Assessment of Preferred Pest Control Method among Cowpea Farmers in Guinea-Savanna Agro-ecological Zone, Nigeria

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Abstract

Cowpea is a major crop consumed by households in Nigeria and sub-Sahara Africa but pest threatens production at economic threshold in both quality and quantity terms. Farmers made frantic and professional efforts to check the menace using different methods but in some cases used combined control method in order to increase cowpea output. The study assessed the preferred pest control methods adopted by cowpea farmers in the guinea-savannah agro-ecological zone of Nigeria. A total of 155 respondents were selected using well-structured copies of well-structured and pre-tested copies of questionnaire and multistage sampling procedure. Result of socioeconomic characteristics of the respondents revealed the average age (46.5years), farming experience (27.3 years), household size (9 members), extension contacts (6 times) and annual revenue (N655, 154.52) among others. Input and pest statistics revealed mean values of pest control cost (N15, 290.77), seed used (47.6kg), agrochemicals (9.8 litres) and number of pests species/farm (2). Multinomial results revealed chemical method with reference to manual method indicated reduction in the use of chemical method as caused by cooperative membership (p<0.01), marital status(p<0.05) and sex (p<0.05) while the use of both methods(manual and chemical) with reference to manual method indicated that cooperative(p<0.05) decreased the use of both methods. High pest incidence was ranked first by cowpea farmers among all highlighted constraints to cowpea in the study area based on the result of Likert scale rating index, while specifically, sucking pod insect was rated highest among the pests attacking cowpea generally on cowpea farms. Hypothesis tested on the relationship between quantity of cowpea output and pest management method was significant at 1% indicating that there is a significant relationship between adopted pest control method and cowpea output among farmers. It was recommended among others that farmers should be exposed to more extension education and also encouraged on cooperative membership for sufficient education on pest control.

**Keywords:** Pest, Cowpea, Control Method, Guinea Savannah, Multinomial Logit

Introduction

Cowpea (*Vigna unguiculata*) is a food and animal feed crop grown in the semi-arid tropics covering Africa, Asia, Europe, the United States, and Central and South America (FAO, 2017). It originated and was domesticated in Southern Africa and was later moved to East and West Africa and Asia. More than 7.4 million hectares of dried cowpeas are produced worldwide with Africa producing nearly 7.1 million which forms approximately 96% of total production. It was being estimated that about 3.3 million tons of cowpea dry grains were produced worldwide in year 2000 (FAO, 2002). Nigeria produced 2.1 million tons of this, making it the world's largest producer, followed by Niger (650,000 tons) and Mali (110,000 tons) (International Institute of Tropical

Agriculture-IITA, 2004). Despite the importance of cowpea production in the West Africa, savannas is faced with numerous constraints such as pests, diseases, parasitic weed *Striga generiosides*, poor soil fertility and intermittent drought (Singh and Tarawali, 1997). The combination of these stresses can cause complete crop loss if not properly managed. Researchers in the sub-region have developed several varieties that are either resistant or tolerant to these stresses (Arega and Singh, 2003; Adegbite and Amusa, 2008). Kormawa (2018) noted that these pest and diseases resistant varieties coupled with improved management practices are capable of increasing crop yield. The following specific objectives are stated to; describe socioeconomic characteristics of cowpea farmers, identify factors influencing choice of most-preferred pest control method among farmers and examine constraints militating against cowpea production. The hypothesis tested was stated in the null form as: there is no significant relationship between types of cowpea pest control and the quantity of cowpea produced.

Methodology

The study was carried out in Niger State in the middle-belt agro-ecological zone of Nigeria. It is characterized by modal rainfall (650mm-1050mm) and mean annual temperature (320C-340C). Cowpea is one of the prevalent and notable crops cultivated in the area with high and quality yield. The population of the State is 3,950,249(National Population Commission, 2006) with a
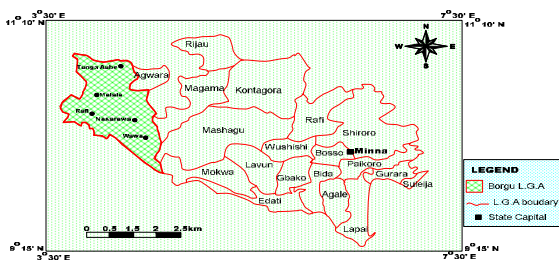
high percentage of households as farmers, either as major or minor occupation. Data used was primary and cross-sectional which were collected with 155 copies of questionnaires, which were administered by trained enumerators. Tools of analysis were descriptive statistics, multinomial logit, Likert scale ratings and student t-test as instrument of testing hypothesis.

