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Adoption Of Cowpea Production Technologies Among Farmers In Taraba State, Nigeria.

[1]Bashir, M.B. and [2]Ndaghu, A.A., [3]Nakwe, S.H.G., [4]Abdulazeez, A.W. and [5]Samuel, R.T.

[1]Department of Agricultural Extension and Management, College of Agriculture, P.M.B 1025 Jalingo, Taraba
[2]Department of Agricultural Economics and Extension, Modibbo Adama University of Technology, Yola
[3]Department of Crop Science, College of Agriculture, P.M.B 1025 Jalingo, Taraba State, Nigeria.
[4]Wurkum Chiefdom Karim-lamido Local Government Area, Taraba State, Nigeria
[5]Community and Social Development Project Office, Taraba State.

Abstract: *This study determines the adoption of Cowpea Production Technologies among farmers in Taraba State, Nigeria. The study described the socio-economic characteristics of the respondents; identified the cowpea production technologies available to the respondents and assess respondent extent of adoption of cowpea production technologies. The study also determined factors that influenced adoption of cowpea production technologies and identified the constraints experienced by the respondents in the adoption of cowpea production technologies. A multi-stage random sampling technique was used to select 150 respondents for the study. Descriptive statistics and logit regression were used to analyze the data. Result revealed that, 84% of the respondents were within a youthful age of 20-49 years. Majority 94.7% of the respondents were male and 92% were married, with 50% of them having acquired one form of education or another. Mean farm size, years of farming experience and household size were 3.0 ha, 11years and 13 persons, respectively. All the respondents (100%) attested that, they were never visited by extension agent. The study indicated that 99.3% of the respondents adopted herbicides while 88.4% and 96.6% had adopted seed treatment and mechanized farming respectively. Logit regression result revealed a significant relationship between respondent's age, marital status, level of education, farm size and farming experience. The constraints identified were inadequate fund, high cost of labour and high cost of farm inputs. It is recommended that a realistic policy on provision of credit to cowpea farmers in particular be put in place. Credit facilities should be accompanied with effective supervision and advice from the disbursing agency to ensure proper utilization of fund disbursed for increased cowpea productivity.*

Keywords*: Adoption, Cowpea, Production, Technologies, Taraba.*

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I. Introduction

Adoption is a decision made by an individual or group to use an innovation in a continuous manner (Orisakwe and Agomuo, 2011). Technology is the systematic application of scientific or other organized body of knowledge to practical purposes (Orisakwe and Agomuo, 2011). This includes new ideas, inventions, innovations, techniques, methods and materials. The importance of technology to agricultural development especially in less developed countries is widely recognized. This is predicted on the observed impact of technology and its potential and actual contribution to the development of agriculture. In developing countries like Nigeria where a greater proportion of the population live in rural areas, agricultural technology could provide a potential means of increasing production and subsequently raising income of the farmers as well as their standard of living (Ani,2002) cited in(Yindau,2014).

Cowpea (*vigna unguiculata (L) walp*) is a leguminous crop grown mainly in the savanna regions of the tropics and subtropics of Africa, Asia and South America (Sani *et al*., 2014). Being a drought tolerant and warm weather crop cowpea is well adapted to the drier region of the tropics where other food legumes do not perform well. It is of major importance to the livelihoods of millions of people in less developed countries of the tropics, particularly in Asia and Africa. From its production, rural families derive food, animal feed and income (IITA, 2009). Cowpea is also one of the most importance economic crops in the tropics for the fact that all of its parts are useful for human consumption and for the provision of livestock feed. The crop tolerates drought and performs well in a wide variety of soil. Similarly, the bacteria in the root nodules contribute to soil fertility through fixation of nitrogen in the soil and production of organic matter (Tijjani *et al*., 2015).

