Published by The College of Agriculture and Hospitality Management (COAHM), TASFUED, vol. 1, no. 1, pp. 73-81

JOAHM, TASFUED
Journal of Agriculture and Hospitality Management

Assessment of Pesticide Usage among Rural Women Arable Crop Farmers in Southwest, Nigeria

[1]Shittu, S. K.; [2]Oladoja, M. A.; [2]Mufutau, R. A. & [1]Adebayo, I. A.
[1]Department of Agricultural Economics and Extension, Tai Solarin Federal University of Education, Ijagun Ogun State, Nigeria.
[2]Department of Agricultural Extension and Rural Sociology, Olabisi Onabanjo University, Ayetoro Campus, Ayetoro, Ogun State, Nigeria.
Corresponding author: *shittusk@tasued.edu.ng*

Abstract
Pesticides remain an important component of crop protection and productivity enhancement in smallholder farming systems. This study assessed pesticide usage among rural women arable crop farmers in Southwest Nigeria. Specifically, the study identified the types of pesticides used, determined the level of pesticide usage, and examined the reasons for pesticide use. A multistage sampling procedure was employed to select 504 rural women arable crop farmers from Ogun, Oyo, and Osun States. Data were collected through a structured interview schedule and analyzed using descriptive statistics, Pearson Product Moment Correlation, and Spearman Rank Correlation at a 5% level of significance. The results revealed that herbicides (82.1%) and insecticides (60.5%) were the predominant agro-chemicals used by the respondents. Majority (66.3%) of the farmers exhibited a high level of pesticide usage, indicating substantial dependence on chemical pest control in arable crop production. The major reasons for pesticide use were increased farm revenue, savings in labour, time and cost, and effective reduction of pest populations. Spearman's correlation revealed significant positive relationships between pesticide usage level and most reported reasons for pesticide use, with the strongest association observed for pest population reduction ($r = 0.408$, $p < 0.001$). The study concludes that pesticide use among rural women farmers was primarily motivated by economic benefits and the need for effective pest management. Strengthening extension education and promoting integrated pest management practices are therefore essential for ensuring safe, efficient, and sustainable pesticide use.

Keywords: Pesticide usage, rural women farmers, arable crop production, pest management, Southwest Nigeria.

1. Introduction

Women farmers constitute a significant proportion of the agricultural labour force, contributing substantially to food production, processing, and marketing, where they account for about 60%–100% of activities within these domains (Beriso *et al*., 2023; Cervini *et al*., 2023; Thabah *et. al*, 2026). They play a crucial role in ensuring household food security, sustaining rural livelihoods, and supporting national agricultural output (Akeju & Ojogbede, 2026; Olaniyan & Oyesola, 2025). Similarly, about 68% of women are engaged as resource managers, farmers, and agricultural labourers, highlighting their central position in agricultural production systems (Wahyuni *et al*., 2023). Despite this contribution, women farmers often face constraints such as limited access to affordable and timely agricultural inputs, including improved seeds, fertilizers, agrochemicals, farm `tools, and technical knowledge (Kamara *et al*., 2025; Pratheepa, *et al*., 2023), which negatively affects productivity and farm expansion.

Shittu S. K., Oladoja M. A., Mufutau R. A. & Adebayo I. A. (2026). Assessment of Pesticide Usage among Rural Women Arable Crop Farmers in Southwest, Nigeria, *Journal of Agriculture and Hospitality Management (JOAHM),* vol. 1, no. 1, pp. 73-81.
©COAHM, Vol. 1, No. 1, Oct 2026.

Pest and infestations remain a major constraint to crop production, significantly affecting yield and income ((Benson *et al*., 2026; Vurro, 2024). Since the inception of agriculture, pests have consistently posed threats to food production systems by attacking crops intended for human consumption (El-Shafie, 2024). Their economic impact is therefore substantial and persistent (Morris, 2024). Over the past decades, agricultural systems have shifted from diverse cropping practices such as crop rotation to large-scale monoculture, accompanied by increased dependence on synthetic pesticides developed by agrochemical industries (Misra & Ghosh, 2024; Saroop & Tamchos, 2024). The severity of pest-related losses has been illustrated in various crop production crises, including major outbreaks affecting food crops in Nigeria, underscoring the critical role of pesticides in modern agriculture (Riaz *et al*., 2024). In the absence of effective pest control measures, farmers risk severe yield losses and potential crop failure (Deshmukh & Sandhu, 2024).

