E-ISSN: 2346-7290

Farmers' utilization of extension services on Bambaranut (*Vigna subterranea*) production in Nsukka agricultural zone of Enugu state, Nigeria

[1]Ukoha, J. C. I.*, .[1]Ekumankama, O. O., [2]Onyiba, P. O. and [1]Nwachukwu, H. C.

[1]Department of Agricultural Extension and Rural Development, Michael Okpara University of Agriculture, Umudike, P.M.B. 7267, Abia State, Nigeria
[2]National Root Crop Research Institute, Umudike, Abia State, Nigeria

*Corresponding author (Email: joyciroukoha@gmail.com; Phone: +234 703 806 1058)

ABSTRACT

The study focused on the utilization of extension services on Bambaranut production by farmers in Nsukka Agricultural Zone of Enugu State, Nigeria. Specifically, it described the socio-economic characteristics of Bambaranut farmers; ascertained the extension services that are available to them; determined the level of use of extension service packages; and ascertained the constraints to effective utilization of extension services on Bambaranut production in the area. A multistage sampling technique was used in the selection of 120 respondents from Bambaranut farmers. Data were collected with questionnaire and analysed using both descriptive and inferential statistics which include frequencies, percentages, mean and multiple regression. The result shows that eight different extension service packages on Bambaranut production were made available to farmers. They are: Provision of information on market, Fertilizer/organic manure application, Supply of improved nut varieties, chemical application, Information on loan/credit opportunities, Storage, Field preparation/harvesting; and Water management technologies. However, the level of use was low, with a grand mean score of 1.88 below the bench mark mean of 2.50. The findings also showed that inadequate subsidies and grants from the government ($\bar{x}$=3.61) was the major constraint while the multiple regression result shows that age was negatively significant (-2.720), farming experience (2.945) and farm size (2.532) were positively significant; therefore, the null hypothesis was rejected. The study concluded that there was no effective use of extension services on Bambaranut production by farmers. Hence, it recommended that government should provide grants and subsidies to Bambaranut farmers to encourage utilization of the extension services.

Key words: Farmers' utilization, extension services, Bambara nut production

INTRODUCTION

Information is an indispensable factor in agricultural practices and it is the basis of extension service delivery. Agricultural extension service agency is one among other institutions that can make a difference in rural development (Ukoha and Okonkwo, 2017).Their roles are the dissemination of improved technologies to farmers among other services. According to Agbarevo (2013), farmers often perceive extension service delivery as an essential tool for improvement in agricultural production. Extension services consist of different activities that provide the information and services needed by farmers and other actors in rural setting to assist them in developing their own technical, organizational, management skills and practices so as to improve their livelihood and wellbeing (Abou, 2015). Abou, (2015) further classified extension services into three, namely: technology transfer, advisory services and facilitation which aim at helping farmers define their own problems and develop their own solutions.

The goal of agricultural extension services in Nigeria is to facilitate farmer's acceptance of improved technologies while the ultimate goal of agricultural extension is to improve standard of living through the transfer of improved farming practices to the rural people. There have been efforts in the last 20 years to avail farmers with beneficial research based agricultural technologies but they do not seem to have yielded the expected impact (Ekumankama, 2019). Nevertheless, Nmadu, *et al*. (2015) opined that the efficiency of extension organizations in providing information to farmers on improved technologies will play a significant role in the level of farmers' innovation uptake with respect to crop production. This of course affects extension service delivery efficiency.

Extension service effectiveness indicators are used to assess the effectiveness of extension personnel. Hence, extension effectiveness may be determined by the level of awareness of extension services created among the farmers, number of visits by the field extension agent to farmers percentage of scheduled meetings held between farmers and extension workers, number of field meetings held, regularity of meetings held by the extension workers, number of field days organized by extension worker, monthly or quarterly, etc., number of demonstrations organized by the extension worker within specified time frame (monthly, quarterly, annually), number of supervisory visits, number and regularity of research-extension linkage workshops and farmer training sessions/farmers trained. Therefore, increase in the frequency of extension contacts could as well lead to an effective extension service delivery (Ukoha and Nzeakor, 2016). However, Nnadozie *et al* (2015) and Nwosu and Nwachukwu (2013) observed that the extension delivery has recorded poor performance with regard to extension effectiveness indicators, especially with regard to farming systems research and farmer training programmes, which have been identified as weak links in the agricultural extension delivery in Nigeria. Furthermore, Ekwe *et al*., (2015) noted that there have been dwindling trends in the provision of all types of extension services. Similarly, most technologies transferred to farmers are not economically beneficial, therefore are inappropriate for farm level application; Nwosu and Nwachukwu (2013) agreed that the actual conditions and circumstances of the resource poor farmers who are the intended beneficiaries are not taken into consideration when the technologies were being generated. They do not meet farmers' needs and are sometimes socially unacceptable to the resource poor farmers. Furthermore, Ekumankama and Anyanwu (2018) reiterated that the technologies being introduced to the farmers are viewed as being taken for granted and so are frontline extension workers who are the change agents.

