Adoption of Recommended Crop Protection Practices By Sesame Farmers In Benue State, Nigeria

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ABSTRACT

This study was conducted to investigate farmers practices and adoption of improved sesame crop protection practices in Benue state, Nigeria. Using survey research, a pre-tested structured interview schedule was used to elicit information from 120 sesame farmers that were randomly selected from ten villages in two agricultural blocks in the northern zone from a sampling frame of sesame farmers. Descriptive and inferential statistics were used to analyze the data. Low adoption level was observed for all the crop protection practices , namely herbicide use (2.9%), disease control (2.0%) insect control(2.0%) and seed dressing (2.9%). Only 1% of the respondents had full package adoption, 5% had partial adoption while 94% did not adopt any of the crop protection practices. The study further revealed a significant relationship between adoption and the following variables: awareness ($r=0.21;p<0.05$), household size involved in farming ($r=0.248;p<0.01$), and years of farming experience ($r = 0.370; p<0.01$). Stepwise regression analysis revealed that years of farming experience was a critical variable in the adoption of crop protection practices by sesame farmers and accounted for 17% of the determinants of adoption. Based on this study it is recommended that efforts should be geared towards increasing the awareness of all crop protection practices in order to increase their adoption using a multimedia approach. These crop protection practices should focus mainly on integrated approaches with little or no chemical and more of practices that are compatible with the farmers practices.

1.0. INTRODUCTION

Sesame (*Sesamum indicum* L.) commonly known as beniseed is an important food and cash crop in Nigeria. It has developed from being a crop of negligible importance to one of major cash earner in its area of production namely :Benue, Borno, Gombe, Kogi, Jigawa, Kano, Nasarawa, Katsina, Plateau and Yobe States as well as the Federal Capital Territory,Abuja. The average yield of sesame is about 300kg/ha which is four times lower than the average yields of other oilseed crops like groundnut and soybeans (Abubakar *et al*, 1998). It is about the lowest in the world due to sustained national neglect of the crop in terms of low level research and extension efforts, and policy initiatives especially owing to its previous status as a minor crop. Other factors responsible for low yield include reliance on traditional method of cultivation, use of unimproved varieties of sesame, pest and disease problems (Abubakar *et al*, 1998). Since sesame is now a crop that is fast emerging as a potential source of foreign exchange to Nigeria (Edache, *et al*, 2000) the need for increased research and extension is urgent.(Abubakar *et al*, 1998). The export of this crop has progressively increased from 12,770 tonnes in 1996 to about 28,598 tonnes in 1997 and 37,000 tonnes in 1998, making it second only to cocoa in Nigeria's non-oil export trade. Nigeria's sesame commands very high premium in the world market due to its high oil content and the high quality oil due to its being free from hydrocarbons. Regardless of its low yield, sesame is an excellent source of high quality oils and protein. The oil is free from undesirable nutritional or flavour components and is very stable because of natural antioxidant such as sesamin and sesamolin which prevent ageing and malfunctioning of the liver. It

is one of the best edible oils available. Furthermore, its protein has a very desirable amino acid profile and is as good nutritionally as that of the soybean (Misari and Iwo,2000).

Of recent there had been appreciable increase in sesame production and utilization in Nigeria. This is due to collaborative efforts of several organizations such as National Cereals Research Institute(NCRI), Institute 0f Agricultural Research(IAR), Institute 0f Agricultural Research and Training(IAR&T), University of Nigeria ,Nsukka(UNN), National Agricultural Extension Research and Liaison Services (NAERLS), Federal Institute of Industrial Research, Oshodi (FIIRO) and the Agricultural Development Projects (ADPs) working to strengthen research and development as well as promoting house-hold utilization and cottage level utilization(Misari and Iwo,2000). The level of extension activities, in terms of media production, broadcast and publication have been poor (Abubakar et al, 1998). It is in this line that this research was initiated to provide empirical data on production practices of this crop and the adoption level of improved practices disseminated to the farmers.

