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Factors Militating against Pesticides use Among Farmers in Akwa Ibom State, Nigeria

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Abstract: *The study assessed the factors militating against pesticides use in Akwa Ibom State, Nigeria. Primary data were collected with the aid of a structured questionnaire and responses recorded during focus group discussion sessions. A sample size of 240 farmers were randomly selected for the study. About 55.8% of the farmers were male, majority (50.8%) were aged range between 21 – 40 years and 65.4% were married. Majority (56.7%) had tertiary education, most of them (49.6%) take farming as their primary occupation while 65.4% earned monthly income around ₦50,000. Most of the respondents (92.1%) were Christian, (56.3%) had farming experience between 1 to 10 years. The empirical findings revealed that age, educational status, farming experience, farm size of the respondents as well as their access to extension services, access to modern farm inputs and access to credit facilities statistically are significant factors that influence pesticide use by farmers in Akwa Ibom State. Therefore, the study recommended that extension agent should have contact with farmers at all times to enable them acquire knowledge of various methods of controlling pest and diseases through the use of pesticides.*
Keywords: pesticide, farmers, production, crops, Akwa Ibom State

INTRODUCTION

Pesticide, a damage control input to safeguard from insects and other pests, is considered to improve nutrition in food, and its use is assumed an economic, labour-saving and efficient tool for pest management (Damalas and Eleftherohorines, 2011). Furthermore, pesticide is believed to improve competitive advantage in agriculture (Delcour *et al.*, 2015). This is because pesticide use is deemed essential for retaining current production and yield levels, as well as maintaining a high-quality standard of life (Delcour *et al.*, 2015). There is a widespread

acceptance that the use of modern agricultural technologies has led to a sharp increase in pesticide use, along with other modern inputs, in the developing economies (Pingali and Rola, 1995). However, there is a widespread claim that pesticides are harmful to human health and the environment (Pimentel, 2005). The environmental and social impact of pesticide use in the USA alone is estimated at USD 10 billion per year (Pimentel, 2005). An estimated 1–5 million farm workers suffer from pesticide poisoning every year, and at least 20,000 die annually from exposure, mostly in developing countries (World Bank, 2006).

Both Asia and Latin America experienced dramatic increases in agricultural productivity due to rapid and widespread adoption of Green Revolution (GR) technologies, which incorporate widespread use of modern agricultural inputs and agro-chemicals (Johnson *et al.,* 2003). However, Sub-Saharan Africa (SSA) did not or could not participate in this drive for GR technologies of the 1970s–1980s, and therefore could not gain from the application of modern agricultural inputs and agro-chemicals (Sheahan and Barrett 2017). The issue of climate change has also contributed to the alteration of planting season in the region leading to the proliferation of varieties of weeds and insect pests which has contributed to the sluggish yields in SSA. The adoption of improve agricultural technology in the region is inevitably, if food security and food self-sufficiency policies is prioritized (Nkeme *et al.,* 2017, Udousung *et al.,* 2019, Udousung *et al.,* 2024a; and Udousung *et al.,* 2024b). In fact, the low use of modern inputs, including pesticides, is assumed to be a norm in SSA agriculture, which led to the setting up of policy directives and programs such as the Comprehensive Africa Agriculture Development Program (CAADP), Abuja Declaration and Malabo Declaration (Sheahan and Barrett 2017).
Nigeria, the largest economy in Africa, is largely dependent on its agricultural sector for the supply of raw materials, food, and foreign exchange, and employs over 70% of the labor force (Liverpool-Tasie *et al.,* 2011). Small-scale semi-subsistence farmers comprising more than 70 million farmers/rural citizens also dominate the sector. The agricultural sector is characterized by low level of productivity and modern technology adoption (Aigbokhan, 2000). The major constraints on improving agriculture in Nigeria is the subsistence production system, the low level of modern technology adoption, land fragmentation, and crop failure, which increases production risk (Udousung and Udeme, 2018; Udousung and Ekerete, 2018). Poor agricultural information dissemination and lack of the use of damage control inputs, e.g., pesticides, further increases the risk of crop losses (Udousung *et al.,* 2018; Udousung *et al.,* 2020). This is because about 20–40% of potential food produced is lost to insects and other pests in Africa (Anang and Amikuzuno, 2015).