Bambara nut (*Vigna subterranea*) is an African indigenous pulse that is predominantly cultivated in sub-Saharan Africa by small scale farmers. This crop is commonly cultivated for its nutritional benefits and high tolerance to drought stress unlike other essential legumes (Mabhandhi *et al*., 2018). Similarly, Obidiebube *et al.*, (2020) observed that Bambara groundnut is resistant to pest and diseases and can grow on poorly drained soils where many other crops cannot thrive.

It has been referred to as an indigenous solution to Africa's food crisis, because it provides an almost complete food source (Jieani, 2016). In particular, Bambara nut is highly nutritious, making it relevant in the nutritional formulation of people that cannot afford expensive protein sources especially animal-based protein (Ndidi *et al*., 2014).

Bambara nut provides staple foods to Nsukka indigenes being an age long crop cultivated and processed into "*okpa*" a local delicacy in the area and even in the entire south east and beyond. However, farmers that engage in Bambara nut farming face a myriads of problems. These problems

according to Anuranjan *et al.*, (2017) include: lack of awareness about availability of extension services, lack of confidence on information provided by extension agents, unavailability of information in local and understandable language and lack of good/updated content in local language.

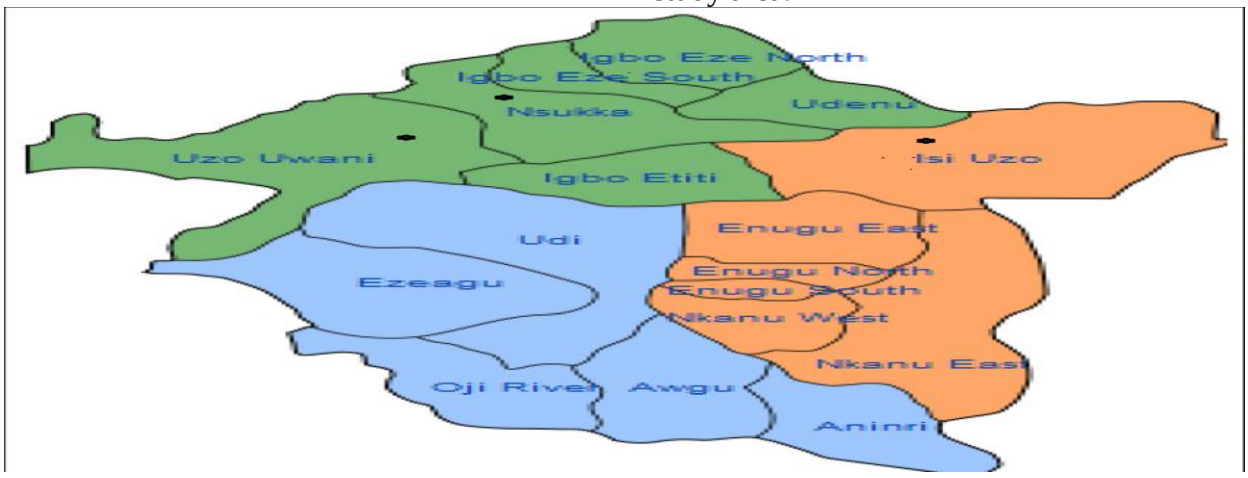
In view of the above background, the study is conducted to: describe the socio-economic characteristics of Bambara nut farmers; ascertain the extension services that are available to Bambara nut farmers; determine the level of use of extension service packages for Bambara nut production among farmers; and ascertain the constraints to effective utilization of extension services on Bambara nut production in Nsukka agricultural zone of Enugu State, Nigeria.

