World Journal of Agricultural Sciences 12 (5): 327-335, 2016
ISSN 1817-3047

DOI: 10.5829/idosi.wjas.2016.12.5.1922

Effectiveness of Integrated Pest Management Practices Utilized by Farmers in Osun State, Nigeria

[1]B.O. Adisa and [2]O.T. Alao

[1]Department of Agricultural Extension and Rural Development,
Obafemi Awolowo University, Ile-Ife, Nigeria
[2]Department of Agricultural Economics and Extension,
Osun State University, Ejigbo Campus, Osun State, Nigeria

Abstract: The study examined the effectiveness of Integrated Pest Management (IPM) practices utilized by Osogbo Catholic Rural Development (RUDEP) farmers in Osun State, Nigeria. Personal and socio-economic characteristics, types of Integrated Pest Management (IPM) utilized, level of utilization of IPM and effectiveness of IPM utilized by the respondents were studied. The study involved 36 RUDEP groups in their four agricultural zones (Ila, Ijesa, Osogbo and Atakumosa) in Osun state, Nigeria. Systematic random sampling was employed to select 131 respondents from the 523 registered farmers, representing 25% of the population. Data were collected using an interview schedule. The collected data were analyzed using descriptive and inferential statistics. The results revealed that 31.3 percent of the respondents' were between 51 and 60 years old, most (93.9 %) were married, 79.4 percent were male, while 20.6 percent were female, Christian (67.9 %) and Muslim (32.1 %). 25.2 percent of the respondents had no formal education and 45.8 percent had below 20 years farming experience. Kerosene-soap solution (86.3%), tobacco-soap solution (72.5), Siam-weed-soap solution (66.4 %) were the IPM mostly utilized by farmers. There was positive and significant relationship at $p < 0.05$ between marital status ($r = 0.056$), ethnicity ($r = 0.092$), nativity ($r = 0.244$,), income ($r = 0.358$), farming experience ($r = 0.036$) and the level of effectiveness of integrated pest practices. In conclusion, termite is the main enemies of the farmers on the farm. The IPM utilized by the farmers was very effective and generally accepted without any cultural or religious bias, hence, scientific investigation is necessary to substantiate the farmers' perception of IPMs.

Key words: Integrated pest management · Utilization · Effectiveness

INTRODUCTION

Man in his day-to-day activities comes in contact with a vast number of social facts which could be used to solve his ever unending problems without him necessarily rely on external knowledge system. This knowledge system spans the entire range of human experience, including history, linguistics, politics, arts, economics, administration and psychology. Its technical aspects include agriculture, medicine, natural resources management and engineering [1]. In the field of agriculture, the knowledge could apply to various farming practices. Using indigenous knowledge of farmers in developing appropriate technologies has been increasingly recognised as a method of attaining sustainability in agricultural development [1].

The drive to boost food security and to fight off insect pests and yield-limiting crop pathogens has led to the build-up of obsolete and toxic pesticides and chemicals [2]. Dependency on chemical pest control and improper pesticide use has resulted in crop and environmental contamination and detrimental effects on humans. Hence, many of the techniques or practices or practices collectively referred to as integrated pest management (IPM) have been designed to address some of the health and environmental concerns of pesticide use and problem of pest resistance to pesticide. Integrated Pest management practices (IPM) reduces these risks.

Environmental Protection Agency [3] asserted that IPM is an environmentally sensitive approach to pest management that relies on a combination of common-sense practices built on indigenous knowledge of farmers.

Corresponding Author: B.O. Adisa, Department of Agricultural Extension and Rural Development, Obafemi Awolowo University, Ile-Ife, Nigeria.

These practices use comprehensive information on life cycles of pests and other interaction with the environment in combination with available pest control methods to prevent or control pest damage. The Environmental Protection Agency (EPA) further emphasizes that farmers who practice IPM use a four-pronged approach: setting thresholds, monitoring and identifying pests, implementing preventive measures (e.g., crop rotation) and implementing control measures (e.g., insect trapping and weed control). The California Plant Health Association [4] summarizes tools and goals of IPM as comprising biological practices (protect/enhance/release natural enemies); cultural practices (crop rotation, cultivation, irrigation, pest monitoring); chemical practices (pesticides, insect growth regulators, pheromones); and genetic practices (sterile release, resistant varieties, transgenic plants). Furthermore, the association states two goals of IPM as, first, "to ensure production of high quality food and fiber in a sustainable, environmentally sensitive economical manner and second, to minimize the risks to human health and to the environment".

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 *et al*. [5] IPM is a sustainable approach to manage pests by combining biological, cultural, physical and chemical tools in a way that minimize economic, health and environmental risks. Weeden *et al*. [6] explained that the objective of IPM is not to eliminate all pests, but rather to reduce pest populations to less damaging numbers using multiple tactics. Using multiple tactics minimizes the chances that a particular pest will adapt to any one of the tactics.