However, with the numerous benefits derived from adopting improved cowpea production technologies, so many farmers are not aware of these technologies. Inspite of the popularity and diverse

importance of cowpea, studies have reported declining production. For example, Tijjani *et al*; (2015) revealed decline in cowpea production in cowpea producing states of Katsina, Kano, Jigawa and Borno, due to problems such as outdated farming practices, parasitic weeds, insects and diseases. In view of the declining cowpea production in Nigeria, it becomes paramount to intensify efforts towards improving its production. This study thus becomes imperative because it seeks to assess the adoption of cowpea production technologies among farmers in Taraba State, Nigeria. Therefore, the objective is to:

i. describe the socio-economic characteristics of the cowpea farmers;
ii. identify cowpea production technologies available to the farmers and;
iii. assess farmers' extent of adoption of cowpea production technologies;
iv. determine the factors that influenced adoption of cowpea production technologies among the farmers; and
v. identify the constraints experienced by the farmers in the adoption cowpea technologies

II. Methodology

The Study Area

The study was conducted in Taraba State, Nigeria. Taraba state was created in 1991 and covers a land mass of 59, 400km^{2}with an estimated population of 2, 300,736 (NPC, 2006). The National Population Commission had projected an annual growth rate of 3.5% which brought the population figure to Three Million, One Hundred and Fifty Four Thousand, Six Hundred and Sixty-Four People (3,134,664) as at 2015. The state has sixteen (16) Local Government Areas and One special Development area which is divided into four agricultural zones namely Zone I, Zone II, Zone III, and Zone IV (TADP, 2016).

Taraba State lies between latitude $6^0$30' and $9^0$36' North and Longitude $9^0$10' and $11^0$50 East of the Greenwich Meridian (Taraba State Government, 2015). It is bounded on the north by Bauchi State and Gombe State in the North East. It is bounded on the east by Adamawa State and by Plateau State in the North-West. It is further bounded by Benue State in the West and shares an international boundary with the republic of Cameroon to the South and South West. The state has a tropical climate marked by dry and rainy seasons. The season starts in April and ends in October. The wettest months are August and September. The main annual rainfall ranges from 800mm in the north to over 2000mm in the south the main daily temperature recorded is 14.8^{0}C and the main maximum daily recorded is 34.4^{0}C (TADP,2016).

The dominant soil groups in the state ferruginous (gleyric, luvison, eutric, regosol and ferric luvisol) found in the north an entisols along the southern parts. The central part of the state is covered with vertisol and ultisol group (TADP, 2016). The vegetation of state is the guinea savannah type. The topography is essentially marked with mountainous land traversed by big rivers valleys such as Benue, Taraba, Donga, Bibinu the valley of Mambilla and Fali Mountains form part of this undulating land scale of the state.

Sources of Data and Sampling Procedure

Primary data were used for this study; the data were collected with the use of a structured questionnaire which was pre-tested using smaller group to ensure its reliability, before the full-scale administered to the respondents that were sampled in the study area on scheduled arrangement basis. The populations for the study were cowpea farmers in Taraba state.

In this study, Purposive and multi stage random sampling techniques were adopted in the selection of respondents. In the first stage, three agricultural development zones in Taraba agricultural development Programme (TADP) out of four were purposively selected. This includes zing (zone1), Wukari (zone2) and Takum (Zones3). In the second stage 20% of the local Government Area in each of the three zones were purposively selected because of their prominence in cowpea production, this include Ardo kola, Gassol and Donga. In the third stage, one block and 20% of the cells were selected from the three LGAs due to intensity of cowpea production to give a total of 10 cells. In the fourth stage snow ball technique were used to select 15 respondents from the selected cells. In all 150 respondents were selected for the study.

TADP Zones	**Block from Each Zone**	**No. of Block in Each Zone**	**Cell 20% of Cells Selected**	**Name of Cells Selected**	**No. of Respondent from Each Cell**	**Respondent Selected from the Zone**
Zing (Zone I)	Iware	14	3	Iware	20	20
				Zangonkombi	15	
				Mallam Ali	18	
Wukari (Zone II)	Mutumbiyu/ Gassol	20	4	Yerima	14	
				Mararraban Gassol	16	
				Tutare	13	
				Baba Hamsu	21	
Takum (Zone III)	Donga	16	3	Kapye	12	
				Akate	10	

				Kadarko	11
Total	**3**	**50**	**10**		**150**

Source: Field Survey, 2016.

Analytical Techniques

The data collected for this study was analyzed based on the number of questionnaires retrieved from the respondents. The data was subjected to descriptive statistics using frequency, percentages and Mean for objectives I, II, III and V while objectives IV was analyzed using logit multiple regression. {Software used in the analysis was special package for social science (SPSS)}.