Furthermore, Ordinary Least Square OLS multiple regression was used to test the effect of selected socio-economic characteristics of the respondents on the level of utilization of the extension services for Bambara nut production in the area.

METHODOLOGY

The study was conducted in Nsukka agricultural zone is one of the three agricultural zones in Enugu State, Nigeria. It is made up of six local government areas (LGAs) namely: Nsukka, Igbo-Eze North, Igbo-Eze South, Isi-Uzo, Udenu and Uzo-Uwani Local Government Areas.

A multi-stage random sampling procedure was adopted for the selection of respondents from the number of farmers that engage in Bambara nut production for this study. Three out of the six LGAs were purposively selected for the study based on the existence of Bambara nut farmers in the areas. They included Nsukka, Isi-Uzo and Uzo-Uwani LGAs. Also, two communities were purposively selected from each of the three LGAs for the same reason. They included Nsukka and Eha-Alumona for Nsukka LGA; Eha-Amufu and Umuero for Isi-Uzo; Nkpologu and Adani for Uzo-Uwani LGA. Furthermore, 20 farmers from each community were randomly selected for the study based on their involvements in Bambaranut farming. This gave a total sample size of 120 respondents from farmers engaged in bambarant production in the study area. Fig 1 is the map of the study area.



KEY: * Study Area

Fig. 1. Map of Enugu State showing the three Local Government Areas used for the Study in Nsukka Agricultural Zone

Data for the study were collected through the use of questionnaire and were analyzed using descriptive statistics which include frequencies, percentages and mean; and inferential statistics such as Ordinary Least Square multiple regression. Also, 4-point likert type of rating scale was used to determine the mean. Objective (i) and (ii) were analysed using descriptive statistics while objective (iii): level of use of extension service packages for Bambaranut production was analysed using a 4-point likert type of rating scale namely: Very High Level = 4, High level = 3, Low Level = 2 and Very Low Level = 1. The bench mark was obtained thus: 4+3+2+1 = 10, divided by 4 to give 2.5. This implies that any mean score responses above the bench mark of 2.5 were adjudged as very high utilization of extension services by the respondents while any mean score responses lower than the bench mark were viewed as otherwise.

For objective (iv): the constraints to effective utilization of extension services on Bambara nut production was analysed using a 4-point likert type of rating scale namely: Strongly agreed = 4, Agreed = 3, Disagree = 2 and Strongly disagree = 1. The bench mark will be obtained thus: 4+3+2+1 = 10, divided by 4 to give 2.5. This implies that any mean score responses above the bench mark of 2.5 were adjudged as major constraints to effective utilization of extension services on Bambara nut production while any mean score responses lower than the bench mark were viewed as otherwise in the study area.

Hypothesis

Ho_1: Selected socio-economic characteristics of the respondents such as age, sex, educational level, farming experience, farm size and membership to cooperative organization do not have significant effect on the level of utilization of the extension services for Bambara nut production in the area.

To test the hypothesis, ordinary least square OLS multiple regression was used to test the effect of selected socio-economic characteristics of the respondents on the level of utilization of the extension services for Bambara nut production in the area. The model is stated thus:

$Y=f(X_1, X_2, X_3, X_4, X_5, X_6, ei)$

Where:

Y = level of use of extension service package for Bambara nut production

X_1 = Age (measured in years)

X_2 = Sex (Male = 1, Female = 0)

X_3 = Educational level (Number of years spent in school)

X_4 = Farming experience (in years)

X_5 = Farm size (measured in hectares)

X_6 = Membership of Cooperative Organization (Yes = 1, No = 0)

e = error term

RESULTS

The major results on Table 1 show that the mean age of Bambara nut farmers in the study area was 41.5years and 65.8% were males while 34.2% were females. The percentage of those that were married was 73.3; 52.5% had secondary school education and 0.8% did not have any formal education. Also 74.2% of the farmers have between 5 and 8 members of household, 52.5% has between 5 and 8 years of farming experience while 48.3% have farm size of 1.5ha to 2.4ha. Only 43.3% have contact with extension and 70% of the respondents belong to different farmers' cooperatives.

