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Utilization of pesticides by farmers in Akwa Ibom state, Nigeria

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Abstract

The research evaluated the extent to which farmers in Akwa Ibom State, Nigeria utilize pesticides. Primary data were gathered through a structured questionnaire, along with responses collected during focus group discussions. A total of 240 farmers were randomly selected for the study, with 55.8% identifying as male and 44.2% as female. The majority of participants (50.8%) fell within the age range of 21 to 40 years, and 65.4% were married. Additionally, 56.7% of the respondents had attained tertiary education, and nearly half (49.6%) regarded farming as their primary occupation. Monthly incomes for 65.4% of participants ranged from N1,000 to N50,000, with 47.9% reporting household sizes of 1 to 10 individuals, and 57.9% served as household heads. Most respondents (92.1%) identified as Christians, while 56.3% had between 1 to 10 years of farming experience. Furthermore, 54.2% engaged in both subsistence and commercial farming, and 56.4% reported similar farm sizes of 1 - 5 ha. Access to extension services was available to 71.7% of respondents, whereas 57.9% had access to modern agricultural inputs, and 76.7% reported lacking access to credit facilities. The pesticides use among farmers in the region was generally low. The Pesticide Use Scale (PUS) was employed to assess the types of pesticides utilized, indicating that the most commonly used products included Quinones (mean = 0.929), organophosphates (mean = 0.900), and Bromethalin (mean = 0.663). Consequently, the study suggests that extension agents should inform farmers about the significance of pesticide usage, given the current low levels of utilization.

Keywords: Pesticide, farmers, crops, chemicals, Akwa Ibom, Nigeria

Introduction

Pesticides are chemical substances named after the French word "peste," meaning pest or plague, and the Latin term "caedere," which translates to kill (Akunyili and Ivbijaro, 2006) [9]. These substances or mixtures are designed to repel, destroy, or manage pests that damage plants or serve as vectors for diseases affecting humans and animals (Anyim, 2003) [10]. As noted by Bolognesi (2003) [14], pesticides encompass a variety of substances utilized to eliminate, deter, or otherwise regulate pests, including insects, snails, rodents, fungi, bacteria, and weeds. They comprise herbicides, insecticides, rodenticides, fungicides, molluscicides, nematicides, avicides, repellents, and attractants, which are employed in agriculture, public health, horticulture, food storage, or related applications (NAFDAC, 1996) [34]. Pesticides play a crucial role in modern life by helping prevent the growth of unwanted organisms (Ivan, 2015, Udousung *et al*., 2022) [30, 48].

In agricultural production, pesticides are extensively utilized to mitigate losses caused by pests, thereby enhancing crop yields and the overall quality of produce, which often holds significant importance for consumers (Oerk and Dehne, 2004; Udousung *et al*., 2022) [38, 48]. They can also contribute to improving the nutritional value of food and, in some cases, its safety (Boxall, 2001; Narayanasamy, 2006) [15, 36]. Pesticides are applied throughout the production process, during transportation, distribution, and processing of food and feed. Additionally, they are administered to livestock for the control of ectoparasites (Yamada, 2017) [55].

As indicated by Cooper and Dobson (2007) [19], the increase in food consumption has significantly enhanced agricultural productivity, with substantial reliance on the widespread use of pesticides. This extensive application of pesticides has played a critical role in mitigating agricultural losses from pests, thus ensuring a greater availability of food at reasonable prices throughout the year. Moreover, pesticides can also be incorporated into animal feed to manage insects, arachnids, or other pests present on animals. Between 1990 and 2010, global usage of insecticides, herbicides and fungicides, and acaricides averaged 342,000, 566,000, and 353,000 metric tons, respectively (Liu *et al*., 2015) [32]. Additionally, Bernhardt *et al*., (2017) [13] reported that total global pesticide usage reached approximately 6 million metric tons. Europe stands out as the largest consumer of pesticides, followed by China and the United States (Benbrook, 2016; Hossain *et al*., 2017) [12, 29]. In developing countries, pesticide application accounts for about 25% of total usage, with notably higher rates observed in vegetable production (De Bon *et al*., 2014) [22]. A study on pesticide consumption in Nigeria revealed that around 15,000 metric tons of approximately 135 different pesticide chemicals are imported into the country annually (Erhunmunse *et al*.,

