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ADOPTION OF COWPEA PROTECTION RECOMMENDATIONS BY RURAL FARMERS IN BENUE STATE, NIGERIA

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Abstract:

This study reveals that the use of storage chemical is the technique with the highest adoption level (70%), closely followed by hermetic storage (63.8%) and use of insecticides on the field (48.4%). Farmers do not use herbicides and fungicides. The non-adoption of herbicides is attributed mainly to high cost and non-availability of herbicides and above all farmers' preference for hoe weeding. About 87% have never used improved cowpea varieties. However, most farmers still use local varieties together with the improved. About 70% of the farmers use at least one type of storage chemical for protecting their produce. Only 1.5% of the farmers use 'Gammallin 20' as a storage chemical. Most of the farmers that use Phostoxin follow the recommended rate of one Phostoxin tablet per 100kg of cowpea or 500g of Actellic dust per tonne of cowpea. Only 4.6% and 1.5% of farmers use wood ash and chilly pepper for protecting their produce respectively. Extension agents are the major source of awareness of recommended crop protection practices. There is a significant relationship between adoption and sources of agricultural information. There is also a significant but negative correlation between age and adoption and a positive correlation between adoption and household size, farm size and extension contact.

1.0 Introduction

Cowpea (*Vigna unguiculata* (L) Walp) is an important grain legume widely grown in the Savanna zone of Nigeria. World production of cowpea was estimated to be 2.27 million tonnes of which Nigeria produces about 850,000t (Jackai *et al*, 1985). Pests and diseases have been identified as major constraints to increased cowpea production throughout its life cycle on the field and during storage (Olufajo, 1997; Jackal *et al*, 1985). The production of cowpea can only be a successful venture by protecting it from pests and diseases through the use of chemicals (Allen *et al*, 1981; Jackai, *et al, 1985).*

When cowpeas are adequately protected from pests and diseases with the use of improved technologies, yield of 1,500kg - 2,000kg can be obtained on sole crops. However, peasant farmers that produce most of the cowpeas available in the market in Nigeria obtain yield ranging from 200 - 350kg/ha and in some cases zero yield because they do not control the pests using the improved technologies available (Singh and Jackai, 1985).

The research efforts of Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria; Institute of Agricultural Research and Training (IAR&T), Ibadan; the International Institute of Tropical Agriculture (IITA), Ibadan and other scientists in Nigeria using the concept of Nationally Coordinated Research Project (NCRP) have led to the development of improved cowpea production package (Olufajo, 1997). The package was released through the agricultural development projects (ADPs) nation wide.

There has not been much attempt of recent to examine the socioeconomic aspect of pest control in cowpea production. The only recent work in this regard was by Atala *et al* (1992) which examined the adoption of cowpea in Kaduna state. Little or no such work has been undertaken in Benue state. Most of the adoption studies conducted on crops have not studied the cowpea protection recommendations specifically. Since crop protection recommendations are important aspects for increased cowpea productivity, there is need to find out whether the farmers are actually adopting the recommendations or not. This study was, therefore, designed to answer the following research questions:

Are the farmers in Benue State adopting the cowpea protection recommendations?

What are the farmers' characteristics?

What are the farmers' awareness sources of information?

The objectives of the study are to:

describe the socio-economic characteristic of farmers

assess the extent to which cowpea protection recommendations are adopted by farmers.

ascertain the relationship between farmers' characteristics and adoption.

establish the relationship between farmers adoption of cowpea protection recommendations and their sources of awareness of agricultural information.

The hypotheses of the study are

there is no significant relationship between farmers characteristics and adoption of cowpea protection recommendations and

There is no significant relationship between farmers adoption of cowpea production recommendations and their sources of awareness of agricultural information.

