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Use of agrochemicals in two selected farming communities in South-West Nigeria

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Abstract

Agrochemicals play a crucial role in modern agriculture by improving crop yields and controlling pests. This study examines agrochemical usage in Ijede and Odigbo, two farming communities in southwest Nigeria, with a focus on socio-economic factors, utilization patterns, and associated challenges. A multistage sampling technique was used to select 100 farmers (50 from each community), and structured interviews gathered data on demographics, agrochemical types, application frequency, and perceived impacts. Findings reveal regional differences in agrochemical preferences Odigbo farmers predominantly use fungicides and insecticides, while Ijede farmers favor herbicides. Major challenges include price fluctuations and limited credit access. Policy recommendations emphasize targeted subsidies, enhanced extension services, and cooperative purchasing initiatives to promote sustainable agrochemical use.

Keywords: Agrochemicals; Farming Communities; Nigeria; Pesticides; Herbicides; Socio-economic Factors

1. Introduction

Agricultural production in Nigeria relies heavily on agrochemicals, including pesticides, herbicides, and fertilizers, to enhance productivity and protect crops from pests and diseases. However, the indiscriminate use of these agrochemicals poses significant environmental and health risks. Farmers in South-West Nigeria, like in many other regions, apply agrochemicals without adequate knowledge of safety measures, proper disposal methods, and the potential implications for human health and ecosystems. Previous studies have highlighted the impact of agrochemical use on farm productivity, soil health, and water contamination. The present study seeks to examine the patterns of agrochemical use in two selected farming communities in South-West Nigeria and evaluate farmers' knowledge, attitudes, and practices regarding pesticide application and disposal. [1] examined farmers' pesticide use and disposal behavior in Nigeria, emphasizing concerns regarding adherence to pre-harvest intervals. Their findings indicate that improper handling of pesticides results in significant residual effects on food crops, affecting both consumer health and export potential. [2] studied the effects of different processing methods on pesticide residues in cowpea seeds, revealing that traditional processing techniques could help reduce contamination levels.

Climate variability significantly influences pesticide use, as observed by [3] in their study on rice production in Nigeria. They found that fluctuations in climatic conditions alter pest prevalence, leading farmers to increase pesticide application rates. Similarly, [4] evaluated the adoption of Integrated Striga Management (ISM) technologies among smallholder maize farmers and reported that improved pest control strategies enhanced maize productivity while reducing environmental degradation.

Efficient utilization of resources is critical for sustainable agriculture. [5] analyzed resource use efficiency in Vitamin A biofortified cassava production and found that optimizing input levels, including fertilizers and pesticides, improved yield outcomes. Their study underscores the importance of precision agriculture in maximizing resource efficiency.

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[6] investigated polychlorinated biphenyls (PCBs) contamination in Nigerian soils and highlighted the long-term ecological risks associated with excessive agrochemical application. Their study reinforces the need for sustainable soil management practices to mitigate contamination. [7] assessed water quality around selected dams and irrigation projects, revealing significant agrochemical runoff, which threatens aquatic ecosystems and human water consumption.

[8] examined the effects of farmers-herdsmen conflicts on maize production in Jigawa State, Nigeria. Their findings suggest that insecurity has led to changes in land use patterns and increased reliance on herbicides to control weed growth, compensating for labor shortages caused by displacement and insecurity.

Ibrahim et al. [9] modified the QUECHER's extraction method to determine organophosphate pesticide residues in fish samples from Wurbo and Yelwa Lakes. Their results confirmed significant contamination levels, highlighting risks associated with agrochemical runoff into water bodies. [10] provided evidence linking air pollution to chronic kidney disease (CKD) in Niger Delta communities, emphasizing how airborne agrochemical residues contribute to environmental toxicity.

[11] analyzed bee species diversity in relation to floral resources in different ecological zones of Niger State. The study revealed that excessive pesticide use reduces pollinator populations, threatening crop yields that depend on insect pollination. The findings align with global concerns about pollinator decline due to agrochemical exposure.

2. Literature Review

The use of agrochemicals in agricultural production has been a subject of concern due to its potential impacts on human health, environmental sustainability, and food security. In South-West Nigeria, several studies have explored the extent of agrochemical application, its benefits, and associated risks among farming communities. [11] examined the link between agrochemical use and kidney disease in rural farming communities, highlighting the prevalence of harmful exposure and inadequate protective measures among farmers. Their findings indicate that a significant proportion of farmers do not adhere to safety regulations, increasing the risk of chronic health conditions. [12] investigated farmers' perceptions of agrochemical use and food safety in Nigeria, revealing a gap between knowledge and practice. While many farmers recognize the potential hazards of agrochemicals, improper handling and disposal methods persist. The study emphasized the need for enhanced awareness programs and policy enforcement to ensure safe agricultural practices.