2012) [27]. Furthermore, it is estimated that Nigeria uses approximately 125,000 to 130,000 metric tons of pesticides each year (Asogwa and Dongo, 2009) [11]. In Ghana, the application of pesticides has contributed to reduced crop losses (Clarke *et al*., 1997) [18], and there has been a sustained increase in pesticide imports and use (Ministry of Food and Agriculture, 2002). The application of pesticides is prevalent in crop production areas as a means to minimize pest infestations, thereby safeguarding crops from potential yield losses and also prevent disease outbreak (Udousung *et al*., 2018, 2019 and 2020) [49]. Additionally, pesticides play a vital role in securing substantial profits for farmers, ensuring consistent supplies of agricultural products at affordable prices for consumers, and improving the aesthetic quality of produce, which is also crucial for marketability (Damalas, 2009) [20]. Considered a damage control measure against insects and other pests, the use of pesticides is viewed as a way to enhance nutritional value in food, representing an economically efficient and labor-saving approach to pest management (Damalas and Eleftherohorinos, 2011) [21].

Moreover, pesticides are believed to enhance competitive advantage within the agricultural sector (Delcour *et al*., 2015) [23]. Their application is considered crucial for sustaining current production levels and yields while ensuring high quality of life standards (Delcour *et al*., 2015) [23]. As noted by Asogwa and Dango, (2009) [11], advancements in mechanization and technology, along with the development of new pesticides, enable farmers to cultivate and manage larger tracts of land with a reduced labour force. The use of pesticides in Nigeria has notably increased since their introduction in the early 1950s for cocoa production, with the country's cocoa industry still reliant on these chemicals to achieve acceptable crop yields (Asogwa and Dango, 2009) [11]. These substances play a vital role in enhancing food production by mitigating damage from insects and pests throughout various stages of the food supply chain. They are broadly utilized in both plant and animal production to prevent, eliminate, repel, and control pests during the phases of production, transportation, storage, and distribution of food (Zikankuba *et al*., 2019) [56]. Additionally, pesticides are essential for managing vectors such as Anopheles mosquitoes, which are responsible for malaria transmission in tropical regions (Zikanhuba *et al*., 2019, Udousung *et al*., 2015a, 2015b, 2015c, 2019, 2020) [56, 43, 44, 45, 46, 47]. Nonetheless, several factors influence pesticide usage on a global scale. In Nigeria, a significant number of rural farmers lack adequate knowledge regarding the necessity and application of pesticides (Nkeme *et al*., 2017, Udousung *et al*., 2019) [37, 46]. Furthermore, challenges such as climate change, traditional beliefs, and the high costs associated with pesticides have impeded their effective utilization among farmers in the country (Udousung, 2024a; Udousung, 2024b) [43, 44]. Consequently, this study aims to explore farmers' level of pesticide usage in Akwa Ibom State.

Theoretical framework

In the past five decades, social scientists have developed numerous theories regarding the impact of communication on human behavior. These theories and models offer insights and illustrations of the factors that influence behavior, the mechanisms involved, and the conditions under which these influences occur. They serve as a basis for strategizing, implementing, and assessing projects. The theories that are particularly pertinent to this study include:

Adoption Theories

Numerous theories and models are utilized to examine individuals' adoption and post-adoption behaviors. This research primarily draws upon social psychology and its relevant theories and models. These frameworks emphasize individuals' intentions to engage in specific behaviors, such as adopting and using a product or service. The key theoretical foundations employed in this study include:

Theory of Planned Behavior (TPB)