2.0 Methodology

The data for this study were obtained from a field survey conducted in the Northern and Central zones of the Benue State Agricultural and Rural Development Authority (BNARDA) in November-December, 1994. BNARDA has three administrative zones namely: Northern, Central, and Eastern zones. Two of the zones, Northern and Central, were randomly selected. Four villages were purposively selected from each of the two zones. Abwa, Taraku, Apier, and Naka from Central zone and Aliade, Gaadi, Yandev and Buruku from Northern zone. In each of the villages sampled, 30 cowpea farmers were selected and administered structured interview schedule by trained enumerators. In all, 240 interview schedules were completed. However only 198 were analyzable.

2.1 Measurement of variables

The following independent variables were measured as indicated:

Age: age of respondent at the time of the study

Sex: whether respondents were female or male

Marital status: whether respondents were married, single or divorced

Number of dependent : as the actual number of dependents living with respondent at the time of the survey.

Educational level: respondents indicated the number of years spent in formal education which gives the education score. In addition, respondents with non -formal education were asked to indicate the type of non-formal education they have had.

Farm-size: respondents farms were measured in hectares

Extension contact: respondents indicated the number of times the extension agent(E.A) visited them per month on the average

Information source: respondents indicated from which of the sources they first got to know about the cowpea recommendations.

Membership of farmers organization: whether farmers belonged to farmers organizations by responding with "yes" or "no".

The dependent variable was the adoption of cowpea protection recommendations which consisted of the following practices:

improved cowpea varieties

herbicides

insecticides (on the field)

fungicides (on the field)

storage chemicals and

hermetic storage

Adoption score was obtained for each respondent by summing up the number of practices the respondent adopted. Each practice had a weight of one. The maximum adoption score was 6 while zero was the least.

In addition, the dosage rates of application of chemicals were estimated based on the quantity used per hectare or bags or quantity of seeds as the case may be and compared with the recommended rate.

2.2 Data analysis:

Descriptive statistic (percentages) was used to achieve objectives 1 and 2 and inferential statistics were used to achieve objectives 3 and 4. The inferential statistics used included Pearson Product Moment Correlation and Chi-square (X^2).

3.0 Results and Discussion

3.1 socio-economic characteristics

Table 1
Socio-economic Characteristics of Farmers in Benue State

Variables	Freq. of Respondents	% of Respondent
Age:		
Under 30 years	15	7.6
30 - 39	57	28.8
40 - 49	99	50.0
50 and above	27	13.0
	198	
Sex:		
Male	192	97.0
Female	6	3.0
	198	
Marital Status:		
Married	195	98.5
Single	3	1.5
	198	
No. of dependents:		
1 - 3	23	11.6
4 - 6	78	39.4
7 and above	97	49.0
	198	
Educational Attainment:		
Non-formal (illiterate, 22.2%: Adult education, 11.1%)	66	33.3
Primary school	66	33.3
Secondary	45	22.6
Post secondary	21	9.7
	198	
Membership of Farm Organisation:		
Yes	153	77.2
No	45	22.8
	198	
Farm Size:		
Less than 1 ha	192	96.8
1.01 - 2 ha	6	3.2
	198	

The socio-economics characteristics of the sampled farmers in Benue state are shown in Table 1. From the table it can be seen that more than 80% the farmers are in age bracket of 40-49 and below, signifying that the cowpea farmers are mainly young adults . As for the educational level, 66.7% of the respondents have formal education, while 33.3% have non-formal education. However, it should be noted that a third (11.1%) of the non-formal education respondents have adult education with only about 22% being illiterate. Majority of the respondents are educated. Most of the farmers (97%) have farms of less than one hectare while over 77% are members of farmers organisations and over 98% are married.