[13] explored pesticide use and disposal behavior among Nigerian farmers, noting a widespread lack of compliance with recommended pre-harvest intervals. The study found that many farmers apply excessive pesticide doses and harvest crops prematurely, leading to residual contamination in food products. These practices pose severe health risks to consumers and undermine food safety regulations. [14] focused on pesticide knowledge and safety practices among cocoa farmers in South-West Nigeria. Their research highlighted gaps in farmers' understanding of safe pesticide handling and post-harvest management. The study suggested the implementation of targeted training programs to promote safer agricultural practices and minimize pesticide-related risks. [15] reviewed the effects of herbicide use on human, animal, and environmental health in Nigeria. Their analysis indicated that indiscriminate herbicide application has led to soil degradation, water contamination, and adverse health effects among farmworkers. The study recommended stricter regulatory frameworks and sustainable alternatives to chemical herbicides.

[16] examined climate change adaptation strategies in cassava production in Ondo State, emphasizing the role of agrochemical use in mitigating climate-related challenges. The study revealed that while agrochemicals help in maintaining crop productivity, their overuse contributes to environmental degradation. Sustainable farming methods were suggested as viable alternatives to excessive chemical inputs.

[17] explored factors influencing the adoption of recommended rice production practices in Kogi State. Their findings showed that while farmers acknowledge the benefits of improved agrochemical applications, financial constraints and lack of technical knowledge hinder full compliance with best practices. Policy interventions were suggested to bridge these gaps and improve sustainable farming. [18] assessed the long-term effects of agrochemical applications on soil health in vegetable farms around the South-West region of Cameroon. Their study found that continuous agrochemical use without soil replenishment strategies leads to declining soil fertility and increased vulnerability to erosion. The authors recommended integrated soil management practices to maintain soil health and productivity. [19] analyzed climate change perception and adaptation strategies among urban farmers in Anambra Metropolis. Their findings indicated that agrochemical usage is a common strategy for coping with climate-induced agricultural stress, but excessive use leads to unintended negative environmental consequences. They advocated for a balance between chemical and organic farming techniques.

3. Methodology

The study employed a multistage sampling technique to select 100 farmers from Ijede and Odigbo farming communities, ensuring a representative sample of agrochemical users. The first stage involved identifying key agricultural zones within the communities, followed by a random selection of farming households engaged in crop production. A final selection was made by systematically choosing farmers who actively use agrochemicals. This approach enhanced the reliability of the data by capturing a diverse range of farming practices, agrochemical application patterns, and economic constraints.

3.1. Data collection

Data collection was conducted through structured interviews, focusing on farmers' demographic profiles, types of agrochemicals used, application frequency, and economic challenges associated with their use. The structured format ensured uniformity in responses, facilitating easier comparison and analysis. The collected data were analyzed using descriptive statistics, including frequency distributions, percentages, and mean values, to identify prevailing trends and patterns in agrochemical use. This method provided a clear understanding of farmers' behaviors and challenges, forming a basis for recommendations on sustainable agrochemical practices.

4. Results and discussion

4.1. Socio-Economic Characteristics of Farmers

The results indicate significant demographic differences between farmers in Ijede and Odigbo, particularly in age distribution and education levels. While younger farmers (29-39 years) dominated in Ijede (62%), Odigbo had a higher proportion of older farmers (40-50 years, 46%). The gender disparity suggests that farming remains male-dominated, with 90% of farmers in Ijede and 78% in Odigbo being men, highlighting potential barriers to female participation in agriculture. Education levels varied, with secondary education being the most common, particularly in Odigbo (72%) compared to Ijede (52%). These socio-economic characteristics influence agrochemical usage patterns, decision-making processes, and the ability to adopt improved farming practices. The variation in educational background may also affect awareness of agrochemical risks, safe handling practices, and compliance with recommended application guidelines.