Most farmers face challenges in dealing with insects, diseases and weeds affecting their crops. Small scale farmers demonstrated less familiarity with IPM than medium and large scale farmers in studies conducted by Molnar *et al*. [7] and Tackie *et al*. [8]. This shortcomings needs to be addressed, taking into consideration the likelihood of farmers' exposure to pesticide residues on farm. Similarly, consumers could be exposed to pesticides residues when they purchase and consume farm produce. Having proper knowledge of IPM and applying that knowledge is a way by which the risk of pesticide exposure can reduce.

The unsafe use of pesticides and other chemical by farmers may have significant impact on the quality of their farm produce and products, which will ultimately affect the consumer and may also affect farmers' health. Moreover, ascertaining small holders farmers' understanding and their use of IPM practices could help formulate strategies or programs to assist them in carrying out effective practices on their farms. This background situation, therefore necessitate the need to carry out the assessment of the effectiveness of Integrated Pest Management (IPM) used by farmers in the study area. The study is therefore aimed at providing answers to the following research questions among others:

- Which of the Integrated Pest Management is mostly practiced by the farmers?
- To what extent are they practicing the most preferred Integrated Pest Management?
- What are the factors influencing the utilization of Integrated Pest Management?
- What are the problems associated with the utilization of Integrated Pest Management?

Objectives of the Study: The specific objectives of the study are to:

- Investigate personal and socio-economic characteristics of farmers that utilized IPM in the study area;
- Identify the types IPM which is mostly utilized by the farmers in the study area;
- Determine the level of utilization of the IPM by the farmers; and
- Determine the level of effectiveness of the IPM used by the farmers; and
- Examine the problem associated with the utilization of IPM.

Statement of Hypothesis

The Hypothesis Was Stated in the Null Form, Thus: There is no significant relationship between the personal and socio-economic characteristics of the farmers (i.e. age, sex, marital status, household size, ethnicity, nativity, length of years spent in the community, income, farm size, farming experience, education, external orientation, participation in community organization) and the level of effectiveness of integrated pest management used by farmers in the study area.

MATERIALS AND METHODS

The study was carried out under the Misereor funding programme of Osogbo Catholic Diocese Rural Development Programme (RUDEP) in Osun State, Nigeria. The project focused on sustainable farming practices using Integrated Pest Management (IPM) to control pest and diseases of crops. Personal and socio-economic characteristics of the farmers, types of IPM mostly utilized by the farmers, level of utilization of the IPM, effectiveness of the IPM utilized and problems militating against the utilization of IPM by the respondents were studied. The study involved 36 RUDEP groups in their four agricultural zones (Ila, Ijesa, Osogbo and Atakumosa) in Osun state, Nigeria. Systematic random sampling was employed to select 131 respondents from the 523 registered farmers, representing 25% of the population. Data were collected using an interview schedule. The collected data were analyzed using descriptive statistics such as frequency counts, percentages, maen and standard deviation while correlation analysis (r) was used to establish the tested hypothesis.

RESULTS AND DISCUSSION

Demographic and Socio-Economic Characteristics of the Respondent: Data in Table 1 shows the socio-economic characteristics of the respondents. The mean year of the respondents was 57.08 year with standard deviation of 13.7 years. Some (31.3%) were between 51 and 60 years, 16.8 percent were above 70 years of age, while 32.1 percent were below 51 years of age. Majority (63.4%) of the respondents were less than 61 years of age, this revealed that they are in their productive age, while very few of them are old. This is an indication that they are in the ages when they can take risk and prone to innovations such IPM practices. Also, 79.4 percent of the respondents were male while 20.6 percent were female. This could be an indication that men adopt IPM than their female farmer counterparts.

Furthermore, 93.9 percent were married and 3.8 percent were widowed, while 0.8 and 1.5 percents of the respondents were divorced and singled, respectively. The results showed that both single and married engaged in farming but mainly dominated by married people. This implies that young singled people were not well represented in farming. For continuity and sustainability of IPM and agriculture in general, youths must be fully involved in farming. Majority (67.9%) of the respondents were Christian, while 32.1 percent were Muslim.

Also, 60.3 percent of the respondents had less than 4 household size. Some (38.9%) had 10 and above household size. Very few (0.8%) had between 4 and 6 household size. The mean household size was 2.40 with standard deviation of 1.1. This implies that the farmers in the study area have relatively low household size. This may be as a result of children and wives not rendering helping hand to their father as before but instead parent paying an unending exorbitant fee on their wards. Virtually all (98.5%) of the respondents were Yoruba while 1.5 percent are Igbo and none belong to Hausa tribe. This revealed that majority of the participant were dominated by Yoruba people.