3.2 Level of adoption of improved crop protection recommendations

Table 2

Distribution of Respondents According to the Technologies and Practices Adopted

Technologies/Practices	Respondents (n = 198)	
	Frequency	%
Adoption of crop protection recommendations*		
Improved cowpea variety	108	55
Herbicides	0	0
Insecticides (on field)	97	48.4
Fungicides (on field)	0	0
Storage chemicals	138	70
Hermetic storage	126	63.8
Type of chemicals and local protectants used in storage*		
Actellic 2% dust*	138	70
Phostoxin*	42	21.1
Actellic E.c.*	36	17.6
Gamallin 20	3	1.5
Name of Insecticide used (n = 97)		
Cymbush E.C.	39	40.2
Cymbush Super E.D.	6	6.2
Actellic E.C.	12	12.4
Rogor (Perfeckthion)	6	6.2
Karate E.C.	31	32.0
Nuvacron (monocrotophos)	3	3.0

Technologies/Practices	Respondents (n = 198)	
	Frequency	%
Type of varieties ever grown*		
Improved (with local)	153	77.3
Local (with improved)	174	87.9
Local only	45	22.7
Name of Improved varieties of cowpea grown (n = 108)*		
Ife brown	102	94.4
TVX7-5H	24	22.2
ITA 60	6	5.5
TVX 3236	42	38.9
IAR 48 (Sampea 7)	9	8.3
Reasons for non-adoption of herbicides*		
No knowledge of herbicides recommendation	63	31.4
Herbicides too costly	174	87.2
Herbicides not easily available	154	76.9
No knowledge of herbicide mixing	60	30.3
Prefer hoe weeding	198	100
Type of Crops grown with cowpea*		
Cassava	53	28.0
Maize	63	33.5
Yam	27	14.4
Benniseed	21	11.2
Sorghum	12	6.4
Bambaranut	12	6.4

*Multiple response

The distribution of respondents according to the technologies adopted is shown in Table 2. The entries shows storage chemicals with the highest (70%) adoption score while the adoption score of hermatic storage system is 63.8%. About 55% of the respondents have adopted improved cowpea varieties. About 48% use insecticides on the field (48.4%). However, none of the respondents use herbicides and fungicides on the field.

3.2.1 Storage chemical

The use of storage chemical is the technique with the highest adoption score(70%). The higher rate of adoption of storage chemicals (70%) when compared with the use of herbicide, insecticides and fungicides might not be unconnected with the ease with which the major storage chemicals listed on Table 2 are usually applied. "Actellic 2% dust" can be applied without the use of any sprayer or mixing with water. The 'Actellic dust' is usually applied directly on the produce from the container called "Shaker". However, for the use of field chemicals, there is the need to use a sprayer and mixing it with water might be necessary depending on the formulation. There is also the need to wear protective clothing and take extra precautions unlike the use of "Actellic dust".

Seventy eight percent of the sampled farmers store cowpea before sale or consumption. Seventy percent of the farmers use at least one type of storage chemical for protecting their produce. Table 2 also shows the distribution of respondents according to the type of chemicals and local materials used in storage. "Actellic" dust is the most commonly used storage chemical (70%) followed by Phostoxin (21%) and Actellic E.C. (17.6%). The preference of Actellic dust to 'Actellic' E.C. by farmers is probably because the dust can be applied directly with no technicalities involved. In constrast, the application of Actellic E.C., requires the use of sprayer and mixing of chemical with water which may even increase the moisture content of the cowpea seed in storage if not properly done.

About 2% of the farmers use Gammallin 20 as a storage chemical. The use of Gammallin 20, a chlorinated hydrocarbon (Lindane), recommended for control of cocoa capsid and other foliar pests, is undesirable as a storage chemical and therefore its use should be discouraged, especially because the World Health Organisation (WHO) has banned the use of chlorinated hydrocarbon in the control of insect pests (Fuglie,1998). As far as the application rate at which storage chemicals such as Photoxin, Actellic dust and Actellic E.C. are concerned, it was found that 90% of the farmers that use Phostoxin, apply the recommended rate of one Phostoxin tablet per 100kg of cowpea or 500g of Actellic dust per tonne (1000kg) of cowpea.