Mean

$X = \Sigma fn$ where

$\overline{X}$= Mean score

Σ Summation

F = frequency of response mode

n = likert nominal value

Nr = number of response

The decision rule that served as basis for acceptance or rejection was determined thus; Decision rule (DR) of 3- point rating scale = (3 + 2 + 1)/3 = 2.0

The rating scale was used to determine the problem encountered by the farmers in the study area. A 3 point rating scale was used as follows very severe 3, severe 2, not severe 1.

To determine the cutoff point, a class interval of 0.05 was used to determine the upper limit of the mean.

The upper limit 2.0 + 0.05 = 2.05

The lower limit 2.0 – 0.05 = 1.95

Therefore responses with mean score $\overline{X}$ up to the above 2.00 were regarded as good while those mean score $\overline{X}$ below 1.95 were regarded as not so strong or good.

Regression model is the situation in which dependent variable (P) is predicted from two or more independent variables. It is used to determine the contributions of independent variables to the dependent variables. To determine the magnitude of each cowpea technology in explaining the variation in total adoption, the total adoption scores of the respondents were regressed on the adoption scores for various cowpea technologies. The order in which the technology were selected gives valuable information on the contribution of each technology in explaining the differences in total adoption of the farmers. This is why regression model were used in this study to analyze the factors that influence adoption of cowpea production technologies. The Multiple Logistic Regression Model is explicitly specified as follows:

$$P = \frac{\exp(b_0 + b_1X_1 + b_2X_2 + \ldots + b_pX_p)}{1 + \exp(b_0 + b_1X_1 + b_2X_2 + \ldots + b_pX_p)}$$

Where:

P = Adoption of recommended cowpea production practices (total number of recommended cowpea production practices adopted).

$X_1 – X_n$ = Independent variables

X_1 = Age (in years)

X_2 = Gender (male=1, female=0)

X_3 = Marital Status (Dummy: married = 1, single= 0)

X_4 = Farm size (hectares)

X_5 = Educational level (number of years in formal schooling)

X_6 = Farming experience (number of years in cowpea production)

X_7 = Household size (number of people in the household)

X_8 = Extension contact (number of visits in 2015)

b_1–b_8 = Regression coefficients

U = Error term

III. Results And Discussion

Socio-economic Characteristics of the Respondents

Age distribution of the Respondents

Farmers age is said to influence farmers' maturity and decision making ability (Sani *et al;*2014). Result of the study in Table 1 indicates that more than three quarters (84%) of the respondents were within the youthful age of between 20 to 49 years who are considered to be agile, more likely to adopt modern production technologies. It implied that farming was embraced by all the age group in the study area which is an advantage

for increased investment. This finding is similar to that of Sani *et al;* (2014) which indicated a relatively widespread dual purpose cowpea production among age group of farmers in Bichi Local Government Area of Kano State.

Gender of the Respondents

As shown table 1 majorities (94.7%) of the respondents were male, this implies cowpea production is determinate by male in the study. This is in agreement with the finding of Ayode, (2010) which showed that male predominated in the effectiveness of information sources on improved farm practices among cowpea farmers in Oyo State, Nigeria.

Marital Status of the Respondents

As indicated Table 1 shows that majority (92%) of the respondents were married while others were single and widow(er) respectively. This means that majority of the cowpea farmers in the zone were married. The high proportion of the respondents who were married was an indication that family labour could be available for cowpea farmers in the study area. This finding agreed with Abah and Tor, (2012) were they found that most of the cowpea farmers in Lafia Local Government of Nassarawa State were married.

Respondents Educational Attainment

It is a well known fact that, literacy level in rural Nigeria is low. The result obtained from this finding, therefore, is not much different from what is expected. Table 1 indicates that most of the respondents (50%) had acquired one form of education or the other. They can easily understand and adopt innovation. This finding is inconsistence with that of Onweremadu and Mathew (2007), and Sani *et al.,* (2014).

