. This is obtained by the submission of the estimate regression co-efficient obtained in the study. If the value of the elasticity is less than unity ( $<1$ ) there is decreasing returns to scale; 1 and greater than 1 connotes constant and increasing returns to scale. This will determine the direction of adjustment of resources (Heady, 1982). Economic theory states that a farm maximizes output/profit with respect to input if the ratio of its marginal value product (MVP) to its marginal cost (MFC) is equal to one (unity) (John, 2002). A ratio ( $r$ ) of less than one show over utilization of that input and so profit would be increased by decreasing the quantity use of that input. However, a ratio greater than one indicates underutilization of that input and increasing the rate of use of that input will increase the level of profit of the firm. The MVP with respect to each input (herbicide, seed, fertilizer and labour) was obtained by taking the first order partial derivatives of the total value product function when other input were held at their geometric means. Similarly, the MFC with respect to each input was obtained by taking the first order partial derivative of the total cost function. However, the production function of the lead equation was used to estimate the efficiency of resource use. This was achieved by multiply the regression coefficients of the variables by their respective values of revenue and or cost to obtain their marginal value products MVP and marginal factor cost MFC respectively. The ratios of the MVP and MFC are then considered as the efficiency ratios of the variable inputs.

## RESULTS AND DISCUSSION

### Socio-economic characteristics of millet producers

The socio-economic parameters in the study included age, marital status, household size, educational level, and years of experience in millet production. Others include; land acquisition, farm size and sources of finance for production.

The result of the study reveals that the age of the surveyed millet farmers in the study area ranged between 21 – 60 years, with an average of 41 years. Out of which 40.83% were in the age bracket of 41 – 50 years, 25% (31 – 40 years), 19.17% (21 – 30%) and only 15% (51 – 60) as shown in Table 1. This implies that the farmers were within their economically active age. This is important because they may be willing to assume greater risk in anticipation of profit than the older or much younger ones who are often more risk averse. This assertion agrees with the findings of Haruna (2002); Alabi *et al.* (2006) and Jabil (2009); all reported that farmer's age may influence his resource allocation, reasoning and management ability and as well, more likely for him to adopt new technologies.

Table 1 also, shows that majority (97%) of millet producers in the study area were married with an average household size of 13 persons. The low participation of the unmarried may be





**Table 1: Socio-Economic Characteristics of Millet Producers**

Variables	Frequency	Percentage	Mean
<b>Age (years)</b>			41.0
21 – 30	23	19.19	
31 – 40	30	25.00	
41 – 50	49	40.83	
51 – 60	18	13.00	
Total	120	100	
<b>Marital status</b>			
Married	116	96.67	
Single	04	3.33	
Total	120	100	
<b>Household size</b>			13.0
1 – 5	15	12.50	
6 – 10	49	40.83	
11 – 15	06	5.00	
16 – 20	26	21.67	
21 – 25	09	7.50	
26 – 30	15	12.50	
Total	120	100.00	
<b>School level attained</b>			
Primary	16	13.33	
Secondary	18	15.00	
Tertiary	16	13.33	
Qur'anic	46	38.33	
Adult	14	11.69	
Never been to any school	10	8.33	
Total	120	100.00	
<b>Farming experience (years)</b>			24.0
1 – 10	21	17.50	
11 – 20	22	18.33	
21 – 30	30	25.00	
31 – 40	47	39.17	
Total	120	100	
<b>Land acquisition</b>			
Hired	16	13.33	
Inheritance	92	76.67	
Purchase	04	3.33	
Inheritance and Hired	06	5.00	
Inheritance/Purchase	02	1.67	
Total	120	100	



**Table 1: Socio-Economic Characteristics of Millet Producers (Cont.)**

Variables Farm size (ha)	Frequency	Percentage	Mean
1 – 2	13	10.83	4.75
3 – 4	63	52.50	
5 – 6	18	15.00	
7 – 8	08	6.67	
9 – 10	18	15.00	
Total	120	100	
<b>Sources of financing</b>			
Personal Saving	85	70.83	
Friends and Relatives	15	12.50	
Commercial Banks	15	12.50	
Cooperatives	05	4.17	
Total	120	100	

attributed to the fact that they were mostly young and still dependent on their parents for livelihood. Again, the majority of the young people were in school or learning trade (Adamu, 2005). Moreover, the relatively large household size in the study area may be linked to the polygamous system practiced in Muslim dominated communities. Adamu (2005) had reported a household size of between 6 and 20 persons for farmers in Jigawa State Nigeria. The implication here is that family expenditure will be large; therefore, there is need for much economic efforts to generate more income, fend for the family.