The use of wood ash (4.6%) and chilly pepper (1.5%) is worthy of note because they have been proven to be effective. Ajayi *et al* (1987) reported the effectiveness of wood ash in the control of storage insects of millet, sorghum and groundnut and a level of control of cowpea bruchids (*Callosobruchus maculatus)* at the rate of 20g/kg seed.

The effectiveness of ground chilly pepper (*Capsicum frutescens*) was reported in the control of storage pest of millet and not very effective in the control of cowpea bruchides (*Callosobruchus maculatus*) (Ajayi *et al* 1987). However, the farmers in this study reported that it is effective in the control of cowpea storage pests

It should be noted that farmers usually apply the wood ash or ground chilly pepper generously hence the apparent effectiveness of these materials as a storage chemicals (Tologbonse *et al* 1990). Another method employed by farmers in the control of insect pest in cowpea is the use of sun drying (1.5%). In this case the infested cowpea is sun dried such that the temperature of the sun kills the insects or they escape during exposure and the cowpea is then stored again. The farmers also reported that this method is effective which is in agreement with Fuglie (1998).

3.2.2 Hermatic storag

As indicated in Table 2, 63.8% of the farmers practise hermetic storage. Hermetic storage objective is the exclusion of air (Oxygen) in order to kill all insects in the grain without the use of chemicals by storing in air tight container. This method is non-hazardous and should be encouraged. Containers used by farmers for hermetic storage ranges form local pots, drums, tins, plastic containers to the use of polythene bags.

3.2.3. Types of insecticides used:

Cowpea farmers in Benue State are also aware of the time to commence spraying of insecticide. All the farmers that use insecticides on the field either commence spraying as soon as flowers are first noticed or when insect pests are noticed on the crop. The number of sprays per season ranges from 2 to 4 with a mean of 2.1. This again, is in the range of the recommended 2 to 3 sprays before harvest. The rate of application per hectare is in the range of 0.5 litre (l) to 1.0 litre with a mean of 0.85 litre/ha. for the emulsifiable concentrate (E.C) formulation. This again is within the recommended range of 0.8-1.0l/ha 65% of those that use insecticide apply the rate of 1.0l/ha. The commonly used insecticides on the field are " Cymbush" E.C (19.7%) and closely followed by Karate E.C. The least adopted insecticide is ""Nuvacron "(1.5%) as indicated on Table 2. The relatively high rate of adoption of insecticides on the field (48.4%) as indicated on Table 2, might be due to the awareness of the farmers of the need to spray cowpea especially the improved varieties in order to get an appreciable yield. Farmers are aware that insect pests are a major constraint to cowpea production, hence the attempt to control them.

3.2.4. Varieties of cowpea grown

The distribution of respondents according to varieties of cowpeas ever grown is shown on Table 2. With regards to the use of improved cowpea varieties, 77% have used one type of improved cowpea variety or the other while only 23% have never used improved varieties at all. The most commonly used improved variety is the Ife-Brown (51.5%), TVX 3236 (21.2%), TVX 7-5H (12%), I.A.R 48 also known as Sampea 7 (4.5%) and ITA 60 (3%) as indicated on Table 2. Most of the farmers (88%) have used a local variety together with the improved variety. All farmers that have ever used local variety claimed that the local variety is less susceptible to pests attack. The use of local varieties by farmers might be due to the fact that local varieties are known to flower late in the season when pests damages are much reduced and are tolerant to pests and diseases and they usually yield better than improved when both improved and local varieties are not sprayed with chemicals (Apeji,1992).

3.2.5. Fungicide

The non-adoption of fungicide might be due to the fact that cowpea fungal diseases are not usually taken seriously by farmers because the causal agents are not visible as the insect and also because the farmers are not aware of the need to use fungicides. The technology of chemical control of fungal diseases through the use of fungicides has been reported as not feasible at farmers level (Singh and Allen 1980).