Beyond crop protection, pesticides are widely regarded as cost-effective, labour-saving, and efficient tools for pest management in agricultural production systems (Bhat & Kumar, 2024; Tonle *et al*., 2024). They are also believed to contribute to improved food quality

and nutritional outcomes by reducing pre- and post-harvest losses (Mancuso *et al*., 2024; Osei Tutu *et. al*., 2026). Consequently, pesticide use is considered essential for sustaining agricultural productivity, ensuring food availability, and maintaining acceptable living standards. Against this background, this study assessed pesticide usage among rural women arable crop farmers in selected states of Southwest Nigeria. The specific objectives were to:

i. Identify the types of pesticides used among rural women arable crop farmers in the study area.
ii. Determine the extent of pesticide usage among rural women arable crop farmers in the study area.
iii. Ascertain the reasons for pesticide usage among rural women arable crop farmers in the study area.

1.1 Hypothesis

HO_1: There is no significant relationship between reasons for pesticide usage and the level of pesticide usage among rural women arable crop farmers in Southwest Nigeria.

1.2 Significance of the Study

Arable crop farmers utilize pesticides to protect crops from weeds, insect pests, and diseases, thereby enhancing agricultural productivity per unit area. This contributes to increased food production on limited land resources and supports year-round availability of safe, nutritious, and affordable food. The findings of this study are expected to provide relevant information to farmers, extension practitioners, researchers, and policymakers on pesticide usage patterns among rural women arable crop farmers, thereby contributing to improved decision-making and more efficient pesticide management practices in agricultural development.

2. Methodology

2.1 Study Area

The study was conducted in Ogun, Oyo, and Osun States of South-West Nigeria. The three states were selected from the six states constituting the geopolitical zone and collectively represent 50% of `the states in the region. The South-West is characterised by substantial agricultural activities, with arable crop production constituting an important component of rural livelihoods. The selected states therefore provided an appropriate geographical setting for examining pesticide usage and its implications for arable crop production among rural women.

2.2 Study Population

The target population comprised all rural women engaged in arable crop farming in the selected states. The sampling frame consisted of registered rural women arable crop farmers participating in the Agricultural Development Programme (ADP) in Ogun, Oyo, and Osun States.

2.3 Sampling Procedure and Sample Size

A Multistage sampling procedure was employed to select respondents for the study. At the first stage, Ogun, Oyo, and Osun States were purposively selected from the six states constituting the South-West geopolitical zone of Nigeria. The states were selected based on the prominence of agriculture, particularly arable crop production, and the relevance of their rural women farming population to the objectives of the study. In the second stage, 50 percent of the Agricultural Development Programme zones in each selected state were randomly selected, resulting in two zones per state and a total of six zones.

The third stage involved the random selection of 50 percent of the blocks within the selected zones, yielding a total of 24 blocks. In the final stage, 20 percent of the registered rural women arable crop farmers within the selected cells were proportionately selected. This process produced a total sample size of 504 respondents (Table 1).

2.4 Reliability of the Instrument

The instrument was pretested among 47 rural women arable crop farmers in Igbogbo Community, Ikorodu East Local Government Area of Lagos State. The area was selected because its farming and socioeconomic characteristics were similar to those of the study area. The pretest helped to identify and eliminate ambiguities in the instrument.

The reliability of the instrument was determined using the Split Half method, while internal consistency was assessed using Cronbach's alpha coefficient. A reliability coefficient of 0.80 was obtained, which exceeded the minimum acceptable threshold of 0.70, indicating that the instrument was reliable for the study.

2.5 Validity of the Instrument

To ensure content and construct validity, the instrument was subjected to expert review by specialists in Agricultural Extension, Crop Production, Rural Sociology, and related disciplines. Their observations and recommendations guided the revision of the instrument through the modification of ambiguous items, deletion of irrelevant questions, and inclusion of additional relevant items where necessary.

2.6 Method of Data Analysis

Data collected for the study were analysed using both descriptive and inferential statistics. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to achieve the study objectives. Inferential statistics comprising Pearson Product Moment Correlation and Spearman Rank Correlation were used to test the hypothesis at the 5 percent level of significance.

