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Full Length Research Paper

Integrated Pest Management (IPM) adoption among farmers in central agro-ecological zone of Delta State, Nigeria

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The adoption of Integrated Pest Management (IPM) among farmers in Central Agro-ecological Zone of Delta State, Nigeria was assessed. Three hundred and twenty farmers were selected and interviewed with the use of structured interview schedule. The findings revealed that 15:63% of the farmers adopted the technology but extension contact was not encouraging. Result of the probit model analysis showed that marital status, household size, involvement of every household member was the significant demographic factors influencing the use of the innovation. There is therefore the need to embark on aggressive extension campaign for the utilization and popularization of the technology among farmers. Extension agents should select contact farmers from among those that are married, middle-aged, willing to involve all household members in decision making for rapid technology adoption and diffusion.

Key words: Integrated pest management, adoption farmers, extension campaign, and central agro-ecological zone.

INTRODUCTION

The need for self-sufficiency in food production cannot be over emphasized. Efficient agriculture helps a country to meet her food demands and supply adequate and cheap raw materials to the industrial sector; brings foreign exchange; serves as a market for products of the Industrial sector and provides employment for her growing population (Olaitan, 1993). In the 1960s, agriculture contributed about 64% to the Gross Domestic Product (GDP) of Nigeria, but for sometime now its average contribution has remained at 25% (Akubuilo and Akubuilo, 2000).

Integrated Pest Management is one of the approaches to pest management. Pest management is embarked upon for the promotion of yields of crops and livestock. Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common sense practices (Hoyt, 2001). IPM programmes use current, comprehensive information on the life cycles of pests and their interaction with the environment. This ecologically based approach is used in combination with available pest control methods to manage pest damage by the most economical means and with the least possible hazard to lives, property, and the environment. Sankoh (1999) found out that the quality of human life depends ultimately on the quality of the environment in which human lives and the ability of this environment to provide food, shelter and natural resources needed to generate employment and a well secured life.

The IPM approach can be applied to both agricultural and non-agricultural settings, such as the home, garden, and workplace. It takes advantage of all appropriate, pest management options including but not limited to the judicious use of pesticides. IPM is not a single pest control method, rather, a series of pest management evaluations, decisions and control. According to Hoyt (2001), it is a sustainable approach to manage pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks, IPM techniques can make the industry more user friendly

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in the eyes of the consumer.

In Nigeria the Agricultural Development Programmes (ADPs) were designed to energize rural agriculture. Eze et al. (2006) opined that if all small-scale farmers who produce over 65% of the nation's food and occupy about 85% of our land mass were able to increase food production, the nation's food and fibre needs would be adequately taken care of. According to Akinbode (1982), rather than engage in direct production, the ADP was designed to stimulate and motivate small-scale farmers. One of the specific objectives of ADP was to teach the small-scale farmers the most modern techniques of farming through farm extension education. The actual implementation of ADP functions is in the farmer's adoption of most modern farm management methods (Eze et al., 2006). Onazi (1982) suggested that although scientific research into new varieties, fertility factors, improved farming system and new technology has continued, impact of these research results on production is still minimal. Uwakah (1985) submitted that farmers could achieve higher yields if they adopt recommended scientific farming techniques in place of their traditional practices. He further observed that to adopt and successfully use improved farming techniques, rural farmers must understand them and to understand them requires effective teaching by extension agents. IPM is one of such modern farming technologies available to farmers for pest control. There is thus the need to unveil the reasons behind farmers' refusal to use or adopt IPM and proffer possible solution.

This study was carried out to ascertain the level of IPM adoption among farmers in Central Agro-ecological zone of Delta State, Nigeria. Specifically, the study:

i.) Ascertained the level of adoption of IPM.
ii.) Determined the frequency of extension contact with farmers.

Hypothesis

The Socio-economic characteristics of the farmers do not significantly influence their adoption of IPM.

METHODOLOGY

This study was conducted in the Central Agro-ecological Zone of Delta State, Nigeria in 2006. Delta State shares common boundaries with Edo, Ondo, Imo, Anambra and Bayelsa States. In the south west and south it has approximately 122 km of coastline bounded by the Bight of Benin on the Atlantic Ocean. Delta State is demarcated into North, Central and South agro-ecological zones. The central agro-ecological zone comprises of 8 Local Government Areas. The people are predominantly small- scale farmers and the crops cultivated include: cassava, maize, yam, cocoyam and vegetables.

All the Local Government Areas that constitute the central agro-ecological zone were used for the study. Purposive random sampling was used to select 40 farmers from each of the Local Government Areas. The farmers used were selected from the list of farmers in the selected villages for the study. Four (4) villages were randomly selected from each of the Local Government Areas to give us a total of 32 villages. Ten (10) farmers were then randomly selected from each of the 32 villages from the lists provided by the village extension agent in-charge of the villages. Altogether, a total of 320 were selected for the study. With the aid of structured interview schedule, data were elicited from the farmers.