Table 1: Percentage Distribution of Respondents according to their Socio-economic Characteristics **n = 120**

Variable	Frequency	Percentage	Mean
Age (years)			
21-30	9	7.5	41.5
31-40	46	38.3	
41-50	40	33.3	
51-60	25	20.8	
Sex			
Female	41	34.2	
Male	79	65.8	
Marital status			
Married	88	73.3	
Otherwise	32	26.7	
Level of education			
No formal education	1	0.8	13
Primary education	13	10.8	
Secondary education	63	52.5	
Tertiary education	43	35.8	
Household size			
1-4	22	18.3	5.8
5-8	89	74.2	
9-12	9	7.5	
Farming experience(years)			
1-4	36	30.0	6
5-8	63	52.5	
9-12	19	15.8	
13-16	2	01.7	
Farm size (ha)			
0.5 - 1.4	29	24.2	2.0
1.5 - 2.4	58	48.3	
2.5 - 3.4	33	27.5	
Nature of farming			
Part-time	30	25.0	
Full-time	90	75.0	
Extension contact			
No	68	56.7	
Yes	52	43.3	
Membership of organization			
Yes	84	70.0	
No	36	30.0	

Source: Field Survey, 2018

Results in Table 2 show eight different extension services made available by extension agents to Bambara nut farmers in the study area. About 35.0% attested to Provision of information on market, 32.5% affirmed that technology on Fertilizer/organic manure application was made available to them and 29.2% was aware of supply of improved nut varieties to farmers. However, less than 1% agreed that water management technologies was extended to them.

Table 2: Percentage Distribution according to Extension Services made available to Respondents **n=120**

S/No	Extension Services	Yes	No	Remark
1.	Provision of information on market	42(35.0)	78(65.0)	1st
2.	Fertilizer/organic manure application	39(32.5)	81(67.5)	2nd
3.	Supply of improved nut varieties	35(29.2)	85(70.8)	3rd
4.	Technologies on chemical application	30(25.0)	90(75.0)	4th
5.	Information on loan or other credit opportunities	27(22.5)	93(77.5)	5th
6.	Storage technologies	07(5.8)	113(94.2)	6th
7.	Field preparation and harvesting technologies	05(4.2)	115(95.8)	7th
8.	Water management technologies	01(0.8)	119(99.2)	8th

Note: the figures in parenthesis are the percentages
Source: Field Survey, 2018

The result in Table 3 shows the level of use of extension service packages by Bambara nut farmers, the bench mark is 2.5. The results specifically indicate mean scores of 2.32, 2.08, 2.05, and 2.02 for harvesting technologies; fertilizers application; Planting distance and supply of improved nut varieties respectively, which were above the grand mean score. The technology on storage technologies has the lowest mean score of 1.43.

The result presented in Table 4 shows the mean distribution of Bambara nut farmers' responses on the constraints that affected their effective use of extension service delivery on Bambara nut production; the bench mark mean score is 2.50. The findings showed that Inadequate subsidies and grants from the government ($\bar{x}$=3.61), Inadequate training on improved farming skills ($\bar{x}$=3.51), Difficulty to understand and apply technologies ($\bar{x}$=3.50), Little attention to the needs of small farmers by government and extension agents ($\bar{x}$=3.50), High cost of farm inputs ($\bar{x}$=3.21), Inability to access credit from financial institutions by farmers ($\bar{x}$=3.20), Difficulty in accessing the improved technologies ($\bar{x}$=3.20), Low level of extension contacts $\bar{x}$= (3.10) and Low literacy level among most of Bambara nut farmers ($\bar{x}$=2.71) were all considered as major constraints that affect the effective use of extension service delivery on Bambara nut production while Low performance of Bambara nut in yield produce with a mean ($\bar{x}$=2.10) lower than the bench mark ($\bar{x}$=2.50) was viewed as a minor constraint that affected the effective use of extension service delivery on Bambara nut production.

Table 3: Distribution of Respondents According to the Level of Use of Bambaranut Production technologies **n =120**

S/N	Items	VHL	HL	LL	VLL	Total	Mean
1.	Harvesting technologies	16(64)	30(90)	51(102)	22(22)	278	2.32
2.	Fertilizer application	13(52)	29(87)	33(66)	45(45)	250	2.08
3.	Planting distance	8 (32)	29(87)	44(88)	39(39)	246	2.05
4.	Supply of improved nut varieties	15(36)	29(87)	43(86)	33(33)	242	2.02
5.	Technologies on chemical application	8 (32)	29(87)	28(56)	54(54)	229	1.90
6.	Field preparation technologies	8 (32)	12(36)	31(62)	69(69)	199	1.66
7.	Provision of information on market	11(44)	8 (24)	18(36)	81(81)	185	1.54
8.	Storage technologies	8(32)	6(18)	16(32)	90(90)	172	1.43
	Grand mean score = 1.875 ≈ 1.88						