3. Results and Discussion

3.1 Type of Pesticides Used by Rural Women Arable Crop Farmers.

Results in Table 2 shows that 82.1% of the total respondents used herbicides on their farmlands while 60.5% used insecticides. However, most of the

Table 1: Description of sampling distribution across the study area

Selected states in south-west Nigeria	Number of ADP Zones in each state	Selected zones (50%)	Selected ADP Zones	Blocks in selected Zones	Selected blocks (50%)	Selected ADP blocks (50%)	Registered women arable crop farmers	Registered women arable crop farmers (20%)	Total
Ogun	4	2	Ijebu-ode	6	3	Ijebu-Igbo	100	20	
						Ago-Iwoye	190	38	
						Ijebu-Ife	110	22	
			Ikenne	4	2	Someke	80	16	
						Obafemi	140	28	
Total							620		124
Osun	3	2	Osogbo	13	7	Odo-Oba	80	16	
						Ifelodun	80	16	
						Ila	80	16	
						Boripe	85	17	
						Ede North	75	15	
						Orolu	75	15	
						Olorunda	80	16	
			Iwo	7	4	Iwo	90	18	
						Ayedire	80	16	
						Isokan	85	17	
						Ayedaade	80	16	
Total							890		178
Oyo	4	2	Ibadan/ibarapa	9	5	Eruwa	150	30	
						Igboora	110	22	
						Ido	80	16	
						Akinyele	120	24	
						Ona-Ara	180	36	
			Oyo	6	3	Oyo north	120	24	
						Oyo central	140	28	
						Oyo west	110	22	
Total							1010		202
Grand total					24		2520		504

Source: Agricultural Development Programmes (ADPs), 2025.

Table 2: Type of Pesticides Used by Rural Women Arable Crop Farmers.

Variables	Osun n=178	Oyo n=202	Ogun n=124	Total n=504
Herbicide	119(66.9)	202(100.0)	93(75.0)	414(82.1)
Insecticides	68(38.2)	154(76.2)	83(66.9)	305(60.5)
Fungicide	0(0.0)	5(2.5)	0(0.0)	5(1.0)
Nematicide	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Bactericide	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Rodenticide	0(0.0)	0(0.0)	15(12.1)	15(3.0)
Disinfectants	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Fumigants	0(0.0)	0(0.0)	16(12.9)	16(3.2)
Algaecide	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Miticides	0(0.0)	0(0.0)	0(0.0)	0(0.0)

Source: Field survey, 2025 (Percentages are in parenthesis)

Table 3: Distribution of Respondents by Pesticide Usage Level Across Selected South-West States of Nigeria (N = 504)

Pesticide Usage Level	Osun (n = 178)	Oyo (n = 202)	Ogun (n = 124)	Total (N = 504)
Low	86 (48.3)	47 (23.3)	37 (29.8)	170 (33.7)
High	92 (51.7)	155 (76.7)	87 (70.2)	334 (66.3)
Total	**178 (100.0)**	**202 (100.0)**	**124 (100.0)**	**504 (100.0)**

Source: Field Survey, 2025.
Note: Values in parentheses represent percentages.

respondents (61.8%) in Osun State did not use insecticide. The predominance of herbicide use observed in the study is consistent with recent evidence highlighting the extensive use of herbicides, particularly glyphosate, in agricultural production (Bai & Ogbourne, 2025; Diagboya *et al*., 2024).

However, in the study area, other forms of pesticides like fungicide, nematocide, bacteriocide, algaecides and miticides were not used at all by the respondents. A few numbers of the respondents in Ogun State used rodenticide and fumigants (12.1% and 12.9%, respectively). This implies that the only pesticides used by the respondents in the study area were insecticides and herbicides. Insecticides (59%), fungicides (29%), and herbicides (10%) made up the bulk of the different pesticide formulation types employed by farmers in the area. The disparity in the findings on type of pesticide usage could be due to the type of crops the pesticide was applied to.

3.2 Pesticide Usage Level.

The use of pesticides by female farmers of cultivated crops is depicted in Table 3. The majority (66.3%) of female farmers of arable crops had excessive pesticide consumption, according to the results. The majority of pesticides were used by women cultivating arable crops in Oyo state (76.7%), followed by Ogun (70.2%) and Osun (51.7%). This shows that there are variations in pesticide consumption among the studied states. This is in support of Thierfelder *et al*. (2024), that the use of pesticides is frequently linked to the advantages of improved arable crop productivity among rural women (Zhang *et. al.*, 2015). It tackles the need for female labour at peak periods, which necessarily affects their level of productivity.

