



SOCIO-ECONOMIC FACTORS INFLUENCING THE EXTENT OF USE OF INPUTS ON PEARL MILLET PRODUCTION IN BOKO HARAM AFFECTED LOCAL GOVERNMENT AREAS OF YOBE STATE, NIGERIA

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ABSTRACT

The study was carried out to examine the socio-economic factors influencing the extent of use of inputs on pearl millet production in *Boko Haram* affected Local Government areas of Yobe State, Nigeria. The objectives were to describe the socio-economic characteristics of pearl millet farmers and determine the socio-economic factors influencing the extent of use of inputs on pearl millet production. A multi-stage sampling procedure was used in selecting 114 respondents for the study. Data were collected through the administration of questionnaire and analyzed using both descriptive and inferential statistics. The result showed that 38.8% and 40.3% of the farmers were within the age bracket of 38 - 47 years for both the affected and non-affected farmers, 86% of the affected farmers and 90.4% of the non-affected farmers were males, 37.2% of the affected farmers and 44.7% of the non-affected farmers had Qur'anic education, 75.2% of the affected farmers and 84.25% of the non-affected farmers were married, 47.9% and 40.4% of affected and non-affected farmers had 0.5-1.4 ha and 1.5-2.3ha as their farm size. In addition, 43.8% of the affected farmers had 1-10 years of experience in farming, while 47.4% of the non-affected farmers had 11-20 years of farming experience. The results further revealed that farm size had a direct relationship (0.118) with the extent of seed usage, while access to credit had an inverse relationship (-0.212) with the extent of seed usage and they are statistically significant ($P < 0.01$) and ($P < 0.10$), respectively. It was concluded that, marital status, household size, farming experience, level of education and access to credit influenced the use of inputs on pearl millet production in the study area. It is recommended that private investors, NGOs and other stakeholders should collaborate with Lake Chad Research Institute and other research institutes to supply farm inputs such as improved seeds, herbicides, fertilizer at subsidized rates to the farmers in order to boost their farming production.

Keywords: Factors, Inputs, Pearl Millet, Production, *Boko Haram*

INTRODUCTION

Pearl millet is a cereal crop grown in tropical semi-arid regions of the world primarily in Africa and Asia (Chisi and Peterson, 2019). Millions of people in semi-arid regions of Africa and Asia use pearl millet as the most important staple food and serving as major sources of food and income for millions of subsistence farmers living in the most marginal agricultural lands of Northern Nigeria (Champion and Fuller, 2018). As the conditions become drier, pearl millet is the only crop that is grown where normal rainfall does not permit the reliable production of sorghum and maize (Negi *et al.*, 2017). In Nigeria, pearl millet is a traditional crop, which is grown in many parts of the country especially in the North-eastern and North-western regions of the country where it is considered as staple cereal crop for millions of people (Vinoth and Ravindhran, 2017). Pearl millet flour is used in preparing "tuwo" a thick binding paste also referred to as "toh" in Northern Africa. It is often ground into flour, rolled into large balls, parboiled, liquefied into a watery paste using fermented milk and then consumed as a beverage called "fura" in Hausa language, and is a popular drink in northern Nigeria (Izge and Song, 2013). Pearl millet is also used in making "Sinasir" and "masa". Masa is a popular staple food consumed by millions of people in Northern Nigeria (Egwin *et al.*, 2013 and Ukwuru *et al.*, 2018). It is also a principal source of energy, protein, vitamins and minerals and hence suitable for animal and human consumption in the regions where it is cultivated. Pearl millet has higher content of calcium, iron, zinc, and folic acid than rice or maize (Jaybhaye, 2011).



Despite the major role the crop plays in food provision, economic gain, and nutritional value in Nigeria, the emergence of *Boko Haram* insurgency and their activities hampered and affects pearl millet production in some part of Yobe State. Farming serves as a major livelihood to farmers in the state but because of the insurgency, about two million small-holder farmers have been displaced and many farmers have been kept away from their usual livelihood activities (United Nation Refugee Agency [UNRA], 2011). In addition, the fear of *Boko Haram* has prevented farmers from cultivating their farm land and the few that did have lost their farm produce to the terrorists who set them ablaze, killing the farmers and destroying their products (Adebisi *et al.*, 2017). Consequently, farming activities in many parts of Yobe State were seriously hampered by the *Boko Haram* insurgency leading to very significant drop in crop production which in turn led to food insecurity and affects the farmers' output (Babagana *et al.*, 2018). Hence, this research intends to answer the following research question.