Furthermore, 25 percent of the respondents had spent less than 11 years in the community they are residing, 22.7 percent had spent between 11and 20 years, 11.4 percent had spent between 21and 30 years, 18.2 percent had spent between 30 and 40 years and above 50 years, respectively, in their community. The mean length of years spent in the community was 2.81 with standard deviation of 1.502. Some (32.1%) of the respondents had small farm size less than 3 acres. 27.5 percent of the respondents had between 4 and 5 acres of farmland while 14.5 percent had between 6 and 8 acres of farmland. 20.6 percent of the respondents had farmlands 9 and above acres. The mean farm size was 2.25 acres with standard deviation of 1.145 acre. This revealed that the respondents were small scale farmers. Majority (83.2%) of the respondents were engaged primarily in farming, 0.8 percent was into blacksmithing, 0.8 percent was into Bricklaying. Only very few (3.8%) were retiree, while 2.3 percent were engaged in teaching and 9.2 percent were engaged in trading. This implies that the major occupation of the respondents was basically farming.

Table 2 shows that 42.7 percent of the respondents earned less than N100, 000 in a year, few (26.7%) of the respondents earned between 100, 000 and 199, 999 Naira per annum. Only, 20.6 percent earned between 200000 and 299, 999 Naira per annum. Very few 9.9 percent earned between 300000 and 399, 999. This implies that majority (69.4%) of the respondents earned less than 200, 000 Naira per annum. This is an indication that the small scale farmers are poor. 25.2 percent of the respondents had no formal education, Some (38.2%) had primary education, 24.4 percent had secondary education, 9.9 percent had post-secondary education, while 1.5 percent had adult education. This implies that some of the respondents were educated which may influence their positive attitudes towards utilization of IPM.

Table 1: Distribution of the respondent according to their socio-economic characteristics (N = 131)

Variable	Frequency	Percentage	Central tendency
Age (Years)			
Less than 40	17	13.0	Mean 57.08
41 – 50	25	19.1	SD 13.7
51 – 60	41	31.3	
61 – 70	26	19.8	
71 - 80	21	16.0	
Above 80	1	0.8	
Sex			
Male	104	79.4	
Female	27	20.6	
Marital status			
Single	2	1.5	
Married	123	93.9	
Divorced	1	0.8	
Widow	5	3.8	
Religion			
Islam	42	32.1	
Christian	89	67.9	
Traditional	0	0.0	
Household size			
1 - 3	79	60.3	Mean 2.40
4 - 6	1	0.8	SD 1.1
7 - 9	0	0.0	
10 and above	51	38.9	
Ethnicity			
Igbo	2	1.5	
Yoruba	129	98.5	
Hausa	0	0.0	
Length of years spent in community			
Less than 11	11	25.0	Mean 2.8
11 - 20	10	22.7	SD 1.502
21 - 30	5	11.4	
31 - 40	8	18.2	
41 - 50	2	4.5	
Above 50	8	18.2	
Farm size (Acre)			
Below 3	42	32.1	Mean 2.25
4 - 6	36	27.5	SD 1.145
7 - 9	19	14.5	
Above 9	27	20.6	
Primary occupation			
Farming	109	83.2	
Blacksmithing	1	0.8	
Bricklaying	1	0.8	
Retiree	5	3.8	
Teaching	3	2.3	
Trading	12	9.2	

Source: Field survey, 2015

Table 2: Distribution of the respondent according to their socio-economic characteristics (N = 131)

Variable	Frequency	Percentage	Central tendency
Income in NGN			
Less than 100, 000	56	42.7	
100, 000 - 199, 999	35	26.7	
200, 000 - 299, 999	27	20.6	
300, 000 - 399, 999	13	9.9	
Level of education			
No formal education	33	25.2	
Primary school education	50	38.2	
Secondary school education	32	24.4	
Post secondary education	13	9.9	
Adult education	2	1.5	
Farming experience (Year)			
Less than 21	60	45.8	
21 - 40	38	29.0	
41 - 60	23	17.6	
Above 60	4	3.1	
Participation in community organization			
Religion	6	4.6	
Community base	2	1.5	
Age group	1	0.8	
Cooperative	37	28.2	
Religion and cooperative	52	39.7	
Cooperative and cultural	23	17.6	
Cooperative, religion and cultural	3	2.3	
Cooperative and trade union	4	3.1	
Religion and community based	1	0.8	
Cooperative, religion and community based	2	1.5	

Source: Field survey, 2015

Some (45.8%) of the respondents had less than 21 years farming experience, 29 percent had between 21 and 40 years farming experience, 17.6 percent had between 41-60 years farming experience, while only, very few (3.1%) had 60 and above years farming experience. This implies that majority of the respondents were experienced farmers who may be interested in adopting innovations that will improve their productivity such as IPM.