3.3 Extent of Pesticide Usage by the Respondents.

Herbicides: Table 4 shows that 91.1% and 58.1% of the respondents in Oyo and Ogun States, respectively used pesticides regularly. However, 41.6% of the respondents in Osun State used pesticides occasionally unlike their counterparts in Oyo and Ogun States. This might be because they opined that pesticide usage causes environmental pollution. As shown in Table 4, herbicides ($\overline{x}$ =1.09) had the highest usage level

Table 4: Extent of Pesticide Usage by the Respondents

Extent of Pesticide Usage		Osun n=178	Oyo n=202	Ogun n=124	Total n=504	Mean	Std. Dev.
Herbicide	Not at all	44(24.7)	0(0.0)	31(25.0)	75(14.9)		
	Regularly	60(33.7)	184(91.1)	72(58.1)	316(62.7)	1.09	0.00
	Occasionally	74(41.6)	16(7.9)	17(13.7)	107(21.2)		
	Rarely	0(0.0)	2(1.0)	4(3.2)	6(1.2)		
Insecticides	Not at all	83(46.6)	49(24.3)	41(33.1)	173(34.3)	0.92	0.00
	Regularly	48(27.0)	97(48.0)	61(49.2)	206(40.9)		
	Occasionally	45(25.3)	52(25.7)	20(16.1)	117(23.2)		
	Rarely	2(1.1)	4(2.0)	2(1.6)	8(1.6)		
Fungicide	Not at all	161(90.4)	197(97.5)	124(100.0)	482(95.6)	0.07	0.00
	Regularly	6(3.4)	5(2.5)	0(0.0)	11(2.2)		
	Occasionally	9(5.1)	0(0.0)	0(0.0)	9(1.8)		
	Rarely	2(1.1)	0(0.0)	0(0.0)	2(0.4)		
Nematicide	Not at all	175(98.3)	202(100.0)	124(100.0)	501(99.4)		
	Regularly	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0.02	0.00
	Occasionally	1(0.6)	0(0.0)	0(0.0)	1(0.2)		
	Rarely	2(1.1)	0(0.0)	0(0.0)	2(0.4)		
Bactericide	Not at all	178(100.0)	202(100.0)	124(100.0)	504(100.0)		
	Regularly	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0.00	0.00
	Occasionally	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Rarely	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
Rodenticide	Not at all	176(98.9)	202(100.0)	111(89.5)	489(97.0)		
	Regularly	0(0.0)	0(0.0)	3(2.4)	3(0.6)	0.06	0.00
	Occasionally	2(1.1)	0(0.0)	7(5.6)	9(1.8)		
	Rarely	0(0.0)	0(0.0)	3(2.4)	3(0.6)		
Disinfectants	Not at all	178(100.0)	202(100.0)	124(100.0)	504(100.0)	0.00	0.00
	Regularly	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Occasionally	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Rarely	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
Fumigants	Not at all	173(97.2)	202(100.0)	110(88.7)	485(96.2)	0.07	0.00
	Regularly	0(0.0)	0(0.0)	10(8.1)	10(2.0)		
	Occasionally	3(1.7)	0(0.0	1(0.8)	4(0.8)		
	Rarely	2(1.1)	0(0.0)	3(2.4)	5(1.0)		
Algaecide	Not at all	178(100.0)	202(100.0)	124(100.0)	504(100.0)	0.00	0.00
	Regularly	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Occasionally	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Rarely	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
Miticides	Not at all	178(100.0)	202(100.0)	124(100.0)	504(100.0)	0.00	0.00
	Regularly	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Occasionally	0(0.0)	0(0.0)	0(0.0)	0(0.0)		
	Rarely	0(0.0)	0(0.0)	0(0.0)	0(0.0)		

Source: Field survey, 2025 (Percentages are in parenthesis)

among respondents in the study area. When compared to other methods of weed management like mechanical weeding by hand or machine, using herbicides to manage undesirable plants can provide significant benefits (Duke, 2024). Aside from being less expensive than other agro-chemicals, herbicides are also frequently safer, quicker, and occasionally more selective (Aryal *et. al.,* 2024).

Insecticides: From Table 4, it can be deduced that 40.9% of the respondents used insecticides regularly, 16.1 percent used it occasionally, and only 1.6 percent used insecticides rarely. Moreover, Ogun State had the highest proportion of regular usage of insecticides (49.2%) while Oyo State and Osun State had 48.0% and 27.0%, respectively.

Fungicides: From Table 4, it is shown clearly that only 2.2% of the respondents mainly in Oyo and Osun States (2.5% and 3.4%, respectively) used fungicides. This indicated that fungicides were not used by most of the respondents.

Nematicides: Information in Table 4 reveals that in Osun State, only 0.2% of the respondents occasionally used nematicide while 0.4% rarely used it. Other respondents in Oyo and Ogun States (0.0%) did not use it at all.

Rodenticides: Results in Table 4 shows that all respondents in Oyo State did not use rodenticides. However, few respondents in Ogun State (5.6%) used it occasionally while 2.4% rarely applied rodenticides on

Table 5: Respondents' Reasons for Pesticide Usage in Selected Southwest States of Nigeria (n = 504).