Furthermore, the result reveals that 38.33% of millet famers had Qur'anic education, 15% had secondary education; and those that had primary and Tertiary education each constituted 13.33% of the respondents, 11.69% adult education and only 8.33% had no any form of education. The dominance of Qur'anic education is associated with the religion (Islam) practiced by almost all the inhabitants of the study area. This implies that majority of millet farmers in the study area had low adoption ability and poor risks management. This is because the more producers acquire formal education the more they would have greater implication for participation in policy matters and generally in development responsibilities (Jabil, 2009).

Table 1 also, shows that most (39.17%) of millet farmers in the study area had farming experience of 31 – 40 years, with an average of 24 years. Years of farming experience enables farmers to analyse production situations, they also have the ability to manage risks and uncertainties in production in an attempt to produce more output. Haruna (2002) added that knowledge and experience have been shared among farmers since time immemorial and passed on from one generation to another.

The result also, reveals that, majority (77%) of millet farmers in the study area acquired their land through inheritance, 13.22% (hired), 5% (both hired and inherited), 3.33% (purchased) and 1.67% (inherited and purchased) as shown in Table 1. The result conforms to the findings of Adamu (2005) who reported that the commonest means through which farmers acquired their farm lands in Jigawa State is through inheritance. This practice encourages land fragmentation, discouraging mechanisation and promotes subsistence of agriculture.

The result further discloses that 52.5% of the farmers had farm size between 3 – 4 hectares, with an average of 4.75 hectares. The result disagreed with Ditttoh (1991), who reported that, on the average, the millet farmers had only 0.82 ha in Adamawa State, Nigeria. The implication here is that, most of the arable lands in the study area were subjected to millet production.



Also, majority (71%) of millet producers in the study area sourced their capital through personal savings, 12.5% acquired credits from friends, relatives and or commercial banks, and 41.7% from cooperative societies. The economic implication of this result is that, the scale of production of millet in the study area remains small with very slow growth rate due to relatively small personal saving. However, CBN (1981) reported that, because the borrower feels he has obligation to the lender and loses his independent, the farmer prefer to use his personal saving only. Jabil (2009) added that, many of the farmers especially the small-scale may lack suitable collateral security which is a pre-condition to obtain loans from the financial institutions.

The result of the double log (Cobb-Douglas) function in Table 2 reveals that years of farming experience was significant ( $P < 0.01$ ). This concurs with the findings of Jabil (2009), who reported that years of farming experience enables farmers to analyze production situations, manage risk and uncertainties in production activities in an attempt to produce more output.

**Table 2: Regression Result of Production Factors that Influenced Millet Output**

Predictor	Functional forms		
	Linear	Semi-log	Double-log
Constant	1.493 (0.23)**	10.32 (0.56)	1.1057 (6.39)***
Land	3.233 (3.03)	76.24 (4.83)	0.7852 (5.35)**
Herbicide	5.413 (2.39)	24.49 (1.65)	0.2775 (2.01)**
Seed	0.2761 (1.20)	-1.651 (-0.20)*	0.07931 (-1.01)
Fertilizer	1.4877 (2.86)	25.65 (1.77)	0.0253 (0.19)**
Labour	-0.02065 (-0.76)	-13.98 (-1.36)	0.02015 (0.21)
Age	0.775 (1.33)	41.61 (0.66)	0.2681 (0.83)
Household size	1.9331 (2.73)	-0.55 (-0.03)	0.04080 (0.41)
Education	0.572 (0.13)	-38.73 (-1.49)	-0.2095 (-1.59)
Experience	-0.4080 (-0.73)	87.71 (4.70)	1.92401 (20.29)***
R <sup>2</sup>	0.306	0.548	0.944