- i. What are the socio-economic characteristics of pearl millet farmers?
- ii. What are the socio-economic factors influencing the extent of use of inputs on pearl millet production?

The objectives of the study were to:

- i. describe the socio-economic characteristics of pearl millet farmers;
- ii. determine the socio-economic factors influencing the extent of use of inputs on pearl millet production.

METHODOLOGY

THE STUDY AREA

The study was carried out in Yobe State, North-eastern part of Nigeria. The State is located between latitude 11° 45' North - 13° 30' North of the Equator and longitude 9° 30' East - 12° 30' East of the Greenwich meridian. It is made up of 17 Local Government Areas (LGAs) which vary considerably in size. The State shares common boundary with Borno State to the East and South East, Jigawa State to the North West, Gombe and Bauchi States to the South and South-West respectively. In addition, the State shares international boundary with the Republic of Niger to the North. It has a total land mass area of 47,153 square kilometers (Ali *et al.*, 2014). The population of the State was 2,321,339 million as of 2006 National population census (National Population Commission (NPC, 2006). This was projected to 3,723,339 in 2021 at a growth rate of 3.2 percent (National Bureau for Statistics (NBS, 2012).

The annual rainfall ranges from 250 mm to 500 mm and the rainy season is normally from May/June to September in the North and May to October in the Southern parts of the State. The two vegetation zones are the Sahel Savannah in the North and the Sudan Savannah in the South. Grasses, scarce dwarf trees and shrubs are the most prominent features of the State's vegetation which is generally under the threat of desertification. Crops such as millet, maize, sorghum, groundnut and cowpea are produced in large quantities throughout the State (YOSADP, 2018).

SAMPLING PROCEDURE AND SAMPLE SIZE

A multi-stage sampling procedure was used for the study. The first stage involves a purposive selection of two Local Government Areas, namely; Geidam and Gujba, from the affected LGAs, for being the two most affected by *Boko Haram* insurgency with high intensity of pearl millet production. The two non-affected LGAs are Yusufari and Machina from non-affected because they were mostly non-affected by the insurgency with high intensity of pearl millet production, given a total of four LGAs. The second stage involved a random selection of three villages from each of the four selected LGAs purposefully given a total of twelve villages namely; Degina-fukurti, Borko, Gumsa (Geidam LGA), Wagir, Mutai, Buni Yadi (Gujba LGA), Kumagannam, Mai-malari, Sumbar (Yusufari LGA), Bogo, Damai, Dole (Machina LGA). In the third stage, the third stage involved the random selection of 121 affected farmers from a sampling frame of 295 from Yobe State Agricultural Development Project (YOSADP) and 114 non-affected farmers were also randomly selected from a sampling frame of 277 from (YOSADP) to give the sample size of 235. In the final stage, Slovic's formula (1967)



(adopted from Abdulrahman *et al.*, 2017) was used to calculate the sample size with 95% confidence level and 5% sampling error assumption. The formula is expressed as follows:

$$n_o = \frac{N}{1 + N(e^2)}$$

Where;

n= Sample size,

N= Total number of observation,

1= Statistical constant,

e= Level of significance which is set at 0.05

Table 1: Sampling Summary of the Farmers

Affected farmers				Non-Affected farmers			
Selected LGAs (Purposive)	Selected villages (Random)	Sample frame	Sample size (41%) (Random)	Selected LGAs (Purposive)	Selected villages (Random)	Sample frame	Sample size (41%) (Random)
Geidam	Degina fukurti	50	21	Yusufari	Kumagannam	49	20
	Borko	44	18		Mai-malari	44	19
	Gumsa	57	23		Sumbar	47	19
Gujba	Wagir	48	20	Machina	Bogo	45	18
	Mutai	45	18		Damai	50	21
	Buni Yadi	51	21		Dole	42	17
Total	6	295	121		6	277	114

Source: YOSADP, 2018

METHODS OF DATA COLLECTION

Data were collected using questionnaire and interview schedules that were administered to farmers through trained enumerators under the supervision of the researcher.

ANALYTICAL TECHNIQUES

Data for this study was analyzed using both descriptive and inferential statistics. Descriptive statistics such as means, frequency distribution, percentages and standard deviation were used to achieve objectives i, while ordered logistic regression model was used to achieve objective ii and hypothesis of the study.