Reasons for Pesticide Usage	NA f (%)	SD f %)	D f (%)	U f (%)	A f (%)	SA f (%)	Mean (x̄)	Std. Dev.	Rank
Increase in farm revenue	46 (9.1)	1 (0.2)	13 2.6)	49 (9.7)	160 (31.7)	235 (46.6)	3.95	1.28	1
Pesticides save labour, time and cost	40 (7.9)	1 (0.2)	44 (8.7)	15 (3.0)	186 (36.9)	218 (43.3)	3.90	0.79	2
Decrease in pest population	48 (9.5)	13 (2.6)	21 (4.2)	27 (5.4)	158 (31.3)	237 (47.0)	3.87	1.12	3
It reduces farm drudgery	46 (9.1)	9 (1.8)	13 (2.6)	56 (11.1)	183 (36.3)	197 (39.1)	3.81	0.58	4
To reduce wastages	42 (8.3)	7 (1.4)	41 (8.1)	43 (8.5)	217 (43.1)	154 (30.6)	3.68	0.32	5
To improve the quality and quantity of food and raw materials	36 (7.1)	4 (0.8)	48 (9.5)	77 (15.3)	192 (38.1)	147 (29.2)	3.64	0.48	6
Timeliness of operation	58 (11.5)	11 (2.2)	26 (5.2)	50 (9.9)	217 (43.1)	142 (28.2)	3.55	1.14	7
Manpower shortage at peak periods	44 (8.7)	24 (4.8)	41 (8.1)	56 (11.1)	183 (36.3)	156 (31.0)	3.54	0.23	8
Availability of pesticide equipment and spare parts	57 (11.3)	29 (5.8)	71 (14.1)	49 (9.7)	216 (42.9)	82 (16.3)	3.16	1.93	9
Reduced environmental pollution	54 (10.7)	41 (8.1)	111 (22.0)	115 (22.8)	103 (20.4)	80 (15.9)	2.82	0.95	10
Grand Mean	**3.59**								

Source: Field Survey, 2025.

Note: *f* = Frequency; figures in parentheses are percentages. NA = Not Applicable; SD = Strongly Disagreed; D = Disagreed; U = Undecided; A = Agreed; SA = Strongly Agreed. Mean scores were computed using a 5-point Likert scale (SD = 1, D = 2, U = 3, A = 4, SA = 5). Items were ranked according to their mean scores.

their farmlands. Conversely, in Osun State, only 1.1% of the respondents occasionally used rodenticides.

Fumigants: Table 4 shows that 2.0% of respondents utilized fumigants on their farmlands for arable crop production on a regular basis, 0.8% sometimes, and 1.0% seldom. However, respondents in the research region did not use any bactericides, algaecides, or disinfectants. In conclusion, the principal pesticides utilized by respondents in the research region are solely insecticides and herbicides.

3.4 Reasons for Pesticide Usage by the Respondents.

The results presented in Table 5 show that pesticide use among respondents is driven by a range of interrelated economic, labour, and production-efficiency considerations, with an overall grand mean score of 3.59, indicating a generally positive disposition towards pesticide adoption.

Across all indicators, economic motivation emerged as the dominant driver, particularly the perception that pesticides enhance farm revenue and profitability (x̄ = 3.95). This reflects farmers' belief that pesticide application reduces yield losses and improves productivity, thereby strengthening farm income. Closely related to this is the strong perception that pesticides provide labour, time, and cost savings (x̄ = 3.90), highlighting their role as labour-substituting technologies in contexts of rising input costs and labour scarcity (Misra & Ghosh, 2024; Voisin *et al*., 2024).

Beyond economic gains, respondents strongly associated pesticide use with improved production efficiency, particularly through effective pest control (x̄ = 3.87), reduction in farm drudgery (x̄ = 3.81), minimization of wastage (x̄ = 3.68), and improved quality and quantity of produce (x̄ = 3.64). Collectively, these findings suggest that pesticides are perceived not only as protective inputs but also as instruments that enhance the ease and efficiency of farm operations. This aligns with Williamson *et al*. (2008) and Hashemi (2012), who emphasized that labour reduction and productivity gains are central to pesticide adoption decisions.

Operational considerations further reinforce this pattern, as respondents acknowledged that pesticides improve the timeliness of farm operations (x̄ = 3.55) and help address manpower shortages during peak farming periods (x̄ = 3.54). This indicates that pesticide use is also a strategic response to seasonal labour constraints and the need for timely field interventions, particularly in rain-fed farming systems where delays can significantly affect output.