4.2. Agrochemical Usage Patterns

The findings highlight distinct patterns in agrochemical usage between the two farming communities. While all farmers reported using agrochemicals, the specific types varied significantly. In Ijede, herbicides were the most frequently used agrochemicals (65%), whereas Odigbo farmers relied more on fungicides (42.31%) and insecticides (36.54%). Rodenticides were also used, but their prevalence differed, with Ijede recording a higher usage (35%) compared to Odigbo (13.46%). The frequency of pesticide application also varied, with 62% of Odigbo farmers applying pesticides at regular intervals, whereas only 29.58% of farmers in Ijede followed this pattern. Instead, most Ijede farmers (70.42%) applied pesticides based on pest problems rather than a fixed schedule. These variations may be attributed to differences in crop types, pest pressures, and farmers' awareness of pesticide application practices.

Table 1 Agrochemical Usage by Farmers

Agrochemical Type	Ijede (%)	Odigbo (%)
Herbicides	65	7.69
Fungicides	0	42.31
Insecticides	0	36.54
Rodenticides	35	13.46

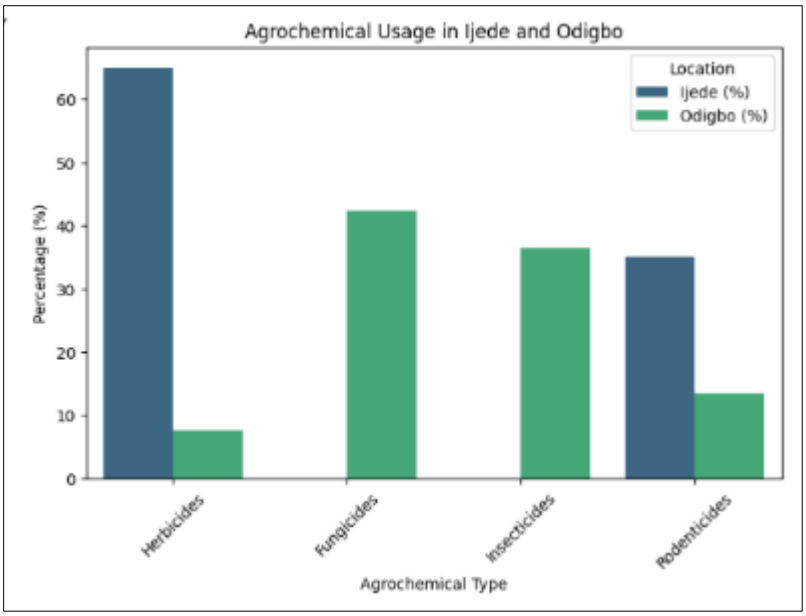

Figure 1 Bar chart using to compare agrochemical usage in Ijede and Odigbo.

Table 2 Frequency of Pesticide Use by Farmers

Frequency of Pesticide Use	Ijede (%)	Odigbo (%)
Regular Intervals	29.58	62
According to pest problem	70.42	38
Not at all	0	0

4.3. Fertilizer Application and Pesticide Use

The study revealed a universal reliance on inorganic fertilizers among farmers in both communities, though the specific types and application methods varied. In Odigbo, NPK 15:15:15 was overwhelmingly preferred (92%), whereas Ijede farmers favored NPK 20:10:10 (69.44%). Urea was used exclusively in Ijede, accounting for 30.56% of fertilizer application. Differences were also observed in the stages at which fertilizers were applied. Most Ijede farmers (51.57%) applied fertilizers during the vegetative growth stage, whereas in Odigbo, the seedling stage was the most common application period (41.2%). These differences suggest variations in farming practices, soil fertility management, and crop selection between the two communities.

Table 3 Fertilizer Types Used by Farmers

Fertilizer Type	Ijede (%)	Odigbo (%)
NPK 15:15:15	0	92
NPK 20:10:10	64.44	8
Urea	30.56	0

Table 4 Fertilizer Application Stages by Farmers

Fertilizer Application Stage	Ijede (%)	Odigbo (%)
Seedling Stage	23.61	41.2
Vegetation Growth Stage	51.57	29.4
Flowering Stage	13.89	17.65
Fruiting Stage	5.56	11.75
Maturation Stage	5.37	0