Furthermore, 4.6 percent of the respondents participated in religion organization, 1.5 percent participated in community based organization, 0.8 percent was members of Age group, few (28.2%) were members of cooperative organization. Some (39.7%) of the respondents participated in both religion and cooperative, 17.6 percent participated in both cooperative and cultural organization, 2.3 percent participated in cooperative organization, religion organization and cultural organization. Also, 3.1 percent participated in cooperative and trade union, 0.8 percent participated in religion and community based organization while 1.5 percent

participated in cooperative, religion and community based organization. This implies that majority of the farmers engaged in cooperative organization where they could save and borrow money to facilitate their farm work. Most of them were involved religion organization to seek God face for protection and better harvest.

Types of IPM Mostly Utilized by the Farmers: Data in Table 3 shows the type of IPM mostly utilized by the farmers. Majority (86.3%) of the respondents utilized kerosene-soap solution to control bugs, mites, aphids and leaf miner, cocoa aphids. 72.5 percent utilized Tobacco-soap solution to control bugs, mites, aphids and leaf miner, cocoa aphids. Some (35.1%) of the respondents utilized Hot-pepper-soap solution to control leaf insects. Also, 84 percent of the respondents utilized siam weed soap solution to control termite. 42.7 percent of the respondents dried neem seed soap solution to control beetles, aphids, grasshopper, leaf and fruit worms, stem borers and white flies.

Furthermore, majority of the respondents soaked *Adenopus breviflorus* (tangiri) in water and add palm oil to it to control Newcastle disease in their poultry (66.4%), mixed powdered clay soil with hot pepper to control maize weevils (56.5%), poured fresh water from processed locust beans into the termitariun to destroy termites (49.6%), poured cassava water squeezed from grated cassava into termitarium to control termite (48.9%), Burying of powder made from sugarcane chaff and skin of lion with dog meat on the farm, in the four corners of their farm to protect the farm from termite invasion (44.3%), kitchen ash or any wood ash to control termite (35.9%), table salt (NaCl) to control termite (30.5%), burying of the big rat (*okete*) intestine on the farm to control termite (30.5%) and solution from soaked fresh or dried tobacco leaves overnight inside water to control Newcastle disease in poultry (29.8%).

In contrast, very few respondents had utilised covering of *Cucumeropsis mannii*/melon pod (Egusi itoo) with mixture of black soap (ose dudu) and *Momordica charantia* (Ejirin wewe) to control termite (8.4 %), Cow scapular to control maize weevils (7.6%), sheep placenta to control termite (4.6%), alligator pepper to control termite (3.8%), soaked *Anchomanes difformis* (abirisoko) in water, that is, *Anchomanes difformis* solution to control Newcastle disease of poultry (4.6%), planted pineapple on their farm randomly to control termite (3.8%); planted *Datura stramonium* L. (gegemu) to keep termite away (3.8%), planted vertiver grass to repel termite (3.1%) and poured fresh water from Shea butter processing into the termitarium to destroy the termites (2.3%).

Level of Utilization of the Integrated Pest Management Practices: Data in Table 4 show the distribution of the respondents according to their level of utilization of IPM. 51.1 percent of the respondents always utilized siam weed-soap solution to combat black-pod disease of cacao on their farms. Some (38.9%) always utilized kerosene-soap solution to control bugs, mites, aphids and leaf miner and cocoa aphids. Few (18. 3%) of the respondents always utilized mixture of powdered clay soil and hot-pepper to preserve maize against weevils and *Adenopus breviflorus* (tangiri) solution to prevent Newcastle disease of poultry, respectively. Also, 14.5 percent always dried neem seeds solution to control termite, while, 10.7 percent always utilized dried neem seed soap solution to control yam beetles, grasshopper, leaf and fruit worms, stem borers and white flies. 9.9 percent always utilized tobacco-soap solution to control bugs, mites, aphids and leaf miner and cocoa aphid. Only, very few (5.3%) buried powder made from sugarcane chaff and skin of lion with dog meat on their farm, while, 4.6 percent always utilized hot-pepper-soap solutions to control leaf insects.

Furthermore, 43.5 percent of the respondents often utilized tobacco-soap solution to control bugs, mites, aphids and leaf miner and cocoa aphid. Few (23.7%) often utilized dried neem soap solution to prevent yam beetles. 22.9 percent often utilized hot-pepper soap solution to control insect and pest of crop.