Pests and diseases have been identified as major constraints to increased sesame production throughout its life cycle on the field and in storage (Dike and Oparaeke, 1997: Misari and Iwo, 2000). Pests and diseases affecting sesame have also been reported to be of economic importance and preventive measures have, therefore, been recommended in order to increase yield. (Misari and Iwo,2000). This, therefore, means that sesame production in Nigeria can appreciably be increased when attempts are made to protect the crop from pests and diseases with the use of adequate control methods. These authors are not aware of any attempt in Nigeria to examine the socio-economic aspect of pest control in sesame production. Most of the adoption studies conducted on crops have not studied sesame production and specifically its protection. Due to the fact that crop protection is an important aspect for increased sesame production, there is need to find out whether the farmers are actually adopting the crop protection recommendation or not. This study was, therefore, designed to answer the following research questions: Are the farmers in Benue State adopting sesame crop protection recommendations?. What are the characteristics of farmers involved in sesame production?. The objectives of the study are to describe the socio-economic characteristic of farmers, and assess the extent to which sesame crop protection recommendations are adopted by farmers in Benue State. The specific objectives were to

1. describe the socioeconomic characteristics of the sesame farmers;
2. ascertain the relationship between farmers characteristics and adoption of crop protection practices by sesame farmers and
3. ascertain the determinants of adoption of sesame crop protection technology

2.0. METHODOLOGY

This study was carried out in Benue State, Nigeria. The target population are the Sesame farmers in Benue State. Benue State has a population of 2,780,398 and total land mass of 69.74million square kilometers with 5.09million hectares that is about 5.4% of the Nations total land mass being arable land (BNARDA, 2000). The state falls within the derived Guinea Savanna vegetational zone and is located on Longitude 6 °35' E to 10^0 E and Latitude 6 ^{0}30'E to 8 °10'N. Its mode of agricultural production is predominantly rain-fed (BNARDA, 2000). There are three agricultural zones in Benue State from where the Northern zone was purposively selected where sesame is a major crop. Two agricultural extension blocks were selected by purposive random sampling from the zone namely Aliade and Taraku out of the 13 extension blocks where sesame is widely grown. From each of the blocks, 5 villages were randomly selected and 12 farmers were randomly selected for interview from a lists of Sesame farmers. In all 120 Sesame farmers were sampled out of which 102 were returned. Pre-tested structured interview schedule questionnaires were used to elicit primary data. Trained enumerators who understand the native language conducted the interview.

Measurement of Variables:

The variables of the study were measured as follows:
The dependent variable was adoption.

Adoption : This was measured at two levels namely adoption index and level (or extent) of adoption. Adoption index was measured by calculating the number of the farm practices reported by the farmer as being used at the time of the survey. The extent (level) of adoption was computed as described by Chikwendu, (1999) as the number of farmers adopting a particular technology without any consideration to speed of adoption.

The farm practices are: Seed dressing, Herbicide use, insect control, and disease control. All practices were assigned equal weights of one point each. The maximum adoption index obtainable was 4, while the minimum was 0. The total number of practices adopted made up the adoption index of each respondent.

The independent variables were measured as follows:

Awareness: based on a 2-point scale of 1 point of being aware and 0 for not being aware. Awareness score was calculated by summing up the number of respondents that was aware of each crop protection practice divided by the number of respondent and multiplied by 100. This gave the extent or level of awareness

Age: was measured as the actual number of years of the respondent at the time of the survey.

Number of children: was measured as the number of children the respondents reported having at the time of survey.

Education: was measured by the highest educational level attained and also whether attended any formal school.

Household size involved in farming: measured by the actual number of household members that help the respondents on his farm.

Extension contact: This was measured based on selected extension effectiveness indicators namely; Contact farmer (yes=1, no=0); Ever received advice from contact farmer? (yes=1,no=0) ; Aware of Extension Agent(E.A) ? (yes=1,no=0); Know the name of extension agent?(yes=1,no= 0), ;where E.A meet you: at farmers field/contact point =1, others=0 ; Ever visited by E.A: (yes=1, no=0) ; The total gave the extension contact score. The maximum extension contact indexed score was 6 and the minimum obtainable was 0.