Ordered logistic regression model

This was used to achieve objective (ii). It was used to estimate the determinants of pearl millet production among pearl millet farming households in the study area based on the result of the extent of use of inputs scores. As earlier noted, the extent of use of inputs score denotes that the higher the value of the extent of use of inputs score is, the higher level of pearl millet production, and vice versa. The extent of use of inputs score rank was applied for all household head *i*, and it takes *j* different values, which are naturally ordered. Thus, there are 4 values (*j* = 0, 1, 2, 3) created. The ordered logit equation is thus given:

$$Y_i^* = X_i\beta + \varepsilon_i \dots \dots \dots 1$$

Where:

Y_i^* = unobservable latent variables from which the observed (ordered) values (Y) derive

X_i = observed individual specific factors assumed to be related to pearl millet production

β s = Vector parameters to be estimated



ε_i = Stochastic disturbance term with normal distribution

The values for the observed variables were assumed to be related to the latent variables Y_i^* in the following manner:

$Y = 0 = \text{extent of use of inputs if } Y_i^* < \mu_0 \text{ where } \mu = 0$

$Y = 1 = \text{low use of input if } 0 \leq Y^* < \mu_1$

$Y = 2 = \text{medium use of input if } \mu_1 \leq Y^* < \mu_2$

$Y = 3 = \text{high use of input if } \mu_2 \leq Y^* < \mu_3$

μ means the unknown threshold parameters that separate the adjacent boundary values and is estimated together with the β s. For the estimated cut-off points, μ follows the order $\mu_1 < \mu_2 < \mu_3$. Using the maximum likelihood estimates technique, the values for the β s parameters can be estimated. The marginal effect (the first derivative of the log likelihood functions) is very important in the interpretation of result. The marginal effects show the probabilities that would rank the extent of use of inputs in any of the four level categories, given the group of explanatory variables assumed to affect the level of pearl millet production found in the study area.

The ordered logit equation was explicitly stated as:

$$Y_i^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon_i \dots 2$$

Where;

$Y_i^* = \text{extent of use of inputs category (Low, medium and high)}$

$X_1 = \text{Age of the farmer (in years)}$

$X_2 = \text{sex of the farmer (Male = 0, Female = 1)}$

$X_3 = \text{Marital status (1 = Single, 2 = Married, 3 = Divorced, 4 = Widowed)}$

$X_4 = \text{Household size (Number of individuals)}$

$X_5 = \text{Farm size (hectares)}$

$X_6 = \text{Farming experience (Years)}$

$X_7 = \text{Educational level (Number of years spent schooling)}$

β s = Vector parameters to be estimated

ε_i = Stochastic disturbance term with normal distribution

RESULTS AND DISCUSSION

Socio-economic Characteristics

The results in Table 2 indicated that 38.8% and 40.3% of the farmers were within the age bracket of 38 - 47 years for both the affected and non-affected farmers with the mean ages of 41 and 42 years. This implies that the farmers were at their active age and more productive stage and can make meaningful contribution to the economy. This finding is in agreement with Onwuaroh (2017), who reported that the mean age of farmers was 31 years. The result in Table 2 revealed that majority (86% and 90.4%) of the affected farmers and the non-affected farmers were males respectively. This implies that, males are more involved in pearl millet production than the females. This finding agrees with the work of Okeke-Agulu and Onogwu (2014), which shows that majority (90%) of the pearl millet farmers in their study were males.

The findings in Table 2 showed that 37.2% of the affected farmers and 44.7% of the non-affected farmers had Qur'anic education, where as 26.4% and 21.1% of the affected and non-affected farmers had primary education. This implies that, the respondents had one form of education or the other, the level of education was low. In addition, low level of education could affect inputs utilization and subsequently affect pearl millet production. This finding agrees with the study of Garba (2014), which asserted that majority (43.67%) of the millet farmers in their study had Qur'anic education.

The result also revealed that majority (75.2%) of the affected farmers and non-affected farmers (84.25%) were married. This shows that a greater proportion of farmers in the study area were married, this could be attributed to the norms and culture of the people in the area, which encourages early marriage. The implication of having more married people in a rural area means more procreation which helps in building a strong farming population and invariably increasing food production. This finding corroborates with that of Ali *et al.* (2018) who, in their work found out that



majority (81.3%) of the millet farmers in Funakaye Local Government Area of Gombe State, Nigeria were married. In addition, the results revealed that 33.9% and 36.8% of the affected and non-affected farmers had a family size of 1-4 persons, while 9.1% and 5.3% had 17-20 persons, respectively, with a mean of 8 persons and a standard deviation of 6 for the affected farmers, while 7 persons with a standard deviation of 5 for the non-affected farmers.