In contrast, virtually all (98.5%, 97.7% and 96.9%) of the respondents never utilized sheep placental to control termite, fresh water used for processing shear butter seed to control termite and planting of vetiver grass to repel termite, respectively. Most (93.9%, 93.1% and 92.4%) never utilized planting alligator pepper to control termite, scapular of cow to prevent grain weevils, plant pineapple and covering of *Cucumeropsis mannii*/melon pod (Egusi itoo) with mixture of black soap (ose dudu) and *Momordica charantia* (Ejirin wewe) termite to prevent on their farm, respectively.

Furthermore, majority (72.5%, 70.2%, 67.9% and 61.8%) of the respondents never utilized big rat (Okete) intestine to control termite, fresh or dried tobacco leaves solution to control Newcastle's of poultry, table salt (NaCl) and kitchen or wood ash to control termite, respectively.

The results revealed that the farmers are selective and always utilized the IPM that are most useful to them and often, rarely or never utilize some of them that less useful to them. This agreed with Molnar *et al*. [7] and Tackie *et al*. [8] that most farmers face challenges in dealing with insects, diseases and weeds affecting their crops.

Table 3: Distribution of the respondents according to the type of IPM utilized (N = 131)

	Yes		No	
Type of IPM utilized	Fre.	%	Fre.	%
Kerosene-soap solution	113	86.3	18	13.7
Tobacco-soap solution	95	72.5	36	27.5
Hot-pepper-soap solution	46	35.1	85	64.9
Siam weed-soap solution	110	84.0	21	16
Dried neem seed soap solution	68	42.7	75	57.3
Sheep placenta	6	4.6	125	95.4
Kitchen ash or any wood ash	47	35.9	84	64.1
Plant vetiver	4	3.1	127	96.9
Fresh or dried tobacco leaves solution	39	29.8	92	70.2
Mixture of powdered clay soil and hot-pepper	74	29.8	57	43.5
Adenopus breviflorus (tangiri) solution	87	66.4	44	33.6
Anchomanes difformis (Abirisoko) solution	6	4.6	125	95.4
Plant alligator pepper on the farm	5	3.8	126	96.2
Plant pineapple on the farm	5	3.8	126	96.2
Plant *Datura stramonium* L. (gegemu) on the farm or solution	5	3.8	126	96.2
Water squeezed from grated cassava	64	48.9	67	51.1
Fresh water used for processing locust beans	65	49.6	66	50.4
Fresh water used for processing shear butter seed	3	2.3	128	97.7
Table salt (NaCl)	40	30.5	91	69.5
Big rat's (Okete) intestine	40	30.5	91	69.5
Burying of powder made from sugarcane chaff and skin of lion with dog meat on the farm	58	44.3	73	55.7
Covering of *Cucumeropsis mannii*/melon pod (Egusi itoo) with mixture of black soap (ose dudu) and *Momordica charantia* (Ejirin wewe)	11	8.4	120	91.6
Cow scapular	10	7.6	121	92.4

Source: Field survey, 2015

Table 4: Distribution of the respondents according to their level of utilization of IPM (N = 131)

	Never	Rarely	Often	Always
Type of IPM	Fre. %	Fre. %	Fre. %	Fre. %
Kerosene-soap solution	18 (13.9)	6 (4.6)	56 (42.7)	51 (38.9)
Tobacco-soap solution	38 (29.0)	23 (17.6)	57 (43.5)	13 (9.9)
Hot-pepper-soap solution	85 (64.9)	10 (7.6)	30 (22.9)	6 (4.6)
Siam weed-soap solution	17 (13.0)	16 (12.2)	31 (23.7)	67 (51.1)
Dried neem seed solution	65 (49.5)	12 (9.2)	35 (26.7)	19 (14.5)
Dried neem-soap solution	76 (58.0)	10 (7.6)	31 (23.7)	14 (10.7)
Sheep placenta	129 (98.5)	2 (1.5)	0 (0.0)	0 (0.0)
Kitchen ash or any wood ash	81 (61.8)	18 (13.7)	26 (19.8)	6 (4.6)
Plant vetiver grass	127 (96.9)	1 (0.8)	3 (2.3)	0 (0.0)
Fresh or dried tobacco leaves solution	92 (70.2)	3 (2.3)	21 (16.0)	15 (11.5)
Mixture of powdered clay soil and hot-pepper	57 (43.5)	2 (1.5)	48 (36.6)	24 (18.3)
Adenopus breviflorus (tangiri) solution	57 (43.5)	2 (1.5)	48 (36.6)	24 (18.3)
Anchomanes difformis (Abirisoko) solution	129 (98.5)	2 (1.5)	0 (0.0)	0 (0.0)
Plant alligator pepper on the farm	123 (93.9)	2 (1.5)	4 (3.1)	2 (1.5)
Plant pineapple on the farm	121 (92.4)	3 (2.3)	3 (2.3)	2 (1.5)
Plant *Datura stramonium* L. (gegemu) on the farm or solution	65 (49.5)	12 (9.2)	35 (26.7)	19 (14.5)
Water squeezed from grated cassava	57 (43.5)	2 (1.5)	48 (36.6)	24 (18.3)
Fresh water used for processing locust beans	81 (61.8)	18 (13.7)	26 (19.8)	6 (4.6)
Fresh water used for processing shear butter seed	128 (97.7)	1 (0.8)	2 (1.5)	0 (0.0)
Table salt (Nacl)	89 (67.9)	25 (19.1)	15 (11.5)	2 (1.5)
Big rat's (Okete) intestine	95 (72.5)	15 (11.5)	20 (15.3)	1 (0.8)
Burying of powder made from sugarcane chaff and skin of lion with dog meat on the farm	75 (57.3)	40 (30.5)	9 (6.9)	7 (5.3)
Covering of *Cucumeropsis mannii*/melon pod (Egusi itoo) with mixture of black soap (ose dudu) and *Momordica charantia* (Ejirin wewe)	121 (92.4)	1 (0.8)	8 (6.1)	1 (0.8)
Cow scapular	122 (93.1)	1 (0.8)	8 (6.1)	0 (0.0)