Explaining variation in pesticide use intensity at the farm level is quite complex and not well explored in the literature (Galt 2008). A limited number of studies are available that examine various aspects and/or determinants of pesticide use at the farm level in Africa. Sheahan and Barrett, (2017) utilized a large-scale multi-country nationally representative dataset generated through the Living Standard Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) with 22,565 households and 62,387 plots from six countries (Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda) collected during 2010–2012. The project aimed to investigate the broader question of the current level of modern input use in agriculture, which also includes the use of agro-chemicals. One of their main conclusions was that although modern input use

may be relatively low in aggregate, it is not equally low across six countries, particularly regarding the use of inorganic fertilizers and agro-chemicals. Anang and Amikuzuno (2015), using a sample of 300 rice farmers from Northern Ghana, reported that a number of socio-economic factors influence farmers' decision to choose pesticides. Adeniyi, Aguntokun and Ibiyinka, 2017) in Nigeria, noted that pesticide price is an important determinants of pesticide use. Van *et al.,* (2009), using a sample of 317 small-scale farmers in Uganda, concluded that the farmers do not use the most dangerous WHO Class 1a and 1b pesticides but mostly use WHO Class II pesticides, and have poor knowledge of the level of toxicity and poor protection practices. Mwatawala and Yeyeye (2017), using a sample of 91 tomato farmers from Morogoro region in Tanzania, noted that the farmers are generally aware of the laws, environment, and consumer health, but could not name a single act, and only 21% of them used the correct dose of pesticides. Idris (2013), using a sample of 50 cocoa farmers from Ogun State, Nigeria, noted that most of the farmers applied fungicides because of the black pod disease.

From the literature available, the issue of pesticide usage among farmers in Akwa Ibom State is lacking. The use of pesticide is critical in achieving the overall objectives of self-food sufficiency agenda of the Akwa Ibom State government. Premise on this, the study specifically determine factors influencing the decision to use pesticides by arable crop farmers in Akwa Ibom State, Nigeria.

THEORETICAL FRAMEWORK

Theory of Planned Behavior (TPB): In this model, perceived behavioural control (PBC) as a new variable is added to extend TRA model. Basically, PBC is determined by the availability of resources, opportunities and skills, as well as the perceived significance of those resources, opportunities and skills to achieve outcomes (Fishbien and Ajzen, 1980). Although both TPB and TRA assumed person's behavioural intention (BI) is affecting individual's behaviour, TPB is using the PBC for individual's actions which are not under volitional control. By adding PBC, not only realistic limitations is composed but also, a self-efficacy type factor is achieved (Taherdoost *et al.,* 2012). Moreover, PBC has the direct influence on actual behaviour as well as the indirect affect through the behavioural intentions. Therefore in TPB model, three main factors are affecting perceived behavioural control, subjective norm, and behavioural attitude. However, there are two main problems with TPB model (Sahibuddin *et al.,* 2011). First, the one's attitudes towards information technology will not be largely relevant if a computer system is not accessible. Second, the revised TPB may be viewed as the more suitable theoretical framework which is influenced the degree of individual's voluntariness that choose or not to choose the use of information technology in the workplace.

METHODOLOGY

Study Area

The study was conducted in Akwa Ibom State. It was created on September 23rd, 1987 and has Uyo as its capital. Akwa Ibom State is one of the nine (9) Niger Delta States. Akwa Ibom State is located in the South – South geopolitical zones of Nigeria, consisting of six states namely:

Akwa Ibom State, Bayelsa, Cross River, Delta, Edo and Rivers State. The state is situated between latitudes 4^0 32^1 and 5^0 33^1 North and longitude 7^0 31^1 and 8^0 25^1 East and has a total land area of 6,900 square kilometers and population of 3,920, 208 people (NPC, 2006). The state comprises of thirty one (31) Local Government Areas, grouped into six agricultural development programme zones. Akwa Ibom State has two distinct season; rainy and dry season, with the evenly distributed throughout the years and decreasing from over 3,000mm in the South to about 2700mm in the North. The mean daily maximum temperature average of 27^{0c} all through the year and the highest temperature is from February to April, but does not exceed 35^{0c}.

The relative humility is highest at 0.900 hours (Nigerian time). Majority of the people in the state are farmers either part time or full time while others are traders, welders, businessmen as well as civil servants. The riverine occupation of the people is fishing. Akwa Ibom State is divided into six (6) Agricultural development programme zones (Abak, Eket, Etinan, Ikot Ekpene, Oron and Uyo) for agricultural development services convenience. The soil type range from loamy through real deep soil, rich in Iron and gray sandy soil to clay soil. The soil is generally fertile and encourages agricultural practices

Sampling Procedure and sample size

A multi-stage sampling technique was adopted in the selection of the respondents. In the first stage, a simple random sampling technique was used to select three (3) agricultural zones out of six (6) Agricultural Development Programme zones in Akwa Ibom State. The selected zones were Uyo, Abak and Ikot Ekpene. In the second stage of the survey, simple random sampling technique was used to select two (2) extension blocks from each of the zones thereby yielding 6 blocks. In the third stage of the survey, two (2) extension cells was chosen from each of the blocks, given twelve (12) extension cells. At the final stage twenty (20) farmers was purposively selected thereby resulting in a total sample size of two hundred and forty (240).