In this model, perceived behavioral control (PBC) is introduced as an additional variable to enhance the Theory of Reasoned Action (TRA). Essentially, PBC is determined by the availability of resources, opportunities, and skills, alongside the perceived importance of these elements in achieving desired outcomes (Fishbein and Ajzen, 1980). While both the Theory of Planned Behavior (TPB) and TRA posit that an individual's behavioral intention (BI) influences behavior, TPB incorporates PBC to address actions beyond an individual's volitional control. By including PBC, the model not only accounts for realistic constraints but also introduces an element akin to self-efficacy (Taherdoost *et al*., 2012) [42]. Furthermore, PBC exerts a direct effect on actual behavior, as well as an indirect influence through behavioral intentions. Thus, in the TPB model, three primary factors shape individuals' perceived behavioral control: subjective norm, behavioral attitude, and PBC. However, two significant challenges arise regarding the TPB model (Sahibuddin *et al*., 2011) [40]. First, an individual's attitudes toward information technology may be largely irrelevant if access to a computer system is unavailable. Second, the revised TPB may be perceived as a more appropriate theoretical framework, influenced by the extent of an individual's volition in choosing whether or not to utilize information technology in the workplace.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB), like the Theory of Reasoned Action (TRA), is a well-established framework in social psychology that posits that certain salient beliefs shape behavioral intentions and subsequent actions (Ajzen, 1991) [2]. In contrast to TRA, TPB introduces an additional component known as Perceived Behavioral Control (PBC), which refers to "an individual's perception of their capability to perform a given behavior with ease" (Ajzen, 1991) [2]. As with research utilizing TRA, studies employing TPB have also identified significant correlations among attitude, subjective norm, perceived behavioral control, and behavioral intention. The inclusion of PBC in TPB highlights the significance of both the perceived difficulty associated with a behavior and an individual's perceived ability to execute that behavior. Numerous studies have established that PBC has a direct impact on technology adoption intentions (Chen, 2005) [17] as well as continuance usage intentions (Chang, 2015) [16].

Methodology

Study Area

The research was carried out in Akwa Ibom State, established on September 23, 1987, with Uyo serving as its capital. Akwa Ibom is one of the nine states located in the Niger Delta region of Nigeria, within the South-South geopolitical zones. It is part of six states comprising the South-South region, including Bayelsa, Cross River, Delta, Edo, and Rivers State. 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, Akwa Ibom covers a land area of 6,900 square kilometres with a population of 3,920,208 individuals (NPC, 2006).

The state is composed of thirty-one Local Government Areas, categorized into six agricultural development zones. Akwa Ibom experiences two main seasons - the rainy season and dry season, with rainfall evenly distributed throughout the year, ranging from over 3,000mm in the South to about 2700mm in the North. The average daily maximum temperature remains around 27°C throughout the year, with the highest temperatures typically occurring from February to April, but does not exceed 35^0c.

The highest relative humidity is recorded at 0.900 hours (Nigerian time). The majority of residents in the state are engaged in farming, either full time or part time, with others involved in trade, welding, business, and civil service. The primary occupation in the riverine areas is fishing. Akwa Ibom State is segmented into six Agricultural Development Programme zones (Abak, Eket, Etinan, Ikot Ekpene, Oron, and Uyo) for efficient delivery of agricultural development services. The soil in the region varies from loamy and rich deep soil to iron-rich and gray sandy soil, as well as clay soil. Overall, the soil is fertile and well-suited for agricultural activities.

Sampling Procedure and sample size

A multi-stage sampling approach was utilized to select the respondents for the study. Initially, a simple random sampling method was employed to choose three agricultural zones from the six Agricultural Development Programme zones in Akwa Ibom State. The selected zones were Uyo, Abak, and Ikot Ekpene. In the subsequent stage of the survey, two extension blocks were randomly selected from each of the zones, resulting in a total of six blocks. Following this, two extension cells were chosen from each block, resulting in twelve extension cells. In the final stage, a purposive sampling technique was used to select 20 farmers, yielding a total sample size of 240.

