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Full Length Research Article

TRAINING NEEDS OF CUCUMBER FARMERS ON AGROCHEMICAL USE IN NSUKKA AGRICULTURAL ZONE, ENUGU STATE, NIGERIA

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ABSTRACT
The study assessed the training needs of cucumber farmers on agrochemical use in the Nsukka Agricultural Zone of Enugu State, Nigeria. A multistage sampling procedure was employed to select 120 cucumber farmers. Data were collected using a structured interview schedule and analysed using mean, standard deviation, and multiple regression analysis. The results showed that farmers had positive perceptions of agrochemical use, as reflected in statements such as "agrochemicals enhance rapid cucumber growth" ($\bar{x}$ = 4.85), "increase yield" ($\bar{x}$ = 4.79), and "reduce the drudgery associated with farm operations" ($\bar{x}$ = 4.77). Key training needs identified included determining the appropriate timing of agrochemical application ($\bar{x}$ = 2.64), assessing the authenticity and quality of agrochemicals from retail outlets ($\bar{x}$ = 2.58), and selecting suitable agrochemicals for specific production practices ($\bar{x}$ = 2.58). Major constraints faced by the farmers were inadequate funds for purchasing agrochemicals ($\bar{x}$ = 2.90), high cost of agrochemicals ($\bar{x}$ = 2.74), and weather-related challenges ($\bar{x}$ = 2.73). Age (t = 1.90) and membership in social organizations (t = 2.08) significantly influenced farmers' use of agrochemicals. The study recommends that extension services, through the Enugu State Ministry of Agriculture and Natural Resources, should intensify training programmes focusing on types of agrochemicals, their authenticity, and appropriate timing of application.

Keywords: Training needs, agrochemical use, cucumber farmers, Nsukka agricultural zone

INTRODUCTION

Cucumber (*Cucumis sativus* L.) belongs to the family Cucurbitaceae, which also includes crops such as melon, squash, watermelon, and pumpkin (Swamy, 2023). It is widely cultivated across the globe, with major producers including China, India, Russia, and the United States. Cucumber is a highly valued vegetable due to its high-water content (about 95%), which supports hydration and is often recommended as a natural diuretic (Pal et al., 2020; Mallick, 2022). Beyond its nutritional value, cucumber contains essential micronutrients such as manganese, calcium, potassium, beta-carotene, and vitamin C, which contribute to its antioxidant properties (Pal et al., 2020). It has also been associated with several health benefits, including the management of hypertension, diabetes, and other chronic conditions, owing to its therapeutic properties, including anti-inflammatory, antimicrobial, and antioxidant effects (Javid et al., 2024).

In Nigeria, cucumber is cultivated across various agroecological zones, from the rainforest to the savannah regions, with production levels varying by location. Major producing states include Plateau, Kaduna, Katsina, Kano, and Benue, while states such as Ebonyi, Akwa Ibom, Oyo, Cross River, Nasarawa, and Enugu also contribute significantly to production (Okafor & Yaduma, 2021). The crop is increasingly popular among farmers due to its economic, nutritional, and medicinal value. However, achieving high yields often requires agrochemicals, particularly in soils that may be deficient in essential nutrients or prone to pest and disease infestations.

Agrochemicals, including fertilizers, herbicides, insecticides, and fungicides, play a critical role in modern agriculture by enhancing crop productivity, protecting crops from pests and diseases, and reducing labour requirements (Kratzer, 2023; Zhang et al., 2021). Fertilizers supply essential nutrients necessary for plant growth, while pesticides and herbicides help minimize yield losses and ensure consistent production. Despite these benefits, the use of agrochemicals poses significant risks to human health and the environment when improperly handled. Studies have shown that exposure to agrochemicals can lead to contamination of food, water, and soil, as well as adverse health outcomes for farmers (Fernandes et al., 2020; Mitra et al., 2022). These risks are often exacerbated by low levels of awareness, inadequate training, and limited access to extension services among smallholder farmers.

Training is therefore essential in improving farmers' knowledge, skills, and attitudes toward the safe and effective use of agrochemicals. It involves structured activities aimed at enhancing the competencies required to improve performance and productivity (Gutterman, 2023). Evidence suggests that training enables farmers to understand better and adopt improved technologies, thereby increasing efficiency, profitability, and sustainability (Xue et al., 2022; Javaid et al., 2022). In the context of agrochemical use, training is particularly important for ensuring proper application, handling, storage, and disposal practices.

Although several studies have examined farmers' perceptions, effects, and risks associated with agrochemical use (e.g., Nwakile et al., 2020; Ugbelu, 2022; Ugwuoke et al., 2024; Apeh et al., 2024), limited attention has been given to the specific training needs of cucumber farmers, particularly in the Nsukka Agricultural Zone of Enugu State. This represents a critical knowledge gap, as understanding these training needs is essential for designing effective extension interventions.