Data Analysis

The study used Probit (a binary model) model to analyze the data collected. Explicitly, the specified model is shown in equation 1:

$$Q = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + +\beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + U_i \ldots\ldots\ldots\ldots (3)$$

Where Q = the decision to use pesticide (a dummy, 1 for yes and 0 for no); X_1 = farmers sex (1 for male and 0 for female); X_2 = farmers' age (years); X_3 = farmers' education (years); X_4 = farmers' income; X_6 = farm size; X_7 = access to extension services; X_8 = access to modern input; X^9 = access to credit.

RESULT AND DISCUSSIONS

Socio- Economic characteristics of farmers in Akwa Ibom State

This section provides an overview of the socio-economic characteristics of farmers in Akwa Ibom State. Socio-economic variables considered in the study were sex, age, marital status, educational status, primary occupation, monthly income, household size, experience, types of farming practiced, farm size, access to extension services, access to modern farm inputs and access to credit facilities.

Table1: Distribution of Respondents Based Socio-economic Characteristics.

Socio-economic characteristics	Frequency (n=240)	Percentage (%)	Mean
Sex			
Male	134	55.8	
Female	106	44.2	
Age(years)			
Less than 21 years	2	0.8	
21-40 years	122	50.8	
41-60 years	98	40.8	
61-80 years	16	6.7	
Above 80 years	2	0.8	42 years
Marital Status			
Single	56	23.3	
Married	157	65.4	
Divorced /separated	13	5.4	
Widowed	14	5.8	
Educational Status			
No format education	9	3.8	
Primary education	22	9.2	
Secondary education	73	30.4	
Tertiary education	136	56.7	
Primary Occupation			
Salaried Job (Government Private)	71	29.6	
Trading	47	19.6	
Farming	119	49.6	
Others (cyclist, hair dressing, selling of food/snack etc)	3	1.3	
Monthly Income			
0 - 50,000	157	65.4	
51,000 – 100,000	69	28.8	
101,000 – 150,000	4	1.7	
Above 150,000	10	4.2	59,403.3

Household size			
1-5	132	55.0	
6 – 10	103	42.9	
11 – 15	5	2.1	6 persons
Farming experience (in years)			
1- 10	135	56.3	
11 -20	75	31.3	
21 – 30	18	7.5	
31 – 40	9	3.8	
41 – 50	3	1.3	13 years
Farm size			
Less than 1 hectare	89	37.1	
1-5 hectares	133	56.4	
Above 5 hectares	18	7.5	
Access to extension services?			
Yes	172	71.7	
No	68	28.3	

Source: Field Survey, 2022.

Table 1 shows that 55.8% of the respondents were male while 44.2% were female, indicating that there were more male farmers than female farmers in the study area. The result disagrees with Umoh (2006) who reported that females make up the bulk of farming population in Akwa Ibom State. About 50.8% of the respondents were aged between 21 and 40 years, 40.8% were aged between 41 and 60 years, 67% were aged between 61 and 80 years, and those aged above 80 years and constituted 0.5%. The average age of the respondents was 42 years. The result disagreed with Akinbile, Akwiwu and Alade (2014) who posited that majority of farmers fall within the age range of 31-40 years.

The finding also reveals that 65.4% of the respondents were married; 23.3% were single, 5.8% were widowed while 5.4% were divorced/separated. The result shows that majority of the respondents were married and corroborates Ekong (2003) who reported that getting married is a highly cherished value among rural dwellers mostly farmers in Nigeria. Ekanem and Okon (2017) also reported that majority of farmers in Akwa Ibom State are married.

Education of the respondents show that 56.7% of the respondents had tertiary education, 30.4% had secondary education, 9.2% had primary education while those that had no formal education constituted 3.8% of the respondents. The findings reveals that majority of the respondents are functionally literate. The result agrees with the findings of Ekanem and Okon (2017) that majority of the farmers in Akwa Ibom State are literate.