To determine the level of usage of pesticide among farmers, 20 popular pesticides were mentioned for confirmation of usage. A three-point Likert-type scale was utilized, with the options of never use (0), rarely use (1), and often use (2). Variables with mean scores of 1.0 and higher were deemed to have significantly use the mentioned pesticide, while those below 1.0 were considered to have insignificantly use the mentioned pesticides. The frequency of each rating was multiplied by the respective categorization code.

Likert scale

$$X = \sum \frac{fn}{nr} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where; $\sum$ = summation; f = Frequency of each of the response made; n = likert value

nr = Number of respondents;

(x) = mean = (F x 0) + (F x 1) + (F x 2) = T …….. (2)

i.e. = ((F x 0) + (F x 1) + (F x 2)

Mean (x) = T - sample size = (0+1+2) = 3/3 = 1.0) …… (3)

Where F = Frequency; T = Total and M = Mean Score

Result and Discussion

Table 1 reveals that a higher percentage of 55.8% of the participants were male, while 44.2% were female, indicating a predominance of male farmers in the study area. This finding contradicts previous studies by Udousung *et al.* (2015c) [45], Akpan and Udom, (2018) [3], Akpan *et al.*, (2019a, 2019b) [6, 7] and, which suggested that females comprised the majority of the farming population in Akwa Ibom State.

Table 1: 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			
1- 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

Additionally, 50.8% of the respondents fell within the age bracket of 21-40 years, 40.8% were aged 41-60 years, 67% were aged 61-80 years, and only 0.5% were above 80 years old. The average age of the respondents was calculated to be 42 years. This outcome is in contrast to the research findings of Akinbile *et al*., (2014) [8], who claimed that a significant portion of farmers were aged between 31-40 years.

The results indicate that the largest portion of respondents, amounting to 65.4%, were married. Meanwhile, 23.3% were single, 5.8% were widowed, and 5.4% were divorced or separated. This aligns with previous studies by Ekong (2003), Udousung, and Umoh (2020) [47], Akpan and Effiong, (2022) [4], and Akpan *et al*., (2024) [5] highlighting the high value placed on marriage among rural individuals, particularly farmers, in Nigeria. Ekanem and Okon (2017) [24] also found that a majority of farmers in Akwa Ibom State were married. In terms of education, 56.7% of respondents had tertiary education, 30.4% had secondary education, 9.2% had primary education, and 3.8% had no formal education. The majority of respondents were found to be functionally literate, which is in line with Ekanem and Okon's (2017) [24] findings regarding literacy rates among farmers in Akwa Ibom State.

According to the results, a higher percentage of the participants, specifically 49.6%, was identified as core farmers (those whose livelihood depend on farming), while 29.6% held salaried positions, and 19.6% were involved in trading. Additionally, a small percentage, 1.3%, were engaged in occupations such as hairdressing, cycling, and selling food/snacks. These findings are consistent with previous studies by Udousung and Umoh (2020) [47], indicating that farming is the primary occupation among the people of Akwa Ibom State. The survey also revealed that the majority of the participants, 65.4%, earned between N1,000 and N50,000 per month. Furthermore, 28.8% earned between N51,000 and N 100,000 monthly, while 4.2% reported earnings above N150,000. Only 1.7% of the respondents fell into the income bracket of N101,000 to N150,000. These results align with the research conducted by Kehinde *et al*., (2014) [31], which showed that most farmers earned between N1 to N50, 000 per season.

A significant portion (55.0%) of the participants had a household size ranging from 1 to 5 individuals, while 42.9% had 6-10 members, and 2.1% had 11-15 members. The average household size was recorded at 6 individuals. This finding is consistent with the research conducted by Ekanem and Okon (2017) [24], which observed a similar average household size of 6 among farmers in Akwa Ibom State. Furthermore, the data presented in Table 1 reveals that 92.1% of the respondents identified as Christians, 4.2% as traditional worshippers, and the remaining 3.8% belonged to other religious groups such as Islam. These results align with the study conducted by Udousung and Umoh (2019) [46], indicating that the majority of farmers in Akwa Ibom State practice Christianity.