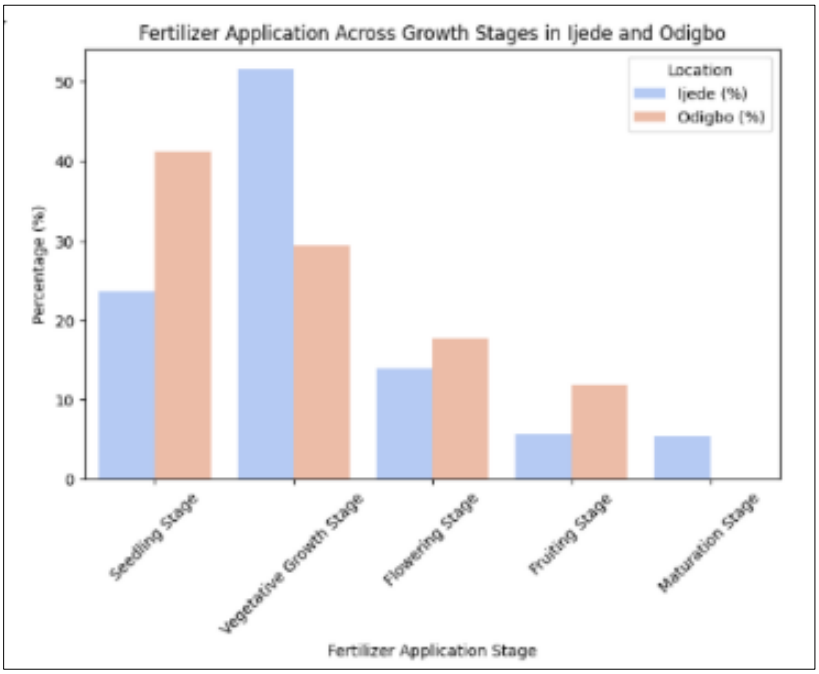

Figure 2 Bar chart to compare fertilizer application percentages at different growth stages

4.4. Economic Impact of Agrochemicals Usage

The study highlights the significant economic impact of agrochemical price fluctuations on farming practices in Ijede and Odigbo. All surveyed farmers acknowledged awareness of rising agrochemical costs, which influenced their application strategies. In response, 58.54% of Ijede farmers opted to reduce their application rates, whereas 70% of Odigbo farmers adjusted the frequency of use. This suggests that while Ijede farmers prioritized maintaining application frequency with lower quantities, Odigbo farmers preferred spreading out applications over a longer period. Additionally, credit accessibility emerged as a major challenge, with 84% of Odigbo farmers and 72% of Ijede farmers struggling to secure funding for agrochemical purchases. The inability to access credit could further constrain farmers' ability to maintain optimal agrochemical use, potentially affecting crop yields and farm profitability.

Table 5 Economic Impact of Agrochemical Usage

Economic Factor	Ijede (%)	Odigbo (%)
Aware of Price Changes	100	100
Reduced Application Rate	58.54	30
Reduced Application Frequency	41.46	70
Difficulty in Credit Access	72	84
No access at all	28	16

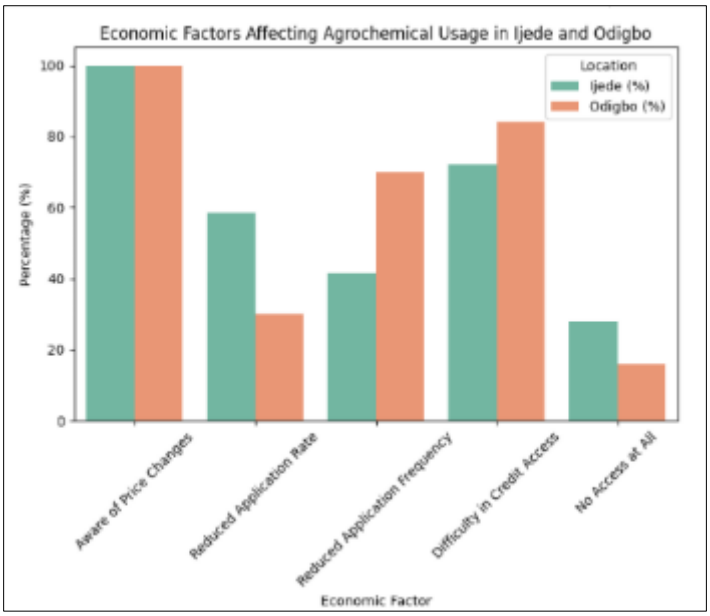

Figure 3 Bar chart for comparison of Economic Factors Affecting Agrochemical Usage in Ijede and Odigbo

4.5. Perceived Impact of Agrochemical Use on Crop Yield and Quality

The perceived impact of agrochemical use on crop yield and quality varied between the two farming communities. While the majority of Odigbo farmers (78%) reported significant improvements in crop quality after agrochemical application, farmers in Ijede had mixed experiences. In Ijede, 54% observed moderate improvements, while 46% noted no significant change in yield or quality. These differences could be attributed to variations in soil composition, agrochemical types, and application methods. The findings suggest that while agrochemicals generally enhance productivity, their effectiveness may depend on region-specific factors such as farming techniques, environmental conditions, and access to quality inputs.