Note: Bench mark mean score is 2.50
VHL= Very Low Level, HL= High Level, LL=Low Level, VLL=Very Low Level
Source: Field Survey, 2018

Table 4: Distribution of Respondents according to Constraints to Effective Utilization of Extension Services on Bambara nut Production **n = 120**

S/No	Items	Mean ($\bar{x}$)	Remark
1.	Inadequate subsidies and grants from the government	3.61	Constraint
2.	Inadequate training on improved farming skills	3.51	Constraint
3.	Difficulty to understand and apply technologies	3.50	Constraint
4.	Little attention to the farm needs of small farmers by government and extension agents	3.50	Constraint
5.	High cost of farm inputs	3.21	Constraint
6.	Inability to access credit from financial institutions by farmers	3.20	Constraint
7.	Difficulty in accessing the improved technologies	3.20	Constraint
8.	Low level of extension contacts	3.10	Constraint
9.	Low literacy level among most of bambaranut farmers	2.71	Constraint
10.	Low performance of bambaranut in yield produce	2.10	Not Constraint
	Grand mean score = 3.164 ≈ 3.16		

Note: Mean Score ≥ 2.5 = Constraint; Mean Score ≤ 2.5 = Not Constraint;
Source: Field Survey, 2018

The double log functional form was chosen as the lead equation for the factors influencing effective use of extension services on Bambara nut production. The functional form was chosen based on the number of significant variables, the significance of the F-ratio and high R^2 value. The overall goodness of fit of the equation as indicated by the coefficient of multiple determination (R^2 = 0.440) indicates that the explanatory variables included in the model explained about 44% of the variations on the extent of use of extension service packages for Bambara nut production in the study area. The F-statistics of the lead model was significant at 1% and confirms the significance of the entire model. Three variables including age (-2.720), farming experience (2.945) and farm size (2.532) were statistically significant 5%, 1% and 5% respectively

Table 5: Regression analysis of selected socio-economic characteristics of the respondents on the level of utilization of the extension services for Bambara nut production

Variables	Linear	Exponential	Semi log	Double log
Constant	3.010(6.472)***	.968(4.527)***	8.096(4.368)***	2.825(3.314)***
Age	-.390(-3.436)***	-.346(-3.025)***	-.347(-3.220)***	-.294(-2.720)**
Sex	-.094(-1.031)	-.110(-1.208)	-.104(-1.135)	-.120(-1.314)
Educational level	-.146(-1.650)	-.128(-1.439)	-.152(-1.721)*	-.120(-1.350)
Farming experience	.188(1.895)*	.276(2.760)**	.207(2.059)*	.296(2.945)***
Farm size	.259(2.648)**	.274(2.772)**	.209(2.197)*	.241(2.532)**
Member of organization	.050(.496)	-.016(-.162)	.024(.245)	-.043(-.437)
R^2	.411	.440	.402	.440
F-value	3.801***	4.27***	3.524***	4.201***

Note: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Field Survey, 2018

DISCUSSION

The results on Table 1 show that the mean age of the respondents is 42 years and 65.8% of them are males while 34.2% are females. This implies that majority of the respondents are in their productive ages, where their energies could be harnessed and utilized for productive ventures in agriculture especially in Bambara nut farming. Age has been described as an important factor that influences the probability of adoption of new technologies (Akudagu *et. al*., 2012). Similarly, Chidiebere-Mark *et al* (2019) reported that the majority of the rice farmers sampled are in Ebonyi State were males. This may be attributed to the fact that males are often more energetic and could readily be available for energy demanding jobs which are usually associated with farming. Also, majority (73.3%) of the Bambara nut farmers in the study area are married and had a mean household size of 6 persons. This has implication on the labour supply in Bambara nut farming by reducing the cost of labour and creating avenues for improved production within the enterprise (Effiong, 2012).