Therefore, the main objective of this study was to assess the training needs of cucumber farmers on agrochemical use in the Nsukka Agricultural Zone of Enugu State, Nigeria. Specifically, the study sought to: (i) identify the types of agrochemicals used; (ii) examine farmers' perceptions of agrochemical use; (iii) determine the training needs of farmers; (iv) analyze the socioeconomic factors influencing agrochemical use; and (v) identify the constraints to agrochemical use among cucumber farmers.

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MATERIALS AND METHODS

The study was carried out in Nsukka agricultural zone, Enugu State, Nigeria, located at latitude $6^0$30' N to $7^0$00' N and longitude $7^0$00' E to 7030' E. The study population comprised all cucumber farmers in the Nsukka agricultural zone, Enugu State, Nigeria. A multistage sampling procedure was employed for selecting farmers for the study. In the first stage, two of the eight blocks were randomly selected from the zone. In the second stage, four of the eight circles were randomly selected in each block, for a total of eight circles. In the third stage, 15 cucumber farmers were selected from each circle using the snowball sampling technique due to the absence of a sampling frame, resulting in a total of 120 respondents for the study.

Data were collected using a structured interview schedule. In the data collection instrument, the types of agrochemicals used were obtained by asking the farmers to indicate either 'yes' or 'no' for each agrochemical provided. Common trade names were used because farmers identify agrochemicals by brand rather than chemical name. This approach improves data accuracy and has precedence in farmer-led extension in the region. Regarding farmers' perceptions of agrochemical use, a 20-item list was provided. Farmers were asked to indicate on a five-point Likert scale of strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). The values were summed and divided by 5, yielding a mean score of 3.0. Any variable with a mean score greater than 3.00 was regarded as indicating a positive perception of agrochemical use. In contrast, any variable with a score below 3.00 was regarded as indicating a negative perception of agrochemical use. A variable with a mean score of 3.00 was considered neutral in terms of perception. The training needs of cucumber farmers were measured by asking respondents to indicate, from a list of 16 items, the agrochemical use skills/competencies they needed. Farmers were asked to indicate on a four-point Likert-type scale of highly needed (3), moderately needed (2), little needed (1), and not needed (0). The values were summed to yield a mean score of 1.5. Any variable with a mean score ≥ 1.5 was considered an area where respondents needed training in the use of agrochemicals. In contrast, any variable with a mean score < 1.5 was not regarded as an area where farmers needed training. Constraints to the use of agrochemicals by the farmers. This was measured by asking the farmers to indicate, from a list of 15 items, their use of agrochemicals. The variables were measured on a three-point Likert-type scale of serious (2), not serious (1), and not a challenge at all (0). The values were summed and divided by 3, yielding a mean score of 1.0. Any variable with a mean score of 1.0 and above was regarded as a constraint to the use of agrochemicals, while variables with mean scores of less than 1.0 were not regarded as a constraint.

Data were analysed using frequencies, percentages, means, and standard deviation. The socioeconomic factors influencing agrochemical use were identified using a multiple linear regression model. The regression model specification is as follows:

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + U$$

Where:
Y = agrochemicals used, scored by the farmers
β_1- β_8 = Regression coefficient
X_1 = Age (years)
X_2 = Number of years spent in school (years)
X_3 = Household size (Number of persons)
X_4 = Farming experience (years)
X_5 = Farm size (hectares)
X_6 = Quantity of cucumber harvested last season (kg)
X_7 = Annual income (naira)
X_8 = Membership of social organization (yes =1, no=0)

RESULTS AND DISCUSSION

Types of Agrochemicals Used

Table 1 presents the types of agrochemicals used by cucumber farmers in the study area.

Herbicides used

The results show that a greater proportion of farmers (71.6%) used Buta force as a pre-emergence herbicide, followed by Buta star (13.8%) and Stomp (7.8%). This indicates that Buta Force is the dominant herbicide for pre-emergence weed control among the farmers. For post-emergence weed control, about 49.1% of the respondents used Slasher, while smaller proportions used Weedstorm (12.9%), Weedoff (12.9%), and Paraforce (4.3%). The high use of both pre- and post-emergence herbicides suggests that farmers adopt integrated chemical weed management practices to ensure effective control throughout the crop growth cycle. Pre-emergence herbicides prevent weed establishment, while post-emergence herbicides control already established weeds. When applied at the correct dosage and timing, these herbicides enhance weed suppression, reduce labour requirements, and improve farm efficiency. This supports Daramola's (2021) assertion that herbicides play a crucial role in reducing drudgery and improving the efficiency of weed control in crop production.

Pesticides used

The findings further reveal that the majority (80.2%) of farmers used Laraforce, making it the most widely used pesticide in the area. Other pesticides used include Attack (17.2%), Imiforce (12.1%), and Imidaspring (1.7%). The dominance of Laraforce may be attributed to its perceived effectiveness against a broad spectrum of pests and its accessibility to farmers. The use of pesticides generally reflects farmers' efforts to minimize pest infestation and yield losses. This finding aligns with Samada and Tambunan (2020), who noted that pesticides, whether chemical or biologically derived, are essential for controlling pests and enhancing crop productivity.