Respondents Farm Size

By classification of Shaib *et al;* (1997*)* cited in Agwu (2004*),* farm holdings in Nigeria fall into three broad categories namely: small scale, medium scale and large scale. Small Scale farmers are the majority (68%) of the respondents cultivate 0.10 – 5.99 hectares, while 8.6% are large scale cultivating 5-10 hectares. These finding differ from the finding of Agwu and Anyanwu, (1996) cited in Agwu (2004) that, cowpea farmers in south eastern Nigeria cultivated not more than 1.5 hectares. This implies that farmers in Taraba State cultivate relatively larger hectares than their counterparts in south eastern Nigeria. This may be for the fact that there is availability of land space in northern Nigeria. This is an advantage for adoption of modern cowpea production technologies.

Respondents Household Size

Most rural households in Nigeria are large because of the kinship structure and the extended family system Gbadegesin and Olorunfemi (2007). It is not surprising therefore that, more than half (56.8%) of the respondents household had between 6 – 20 or more members with the mean household size of 13 members as show in Table 1. This finding closely related to Sani *et al*; (2014) who reported 8 persons as an average household size in the adoption of dual purpose cowpea production. Ekwe and Nwachukwu, (2006) also reported that the average household size in Africa was 8-9 persons per household. This is highly indicative of the extended family system in the study area where parents and other relation dwell together as a household. The implication of this finding is that large family size of the farmers probably necessitated them to lean new agricultural technologies for augmenting production and increasing returns. More family labour would also be readily available since relatively large household size is an obvious advantage in terms of labour supply.

Respondents Farming Experience

As indicated in Table 1, Majority (53.9%) of the respondents had 6-15 years of farming experience. The mean farming experience was 11years. This indicated that, the farmers were experienced enough to be able to understand the technologies and adopt it. The length of experience in farming is probably an indicator of a farmer's commitment to agriculture. It may not necessarily pre-dispose them to adoption of new practices. It is more logical to expect veteran farmers to be less receptive to innovation. Long farming experience is an advantage for increasing farm productivity since it encourages rapid adoption of farm innovation, long experience according to Obinne (1991)and Sani *et al*; (2014) is an advantage for increasing farm productivity.

Respondents Access to Extension Service

Adoption of cowpea production technologies is highly facilitated by the efforts of extension workers in introducing and demonstrating to the farmer how to use the technologies *(*Bzugu and Gwary, 2004 cited in Tijjani *et al*., 2015). However, all (100%) respondents indicated they had no contact with the extension agents but adopt the practice on their own or with the help of fellow farmers. This lack of farmers contact with extension agents negates the theoretical role extension agencies supposed to play in technology diffusion and adoption Tijjani *et al.,* (2015) which may be due to inadequacy or insufficient logistics for the extension worker to reach the farmer or incompetency of the personnel to be conversant with technical aspect of the technology.

Table 1: Distribution of Respondents based on Socio-economic Characteristics (n=150)

Socio-economic Variable	Frequency (F)	Percentage (%)
Age(Years)		
20 – 29	28	18.7
30 – 39	69	46.0
40 – 49	29	19.3
50 – 59	17	11.3
≥ 60	7	4.7
Gender		
Male	142	94.7
Female	8	5.3
Marital Status		
Married	138	92.0
Single	8	5.3
Widow(er)	4	2.7
Divorce	-	-
Educational Level		
Non formal Education	75	5.0
Primary Education	25	16.7
Secondary Education	33	22.0
Tertiary Education	17	11.3
Farm Size		
0.1 – 5.99	102	68.0
6 – 9.99	35	23.3
10 – 15.99	8	5.3
16 – 20	2	1.3
> 20	3	2.
Household Size		
1 – 5	56	37.8
6 – 10	64	43.2
11 – 15	16	10.7
16 – 20	6	4.1
> 20	6	4.1
Years of Farming Experience		
1 – 5	18	12.0
6 – 10	47	31.3
11 – 15	35	23.3
16 – 20	18	12.0
> 20	32	21.3
Access to Extension Service		
Yes	0	0
No	150	150

Source: Field Survey, 2016.