Descriptive statistics and quantitative statistics were employed in the analysis of the data. The probit (maximum likelihood estimate) model was used in analyzing the influence of socio-economic characteristics of the farmers on their adoption of IPM.

The model specified that:

$$Yi^* = B^t X_1 +$$
$$Yi = D \text{ if } yi^* \subseteq 0$$
$$Yi = I \text{ if } yi^* > 0$$

Where;

Yi = an underlying talent variable that indexes the use of IPM.
Yi = observable chemmy variable that indexes use of IPM (use = I, not Used = 0).
B^t = a vector of estimated parameter
= the error term, while
xi = individual socio-economic variables considered in the study as
X_1 = Age of the farmer.
X_2 = Gender of farmer (male = 1; female = 0)
X_3 = Marital status (married = 1; otherwise = 0)
X_4 = Level of education (number of years in school)
X_5 = Household size
X_6 = Number of household members involved in farming
X_7 = Years of experience in farming
X_8 = Participation of household members in decision making (all members = I; otherwise = 0).

RESULTS and DISCUSSION

Demographic characteristics of the respondents

Table 1 indicates that the average age of the farmers in the study area was 43 years. Most (62.81%) of the farmers were in their middle age bracket of 31 - 40 years and 41 - 50 years. About 15.31% of the farmers were of the age of 30 years and below, while 21.88% were above the age of 50 years. The age composition of most of the farmers is best suited for possessing the skill required in IPM application.

Table 1 reveals that the percentage of male and female farmers who were involved in the use of pesticides were 51.89% for males and 48.11% for females. The large proportion of males involved in the application of pesticides is indicative of the culture of the people and the danger of pesticides to unborn children of women when exposed to them. This is in consonance with Prakash (2003) who suggested that in most cultures, the application of pesticides is considered a male task as women are aware of the danger to their unborn children when exposed to chemicals.

Table 1 further shows that most (70.30%) of the

Table 1. Percentage distribution of respondents according to demographic characteristics.

Demographic Variables Age(years)	%	Demographic variables Sex	%
30	15.31	Male	15.89
31-40	34.38	Female	48.11
41-50	28.43	Total	100.00
Above 50	21.88		
Total	100.00		
Marital Status		Educational Status	
Single	19.39	No formal Education	20.60
Married	70.30	Primary Education	28.40
Widowed	6.57	Secondary Education	41.00
Divorced	3.74	Tertiary Education	10.00
Total	100.00	Total	100.00
Household Size		Household members involved in pesticide application	
0-5 members	25.00	0-5 members	64.04
5-10 members	63.73	6-10 members	33.45
Above 10 members	11.27	Above 10 members	2.51
Total	100.00	Total	100.00
Participation of household members in decision making		Years of experience in pesticide application	
All household members	35.45	1-10	33.44
Husband and wife only	34.23	11-20	41-57
Parents and children	17.71	Above 20	24.99
Head of household only	12.30		
Traditional rulers	0.31		
Total	100.00	Total	100.00

N = 320
Source: Field Survey, 2006.

farmers were married; 19.39% were singles; 3.74% were divorced; while 6.75% were widowed. The large proportion of married farmers was as a result of the prevailing culture of early marriage in the study area. Marriage was also perceived as a very essential factor facilitating household farming and processing activities in the area (Ekong, 2003).

The highest educational level attained by most of the farmers (Table 1) was secondary education: 10% had tertiary education; 41% had secondary education, 28.40% had primary education while 20.60% had no formal education. The education of farmers influences their ability for a balanced assessment of innovations disseminated to them. Ekwe and Nwachukwu (2006) opined that high educational status of farmers enables them to make better assessment of the technology.

The result further shows that 63.73% of farm households had 6 - 10 members, 25% had the size of 0 - 5 members while 11.27% had over ten household members. The average household size was 8 persons per household. This is in agreement with Ekwe and Nwachukwu (2006) as he averred that the average household size in Africa was about 9 persons per household. This is highly indicative of the extended family system in the area of study whereby parents, children and other relations dwell together as a household.

The results also shows that 64.04% of the farmers had less than six household members assisting in pesticides and other agro-chemical application, while 33.45% had between 6 - 10 persons and 2.51% had over 10 household members assisting in pesticide application.

In the Central Agro-ecological Zone of Delta State, most of the household decisions were mostly taken by all members of the household. In some households decisions were made by the husband and wife only. Table 1 indicates that 35.45% of the farmers made every member of the household to participate in decision making, while 34.23% take decision with their spouses only. Sharing of ideas from every member household when decisions are taken led to sound and balanced decisions, which went further to enhance cohesion in the implementation of such decisions. The reason behind the involvement of every household member in decision-making by farmers is attributed to this.