Source: Field survey, 2015

Level of Effectiveness of Integrated Pest Management Practice: Table 5 show the distribution of the respondents according to their perception of effectiveness of the IPM utilized. Majority (93.2%) of the respondents perceived burying of powder made from sugarcane chaff and skin of lion with dog meat on the farm to control termite, very effective. 88.5 percent of the respondents perceived kerosene-soap solution to control bugs, mites aphids and leaf miner and cocoa aphids, very effective. Also, 90.4 percent of the respondents perceived siam-weed-soap solution to control black-pod disease of cocoa to be very effective. 76.4 percent of the respondents perceived soaking *Adenopus breviflorus* (tangiri) in water to control Newcastle disease in poultry to be very effective. 58.3 percent of the respondents considered usage of water squeezed from grated cassava to control termite invasion to be very effective. Some (49.5%) of the respondents perceived tobacco-soap solution to control bugs, mites, aphids and leaf miner, cocoa aphids, very effective and 48.5 percent considered the use of fresh water from locust beans production to control termites to be very effective.

Furthermore, majority of the respondents perceived the following IPMs' to be effective: planting of vetiver grass to repel termite (80.0%), utilized cow scapular to prevent grain weevils (72.7%), fresh or dried tobacco solution to control Newcastle disease of poultry (67.5%), mixture of powdered clay soil and hot-pepper to control grain weevils (57.1%), dried neem seed solution to control termite (59.6%), planting *Datura stramonium L.* (gegemu) or solution to repel termite or dressed grain seeds (66.7%), burying sheep placenta to termite (53.8%), use of kitchen ash or any wood ash to control termite (43.5%), use of table salt to control termite (43.5%), burying of big rat (Okete) intestine to control termite (50.0%).

However, majority (56.7%) of the respondents perceived utilization of table salt (NaCl) as less effective in controlling termite. 50 percent of the respondents perceived planting of pineapple to repel termite to be very effective and effective, respectively. While, 40 percent of the respondents perceived covering of *Cucumeropsis mannii*/melon pod (Egusi itoo) with mixture of black soap (ose dudu) and *Momordica charantia* (Ejirin wewe) to be effective and not effective, respectively. Majority (50.0%) perceived utilization of planting alligator pepper on the farm to repel termite to be very effective and effective, respectively.

The study revealed that some of the IPMs are very effective and effective, respectively. Very few are perceived less effective and not effective. Most of the IPMs are used for either repelling or controlling termites on the farm. It may be deduced that termite is the main enemies of the farmers on the farm.

Problems Militating Against Utilization of IPMs: Data in Table 6 show the perception of the respondents on the problems militating against utilization of IPMs. Likert's scales of strongly disagreed, disagreed, undecided, agreed and strongly agreed were used to measure their perception. 83.2 percent of the respondents disagreed that the materials needed are scarce to come by while 53.4 percent of the respondents agreed that materials needed are readily available, 42 percent strongly agreed that the materials are readily available. 56.5 percent of the respondents agreed that the methods are compatible with their culture and farmers experience, 37.4 strongly agreed that the methods are compatible with the culture and farmers experience while 51.1 percent of the respondents disagreed that the methods are complex to understand and use. Also, almost the same percentage (48.9% and 50.4%) of the respondents disagreed and strongly disagreed that there is a taboo against the utilization of IPMs. 48.9 percent of the respondents disagreed while 46.6 percent strongly disagreed that people regards those who utilized IPMs as herbalists. 44.3 and 52.7 percent of the respondents disagreed and strongly disagreed, respectively that religious bodies preach against IPM practices. 50.4 percent of the respondents agreed while 22.1 percent strongly agreed that religious bodies support IPM practices.