In terms of farming experience, a majority (56.3%) of the participants reported having 1-10 years of experience, followed by 31.3% with 11-20 years, 7.5% with 21-30 years, 3.8% with 31-40 years, and 1.3% with 41-50 years of experience. The average years of experience in farming among the respondents was 13 years. These findings differ from the research findings of Udousung and Umoh (2020) [47], who suggested that most farmers in Akwa Ibom State had 10 years of experience in farming.

A significant portion (56.4%) of the participants possessed farm sizes ranging from 1-5 hectares (ha), with 37.1% owning less than 1 ha and 7.5% owning over 5 ha. The mean farm size was calculated to be 2 ha. These findings contradict the claims made by Adekunmi *et al*., (2017) [1], who stated that most farmers owned less than one hectare of

agricultural land. The majority (71.7%) of respondents had access to extension services, while 28.3% did not. This outcome contradicts Akpan *et al*., (2024) [5] and Akpan *et al*., (2019b) [7] assertions that most farmers in Akwa Ibom state do not have sufficient access to extension services.

Level of pesticide use by farmers in Akwa Ibom State, Nigeria

The ranking of pesticide used by farmers in Akwa Ibom State for their farming activities is shown in Table 2. The pesticide use scale (PUS) was used to survey the pesticides used by the respondents. Table 2, reveals that the most used pesticides by the respondents are Quinones (mean = 0.929), organophosphorus (mean = 0.900) and Bromethalin (mean = 0.663) Pentachlorophenol (mean = 0.579). The pesticides utilized by farmers in the study area are predominantly chosen for their effectiveness in managing prevalent pests like rodents, fungi, and insects that pose threats to common crops including garden egg, vegetables, pepper, maize, rice, cassava, melon, and tomatoes within the state.

The findings align with those of Seynmon and Girardet (1987) [41] and Okeke (1993) [39], who indicated that Quinones, organophosphorus compounds, and Bromethalin are the predominant pesticides utilized by farmers in Nigeria. Conversely, the least frequently employed pesticides in the study area include crush (mean = 0.413), Oxadiazon (mean = 0.442), Metolachor (mean = 0.471), Carbamates (mean = 0.425), glyphosphate (mean = 0.408), and paraquat (mean = 0.396). This could be due to the fact that these pesticides are considered as weed control agents and are not perceived by the farmers as significant threats to their farming activities, hence they are least used by the farmers. Also the farmers might feel that it can affect their useful plants while spraying in their farms.

Table 2: Ranking of pesticides used by farmers in Akwa Ibom State

S/N	Pesticides	Never use (0)	Rarely use (1)	Often use (2)	Total	Mean	Rank
1	Carbamates	164(68.3)	50(20.8)	26(10.8)	102	0.425	17
2	Benzere	159(66.3)	47(19.6)	34(14.2)	115	0.479	13
3	Primixctral	159(66.3)	52(21.7)	29(12.1)	110	0.458	15
4	Paraquat	169(70.4)	47(19.6)	24(10.0)	95	0.396	20
5	Crush	166(69.2)	49(20.4)	25(10.4)	99	0.413	18
6	Glyphosate	164(68.3)	54(22.5)	22(9.2)	98	0.408	19
7	Oxadiazon	157(65.4)	60(25.0)	23(9.6)	106	0.442	16
8	Metolachor	153(63.7)	61(25.4)	26(10.8)	113	0.471	14
9	Benomyl	149(622.1)	64(26.7)	27(11.3)	118	0.492	11
10	Oxamyl	150(62.5)	64(26.7)	26(10.8)	116	0.483	12
11	Triazophos	146(60.8)	67(27.9)	27(11.3)	121	0.504	10
12	Carbosulfan	146(60.8)	64(26.7)	30(12.5)	124	0.517	9
13	Pentachlorophenol	137(57.1)	67(27.9)	36(15.0)	139	0.579	4
14	Quinones	95(39.6)	67(27.9)	78(32.5)	223	0.929	1
15	Bromethalin	125(52.1)	71(29.6)	44(18.3)	159	0.663	3
16	Zinc phosphorus	139(57.9)	70(29.2)	31(12.9)	132	0.550	7
17	Niclosamide	136(56.7)	71(29.6)	33(13.8)	137	0.571	5
18	Organophosphorus	102(42.5)	64(26.7)	76(30.8)	216	0.900	2
19	Organo chlorines	138(57.5)	68(28.3)	34(14.2)	136	0.567	6
20	Dragon	139(57.9)	72(30.0)	29(12.1)	130	0.542	8