Primary occupation of the respondents indicates that 49.6% of the respondents were farmers, 29.6% of the respondents had salaried jobs, 19.6% were traders while hair dressing, cyclist, selling of food/snacks constituted 1.3% of the respondents. The result agrees with the findings

of Udousung and Umoh (2020) that the primary occupation of Akwa Ibom State people is farming. The monthly income of the respondents shows that 65.4% of the respondents earned between ₦1,000 and ₦50,000 monthly, 28.8% earned between ₦51,000 and ₦ 100,000 monthly, 4.2% earned above ₦150,000 , while those that earned between ₦ 101,000 to ₦ 150,000 accounted for 1.7% of the respondents. The mean income of respondent s stood at N59, 403.3/annum. The finding agrees with Kehinde, Tologbonse, Ademiji Yemison and Tohogbonse (2014) that majority of the farmers in western region of Nigeria earned around ₦50, 000 per season.

Household size indicated that 55.0% of the respondents had a household size of 1-5 persons, 42.9% had 6-10 persons, while 2.1% had 11-15 persons. The mean household size was 6 members. The finding agrees with Ekanem and Okon (2017) that the mean household size of farmers in Akwa Ibom State is 6 members. A greater proportion 57.9% of the respondents were household heads while 42.1% were not household heads. The majority about 92.1% were Christians, 4.2% were traditional worshippers while others (e.g. Islam) constituted 3.8% of the respondents. The study is in conformity with the findings by Ekanem and Okon (2017) that the majority of the farmers in Akwa Ibom State are Christians.

Years of farming experience shows that 56.3% of the respondents had 1-10 years of farming experience, 31.3% had 11-20 years, 7.5% had 21-30 years, 3.8% had 31-40 years while 1.3% had 41-50 years of farming experience. The mean score was 13 years. The result disagrees with Udousung and Umoh, (2020) who reported that majority of the farmers had 10 years experience in farming in Akwa Ibom State. The farm size distribution indicates that 56.4% of the respondents had 1-5 hectres (ha) of farm size, 37.1% had less than 1 ha while 7.5% had above 5 ha. The average size of farm size was 2 ha. The result disagrees with Adekunmi, Abdu-Raheem and Awoyem, (2017) who affirmed that majority of the farmers had less than one hectre of agricultural land.

Data in table 1 shows that 71.7% of the respondents had access to extension services while 28.3% had no access to extension services. The result agrees with Asiabaka (2010) who reported that agricultural extension is viewed as an educational programme that provides support to the farmers, to set and fulfill their own development goal.

Factors Influencing Pesticides Use by Farmers in Akwa Ibom State

The probit regression analysis result of the factors influencing pesticide use by the respondents is shown in table 2. The table reveals that age, educational status, farming experience, farm size of the respondents as well as their access to extension services, access to modern farm inputs and access to credit facilities statistically are significant factors that influence pesticide use by farmers in Akwa Ibom State while sex and income are not a statistically significant factors that influence pesticide use.

Table 2: Probit regression result of factors influencing pesticides use by farmers in Akwa Ibom State

S/N	Variables	Slope coefficient	Standard	Z
1	Sex	0.024	0.066	0.365
2	Age	0.177	0.103	1.718*
3	Educational Status	0.136	0.042	3.238***
4	Income	0.000	0.000	0.905
5	Farming experience	0.333	0.103	3.238***
6	Farm size	0.441	0.158	2.787***
7	Access to extension services	0.204	0.087	2.403**
8	Access to modern input	0.124	0.071	1.744*
9	Access to credit facilities	0.227	0.084	2.703***

Note: *, ** and * indicate statistical significance at 10 %, 5% and 1% levels respectively; Pseudo R^2 = 0.37.**

The Statistically Significant Factors

The age of the respondents significantly and positively (with a coefficients of 0.177) influenced pesticide use by the respondents at 10% level. The regression coefficient implies that an increase in the age of the farmers will lead to 0.177 increase in their level of pesticide use. This result disagrees with Adejumo, Ojoko and Yusuf (2014) who claim that increase in age will reduce the use of pesticides. The education status was significant at 1% and also carried a positive sign. This implies that an increase in the educational status of farmers will lead to an increase in the use of pesticide by 0.136. Gunjal and Coffin (1990) posited that educated farmers are more likely to adopt new technologies such as pesticides use.

Farming experience of the respondents was positively significant at 1% level of significant and it has a positive coefficient of 0.333 implying that an increase in years of farming experience of the farmers will cause 0.333 increase in the use of pesticides. The result is in agreement with Adejumo, Ojoko and Yusuf, (2004) who posited that more experienced farmer is likely to have higher productivity and hence be able to provide more food for his household members. Farm size was significant at 1% and carried a positive sign. This implies that an increase in the farm size will lead to an increase in the use of pesticide by 0.441. The result agrees with Ajabi, Lawal, Coker and Adoyinklee (2014) who find a positive relationship between Agro-chemical use and farm size from their study titled Probit Model Analysis of Small Holders Farmers Decision to use Agro-chemical input in Guagwalada and Kuje Area Councils of Federal Capital Territory, Abuja, Nigeria.