Cowpea Production Technologies

The percentage of the adoption rate of the eleven-cowpea production technologies among farmers are presented in Table 2, highest (99.3%) adoption percentage was recorded for land preparation. This is not surprising as it is well known that, the yields of cowpea varieties are generally decreases without proper land clearing and cultivation procedures. Hence, the high level of adoption associated with this technology implies that farmers in the study area were aware of the fact that proper land preparation in their cowpea farms provides an attractive opportunity for them to make better economic gain of recommended spacing and planting date and storage techniques recorded 98.7% and 97.3% respectively while seed rate and used of herbicide for weed control recorded 95.3% and 96% respectively. For mechanize farming use of tractor for land preparation and pesticide to control pest on cowpea farms recorded.94% and 90.4% respectively. Field practices showed that the use of tractor for land preparation was more popular than the use of ox-drawn plough for land preparation among the respondents because tractor cultivates larger hectares within shorter period and has ability of turning soil than oxen with minimum energy required. Furthermore fertilizer application and seed treatment recorded 69.3% and 58% respectively. The low adoption 8% recorded for improves seed may be associated to the low level of awareness of the technology among the respondents.

Table 2: Cowpea Production Technologies (n = 150)

Technologies	Frequencies	Percentage	Ranking
Land preparation	149	99.3	1
Spacing and Planting Date	148	98.7	2
Storage	146	97.3	3

Seed rate		143		95.3	4
Herbicide		142		94.7	5
Mechanized farming		141		94.0	6
Pesticide		136		90.7	7
Fertilizer application		104		69.3	8
Harvesting		102		68.0	9
Seed Treatment	87		58.0		10
Improved seed	12		8.0		11

Source: Field Survey, 2016.
**Multiple responses*

Extent of Adoption of Cowpea Production Technologies

This section discusses the extent of adoption of cowpea production technologies among the respondents. Using a five steps (awareness to adoption) adoption model; the technologies discussed here in the cowpea production package are used of improved seeds, herbicide, pesticide, seed treatment, mechanized farming, spacing and planting date, fertilizer application, land preparation and seed rate.

Adoption of Improved Seed

Table 3 revealed that 56.7% of the respondents were aware of the improved cowpea varieties but are yet to start using it, 26.7% and 5.3% were at the interest and evaluation stage. About 3.3% of the respondents were at the trial stage in the adoption of this technology while 8% of the farmers have already adopted the technology. This means that majority of the respondents were yet to adopt the use of improved cowpea varieties. Cowpea varieties introduced in the study area include; IT 94K-440-3, IT 90K-82-2, IT93- 452-1 and IT 96D-757. Here it is necessary for extension workers to improve the levels of awareness of practice this is based on the fact that when there is an increase in the awareness of these practices there will be need for more information regarding the practice by the farmers, which might further increase the adoption rate of the technology.

Adoption of Herbicides as Measures for Controlling Weeds

Table 3 also shows that, majority (99.3%) of the farmers have adopted herbicide as one of the major means of controlling weeds. None of the respondents was of the awareness, interest and evaluation of these technologies. 0.7% were at the trial stage it therefore, means that majority of the respondents applied herbicides in their farms to control weeds. Insect pests and diseases are harmful to cowpea plants and the products, therefore, farmers applied chemicals on the plants and after harvest before storage (postharvest treatment). Most of the respondents reported to have adopted the use of chemicals on farms and during post harvest storage.

Adoption of Pesticide as Measure for Controlling Insect Pest

Based on the analysis in Table 3, it could be depicted that 74.7% of the respondents adopted the recommended pest control measure on their farms. About 14.6% were at trial while 6.7% were at evaluation stage those who were at the interest stage constituted 2.7% of the respondents, with 1.3% being at the awareness stage. This indicated that all farmers are in one stage or the other in the adoption of pest control measures.

Adoption of Seed Treatment

Furthermore, table 3 indicated that majority (87.4%) of the farmers had adopted the practice while 5.3% and 3.3% were at the stage awareness and trial. About 1.3% and 2.7% of the respondents are at the interest and evaluation stage. The reason for this level of adoption could be that the practice was simple and it is very effective in controlling insect, rodents and birds that hinders the germination of the seeds after sowing. Respondents revealed that they treated cowpea seed with chemicals such as FANASON D., Apron-Plus and Aldrex T. This is to avoid pests and diseases attack.