\*\*\* = Significant at  $P < 0.01$ ; \*\* = Significant at  $P < 0.05$  \* = Significant at  $P < 0.1$

The economic implication of this, here is that the more experience a farmer has in millet production, the more he is likely to make more output than the less experienced ones. The result further revealed that land, herbicide and fertilizer were significant ( $P < 0.05$ ). This conforms to the *a priori* expectation that unit increase in these factors while holding others constant, will lead to increase in the level of output of millet in the study area. The coefficient of determination ( $R^2$ ) was 0.944 implying that; 94.4% variation in output was accounted for by the factors included in the model, and the remaining proportion was by other external factors (error term).





The results of the marginal value product (MVP), marginal factor costs (MFC) and efficiency ratios ( $r$ ) were presented in Table 3. The result revealed that the labour factor has MVP of 163.94; and  $r$  of 0.41. Meaning that increase in labour by one unit (1 man-day); there will be increase in revenue by ₦ 108.65 only. This is because the  $MFC > MVP$ , evidently, the efficiency ratio of labour (0.41) signifies over utilization of the resource. The study suggests that, the millet farmers in the study area should therefore reduce the level of labour input by 41% (while holding other inputs constant) so as to attain optimality in output and profit. Moreover, the MVPs of farm size, seed and fertilizer used in millet production in the study area, were greater than the MFCs. Their efficiency ratios on the other hand were  $> 1$ . This shows that these factors were under utilised. However, while holding other factors constant, millet farmers should therefore increase the level of farm size, seeds and fertilizer to attain optimality in output and profit. This disagreed with Ojo *et al.* (2009), who found that, the labour efficiency ratio was 9.584 in tomato production in Niger State Nigeria. But the efficiency ratio for farm size corroborates with that of Orefi *et al.* (2011) who in their findings, the ratio of farm size was 1.24, implying that the input was under-utilised in tomato production in Benue State. However, Ibitoye *et al.* (2015) further suggested that, all variable inputs having efficiency ratio ( $r$ )  $> 1$ ; should therefore be increased to achieve optimum output.

**Table 3: Efficiency of Resources Used in Millet Production**

Variables	Coefficient	$P_y$ (₦/100kg)	MVP	MFC	$R$	Remark
Labour	0.02015	8,136	163.94	400	0.41	Over-utilised
Farm size	0.7852	8,136	6,388.39	5,300	1.21	Under-utilised
Seed	0.07931	8,136	645.27	587.43	1.10	Under-utilised
Fertilizer	0.0253	8,136	205.84	127.03	1.62	Under-utilised

## CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were made; that millet production was profitable, majority of the millet farmers in the study area were economically active, and have relatively large family size. Most of the millet farmers in the study lack formal education. However, they have long experience in farming of millet which enables them to analyse production situations, manage risk and uncertainties in production activities in an attempt to produce more output. The technical efficiency ratio of labour was  $< 1$ , while those of farm size, seed and fertilizer were  $> 1$ . Implying that labour factor was over utilised, while factors were over utilised. Technically, adjustments in the level of these factors are needed to achieve optimum efficiency in millet production in the study area. The study recommends that: (i) millet farmers should be encouraged through efficient extension services to use improved variety, so as to have increased level in output; they should also reduce labour factor but increase amount of land, herbicide and fertilizer used so as to achieve higher productivity and efficiency. (ii) millet farmers in the study area should be encouraged to explore other sources of finance; such as banks and cooperative societies to enable them boost their production from subsistence levels to more commercial level. (iii) Governments and other agencies should provide enough relevant inputs at subsidized rate to the millet farmers in the study area.