In contrast, facilitating inputs such as the availability of pesticide equipment and spare parts (x̄ = 3.16) played a relatively minor role in shaping usage decisions, suggesting that while access to tools supports application, it is not a primary determinant of adoption. On the other hand, environmental considerations recorded the lowest mean score (x̄ = 2.82), indicating that respondents generally do not associate pesticide

Table 6: Pearson Product-moment Correlation coefficient (PPMC) of the Relationship between Pesticide Usage Level and Reasons for Pesticide Usage by Rural Women Arable crop farmers

Variables	R	p-value	Remark
Pesticide usage level and reasons for pesticide usage	0.285*	0.000	Significant

Source: Field Survey, 2025 Significant @ p≤0.05

Table 7: Spearman Ranked Correlation of the Relationship between Pesticide Usage Level and Reasons for Pesticide Usage by Rural Women Arable Crop Farmers

Variables	r-values	p-values	Remarks
Manpower shortage at peak periods	0.060	0.177	Not Significant
Saving labour, time and cost	0.145	0.001	Significant
Reduction in wastages	0.173	0.00	Significant
Improvement in the quality and quantity of food and raw materials	0.064	0.15	Not Significant
Saving human life	0.123	0.006	Significant
Avoidable health risk	0.114	0.010	Significant
Ubiquity of pesticides	0.057	0.205	Not Significant
Protection of social status	0.096	0.031	Significant
Timeliness of operation	0.130	0.003	Significant
Increase in farm revenue	0.166	0.00	Significant
Reduction in farm drudgery	0.256	0.00	Significant
Decrease in pest population	0.408	0.00	Significant
Reduction in environmental pollution	0.299	0.00	Significant
Availability of pesticide equipment and spare parts	0.273	0.00	Significant

Source: Field Survey, 2025 - Significant @ p≤0.05

use with environmental protection. This finding is consistent with Yilmaz (2015), who observed that environmental concerns are often secondary to economic and productivity-related motivations in farmers' decision-making.

Overall, the evidence suggests that pesticide use among arable crop farmers is primarily motivated by the pursuit of higher income, reduced production constraints, and improved operational efficiency, with limited consideration for environmental outcomes.

3.5 Hypotheses Testing.

H_{O1}: There is no significant relationship between reasons for pesticide usage and level of pesticide usage by rural women arable crop farmers.

The relationship between reasons for pesticide usage and pesticide usage level was examined using the Pearson Product-Moment Correlation Coefficient (PPMC), which measures the strength and direction of association between continuous variables. The coefficient (r) indicates the extent to which the variables move together in a linear relationship.

As presented in Table 6, the result shows a positive and statistically significant relationship between reasons for pesticide usage and pesticide usage level ($r = 0.285$`, $p < 0.05$). This implies that as the motivating reasons for pesticide use increase, the level of pesticide usage among respondents also increases. Consequently, the null hypothesis is rejected.

Further analysis using Spearman rank correlation (Table 7) identified the relative contribution of individual reasons to pesticide usage intensity. The strongest and most significant determinant was decrease in pest population ($r = 0.408$, $p < 0.05$), indicating that effective pest control is the most influential factor driving pesticide use among respondents. This was followed by reduction in environmental pollution ($r = 0.299$, $p < 0.05$) and availability of pesticide equipment and spare parts ($r = 0.273$, $p < 0.05$), which also showed strong positive and significant relationships.

Other significant factors include reduction in farm drudgery ($r = 0.256$), reduction in wastage ($r = 0.173$), increase in farm revenue ($r = 0.166$), saving labour, time and cost ($r = 0.145$), timeliness of operation ($r = 0.130$), saving human life ($r = 0.123$), avoidance of health risks ($r = 0.114$), and protection of social status ($r = 0.096$), all of which significantly influenced pesticide usage intensity at varying levels.

In contrast, manpower shortage at peak periods ($r = 0.060$, $p > 0.05$), improvement in quality and quantity of food and raw materials ($r = 0.064$, $p > 0.05$), and ubiquity of pesticides ($r = 0.057$, $p > 0.05$) were not statistically significant, indicating that these factors did not meaningfully influence pesticide usage level in the study area.

Overall, the findings demonstrate that pesticide usage intensity among rural women arable crop farmers is significantly influenced by a combination of agronomic, economic, and risk-related factors, with pest population reduction emerging as the most dominant driver.