The result implies that the household members could serve as a source of labour availability for pearl millet production in the study area. The finding contradicts that of Tijjani *et al.* (2018), who in their study on the socio-economic determinants of adoption of improved millet production practices revealed that 42% of the farmers had a household size of 6-10 persons.

The results further showed that 47.9% and 40.4% of both affected and non-affected farmers, had 0.5-1.4 ha and 1.5-2.3ha land in the study area. However, the result also indicated that 3.3% and 12.3% of both affected and non-affected farmers had farm size above 3.3ha. This implies that most of the respondents are small scale farmers. The result is in line with the findings of Ali *et al.* (2018), who in their study on the economics of millet production in Funakaye Local Government Area of Gombe State, Nigeria revealed that, most of the farmers were small scale with 0.5-1.5ha of land devoted for millet production. This is an indication that there could be low pearl millet production in the study area.

The results also showed that 43.8% of the affected farmers had 1-10 years of experience in farming, while 47.4% of the non-affected farmers had 11-20 years of farming experience. Also, 33.9% and 35.1% of both the affected and non-affected farmers, had 11-20- and 1-10-years of farming experience with a mean of 13.48 and 13.82 years for affected and non-affected farmers, respectively. This implies that, both categories of farmers had farming experience in pearl millet production. In addition, the more experienced farmers are, the more knowledgeable they are in terms of production. The result agrees with Galadima (2014), who reported that majority (86%) of the farmers had 4-9 years of farming experience.

Table 2: Distribution of Socio-economic Characteristics of the Farmers

Variable	Affected Farmers				Non-Affected Farmers			
	Frequency	Percent	Mean	S.D	Frequency	Percent	Mean	S.D
Age								
18 – 27	16	13.2	41	11.42	10	8.8	42	10.30
28-37	20	16.5			26	22.8		
38-47	47	38.8			46	40.4		
48-57	29	24			24	21.1		
>58	9	7.4			8	7		
Sex								
Male	104	86			103	90.4		
Female	17	14			11	9.6		
Education level								
Qur'anic	5	4.1			5	4.4		
Adult	32	26.4			24	21.1		
Primary	31	25.6			27	23.7		
Secondary	8	6.6			7	6.1		
Tertiary								
Marital status								
Single	8	6.6			2	1.8		
Married	7	5.8			8	7.0		
Divorced								
Widowed								
Household size								
1-4	41	33.9	8	4.37	42	36.8	7	1.95
5-8	26	21.5			32	28.1		
9-12	28	23.1			18	15.8		
13-16	15	12.4			16	14.0		
>17	11	9.1			6	5.3		
Farm size								
0.5 - 1.4	58	47.9	1.5	0.62	35	30.7	2.0	0.80
1.5 - 2.3	50	41.3			46	40.4		
2.4 - 3.2	9	7.4			19	16.7		
>3.3	4	3.3			14	12.3		
Farming experience								
1-10	53	43.8	13.48	8.38	40	35.1	13.82	8.07
11-20	41	33.9			54	47.4		
21-30	20	16.5			15	13.2		
>31	7	5.8			5	4.4		

SOCIO-ECONOMIC FACTORS INFLUENCING THE EXTENT OF USE OF INPUTS ON PEARL MILLET PRODUCTION

The marital status of the respondents was significant at ($P < 0.10$) for the labour usage and it had a marginal effect (0.242), implying that married farmers have the higher probability of labour usage for pearl millet production by 24.2%. This is in line with a prior expectation of this study. Household size was found to be significant ($P < 0.01$) for labour usage and fertilizer usage. The marginal effect of the two, labour usage (-0.155) and fertilizer usage (-0.058) were negative implying that the less the household size of the farmers, the lesser the probability of their labour usage and fertilizer usage for pearl millet production by 15.5% and 5.8%, respectively (Table 3). For the labour usage, it could be as a result of *Boko Haram* insurgency where by labour supply is limited in the area.



Most of the potential labourers migrate to the cities to save their lives from *Boko Haram* attack which brings about inadequate farm labour supply. The result supported the finding of Tessema (2015), who pointed out that household size negatively influences the use of input at ($P < 0.01$) on agricultural labour. While for the fertilizer usage, it could be that the household head will use the household members to transport manure fertilizer, more especially during dry season thereby reducing the use of chemical fertilizer for pearl millet production. The result is contrary to a prior expectation of this study.