The study revealed that IPMs materials are locally available, compatible with their culture and farming experience, methods easy to understand, no taboo is against it and supported by religious bodies. This is an indication that IPM is sustainable and could be adopted by all farmers without religion and cultural restrictions. This could be as a result of using indigenous knowledge in compounding the IPMs. The study is in agreement with Warren and McKiernan, [1] that using indigenous knowledge of farmers in developing appropriate technologies has been increasingly recognised as a method of attaining sustainability in agricultural development.

Hypothesis Testing: Table 7 shows the linear relationship between the selected socio-economic characteristics of the respondents and their level of effectiveness of integrated pest management utilized by the farmers. The results show a positive relationship at $p < 0.05$ between marital status ($r = 0.056$,), nativity ($r = 0.109$),

Table 5: Distribution of the respondents according to their perceived level of effectiveness of the integrated pest management practiced

IPM	Pest and diseases	Very effective	Effective	Less effective	Not effective
Kerosene-soap solution	Bugs, mites, aphids and leaf miner and cocoa aphids	100 (88.5)	12 (10.6)	1 (0.9)	0 (0.0)
Tobacco-soap solution	Bugs, mites, aphids and leaf miner and cocoa aphids	47 (49.5)	45 (47.4)	3 (3.2)	0 (0.0)
Hot-pepper-soap solution	Leaf insects	17 (34.7)	28 (57.1)	4 (8.2)	0 (0.0)
Siam weed-soap solution	Black pod diseases of cocoa	85 (90.4)	7 (7.4)	2 (2.1)	0 (0.0)
Dried neem seed solution	Termite	20 (35.1)	34 (59.6)	3 (5.2)	0 (0.0)
Dried neem-soap solution	Yam beetles, aphids, grasshoppers, leaf and fruit worms, stem borers and white flies	16 (36.4)	23 (52.3)	5 (11.4)	0 (0.0)
Sheep placenta	Termite	7 (53.8)	5 (38.4)	1 (7.7)	0 (0.0)
Kitchen ash or any wood ash	Termite	13 (28.3)	20 (43.5)	12 (26.1)	1 (2.2)
Plant vetiver grass	Termite	1 (20.0)	4 (80.0)	0 (0.0)	0 (0.0)
Fresh or dried tobacco leaves solution	Newcastle disease of poultry	9 (22.5)	27 (67.5)	4 (10.0)	0 (0.0)
Mixture of powdered clay soil and hot-pepper	Grain weevils	24 (18.3)	45 (63.4)	2 (2.8)	0 (0.0)
Adenopus breviflorus (tangiri) solution	Poultry diseases	68 (76.4)	20 (22.5)	1 (1.1)	0 (0.0)
Anchomanes difformis (Abirisoko) solution	Newcastle disease of poultry	3 (60.0)	1 (20.0)	0 (0.0)	1 (20.0)
Plant alligator pepper on the farm	Termite	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)
Plant pineapple on the farm	Termite				
Plant *Datura stramonium* L. (gegemu) on the farm or solution	Termite or seed dressing	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)
Water squeezed from grated cassava	Termite	35 (58.3)	24 (40.0)	1 (1.6)	0 (0.0)
Fresh water used for processing locust beans	Termite	32 (48.5)	33 (50.0)	1 (1.5)	0 (0.0)
Fresh water used for processing shear butter seed	Termite	2 (33.3)	2 (33.3)	0 (0.0)	2 (33.3)
Table salt (Nacl)	Termite	0 (0.0)	13 (43.3)	17 (56.7)	0 (0.0)
Big rat's (Okete) intestine	Termite	7 (21.9)	16 (50.0)	7 (21.9)	2 (6.3)
Burying of powder made from sugarcane chaff and skin of lion with dog meat on the farm	Termite	41 (93.2)	1 (2.3)	2 (4.5)	0 (0.0)
Covering of *Cucumeropsis mannii*/melon pod (Egusi itoo) with mixture of black soap (ose dudu) and *Momordica charantia* (Ejirin wewe)	Termite	0 (0.0)	2 (40.0)	1 (20.0)	2 (40.0)
Cow scapular	Grain weevils	2 (18.2)	8 (72.7)	0 (0.0)	1 (9.1)

Source: Field survey, 2015

Table 6: Distribution of the respondents according to problems militating against utilization of IPMs