Rating of sources of information: Respondents rated the sources, of agricultural information according to their perceived importance as it pertained to improved crop protection technology based on a 4-point scale of, (4= very important ;3= important ;2= slightly important ;1= not important). Analysis was carried out by adding the response frames of 1 to 4 and divided by 4 to give 2.5 as the mean. The mean for each information source was obtained by multiplying the point scale by the number of respondents in each point scale. Any information source with a mean score of equal or above the cut-off mean of 2.5 was regarded as an information source perceived as important and any mean score of lower than 2.5 as an information source perceived as not important.

Data Analysis : The data was analyzed using both descriptive and inferential statistics. Descriptive statistics was used to achieve objectives 1, while inferential statistics specifically regression analysis was used in the analysis of objective 3. However, inferential statistics(Chi-square(X^2) and Pearson Product Moment Correlation (PPMC)) were used in analysis of objective 2. The data was analyzed with the aid of the Statistical Package for Social Science(SPSS 10.1) computer software programme.

3.0. RESULTS AND DISCUSSION

The personal and socioeconomic characteristics of the farmers is shown in Table 1.

Majority of the farmers were males (90%) while only 10% are females. About 60% of the farmers were in age bracket 30-49years followed by 34% between 50years and above. This means that majority (94%) ware in their middle age and above. About 62% of the farmers had formal education while only 30% had no formal education. Also, majority (85%) of the farmers were of Tiv ethnic group and (72%) of the farmers were Christians, while 11% were traditional worshippers. Most of the farmers(80%) were not contact farmers. Most (79%) of them grow sesame sole and about 21% grow it in mixtures. Majority (65%) of the farmers had less than 10 children and 52% also have house hold size of less than 10 members. Majority (64%) have farming experience of 19years and below. Only about 8% of the respondents received credit and about 21% are contact farmers. Majority(61%) of the respondents had high extension contact.

Table 1: Socio-economic Characteristics of Sesame Farmers

Variable	Frequency	%	Mean
Gender: Male	91	89.2	
Female	11	10.8	
Total	102	100	
Religion - Christians	73	71.6	
- Traditional	12	11.8	
- No response	17	16.6	
- Total	102	100	
Ethnic group - Tiv	87	85.3	
-No response	15	14.7	
-Total	100	10	
Age: Below 30 yrs	6	6	45.04 yrs
-30-49 yrs	61	59.8	
-50 & above	35	34.2	
Total	102	100	
Formal Education: -Yes	61	59.8	
- - No	38	37.3	
-No response	3	2.9	
Total	102	100	
Highest Educational level			
-Adult Education	7	6.8	
-Primary	22	21.6	
-Second/Teacher TC	24	23.5	
-Post Secondary	12	11.8	
-No response	37	34.3	
Total	102	100	
No. of children: -Below 10	66	64.7	8.35
-10-19	28	27.5	
-20-29	3	2.9	
-30-39	1	1.0	
-no response	4	3.9	
Total	102	100	
Household size : Below 10	53	52	11.82
-10-19	32	31.4	
-20-29	9	8.9	
-30-39	2	1.9	
-40 and above	4	3.9	
-No response	2	1.9	
Total	102	100	
Farming Experience			16,07 yrs
-Below 20 yrs	64	64.9	
-20-39	30	29.4	
-40 & above	4	3.9	
-No response	2	1.9	
Total	102	100	
No of farms owned: -5 and below	58	55.9	5.36
-6-10	41	40.2	
-11 & above	3	2.9	
Total	102	100	

Contact farmer?: - Yes	21	20.6	
-No	81	79.4	
Total	102	100	
Extension contact:low(below 3.48)	41	40.2	3.48
High(3.48-6)	61	59.8	
Total	102	100	
Received credit?: Yes	8	7.8	
No	90	88.2	
No response	4	3.9	
Total	102	100	