Figure 1: Map of the Study Area.
Source: Ministry of Information,

Multinomial logit is stated following Gujarati and Porter (2009):

$$\text{II}_{jk} = \frac{\exp(\beta'_k X_j + \theta' z_{jk})}{\sum_{i=1} \exp(\beta'_1 X_j + \theta' z_{jl})}$$ where, β: vector of parameters to be estimated; x: dependent variables

Results and Discussion

Socioeconomic Characteristics of Cowpea Farmers

Socioeconomic characteristics results of the respondents in Table 1 reveals the average age, years of experience, household size, extension contact and revenue were 46.5years, 27.3years, 9members, 6 contacts and N655,154.52 respectively. These results suggest that, cowpea farmers are active with good number of years that enhanced efficient performance. Household size was fairly large for the purpose of family labour use while extension contact was 25% of the total and recommended seasonal contacts of 24 times. Seasonal revenue of cowpea farmers was fairly high and the amount realized is proportional to their farm size and incurable cost as small scale farmers.

Table 1: Socioeconomic Characteristics of Cowpea Farmers

Variable	Age(in yrs)	Exp.(in yrs)	HHsize(No.)	Ext.Cont.(No)	Rev.(in N)
Mean	46.5	27.3	9	6	N655,154.52

Note: Exp.: Experience; HHsize: Household size; Ext. Cont.: Extension contact; Rev.: Revenue
Source: Field Source: Field Survey, 2021.

Determinants of Pest Control Method Adopted by Cowpea Farmers

Result for determinants of most preferred pest control method among cowpea farmers is shown in Table 2. Likely ratio (42.50) was significant at 1% showing appropriateness of the model used. Cooperative membership, marital status and sex significantly decreased chemical method in favor of manual method of pest control. Also, years of education significantly increased use of both the chemical and manual methods relative to manual method, while cooperative membership decrease the use of manual and chemical method in favor of manual method significantly.

Table 2: Maximum Likelihood Estimation of Pest Control Method Adopted by Cowpea Farmers

No. of Obs.(155), LR-2(18)-(42.50),	Prob.>chi2 (0.009)	Pseudo R^2(0.1485)	LL(121)			
Pest Control Method	**Coeff.**	**S.E**	**p>/z/**	**Coeff.**	**S.E**	**p>/z/**
Chemical				**Both**		
Constant	0.7775	-0.97	0.309	0.1267	0.11	0.912
Education Level(in years)	0.4562	0.77	0.439	1.4537*	1.80	0.071
Variety of Seed(Hybrid=1;OPV=0)	0.3105	0.57	0.567	-0.8738	-0.77	0.441
Type of Pest(Insect=1; Rodent=0)	-0.7138	-1.26	0.209	-15.5347	-0.01	0.989
Extension Contact (in No.)	-0.2241	-0.54	0.587	-0.3541	-0.57	0.568
Cooperative Memb.(Yes=1; No=0)	-1.7221***	-3.62	0.000	-1.8499**	-2.42	0.016
Marital Status(Married=1; Others=0)	-1.2378**	-2.26	0.024	-0.0490	-0.07	0.944
Sex(Male=1; Female=0)	-0.9801**	-2.33	0.020	-0.8009	-1.22	0.221
Farm size (in Ha)	0.3435	1.22	0.223	-0.0229	-0.05	0.958
Household Expenditure(in Naira)	$-1.16e^{-6}$	$1.19e^{-6}$	0.331	$-1.07e^{-6}$	-0.54	0.591

Note : Manual*(Base Outcome);* ***, ** & * show significant levels @ 1%, 5% & 10% respectively.
Source: Field Source: Field Survey, 2021

Constraints Militating Cowpea Production

Constraints associated with cowpea production among farmers in the study area are presented in Table 3. High pest incidence, high incidence of theft and shortage of extension contacts were the first three problems ranked successively by the respondents. Pests such as Maruca spp reduced yield significantly while theft also reduce the expected harvest of farmers which if otherwise could have increased marketable surplus significantly, and in turn, better income.