Table 2. Percentage distribution of farmers according to IPM adoption.

Variable	%
Adopter	15.63
Non-Adopter	84.37
Total	100.00

Source: Field Survey, 2006.

Table 3. Frequency of extension contact with farmers.

Number of times	%
Every week	0.31
Fortnightly	11.20
Once per month	33.23
Once per 2 month	26.35
Once per year	25.50
No Contact	3.41
Total	100.00

Source: Field Survey, 2006.

Most (41.57%) of the farmers had 11 - 20 years of experience in pesticides usage, 24.99% had over 20 years of experience; while 33.44% had 1 - 10 years of experience in pesticides usage. It was observed that the farmers had their local organic control technologies which they practiced before the introduction of chemical pesticides.

IPM adoption among farmers

Table 2 indicates that majority (84.37%) of the farmers had not adopted IPM, while 15.63% of them have adopted it. This may be because most of the farmers consider IPM as a computer technology. According to Agbamu (2006), certain research findings, which are deemed to improve farm production, may be beyond the understanding of rural farmers, even with the interpretation of extension agents. It is also probable that the availability of local pest control technique provided cheaper alternatives to improved one like IPM.

Frequency of extension contact

Table 3 shows that majority (33.23%) of the farmers had contact with extension agents once in a month; 26.35% once in two months; 25.50%, once in a year; 11.20%, once fortnightly; 0.31% every week; while 3.41% had no contact with extension agents. The above result implies that extension contact is very poor. Floyd et al. (1999, 2006) revealed that in the Western Hills of Nepal, the level of adoption of technologies was consistently and significantly affected by the level of extension input.

Test of Hypothesis

Table 4 shows the result of the probit model analysis of the influence of farmers' demographic characteristics and the adoption of IPM. The result showed that the R^2 value was 0.0728 which indicates that there is 7.28% variation in the adoption or use of IPM in pest control as explained by the variables captured for the study.

Farmers' adoption of IPM was positively influenced by marital status, household size, and participation of household members in decision-making but was negatively influenced by farmer's years of experience in the use of pesticides. Effect of these variables on the use of IPM contributed 7.28% of the total variation in the innovation.

In Table 4, marital status had positive influence on the use of the improved pest control technology. The practice of IPM was predominantly carried out by the married respondents. This implies that the more farmers marry, the more they were involved in pest control using the IPM technology. This is because, as a man marries, his household increases and he is faced with added responsibility of fending for his household members. Food is usually the most basic need in every household and use of improved technology to protect crops and livestock is usually opted for.

Household size had positive influence on the use of the innovation. This implies that the larger the household size, the larger the number of household members assisting in pest control, which resulted in the adoption of more IPM, practices. With increasing household size, there is also corresponding increase in number of individuals assisting in IPM application.

Participation in household decision-making significantly favoured the use of IPM. IPM practice was used because every member of the household was involved in taking the decision to use the technology.

Years of experience in IPM practice had negative influence on the adoption of the technology. The use of the innovation got lesser as farmers' experience in pest control increased. Long experience in the use of local or indigenous pest control methods did not encourage the use of the new practice of pest control.

Conclusion and Recommendations

The level of adoption of IPM was not encouraging and the frequency of extension contact was very poor. The level of adoption of the technology was poor because of the poor frequency of extension contact that would have enhanced the adoption of the innovation. However, it was evident that demographic factors like marital status of farmers, household size and involvement of every

Table 4. Probit model analysis of the relationship between farmers' demographic characteristics and adoption of IPM.

Variable	Coefficient	t-ratio
Constant	-0.6342	-0.387
Age (X_1)	-0.1959	-0.943
Gender (X_2)	0.3242	0.797
Marital Status (X_3)	0.7579	2.246*
Educational Level (X_4)	-0.2771	-0.195
Household Size (X_5)	0.5725	1.738*
Household members in pesticide application (X_6)	0.2025	0.502
Years of experience (X_7)	-0.5079	-1.667**
Participation of household decision making (X_8)	0.1522	1.960*

R2 = 0.0728

* = Significant at 5% level of significance.

** = Significant at 5% level of significance.

member of farmers' households in decision making positively influenced the adoption of the technology, while increase in farmers' years of experience in pest control did not favour the use of the innovation.

It is recommended that the Delta State Agricultural Development Programme (DTADP) should move swiftly into an aggressive extension campaign for the use of IPM to make it popular among the farmers.

In disseminating the innovation, more efforts should be made by extension agents to identify the large sized farm households whose heads are middle aged, educated and married, willing to involve every household member in decision making. If such household heads are used by extension agents as contact farmers, the adoption rate of the technology and its rapid diffusion will be very encouraging in the Zone.

Aging farmers should not be selected and appointed as contact farmers as they will most likely not exhibit the zeal and interest required in promoting and popularizing the new innovation. The study should also be extended to the other two agro-ecological zones of the state.

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