Source: Field survey,2000

Awareness and Adoption

Table 2 shows the extent of awareness and the adoption of the crop protection practices by farmers. The table reveals that farmers were aware of all the crop protection practices but with varying degree namely; insect control (27.5%), disease control (25.5%), herbicide use (23.5%) and seed dressing (12.7%). The low extent of adoption of crop protection technologies namely insect control, disease control, herbicide use and seed dressing could be due to the fact that the technology did not fit into the farmers existing practices and may not be attractive to farmers to adopt (Okoro ,1997; Igbokwe,2000) The use of pesticide to control pests have been reported to be effective but uneconomical presently at farmers' level (Dike and Oparaeke, 1997). This could be the major reason for the low extent of adoption reported by farmers. In the case of herbicide use, all the farmers (100%) reported preference of hoe-weeding. The relatively low extent of adoption of herbicide use, disease and insect control and seed dressing could be attributed to their relatively low extent of awareness as shown in Table 2.

Table 2: Distribution of Respondents According to Extent of Awareness and Adoption *

Improved practices	Extent/ level of Awareness %	Extent/ level of Adoption %
seed dressing	12.7	2.9
Herbicide use	23.5	2.9
Disease control	25.5	2
Insect control	27.5	2

* multiple response
Source: Field survey,2000.

Table 3 shows the distribution of farmers according to types of pests and methods of control employed. Forty five percent of the respondents were able to identify disease infection on their sesame crop, while the rest did not identify any disease problem. About 96% of the farmers who identified disease did not make any attempt to control it. The major reason given for not controlling disease of sesame was that they were not aware of any disease control method (100%) and about 34% of the farmers reported that disease was considered by them not to be a problem.

With regard to insect pest control, about 93% reported that they noticed insect pests on sesame crop. However about 98% did not control the insect pest. About 62% of the farmers reported that they were not aware of the need to control insect pests, while about 15% believed that insect pests was not a problem.

All (100%) the farmers noticed weeds on their farm and all (100%) of them controlled the weeds. So also all (100%) the farmers controlled the weeds manually by hand pulling and or hoe weeding while only 3% of them also used herbicide to control weeds in addition to hoe weeding . Only about 3% of the farmers reported that they dressed the sesame seeds with chemicals before planting.

Table 3: Distribution of Farmers according to Type of Pests and nature of Control Employed*

Type of pests & nature of control		frequency	%
1.Disease			
A Noticed any disease: (n=100)	-Yes	45	45
	-No	55	55
b. Was the disease controlled:-	-Yes	2	4.4
(n=45)	-No	43	95.6
c. Method of disease control employed (n=2)			
- Chemical		2	100
d. Reason for not controlling disease(n=43)*			
-not aware of any control method		43	100
-do not know how to control		5	11.6
-not taken as a problem		15	33.9
-no need to control		1	2.3
-no chemical available to control		4	9.3
2. Insect control			
a. Noticed any insect?	-Yes	83	93.3
	-No	5	5.7
b. Was the insects controlled?:	-Yes	2	2.4
(n= 83)	-No	81	97.5
c. Method of insect control employed (n=2)		2	100
- Chemical			
d. Reason for not controlling insect (n=72)			
-Not aware of the need to control		53	61.6
-no need to control insect		1	1.1
-insect not a problem		13	15.1
-no chemical available to control it		3	]3.5
-don't know how to control insect		2	2.3
3. Weed control (n=102)			
a. Noticed any weeds?	-Yes	102	100
	-No	0	0
b. Weeds controlled?	-Yes	102	100
	-No	0	0
c. Method of weed control:* (n=102)			
-manual(hand pulling/hoe weeding)		102	100
-herbicide		3	2.9
4. Seed dressing with chemical (n=102)			
a. dressed your seeds:?	Yes	3	2.9
	No	99	100

Source: Field survey,2000.
* multiple response

Reasons for non-adoption:

The reasons given by farmers for not adopting crop protection recommendations are given in Table 4. The major reason for not adopting the use of herbicide was that the technology was too costly (90%), the technology was not useful (40%) and preference for hoe weeding (100%)). Technology not useful was the major reasons for not adopting seed dressing (52%), insect control (57%) and disease control (60%). The

high cost for non adoption of crop protection technology by farmers is mainly based on the fact that all the crop protection practices in sesame are chemical based all of which are imported into the country. Other reasons given for non-adoption are information not adequate on seed dressing (51%), insect control (51%) and disease control (59%). Preference for hoe weeding (100%) by all the farmers as a major reason for non adoption of herbicide use (2.9%) due to high cost might be due to the fact that hoe weeding fit into the existing farmers practice and seems to cost the farmers less money. On a general note, the low adoption of the crop protection technologies might be due to the fact that they do not fit into the existing practice and may not therefore offer much attention to farmers to adopt (Okoro 1997, Igbokwe, 2000). This tends to confirm the that, though the use of chemicals to control insects, diseases, weeds and dressing seeds was reported to be effective but presently uneconomical at the farmers level (Dike and Okparaeke, 1997) mainly because they term the technology is too costly for poor resource farmers. The technicalities involved in the application of the chemicals was another draw back. The low adoption of these technologies seems to favour the current concept of organic farming where low or no use of chemicals is being advocated world wide especially since organically produced product are said to be more costly in the world market. (UAM, 2002). The low level adoption of seed dressing could also be responsible for low level disease control. This is because the rationale for seed dressing technology is to control seed borne diseases and control of disease at the early stage of the plant.

All the crop protection technologies are material based technologies which according to Swanson, 1996, are simple and straight forward technologies to transfer. Their low level adoption may be connected with high cost of these technologies generally. The very low adoption of disease control (2%) could be attributed to the fact that farmers generally do not regard diseases as a serious problem (33%) apart from the fact that they were not aware of any control method. Farmers generally attach low level importance to diseases because they can not see the casual organism which is microscopic in nature, despite causing economic loss (ODA, 1995). This could also be responsible for the relatively lower notice of disease by farmers (45%), compared to higher notice of insect (93.3%) and weeds (100%).

Table 4: Distribution of Farmers according to reasons for non-adoption of crop protection technology*

Reasons	Crop Protection Technology %			
	Seed dressing	Herbicide use	Insect control	Disease control
Information not adequate	51	26	51	59
Technology not useful	27	40	21	28
Technology too costly	52	90	57	60
Input for technology not available	24	14	28	25
Lack of labour	-	9	2	1
Late information	29	2	1	1
Preference for hoe weeding	-	100	-	-

*Multiple response
Source: Field survey,2000.

The reason for higher notice of insect (93.3%) and weeds (100%) could be due to the fact that insect and weeds could be seen clearly with the physical eyes so also their effect on the plants compared to disease that the causal organisms are microscopic in nature. The reason for all the farmers (100%) for noticing weeds could also be attributed to the fact the weeds are also plants just as the crop sesame and farmers are aware that nutrients will be depleted from the soil by the weeds to the disadvantage of their main crop.

As for the adoption of the crop protection technologies, only 1% of the farmers had full package adoption, i,e. adopted all the 4 crop protection practices. Also about, 94% had no adoption i.e. did not adopt any of the 4 practices, while 5% of the respondents had partial adoption because they adopted between 1 and 3 practices. This observation is in agreement with researches that have shown that farmers do not

necessarily adopt technologies as a 'package' but rather adopt single technologies or 'clusters' of technologies on their way to adopt the total package (Byerlee and Hesse de Polance,1986). Adoption of technologies in a package are reported to be based on its profitability, risk, initial cost requirements, complexity and availability. Farmers will first of all select technologies in a package that exhibit these attributes and only add other technologies after having positive experience with the technologies already adopted. In essence, the farmers seem to adopt technologies in a package in a logical sequence (Nagy and Sanders, 1990).