Table 6 Perceived Effectiveness of Agrochemical Use

Impact on Crop Yield	Ijede (%)	Odigbo (%)
Moderate Improvement	54	78
No Significant Change	46	22

4.6. Challenges and Policy Recommendations

The study identifies key challenges faced by farmers in the use of agrochemicals, including rising costs, difficulty accessing credit, and concerns over environmental and health risks. High prices have forced many farmers to either reduce application rates or adjust frequency, potentially affecting crop productivity. Additionally, limited financial support has further constrained smallholder farmers' ability to purchase necessary inputs. To address these challenges, policy measures should focus on strengthening cooperative purchasing systems to enhance affordability, expanding government subsidies for smallholder farmers, and improving agricultural extension services. Furthermore, promoting alternative pest control strategies, such as integrated pest management (IPM), can help reduce excessive dependence on agrochemicals while ensuring sustainable agricultural practices.

Table 7 Preferred Strategies for Improving Access to Affordable Pesticides and Fertilizers

Strategy	Ijede (%)	Odigbo (%)
Subsidies on Inputs	38.1	83.33
Cooperative Buying Groups	35.24	13.33
Training on Alternative Pest and Disease Management	26.66	3.34

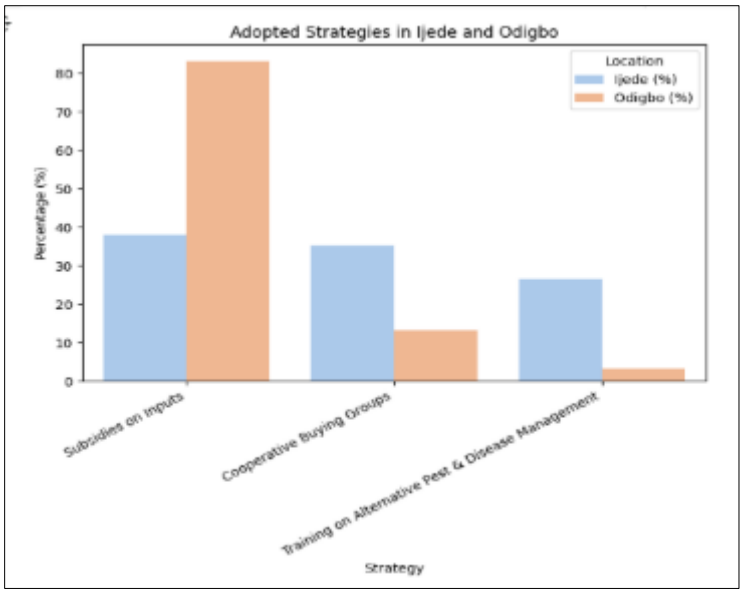

Figure 4 Bar chart comparing Ijede and Odigbo's strategies

5. Conclusion

The findings of this study emphasize the essential role agrochemicals play in improving agricultural productivity in Ijede and Odigbo. However, financial barriers, including high costs and restricted credit access, have limited their optimal use. The unavailability of agricultural loans and subsidies further exacerbates the situation, leaving smallholder farmers struggling to afford necessary inputs. Additionally, improper handling and application of agrochemicals pose significant risks to both human health and the environment. Many farmers lack proper training on safe usage, and inadequate personal protective equipment (PPE) increases their exposure to harmful substances. Furthermore, poor disposal methods contribute to water pollution, threatening local ecosystems.

Although initiatives like the Growth Enhancement Support Scheme (GESS) aim to address these challenges, their effectiveness is hindered by inefficiencies in implementation and distribution. To enhance sustainable agricultural practices, policymakers should focus on improving subsidy programs, facilitating cooperative purchasing systems, and expanding farmer education on safe agrochemical use. Encouraging alternative pest control methods, such as integrated pest management (IPM), could further support a balanced approach, ensuring productivity while minimizing environmental and health risks

Compliance with ethical standards

Disclosure of conflict of interest

Thank you for confirming the compliance with ethical standards. We reiterate that we have no conflicts of interest to disclose, and that informed consent was obtained from all individual participants included in the study. Please let us know if you need any additional information or documentation.

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