3.2.6. Herbicide

The non-adoption of herbicides as indicated is attributed mainly to high cost (87%) and non-availability (76%) of herbicides and above all, farmers' preference for hoe-weeding (100%) which is in agreement with Ogungbile and Olukosi 's (1991) findings.

3.3. Type of crops grown with cowpea

Majority of the farmer (95%) grow cowpea as a mixed crop and not as sole. The most common type of mixed cropping is with maize (32%) cassava (27.3%) and yam (13.63%). Other crops include benniseed (11%), sorghum (6%) and bambara-nut (6%). Growing of cowpea in mixtures with crops such as maize, cassava and yam has been reported to reduce pest population and increase yield. This may be the major reason why majority of the farmers grow cowpea in a mixtures. However, when grown as a monocrop, cowpea is subjected to heavy pest population resulting in yield reduction (Singh and Jackai ,1985).

3.4. Sources of awareness of information:

Table 3

Distribution Of Farmers According To Sources Of Awareness Of Information

Sources of Awareness	Respondent	
	Freq.	%
1. Village Extension Agent	150	75
2. Relatives (Parents)	24	12
3. Fellow Farmers	21	11
4. Extension Publication	3	2
Total	198	100

The distribution of farmers according to sources of awareness is shown on Table 3. Seven five percent (75%) of the farmers got to know about the cowpea protection recommendations through the village extension agent (VEA). Twelve percent and 11% got to know through their parents and fellow farmers respectively while 2% through the use of extension publications. However, the sources of awareness did not include the use of any electronic media such as radio and television. This study has shown that the extension agent is the major source of awareness of recommended cowpea protection practices. This is in line with the findings of Willians (1969) and Voh (1979).

Since the extension agent is a major source of awareness to the farmers, it is, therefore, necessary that they are given all necessary support and encouragement in form of training and incentives.

3.5. Relationships between variables

Table 4

Relationship between Awareness of Information Source and Adoption

Sources	Adoption Level			
	Low (1 - 2)	Medium (3 - 4)	High (5 - 6)	Total
Extension agent	62	77	11	150
Relatives/fellow farmers	5	38	2	45
Extension Publication	1	1	1	3
Total	198	68	116	14

Calculated X^2 =19.48 ; Tabulated X^2 =9.49, p=0.05.

d.f= 4

With regard to the relationship between sources of awareness of information and adoption, there is a significant relationship between farmers' awareness information sources and adoption (X^2 = 19.48; p = 0.05) (Table 4). Table 5 shows the Pearson Product Moment Correlation analysis of selected variables and adoption. There is a positive correlation between . educational level, household size, extension contact and adoption. This is in agreement with Akanya, *et al* .(1991) and Atala, *et al* (1992) findings .

Table 5

Pearson Correlation Analysis Of The Relationship Of Selected Variables And Adoption

Variables	Correlation coefficient
Age	-0.323
Educational level	0.437*
Household size	0.238*
Farm size	0.112 n.s.
Extension contact	0.513*

*significant correlation at p = 0.05

n.s = not significant

4.0. Recommendations and Conclusion

Based on this study it is recommended that the farmers be informed of the danger of the use of chlorinated insecticides such as 'Gammalin 20' as a storage chemical, especially since it has been banned in the control of insect pests in general. There is a need for the state government to embark on enlightenment campaign to inform the farmers in general of the need to use only recommended storage chemical. Efforts should also be made for farmers to have assess and be able to afford these chemicals

Due to the fact that extension agents are the major source of awareness and the positive correlation between adoption and extension contact, there is the need to give necessary support and encouragement in form of training and incentives, to the extension agents. However, the use of electronic media such as radio and television by the government of Benue State to supplement extension agents, will also enhance the dissemination and adoption of improved technologies.

The use of wood ash and chilly pepper and other indigenous knowledge should be encouraged and documented and passed on to appropriate research institute to ascertain their efficacy and recommend the appropriate dosage rates.

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