Note: * and ** = Frequencies and percentages respectively; rank 1 is the most used pesticide by the respondents while rank 20 is the least used pesticide. Source: Field Survey, 2022.

The aggregated scores from the Pesticide Use Scale (PUS) resulted in a total score ranging from 1 to 20. Utilizing this total PUS score range, farmers' levels of pesticide use were classified into two distinct categories: low (1-10) and high (11-20). This classification is illustrated in Table 3, which shows that 62.5% of respondents exhibited low pesticide usage, while 37.5% demonstrated high usage. This finding highlights significant concerns regarding the detrimental effects on both human health and the environment. This perspective aligns with the findings of Environews Forum (1999) [26], which reported that approximately 1 million deaths and cases of chronic illness globally each year are attributable to pesticide poisoning.

Table 3: Categorization of level of pesticide uses by farmers in Akwa Ibom State

Level of pesticides use	PUS Score	Frequency	Percentage
Low	1-10	150	62.5
High	11-20	90	37.5
Total		240	100.0

Source: Field Survey, 2022

Conclusion

The socio-economic characteristics of farmers in Akwa Ibom State demonstrate that 55.8% of the farmers are male, while 44.2% are female. The predominant age group is between 21 and 40 years, comprising 50.8% of the farmers, and 65.4% of respondents are married. A majority, 56.7%, hold a tertiary education, with 49.6% considering farming as their primary occupation. Monthly earnings for 65.4% of the farmers range from N1,000 to N50,000, with 47.9% belonging to households of 1 to 10 individuals, and 57.9% acting as heads of their households. Additionally, 92.1% of the respondents identify as Christian, and 56.3% have farming experience ranging between 1 to 10 years. Furthermore, 54.2% engage in both subsistence and commercial farming, with a corresponding 56.4% of farmers having farm size in the range of 1 - 5 ha. Access to extension services is reported by 71.7% of respondents, while 57.9% have access to modern farming inputs; however, 76.7% do not avail themselves of credit facilities. Nonetheless, the actual level of pesticide use among farmers

in Akwa Ibom State remains low at 62.5%. The Pesticide Use Scale (PUS) was employed to assess the pesticides utilized by respondents. As reveal by the results, the most frequently used pesticides include Quinones (mean = 0.93), Organophosphorus (mean = 0.85), and Bromethalin (mean = 0.66). These pesticides are favoured by farmers in the region as they effectively control prevalent pests such as rodents, fungi, and insects that threaten common crops such as garden egg, vegetables, pepper, maize, rice, cassava, melon, and tomatoes etc. On the other hand, the least used pesticides by farmers in the study area were identified as, crush (mean = 0.41), glyphosphate (mean =0.41) and paraquat (mean = 0.40). This could be due to the fact that these pesticides are weed control and are not perceived by the farmers as significant threats to their farming activities, hence they are least used by the farmers.

Recommendations

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

1. It is essential for farmers to receive education from extension agents regarding the proper methods for storing, handling, and disposing of pesticides, as many lack the necessary knowledge in this area.
2. Extension agents should focus on enhancing awareness about the importance of attitudinal shifts and perceptions regarding pesticide use among farmers.
3. Extension agents ought to inform farmers about the significance of pesticides in their agricultural practices, given the current low levels of pesticide use.
4. Farmers are encouraged to participate in cooperative societies to access credit facilities, which will allow them to purchase essential farm inputs and increase food production for the community.

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