Statements	SD	D	U	A	SA
Materials needed are scarce to come by	109(83.2)	15(11.5)	-	5(3.8)	2(1.6)
Materials needed are readily available	1(0.8)	3(2.3)	2(1.5)	70(53.4)	55(42)
The methods were compatible with the culture and farmers experience	5(3.8)	2(1.5)	1(0.8)	74(56.5)	49(37.4)
Methods are complex to understand and use	59(45)	67(51.1)	3(2.3)	1(0.8)	1(0.8)
There is a taboo against the use of the practices	66(50.4)	64(48.9)	-	1(0.8)	-
People regards those who use the methods as herbalist	61(46.6)	64(48.9)	3(2.3)	3(2.3)	-
Religious bodies preach against it	69(52.7)	58(44.3)	3(2.3)	1(0.8)	-
Religious bodies support it	4(3.1)	11(8.4)	21(16)	66(50.4)	29(22.1)

Source: Field survey, 2015

Table 7: Linear relationship between the socio-economic characteristics of the respondents and the effectiveness of the integrated Pest management utilized.

Variable	Pearson correlation	Sig (p)	N
Age in years	-0.056	0.522	131
Sex of respondent	-0.081	0.360	131
Marital status	0.056	0.527	131
Religion	-0.045	0.608	131
Ethnicity	0.092	0.298	131
Household size	0.045	0.045	131
Indignity	0.109	0.216	131
Length of years spent in the community	0.244	0.119	42
Income in Naira	0.358**	0.001	111
Farm size	0.687	0.157	124
Farming experience	0.036	0.687	125
Level of education	-0.072	0.415	130
Participation in community organization	0.157	0.073	131

Source: Field survey, 2015.

Level of Significance: ** 0.01 and 0.05

period resided in the community (r = 0.244,), farming experience (r = 0.036,) income (r = 0.358) and level of effectiveness of IPMs.

In addition, there is negative but significant relationship at $p < 0.05$ between age (r = -0.056,), sex (r = -0.081), religion (r = -0.045,) and education (r = -0.117) and the level of effectiveness of integrated pest management utilized by the farmers.

CONCLUSION AND RECOMMENDATION

Majority of the respondents had farming as their major occupation, were in their middle age, which contribute to their vibrancy and ability to adopt and utilized various IPM practices introduced to increase their production and farm output. Some of IPM utilized by the respondents are: Kerosene-soap solution (86.3%), tobacco-soap solution (72.5), Siam-weed-soap solution (66.4 %) and found them highly effective. There was a positive relationship between marital status, ethnicity, nativity, length of years spent in the community, income and farming experience and level of IPM effectiveness.

IPM should be introduced by the researchers and extension agents to the farmers, in order, to reduced cost of production and losses caused by pests and diseases to their farm produce. Researchers and agricultural extension agencies should be empowered and funded to seek knowledge on the IPM dozing necessary for application, in order, to reduce waste and ensure higher effectiveness.

REFERENCES

1. Warren, D.M. and G. McKiernan, 1999. CIKARD: A global approach to documenting indigenous knowledge for development in The Cultural Dimension of Knowledge Development Ed. D. M. Warren, L. J. Slikkerveer and D. Brokensha. Intermediate Technology Publications Ltd, Southampton Row, London.
2. Schwab AI, I. Jager, G. Stoll, R. Gorgen, S. Prexterschwab and R. Attenburger, 1995. Pesticide in tropical agriculture: hazards and alternatives. PAN ACTA Tropica Agroecologia. No. 131.
3. Environmental Protection Agency, 2008. Integrated Pest Management(IPM) principles. Retrieved May 22, 2008 from: http://www.epa.gov/opp00001/factsheets/ipm.html.
4. California, 1990. Plant Health Association, 1990. IMP: The quiet evolution. Retrieved February 27, 2007 from: http://www.healthyplants.org/ipm.htmell.edu/ent/biocontrol/info/ipmstrat.html.
5. Hoyt, 2001. Integrated Pest Management (IPM) and Food production: Communication Services, Branch Office of Pesticide Programmes, U.S. EPA. 1200 Pennsylvania Ave, NW Washington, DC.
6. Weeden, Shelton and Hoffman, 2008. Biol;ogical control: a guide to natural enemies in North America. Retrieved May 22, 2008 from: http://www.nysaes.cornell.edu/ent/biocontrol/info/ipmstrat.html.
7. Molnar, *et al*., 2002. Implementing core conservation practices: practices and experiences of black and non-black small farmers in the deep south. In N. Baharanyi, R. Zabawa and W. Hill (Eds), Land Community and Culture: African American and Hispanic American/Latino Connections (pp: 67-81). Tuskegee, AL: Tuskegee University.
8. Talkie, Jackai, Ankumah, Noble and Hardney, 2004. Small farmers perceptions on integrated pest management. Series in Applied Economics and Related Sciences Number 0604-01. George Washington Carver Agricultural Experiment Station, Tuskegee, AL: Tuskegee University.