Adoption of Mechanized Farming

Based on the revelation from Table 3, the majority (96.6%) have adopted the technology of using tractors than oxen for land preparation which was more popular among the farmers. Thus some (0.7%) are on awareness; interest and evaluation while 1.3% are on trial stage of their technology. These could attributed to the fact that majority of the farmers own from 0.1 to 9.99 hectares requires tractors to cultivate within a shorter period than oxen

Adoption of Spacing and Planting Date of Cowpea

The recommended date for planting of cowpea in the study area is early August through September. This is when the rain is relatively steady. Table 3 shows that 64% of the farmers had adopted the recommended term for planting of cowpea, 4.7% were aware of the technology, 9.3% were at the interest stage while 16.7% and 5.3% were at the evaluation and trial stage respectively. This means that majority of the respondents have adopted the term of cowpea planting in the zone. Cowpea requires a seed rate of approximately 25.30kg/ha (viable seeds) with a spacing of 20 x 75cm for erect varieties and 50 x 75cm for the spread types at 2 seeds per hole 4-5 cm depth.

Adoption of Fertilizer Application

The recommended inorganic fertilizer rates for cowpea production are single super phosphate before planting at $200kg/ha^{-1}$. Table3 indicated that 8% of the respondents were aware of technology, 10% are at the interest stage of the adoption of inorganic fertilizer application rate for cowpea production. About 18% and 5.3% were at the evaluation and trial stage respectively while majority (58.7%) had adopted the technology. The farmers indicated that the soil was fertile enough for cowpea production and they would use available inorganic fertilizer on their cowpea farms.

Adoption of Land Preparation

Notwithstanding, table 3 highlighted that 98.7% of the farmers had adopted land preparation. 1.3% were at trial stage none of the respondent was at the stage of awareness, interest and evaluation of this technology. It's therefore means that majority of the respondents practice land preparation on their cowpea farm before planting. Use of tractors and OX-Plough were reported to have been used by respondents Field clearing is done by the use of cutlasses, rakes, hoes and axes as reported by the respondents.

Adoption of Seed Rate

Finally, table 3 showed the distribution of farmers based on the stages in the adoption of seed rate as planting material for cowpea production. The recommended seed rates are 2 to 3 seeds per hole. The table shows that 1.3% of the respondents were at the evaluation and 2% were at the trial stage majority of the respondents 96.5 had adopted while none of the respondents were at the awareness and interest stage.

Table 3: Extent of Adoption of Cowpea Production Technology

Cowpea Technologies	Stages of Adoption				
	Awareness	**Interest**	**Evaluation**	**Trial**	**Adoption**
Improved seed	56.7	26.7	5.3	3.3	8
Herbicides	0	0	0	0.7	99.3
Pesticides	1.3	2.7	6.7	14.6	74.7
Seed treatment	5.3	1.3	2.7	3.3	87.4
Mechanized farming	0.7	0.7	0.7	1.3	96.6
Spacing and Planting date	4.7	9.3	16.7	5.3	64
Fertilizer application	8	10	18	5.3	58.7
Land preparation method	0	0	0	1.3	98.7
Seed rate	0	0	1.3	2	96.7

Source: Field Survey, 2016.

Logit multiple Regression of Some Variables Influencing Adoption of Cowpea Production Technologies among Farmers in the Study Area.

The factors influencing the adoption of cowpea production technologies were evaluated using multiple (Logit) regression analysis where four functional forms were tried and linear function gave the best fit. The result is presented in table 4 which revealed that the coefficient of multiple determinations (R^2) was 0.79 implying that about 79% of the variations in the adoption of cowpea production technologies were explained by variables in the models. Z value was statistically significant at 1% which also showed model fit.

The coefficient for (X_1) was positive and statistically significant at 1%. The positive coefficient of age means that there is direct relationship between adoption of cowpea production technologies and age of the farmers. Age is said to be primarily latent characteristics in adoption decisions. However, there is contention on

the direction of the effect of age on adoption. Age was found to positively influence adoption of cowpea. The farmers' age can increase or decrease the probability of adopting cowpea production technologies.