Farm size had a positive sign and was significant at ($P < 0.01$) for the entire inputs variable. The marginal effect of seed usage (0.118), labour usage (0.091), herbicide usage (0.109) and fertilizer usage (0.085) showed that the larger the farm size of the farmers, the higher the probability of seed usage, labour usage, herbicide usage and fertilizer usage for pearl millet production by 11.8, 9.1%, 10.9% and 8.5 respectively. The results of seed usage and labour usage is in agreement with the finding of Gichangi *et al.* (2019), who found that total land holding influenced use of seed as production inputs by smallholder farmers at ($P < 0.01$) and Ibitola *et al.* (2019), who reported that farm size is significant and positively influence the use of production input for labour at 1% level of probability. Similarly, the result of herbicide and fertilizer usages is in line with the finding of John (2018) who found that farm size significantly influence the use of herbicide in groundnut production at ($P < 0.01$) in the study area and Abate (2020), who reported that farm size had significant influence on the use of fertilizer in agricultural production.

The farming experience of the respondents was significant at ($P < 0.10$) for seed usage, at ($P < 0.01$) for labour usage and fertilizer usage and ($P < 0.05$) for herbicide usage. The marginal effect of seed usage (0.043), labour usage (0.070), herbicide usage (0.045) and fertilizer usage (0.036) shows that an increase in farming experience is likely to increase farmers' seed usage, labour usage, herbicide usage and fertilizer usage for pearl millet production by 4.3%, 7.0%, 4.5% and 3.6% respectively. The result of seed usage, fertilizer usage and herbicide usage is in line with a prior expectation of this study. However, the finding of labour usage is in agreement with the result of Ibitola *et al.* (2019), who reported that years of farming experience is significant and positively influence the use of labour on Maize output at 5% level of probability.

Level of education was significant ($P < 0.10$) for the labour usage and fertilizer usage. The marginal effect of the two, labour usage (0.279) and fertilizer usage (0.204) were positive implying that, the higher the level of education, the higher the probability of labour usage and fertilizer usage in pearl millet production by 27.9% and 20.4%, respectively. The result corroborates with the finding of Gichangi *et al.* (2019), who discovered that the coefficient for education level has the expected positive sign and is statistically significant in influencing smallholder's farmers' use of labour at ($P < 0.10$).

Table 3: Factors Influencing the Extent of Inputs Use on Pearl Millet Production

Variable	Seed		Labour		Herbicide		Fertilizer	
	Mgnal Eff	Std Err	Mgnal Eff	Std Err	Mgnal Eff	Std Err	Mgnal Eff	Std Err
Age	-0.013	0.022	0.026	0.017	0.021	0.015	0.003	0.006
Sex	-0.002	0.333	-0.160	0.103	-0.141	0.343	-0.046	0.053
Marital status	0.040	0.208	0.242*	0.142	0.072	0.164	-0.033	0.047
Household size	-0.027	0.050	-0.155***	0.039	-0.024	0.041	-0.058***	0.021
Farm size	0.118***	0.032	0.091***	0.028	0.109***	0.033	0.085***	0.029
Farming experience	0.043*	0.024						
Level of education	-0.023	0.031	0.070***	0.024	0.045**	0.021	0.036***	0.010
Access to credit	-0.212*	0.125	0.279*	0.165	-0.029	0.027	0.204*	0.120
Membership of coop	-0.080**	0.037	-0.011	0.009	-0.012	0.010	-0.021	0.055
Extension visits	-0.054	0.046	-0.206*	0.117	-0.039	0.031	-0.021	0.015
No of observation			-0.026	0.033	-0.007	0.038	0.023	0.018
LR chi ² (10)	235		235		235		235	
Prob > chi ²	357.94***		286.96***		390.63***		275.94***	
Pseudo R ²	0.000		0.000		0.000		0.000	
Log Likelihood	0.748		0.689		0.799		0.540	
	-60.29		-64.73		-48.98		-117.54	

Note: *** P < 0.01, ** P < 0.05, * P < 0.10, Mgnal Eff = Marginal Effect, Std Err = Standard Error

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, it was concluded that marital status, household size, farm size, farming experience and level of education were significant in influencing the extent of use of farm inputs on pearl millet production in the study area. Also *Boko Haram* insurgency has significant impact on the extent of use of inputs on pearl millet production. Therefore, it was recommended that private investors, NGOs and other stakeholders should collaborate and liaise with Lake Chad Research Institute in supplying farm inputs such as improved seeds, herbicides and fertilizer to these rural farmers at highly subsidized rates to boost their production.

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