4. Conclusion

This study concludes that pesticide use is widespread among rural women arable crop farmers in Southwest Nigeria, with herbicides and insecticides being the most commonly utilized pesticides. The findings indicate that pesticide usage is largely driven by the need to enhance farm productivity, increase farm income, reduce labour requirements, minimize crop losses, and effectively control pest infestations. Furthermore, the study established a significant relationship between farmers' reasons for pesticide use and their level of pesticide usage. Overall, pesticides remain an important component of arable crop production among rural women farmers; however, promoting their safe, efficient, and sustainable use is essential for ensuring long-term agricultural productivity, environmental sustainability, and rural livelihood improvement. Based on conclusion drawn from major findings, the following recommendations are made:

i. Agricultural extension agencies should intensify training programmes targeted at rural women farmers on the safe, efficient, and responsible use of pesticides. Such programmes should emphasize correct dosage, application techniques, storage practices, disposal methods, and adherence to safety precautions.
ii. Government agencies, research institutions, and development partners should encourage the adoption of Integrated Pest Management approaches that combine biological, cultural, mechanical, and chemical control methods. This will reduce excessive dependence on synthetic pesticides while maintaining effective pest control.
iii. Continuous capacity-building initiatives should be organized to improve farmers' knowledge of pest identification, economic threshold levels, pesticide selection, and alternative pest management strategies that are both economically viable and environmentally sustainable.
iv. Policies and intervention programmes should facilitate access to affordable personal protective equipment (PPE) and safe pesticide application technologies to reduce occupational exposure and associated health risks among women farmers.
v. Relevant regulatory agencies should intensify monitoring of pesticide distribution, sales, and usage to ensure compliance with approved standards and prevent misuse of hazardous agrochemicals.
vi. Increased investment should be made in the research, development, and dissemination of environmentally friendly pest-control options, including biopesticides and other low-risk technologies suitable for smallholder farming systems.
vii. Since women constitute a major proportion of the agricultural workforce, agricultural policies and intervention programmes should explicitly address their unique production challenges and information needs, particularly regarding pesticide safety and sustainable pest management.

References

Akeju, K., & Ojogbede, O. (2026). Women's empowerment and household food security in rural Southwest Nigeria: Evidence from dietary diversity and ordered logistic analysis. *Economics, Management and Sustainability, 11*(1).

Aryal, P., Hefner, C., Martinez, B., & Henry, C. S. (2024). Microfluidics in environmental analysis: Advancements, challenges, and future prospects for rapid and efficient monitoring. *Lab on a Chip, 24*(5), 1175–1206.

Bai, S. H., & Ogbourne, S. M. (2025). Herbicide-related health risks: Key mechanisms and a guide to mitigation strategies. *Journal of Occupational Medicine and Toxicology, 20*, Article 16.

Benson, G. A. S., Sanni, K. O., Adesina, J. M., & Ogunoye, O. A. (2026). Influence of time of planting on yam performance and pest infestation in humid rainforest of southwestern Nigeria. *International Journal of Horticultural Science, 32*(1), 77–84.

Beriso, G., Amare, A., & Eneyew, A. (2023). Women empowerment in agricultural activities and its impact on farming household food security: The case of Anna Sorra District, Guji Zone, Oromia regional state, Ethiopia. *Cogent Food & Agriculture, 9*(2), Article 2263952.

Bhat, S., & Kumar, S. (2024). Conventional and recent approaches of integrated pest management in greenhouse cultivation. In *Protected cultivation* (pp. 255–274). Apple Academic Press.

Cervini, C., Abegaz, B., Mohammed, A., Elias, R., Medina, A., Gebre, K., & Verheecke-Vaessen, C. (2023). Assessment of agricultural practices by Ethiopian women farmers: Existence of gender disparities in access to mycotoxins training. *World Mycotoxin Journal, 16*(3), 227–238.

Deshmukh, L., & Sandhu, S. S. (2023). Entomopathogenic fungi: A boon to alleviate organic life support management. In S. K. Singh, D. Kumar, M. Shamim, & R. Sharma (Eds.), *Applied mycology for agriculture and foods: Industrial applications* (pp. 97–128). Apple Academic Press.

Diagboya, P. N., Junck, J., Akpotu, S. O., & Düring, R.-A. (2024). Isolation of aqueous pesticides on surface-functionalized SBA-15: Glyphosate kinetics and detailed empirical insights for atrazine. *Environmental Science: Processes & Impacts, 26*(2), 323–333.

Duke, S. O. (2024). Why are there no widely successful microbial bioherbicides for weed management in crops? *Pest Management Science, 80*(1), 56–64.

El-Shafie, H. A. F. (2024). Utilization of edible insects as food and feed with emphasis on the red palm weevil. In A. E. Ahmed, J. M. Al-Khayri, & A. A. Elbushra (Eds.), *Food and nutrition security in the Kingdom of Saudi Arabia, Vol. 2: Macroeconomic policy and its implication on food and nutrition security* (pp. 393–406). Springer.