The coefficient of gender was negative and not statistically significant. This implies that gender is not a factor influencing adoption of cowpea production technologies in the study area. This agrees with the appriori expectation that irrespective of one gender he or she could adopt cowpea production technologies. There was a positive significant relationship between marital status (X_3) and adoption of cowpea production technologies in the study area. This could be explained for the fact that, married farmers have more responsibilities to catered for their families which could stimulate them to adopt the new technologies in order to enhance their farm yield. The coefficient of household size was positive and statistically significant at 1% level. This agrees with the appriori expectation, that the large household size could supply cheap family labour which positively enhances adoption of cowpea production technologies in the study area. The coefficient of educational level (X_5) was also found to be positive and statistically significant at 1%. The positive coefficient of educational status means that there is a direct relationship between adoption of cowpea production technologies and educational status, whereby as educational status increased adoption level also increased among farmers. This agreed with appriori expectation that the higher the educational level the higher the level of adoption. Low level of education of the farmers is inimical to the adoption of innovation especially for technologies that are complex.

The coefficient in farm size was positive and statistically significant at 1% level. The positive coefficient implies a direct relationship that as farm size increases, adoption of cowpea production technologies increase and vice-versa. In other word, the larger the farm size the higher the potential of adoption, these agree with the appriori expectation that large farmers in comparison to small farmers adopt improved technologies at a faster rate. It will be difficult to used mechanized farming system on small and fragmented individual farms. Small scale farmers live at subsistence level which may discourage them from adopting improved technologies probably because of financial constraints. The table further revealed that years of farming experience was found to be important in influencing the likelihood of adoption of cowpea production technologies. The variables was found to be statistically significant at 1% level and positively related with likelihood of adoption. Most farmers fear trying improved technology because they do not have previous experience in applying the new technology and due the possible risk of failure. Years of farming experience could enable the farmers to have courage in adopting the technology as it confirmed appriori expectation. However, the studies of Ajala (1992) and Ikini *et al*; (1998) cited in Agwu (2004) show that age, farming experience and organizational participation significantly influenced adoption. The difference might be the type of technologies studied among other factors.

Furthermore, this result conformed to the findings of Salau *et al*; (2010) who reported in their study of assessing adoption level of diffused light storage technology among irish potato farmers in Jos South Local Government Area of Plateau State. The logistic regression result showed that farmer's age, education, income and farm size are significant determinants of adoption. Similarly, Isibor and Ugwumba (2014) applied logistic regression model in their study on adoption of oil palm production technologies in Ihiala Local Government of Anambra State, Nigeria. The found out that farm size, educational level and annual farm income were positively significant.

Table 4: Logit Multiple Regression Result of some Factors influenced Adoption of Cowpea Production Technologies

Variables	**Regression Coefficient**	**Standard Error**	**Z-Statistics**	**Prob.**
X_1(Age)	0.119036	0.234414	0.5077800	0.0016**
X_2 (Gender)	-0.023008	0.284920	-0.087520	.1256
X_3 (Marital Status)	6.076718	0.173239	0.442848	0.6579
X_4 (Household Size)	9.019533	0.205743	0.094939	0.0004**
X_5 (Level of Education)	21.026517	0.161526	0.164168	0.0016**
X_6 (Farm Size)	10.0196631	0.082606	0.237648	0.0022**
X_7 (Farming Experience)	0.053827	0.166034	0.324189	0.0058**
C	-3.067822	6.759884	0.453828	0.0002
R – Squared	0.794265			
Adjusted R – Squared	0.782083			
F – Value	65.20157			
1%level of significance**				

Source: Field Survey Data, 2016.

Constraint Affecting the Adoption of Cowpea Production Technologies

This section discusses the constraint affecting the adoption of cowpea technologies by the farmers. The constraints discussed here are in adequate funds, high cost farm inputs, high cost of labour, lack of improved

seeds, poor price of the product, inadequate storage facilities, pest and disease attack, inadequate transportation facilities, unfavourable weather condition, lack of awareness and harvesting problems.

The result in table 5, shows that inadequate funds is the most very severe constraints encountered by cowpea farmers in the study area which ranked first with a means score of(2.82), follow by high cost of labour 2.31, high cost of farm inputs 2.26, harvesting problem 2.16, lack of improved seed 2.08, pest and disease attack 2.04, inadequate storage facilities 1.81, lack of awareness1.78, inadequate transportation facilities1.74, unfavourable weather condition 1.41, and poor price of the product 1.36 respectively. This implies that inadequate fund is the most severe problem encountered by cowpea producers in the study area. The result concurred with that of Ibrahim *et al.,* (2016) they observed that lack of input, financial constraint, poor storage facilities and lack of implement were the major constraint to adoption of cowpea production technologies among farmers in Askira/Uba Local Government area of Borno State Nigeria.