Table 3: Constraints Associated with Cowpea Production among Farmers

Constraint	SA	A	U	D	SD	Mean	Rank
High pest incidence	82(41.0)	79(39.5)	25(12.5)	9(4.5)	5(2.5)	4.12	1st
High incidence of theft	61(30.5)	107(53.5)	12(6.0)	8(4.0)	12(6.0)	3.98	2nd
Shortage of extension services	76(38.0)	83(41.5)	11(5.5)	18(9.0)	12(6.0)	3.96	3rd
High cost of seed	52(26.0)	74(37.0)	27(13.5)	30(15.0)	17(8.5)	3.57	9th
High cost of labour	34(17.0)	75(37.5)	38(19.0)	30(15.0)	23(11.5)	3.56	8th
High cost of agrochemicals	39(19.5)	76(38.0)	42(21.0)	30(15.0)	13(6.5)	3.58	7th
Poor market	22(11.0)	48(24.0)	35(17.5)	51(25.5)	44(22.0)	2.77	10th
Climatic effect	56(25.0)	74(37.0)	35(17.5)	25(12.5)	16(8.0)	3.59	6th
Insecurity	63(31.5)	88(44.0)	23(11.5)	17(8.5)	9(4.5)	3.90	5th
Lack of credit facility	66(33.0)	81(40.5	33(16.5)	11(5.5)	9(4.5)	3.92	4th

Source: Field Survey, 2021   *Note: SA=Strongly Agreed; A= Agreed; U=Undecided; D=Disagreed; SD= Strongly Disagreed*

Extension contact affected farmers as a great number of them were denied extension contacts in the previous planting season as this reduce access to innovation and skills. Lack of credit facilities, and insecurity and climatic effect were ranked fourth, fifth and sixth constraints. Cowpea farmers' seasonal production was financed from personal savings and private money lenders at high interest rate which increased cost and in the long run reduced profit margin. Insecurity also prevents farmers from full presence on the farm on-season and this hinder the level of performance required of them hence low efficiency. Torrential rainfall also affect output as heavy down-poor cause flower to wider, hence low yield. The least of the ranked constraints is poor market for output which invariably means low sales which result in low seasonal income.

Prevalent Cowpea Pests

Ranking of prevalent pests in cowpea farms are presented in Table 4. Sucking bug which attacks pod mostly in the area of sucking fluid which results in loss of beans in the pod. Legume pod borer was ranked second. They bore into the pod by eating and destroying it. Cowpea aphid (*Aphis craccivora*) ranked third among the prevalent pests which is a major natural vector of viral disease that results in total loss of crop. Flower bug thrips and foliage beetle also destroy both flower which produce pod and destroy cowpea plant vegetative part hence reduction in photosynthetic potentials of the cowpea.

Table 4: Distribution of Prevalent Pests of Cowpea in the Study Area

Pest Type	Frequency	Percentage	Rank
Legume pod borer	34	21.9	2nd
Cowpea Aphid	30	19.4	3rd
Foliage beetle	26	16.8	5th
Sucking bug	36	23.2	1st
Flower bud thrips	29	18.7	4th
Total	**155**	**100.0**	

Source: Field Survey, 2021.   Note: *Multiple selections are allowed.*

Test of Hypothesis

Test of relationship between cowpea output and pest management method is presented in Table 5. The null hypothesis is rejected and the alternate hypothesis was accepted that, there is a relationship between cowpea output and cost of pest control expended by farmers. It could be inferred from this result that the more the pest infestation, the more the cost incurred in controlling them, and also, reduction in output and revenue.

Table 5: Test of Hypothesis on Relationship Between Cowpea Output and Pest Management Method.

Variable	t	Degree of Freedom	Sig.(2-Tailed)	Mean Difference
Cowpea Output	29.069	154	0.000	567.019
Pest mgt method	28.928	154	0.000	1.548

Source: Field Survey, 2020

Conclusion and Recommendation

It could be concluded from this study that, pest control method plays a significant role in the quantity of output adopted by farmers. It was recommended among others that farmers should be exposed to more extension education and also be encouraged on cooperative membership for sufficient education on pest control.

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