## REFERENCES

- Adamu, A. A (2005). *Efficiency of Resource use in Irrigated misleads production among Farmers in Hadejia Jama'are River-Basin, Nigeria*. Unpublished M.Sc. Thesis, Department of Agricultural Economics and Extension, ATBU Bauchi, 133pp.
- Alabi, O. O. Onotucyha, J. T. Kadir, S. S. Olutotun, O. Momadu, G. G. Nwamouh, A. Sodimu, A. I and Ariyo, M. O (2005). Economic Analysis of Irish Potato Marketing in Kaduna North Local Government Area of Kaduna State. *Journal of Food and Agriculture*, **8**(2): 67 – 89.
- Alamu, J. F. and Olukosi, J. O. (2010). *Simplified Research Methodology: Principles and Practices*: (revised edition), Zaria, Great Glory Publishers, 130pp.
- Ali, A. and Denga, I. D. (1983). *An Introduction to Research Methods and Statistics in Education and Social Sciences*, Jos, Savannah Publishers Limited, 213pp.
- Barlett, J. E., Kotrlik, J. W. and Higgins, C. C. (2001). Organizational Research, Determining Appropriate Sample Size in Survey Research. *Information Technology, Learning and Performance Journal*, **19**(1): 5 – 12.
- Central Bank of Nigeria, CBN (1981). *Agricultural Credit and Finance in Nigeria: Problems and Prospects Process*. Seminar organised by Central Bank of Nigeria, Lagos. April 27-30 P. 633.
- Dittoh, S. (1991). *Efficiency of Agricultural Production in Small scale and Medium scale Irrigation in Nigeria*. In: Doss, C. R. and Olsan, C. (eds). International Institute for Agricultural Development, Arlington, Virginia. 12-16/4/1992.
- Gujarati, D. N. (1988). *Basic Econometrics*, (2<sup>nd</sup> ed), New York, McGraw-Hill Books Company, 166pp.
- G.S.A.D.P. (2001). *Agricultural Development Project; Zonal Annual Report*, 5pp.
- Haruna, U. (2002). *Economics of Sustainable Fadama Farming among Fadama users Association Bauchi State, Nigeria*. Unpublished Ph.D. Dissertation, Department of Agricultural Economics and Extension, ATBU, Bauchi, 337pp.
- Heady, E. O. (1982). *Economics of Agricultural Production and Resources use*. New Jersey, Prentice Hall Inc. Englewood, USA, 130pp.
- Ibitoye, S. J., Shaibu, U. M. and Omole, B. (2015). Analysis of Resource Use Efficiency in Tomato (*Solanum lycopersicum*) Production in Kogi State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology*, **6**(4): 220 – 229.
- ICRISAT (2009). *Millet Production Growing in Africa: Design improved cropping system for Sahelian millet*. <http://www.worldbank.org/html/cigar/newsletter/mar96/4millet.htm>
- Jabil, I. Y. (2009). *Marketing of Selected Processed Dairy products in Bauchi State, Nigeria*. M.Sc. Thesis Department of Agricultural Economics and Extension ATBU, Bauchi, 144pp.
- Jefferson, L. A. (2009). *Growing pearl Millet production tips, economics, and more* <http://www.jeffersoninstitute.org/probs/millet.sbtml>. Accessed on 23/09/2010.
- John, A. J. (2002). Analysis of Resource use Efficiency in Small-scale Sorghum: A case study of Zuru LGA, Kebbi State. *Journal of Agricultural Economics*, **4**(2): 8 – 15.
- Kumar, S. and Sandeep, K. (2005). Resource Use Efficiency and Returns from Selected Food grain Crops of Himachal Pradesh: A Study of Low Hill Zone. *Indian Journal of Agricultural Economics*, **85**(339): 549 – 568.
- Ojo, M. A., Ibrahim, O. A. and Mohammad, U. S. (2009). Profitability and Production Function of Small-scale Irrigated Tomato Production in Niger State, Nigeria. *Continental Journal of Agricultural Economics*, **3**:16 – 22.



- Orefi, A., Mimidoo, A. and Peter, T. T. (2011). Can Small-scale Tomato Farmers Flourish in Benue State, Nigeria? *Journal of Agricultural Science*, **2**(2): 77 – 82.
- Otokiti, S. O. (2005). *International Business: How to Get Started in International Business Environment*. Lagos, Pumark Publishers Nigeria Limited, 249pp.
- Rahman, S. A. (2014). *Fundamentals of Econometrics*. Abuja, Fix Impression Ltd. 119pp.
- Upton, M. (1979). *Farm management in Africa: Principle of production and planning*. London, Oxford University Press Oxford, U.K. 592pp.