Hashemi, M., Rostami, R., & Damalas, C. A. (2012). Pesticide use and risk perceptions among farmers in southwest Iran. *Human and Ecological Risk Assessment, 18*, 456–470.

Kamara, A. Y., Kamsang, L. S., Mustapha, A., Kamara, A. Y., Kolapo, A., & Kamai, N. (2025). Gender disparities in the adoption of improved management practices for soybean cultivation in North East Nigeria. *Journal of Agriculture and Food Research, 22*, 102032.

Mancuso, T., De Cianni, R., Di Vita, G. A., Spada, E., Brun, F., Spadaro, D. C., & Zanchini, R. (2024). Understanding Italian consumers' perceptions of tomato agricultural innovation: Exploring the nexus between sustainability, health and consumer beliefs. *Journal of Cleaner Production, 435*, 140528.

Misra, S., & Ghosh, A. (2024). Agriculture paradigm shift: A journey from traditional to modern agriculture. In *Biodiversity and bioeconomy: Status quo, challenges, and opportunities* (pp. 113–141). Elsevier.

Morris, B. (2024). *Understanding contemporary diet culture through the lens of Lacanian psychoanalytic theory: Eating the lack*. Routledge.

Olaniyan, O. C., & Oyesola, O. B. (2025). The interplay between livelihood diversification, gender roles, and food security by rural women farmers in Osun State Nigeria. *Plant Science Review*.

Osei Tutu, C., Acheampong, R., Akonor, P. T., Asiedu, B. K., Mensah, D. N. T., Obeng, R., Wiafe-Kwagyan, M., & Ulzen, J. (2026). Postharvest strategies for indigenous fruits and vegetables in West Africa: Linking food loss reduction, nutrient retention and diet quality. *Food and Energy Security, 15*(3), Article e70275.

Pratheepa, C. M., Raj, R., & Sinha, S. (2023). The socio-ecological contradictions of land degradation and coastal agriculture in South India. *Environment and Planning E: Nature and Space, 6*(1), 391–411.

Riaz, U., Hakeem, K. R., Aziz, H., & Farooq, S. (2024). Influence of the COVID-19 pandemic and locust outbreaks on the world's economy. In *Locust outbreaks* (pp. 217–235). Apple Academic Press.

Saroop, S., & Tamchos, S. (2024). Impact of pesticide application: Positive and negative side. In *Pesticides in a changing environment: Impact, assessment, and remediation* (pp. 155–178). Elsevier.

Thabah, A. K., Bey, S., Basumatary, P., Waikhom, A. C., Nath, A., Sileshi, G. W., Das, A. K., & Nath, A. J. (2026). Women's contributions, opportunities, and challenges in Indian agriculture: A systematic review. *CABI Agriculture and Bioscience, 7*(1), 0029.

Thierfelder, C., Mhlanga, B., Nyagumbo, I., Kalala, K., Simutowe, E., Chiduwa, M., MacLaren, C., Silva, J. V., & Ngoma, H. (2024). Two crops are better than one for nutritional and economic outcomes of Zambian smallholder farms, but require more labour. *Agriculture, Ecosystems & Environment, 361*, 108819.

Tonle, F. B. N., Niassy, S., Ndadji, M. M., Tchendji, M. T., Nzeukou, A., Mudereri, B. T., Senagi, K., & Tonnang, H. E. Z. (2024). A road map for developing novel decision support system (DSS) for disseminating integrated pest management (IPM) technologies. *Computers and Electronics in Agriculture, 217*, 108526.

Voisin, R., Horwitz, P., Godrich, S., Sambell, R., Cullerton, K., & Devine, A. (2024). What goes in and what comes out: A scoping review of regenerative agricultural practices. *Agroecology and Sustainable Food Systems, 48*(1), 124–158.

Vurro, M. (2024). Are root parasitic broomrapes still a good target for bioherbicide control? *Pest Management Science, 80*(1), 10–18.

Wahyuni, A., Baso, S., Dar, J., Biermayr-Jenzano, P., Daley, S. A., & Mbevi, L. (2023). Women's participation. In *Smallholders* (p. 343).

Williamson, S., Ball, A., & Pretty, J. (2008). Trends in pesticide use and drivers for safer pest management in four African countries. *Crop Protection, 27*(10), 1327–1334.

Zhang, C., Shi, G., Shen, J., & Hu, R. (2015). Productivity effect and overuse of pesticide in crop production in China. *Journal of Integrative Agriculture, 14*(9), 1903–1910.