Table 5:Distribution of the respondents based on the constraints experienced in the adoption of cowpea production technologies.

Constraints	Very Severe	Severe	Not Severe	Score	Ranking
Inadequate funds	127(84.6)	19(12.7)	4(2.7)	2.82	1
High cost of farm inputs	46(30.7)	98(65.3)	6(4)	2.26	3
High cost of labour	53 (35.3)	91 (60.7)	6 (4)	2.31	2
Lack of improved seed	49 (32.7)	65 (43.8)	36 (24)	2.08	5
Poor price of the product	6 (4)	87 (87.3)	13 (8.7)	1.36	11
Inadequate storage facilities	11 (7.3)	110 (73.3)	19 (12.7)	1.81	7
Pest and Disease attack	37 (24.7)	88 (58.7)	25 (16.6)	2.04	6
Inadequate transport facilities	11 (7.3)	89 (59.3)	50 (33.3)	1.74	9
Unfavourable Weather Cond.	11 (7.3)	40 (26.7)	99 (66)	1.41	10
Lack of Awareness	17 (11.3)	84 (56)	49 (32.7)	1.78	8
Harvesting Problem	18 (12)	128 (85.3)	14 (9.3)	2.16	4

Source: Field Survey, 2016.

IV. Conclusion

On the bases of the major findings of the study, the following conclusion and implication are drawn. Majority of the farmers were middle-aged and averagely literate, implying that, many of them were in a good position to be aware of understand and adopt the cowpea production technologies. They were predominantly males, with long period of farming experience. Additionally most of them were married and had average household size of six members, which is fairly large. This is expected to serve as an incentive to continue adoption of cowpea production technologies since supply of labour is ensured. The farmers also had mostly small farm holdings and had indicated never have contact with extension. In terms of the level of awareness of the cowpea production technologies, it was concluded that majority of the farmers were aware of cowpea production technologies. With regard to the extent of adoption of cowpea production technologies majority of the farmers had adopted herbicide, pesticide, seed treatment, mechanized farming well others are at the awareness, interest, evaluation and trial stage of the technologies. This implies that the extent of adoption of the cowpea production technologies was fairly good. The variable which significantly influenced the adoption of the cowpea production technologies were age, marital status, level of education, farms size and years of farming experiences. The study concluded that there are production complexity problem, economic problems, poor technical information and pathological problems constraining the increase adoption of the cowpea production technologies. This suggest the need for researchers, policy makers and administrators of extension services to consider seriously these issue which constitute limiting factors to increase cowpea production in the study area.

V. Recommendations

Based on the findings of this study, the following recommendations were suggested:

i. The extension agents should use the group approach in extension service delivery and identify farmers that should be taught the technical skill involved in the cowpea production technologies. In this way a large number of farmers would be reached at the same time. These farmers would in turn teach these technologies to other farmers in the area.

ii. The poor economic condition of the farmers occasioned by lack of funds to carryout necessary farm activities associated with cowpea production technologies, among other variables, was major constraints to the production capacity of the farmer were handicapped in this area. Thus, even though the issue of provision of credit is an intractable problem in Nigeria agriculture, it is suggested that a realistic policy on provision of credit to cowpea farmers in particular be put in place. The Government may have to revisit this

issue. Once this is done, the credit facilities must be accompanied with supervision and advice from the disbursing agency to ensure their proper utilization for increase cowpea production.

iii. Farmers should be encourage to participate actively in farmers/social organization and co-operative societies in order to strengthen their group action, since such organization act as effective channels for extension contact with larger number of farmers. It also creates opportunity for participatory interaction of farmers with extension organization further more. Co-operative societies help in providing marketing facilities for the mutual benefit of the famers.

iv. Loans should be made available to farmers so as to enable them procure farm inputs and mechanized services for improved agricultural production. Farm inputs such as fertilizers, chemicals and improved seeds should be made available to farmers at subsidized rate before the onset of rainy season by government.

v. Modern storage facilities should be introduced to farmers in order to reduce post harvest loss as a result of pest attack.

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