Furthermore, the average farm size of the farmers was 2.0 hectares. This is in agreement with the findings of Chikezie (2012), that the size of the farm cultivated is a function of population pressure, family size and financial background of the farmers. The average years of farming experience of the respondents was 6 years and about 56.7% of the farmers had extension contacts while 43.3% had no extension contacts. The implication of this result is that the farmers in the study area are not substantially exposed to technical innovation which should increase their productivity. This result agreed with that of Ukoha and Nzeakor (2016), that the level of extension contact among farmers was low.

Majority (75%) of the respondents are into full time Bambara nut farming indicating that Bambara nut production and processing is the farmers' means of livelihood and major source of income. Similarly, a good proportion (70%) of the farmers belonged to various Cooperative Organizations. Odoemelam *et al*. (2016) posited that farmers who are not members of associations are expected to have lower probabilities of adoption and lower level of adoption of technologies.

The results on Table 2 show that 99.2%, 95.8% and 94.2% of the farmers were not aware of the availability of some of the extension services such as water management technologies, field

preparation harvesting technologies and storage technologies respectively. This implied that extension services were not available to a larger number of Bambara nut farmers in Nsukka agricultural zone considering the number of farmers who answered in the affirmative on the availability of extension services. Odoemelam *et al*. (2016), observed that extension contact is expected to have a positive influence on farmers' investment decisions on agricultural technologies.

The result in Table 3 implies that the Bambara nut farmers in the Zone did not fully use any of the extension packages in the course of their production as the mean scores of all the extension service packages were lower than the bench mark mean scores of 2.50 on a 4-point scale and the grand mean score of 1.88, which was very low. Therefore, there was very low utilization of extension services by the respondents.

Results on the constraints to effective utilization of extension services on Bambara-nut production presented on Table 4 shows that majority of the constraints listed in the Table 4 were accepted as constraints which affected the effective use of extension services on Bambara nut production in the study. This is because the grand mean score obtained was 3.16, greater than the bench mark mean score of 2.50. The findings showed that Inadequate subsidies and grants from the government ($\bar{x}$=3.61), Inadequate training on improved farming skills ($\bar{x}$=3.51), Difficulty to understand and apply technologies ($\bar{x}$=3.50), Little attention to the needs of small farmers by government and extension agents ($\bar{x}$=3.50), High cost of farm inputs ($\bar{x}$=3.21), Inability to access credit from financial institutions by farmers ($\bar{x}$=3.20), Difficulty in accessing the improved technologies ($\bar{x}$=3.20), Low level of extension contacts $\bar{x}$= (3.10) and Low literacy level among most of Bambara nut farmers ($\bar{x}$=2.71) were all considered as major constraints that affect the effective use of extension services on Bambara nut production. This is in agreement with the findings of Uwem *et al.*, (2012) observed that lack of favourable government policies (especially with regards to provision of grants and subsidies to farmers) was one of the major constraints faced by farmers. Also, Nwachukwu (2014) who noted that up to 80% of the Nigerian population lives in rural areas where social services and infrastructure are limited.

Results as presented in Table 5, showed that Age (-3.025) is significant though negative. This is an inverse relationship meaning that the younger the farmers, the higher their level of utilization of the extension services. Farmers within the active age group have more innovative ability and capacity to do manual work than farmers in their inactive years (Ominikari, 2017). The coefficient of farming experience (2.760) was positive and significant at 5% level of significance. This direct relationship implies that as the farming experience of the Bambara nut farmers increases, there is also a corresponding improvement in the level of use of extension service packages for Bambara nut production in the study area. The coefficient of farm size (2.772) was also positive and significant at 5% level. This implies that the larger the farm size owned and used by Bambara nut farmers, the more the level of use of extension service packages. This is in line with *a priori* expectation. Given that the computed F-value of 4.27 was greater than the tabulated F-value of 2.02 at 5% level of significance, indicating a direct relationship between selected socio-economic characteristics of the respondents and the level of use of extension service packages. The study therefore rejects the null hypothesis that states that selected socio-economic characteristics of the respondents have no effect on the level of utilization of the extension services for Bambara nut production.

CONCLUSION

The study concluded that there was low level of utilization of extension services on Bambara nut by farmers in Nsukka Agricultural Zone of Enugu State, Nigeria which was majorly due to inadequate subsidies and grants from the government. It is therefore recommended that government should provide grants and subsidies to Bambara nut farmers to encourage utilization of the extension services available to them which will in turn to boost production and increase income.

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