Access to extension services of the respondents was found to be positively significant at 5% level of significance and it has a positive coefficient of 0.204, implying that pesticide use increases with contact with extension agents by the respondents. Benjamin and Amikuzuo (2015) observed that farmers who receive extension contacts as well as farmers who are educated are expected to acquire knowledge of various methods of controlling pest and diseases.

Access to modern inputs was significant at 10 % and also carried positive sign. This implies that an increase in access to modern inputs by farmers will lead to an increase in the use of pesticides by 0.124. Agbanus, (2011) posited that the success of agricultural extension programs are enhanced when they are linked to research and organized delivery of farm inputs to farmers. Access to credit facilities of the respondents was found to be positively significant at 1% level of significance and it has a positive Coefficient of 0.227, implying that an increase in the credit facilities of the farmers will cause 0.227 increase in the use of pesticides which will bring more income to the farmers through high yield of their productivity. The result agrees with Idris, Rasak, Folake and Hakeem (2013) who found income of farmers to be positively related to the level of pesticide use in Nigeria.

Finally, sex of the farmers and their income did not statistically influence their use of pesticides in the study area. This could be due to the fact that there was no gender discrimination in access to pesticide by farmers.

Hypotheses of the Study
The results of all the hypotheses tested in this study are presented and discussed in this section.

Hypothesis One
The correlation coefficients between farmers' level of pesticides use and their knowledge of pesticide use, attitudes toward pesticide use and perceptions of pesticide use is shown in table 3. The table shows that the farmers' level of pesticide use positively associated with their knowledge of pesticide use (r =0.77) and perceptions of benefits regarding pesticides use (r=0.89) at 5% and 1% levels respectively. The farmers' level of pesticide use showed negative association with farmers' attitudes toward pesticide use (r = -0.57) at 1% level implying an inverse relationship between the two variables and indicating that lower levels of pesticide use by farmers in the study area as reported earlier in table 2 is related to higher unfavourable attitudes toward pesticide use as reported in table 4. However, no significant relationship exist between the farmers' level of pesticide use and their perceptions of hazards associated with pesticide use.

Table 3: correlation analysis results of relationships between the levels of pesticide use and farmers knowledge, attitudes and perceptions to pesticide use.

Variable	Knowledge of pesticide use	Attitude toward pesticide use	perceived benefits	perceived hazard
Farmer's level of pesticides use	0.77***	-0.57**	0.89***	0.43

Note: ** and *** = Significance at 5% and 1% levels respectively; r= correlation coefficient; ns= not significant.

CONCLUSION

The study aimed at assessing level of pesticide use by the respondents, The result of socio – economic characteristics of farmers in Akwa Ibom State indicates that (55.8%) of the farmers

were male while 44.2% were female, majority (50.8%) were aged range between 21 – 40 years and 65.4% were married. Majority (56.7%) had tertiary education, most of them (49.6%) take farming as their primary occupation, 65.4% earned monthly income between N1,000 and N50,000 with (47.9 %) household size ranging from 1 to 10 persons while (57.9%) were household headship. Most of the respondents (92.1%) were Christian, (56.3%) had farming experience between 1 to 10 years, 54.2% practiced both subsistence and commercial farming with farm size of 56.4% respectively. The respondent (71.7%) had access to extension services, 57.9% of the respondents had access to modern farm inputs and 76.7% had no access to credit facilities.

Probit regression result of factors influencing pesticide use revealed that age of the respondent educational status, farming experience, farm size, access to extension services, access to modern farm inputs and access to credits facilities were the significant factors influencing the level of pesticides use by farmers in the study area.

Recommendations

Based on the findings of the study, the following recommendations were made:

- Extension agent should have contact with farmers at all times to enable them acquire knowledge of various methods of controlling pest and diseases through the use of pesticides.
- Farmers should be educated through the extension agents on proper ways of storing, handling and disposal of pesticides since majority of the farmers lack knowledge about it.
- Farmers are advised to join cooperative societies to gain access to credits facilities which will enable them buy farm inputs and produce more food for the citizens.
- Increase awareness on attitudinal change and perception of farmers towards pesticides use by the extension agents.
- Extension agents should educate the farmers on importance of pesticides in their farms, since the level of pesticides use was low.

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