Importance of Information Source

Data in Table 5 shows the distribution of farmers according to importance (rating) of information sources. Judging from the mean, radio (X=2.78) neighbours/friends (X =3.54), extension Agent (X =3.44) field day/Agric show (X =3.03) demonstration/SPAT (X =3.43) and parent (X =2.8) were perceived as important sources of information by the farmers because the mean is above 2.5. However Television (X =2.00) and Newspaper (X =2.2) were reported as being unimportant sources of information by sesame farmers. The reason for rating T.V. as unimportant sources of information could be attributed to the fact that the number of TV programmes aired by the state Agricultural development project decreased from 26 in 1996 to 0 in 1999(BNARDA, 2000). Most of the ADP' could not continue with their television programmes due to high cost of production and cost of air time (NAERLS,1996). It could also be due to the poor level of extension activities in term of media broadcast and publication on sesame (Abubakar, *et. al* 1998).

Table 5: Distribution of Respondents According To Perception of Information Sources.

Sources	Not Important	Slightly Important	Important	Very Important	Sum	Mean	Overall perception
Radio	11	22	33	24	250	2.78	important
T.V	45	9	21	12	174	2.00	Not important
Neigbour/Friends	2	18	1	70	322	3.54	important
Extension Agent	4	20	2	67	318	3.44	important
Field day/ Agric. shows	4	37	5	46	277	3.03	important
Newspapers	24	20	34	4	182	2.2	Not important
Demonstration/S PAT	2	23	2	65	314	3.43	important
Other (Parent)	2	2	1	5	29	2.80	important

Relationship between Variables

Table 6 shows the relationship between adoption and the following variables namely awareness ($r = 0.21$; $p < 0.05$), household size involved in farming ($r = 0.25$; $p < 0.05$) were positive and significant. There was a positive correlation between adoption and awareness ($r = 0.21$; $p < 0.05$) ; household size ($r = 0.25$; $p < 0.05$) and years of farming experience ($r = 0.37$; $p = 0.05$). The positive correlation between adoption and awareness means that as farmers' awareness of crop protection technology increases, the more they are likely to adopt it.

Therefore, it means that in order to increase adoption of crop protection technology, the level of awareness must be increased. In the same vein, the positive correlation between household size involved in farming means that the higher the household size involved in farming the more the farmers adopt crop protection technology. So also, the positive correlation between years of farming experience and adoption means that the more experienced a farmer is the more likely the farmer will adopt crop protection technologies.

The stepwise regression analysis shows that only one of the independent variables, namely years of farming experience accounted for 17.4% of the determinants of adoption of crop protection technologies..

This implies that the year of farming experience is critical in the adoption of crop protection technology by sesame farmers. The higher the farming experience the higher the possibility of adopting the crop protection technology.

Table 6: Correlation coefficient between Adoption and selected variables

VARIABLES	Correlation coefficient (r)
Age	0.129
No. of children	-0.033
Household size	0.248*
Household size involved in farming	0.248*
Farming experience	0.370
Extension contact	0.075
Awareness	0.210*

*Significant at 0.05 level of probability

4.0. RECOMMENDATION AND CONCLUSION

The adoption and awareness of seed dressing, herbicide use, disease control and insect control were relatively low, probably due to the fact that they do not fit into the existing farmers practices. The low yield of sesame reported in Nigeria could be due to the low level of adoption of crop protection technologies.
Based on this study, it is recommended that efforts should be geared towards increasing the awareness of crop protection technologies which probably will increase the level of adoption. These technologies must, however, be reviewed with the idea of making them fit into the existing farmers practices by introducing them in a more compatible form. The use of non-chemical based crop protection technologies might be the best option. Research should focus on organic and crop protection practices that will not require the use of chemicals at all so as to meet the world market for organically produced sesame for export purposes. Use of non chemical based technology might suffice because of the addition costs which farmers have to incur for purchasing and applying chemicals. It is recommended that integrated Pest Management (IPM) be introduced into the farming system of the study area which involves the use of less chemical and more of practices that are compatible with the farmers practices. This could be developed through participatory approach to pest control.

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