Fungicides used

The results indicate that Red force fungicide was the most commonly used (53.4%), followed by V-powder (17.2%), Z-force (16.4%), and Cotzeb (8.6%). Other fungicides, such as Team (3.4%) and a few other products (less than 2%), were rarely used. The relatively high use of Red Force suggests that it is either recommended by extension agents or widely available in agro-input markets. This finding corroborates Adejori and Akinnagbe (2022), who also reported high levels of Red force usage among farmers, likely due to its inclusion on the list of recommended fungicides for crop protection.

Fertilizers used

With respect to fertilizer use, a large proportion (82.8%) of the respondents used Haifa bonus (NPK 20:20:20), while 28.4% used Super grow, 6.0% used Di grow, and less than 1% used Multi K. The dominance of NPK 20:20:20 fertilizer indicates a strong

reliance on inorganic fertilizers for cucumber production. This reflects farmers' focus on improving crop yield and quality through nutrient supplementation. The finding is consistent with Hochmuth and Hanlon (2020), who emphasized that fertilizer application is critical for achieving optimal yield and fruit quality in cucumber production, despite constituting a significant portion of production costs.

In general, the results show a high reliance on agrochemicals among cucumber farmers. The pattern of use suggests that farmers prioritize yield improvement and labour reduction. However, the heavy reliance on agrochemicals also underscores the need for proper training in safe handling, proper application, and environmental sustainability.

Table 1: Types of agrochemicals used

Agrochemicals	Frequency (n = 120)	Percentage (%)
Herbicides		
***Pre-emergence herbicides**		
Buta force	83	71.6
Buta star	16	13.8
Stomp	9	7.8
***Post-emergence herbicides**		
Slasher	57	49.1
Paraforce	5	4.3
Weedstorm	15	12.9
Weedoff	15	12.9
Pesticides		
Imiforce	14	12.1
Laraforce	93	80.2
Imidaspring	2	1.7
Attack	20	17.2
***Fungicides**		
Team	4	3.4
Z-force	19	16.4
Cotzeb	10	8.6
V-powder	20	17.2
Red force	62	53.4
Blue bolt	1	0.9
Star insect	2	1.7
Long shield	1	0.9
Ben late	1	0.9
***Fertilizer**		
Multi K	1	0.9
Super grow	33	28.4
Di grow	7	6.0
Haifa bonus (NPK 20:20:20)	96	82.8

*Multiple responses
Source: Authors' construct

Farmer's perception of the use of agrochemicals
The results in Table 2 indicate that farmers generally had a strongly positive perception of agrochemical use in cucumber production, as most perception statements recorded high mean scores ($\bar{x}$ 4.00). Specifically, farmers strongly agreed that agrochemicals enhance rapid cucumber growth ($\bar{x}$ = 4.85; SD = 0.38), increase yield ($\bar{x}$ = 4.79; SD = 0.47), and are indispensable in modern farming systems ($\bar{x}$ = 4.78; SD = 0.52). They also perceived agrochemicals as reducing the drudgery associated with farm operations ($\bar{x}$ = 4.77; SD = 0.50), controlling pest attacks ($\bar{x}$ = 4.71; SD = 0.51), and serving as a solution to disease outbreaks ($\bar{x}$ = 4.68; SD = 0.51). In addition, respondents agreed that agrochemicals contribute to increased food production ($\bar{x}$ = 4.66; SD = 0.79) and are conveniently packaged in smaller units for easy purchase ($\bar{x}$ = 4.51; SD = 0.86).

Farmers also associated agrochemicals with soil fertility improvement, as reflected in their agreement that agrochemicals increase soil nutrients ($\bar{x}$ = 4.45; SD = 0.92) and function as soil conditioners ($\bar{x}$ = 4.37; SD = 0.99). These perceptions suggest that farmers recognize the role of agrochemicals, particularly fertilizers, in supplying essential nutrients required for rapid plant growth and improved crop performance. Despite these positive perceptions, farmers also acknowledged several concerns associated with agrochemical use. They agreed that agrochemicals are relatively expensive ($\bar{x}$ = 4.38; SD = 1.17) and that spraying equipment is costly ($\bar{x}$ = 4.36; SD = 1.17). There was also considerable agreement that agrochemicals pose health risks ($\bar{x}$ = 4.19; SD = 0.81), are difficult to apply correctly due to la ack of precise dosage knowledge ($\bar{x}$ = 4.11; SD = 1.31), and may not be easily applied as instructed ($\bar{x}$ = 3.98; SD = 1.28). Furthermore, respondents perceived agrochemicals as somewhat dangerous ($\bar{x}$ = 3.94; SD = 0.77) and complex to use ($\bar{x}$ = 3.89; SD = 1.32).

Perceptions related to social and gender dimensions were less strongly held but still notable. Some respondents agreed that agrochemical application may not be suitable for women due to its hazardous nature ($\bar{x}$ = 3.60; SD = 1.66) and that its use is more common among wealthier farmers ($\bar{x}$ = 3.56; SD = 1.67). However, farmers generally disagreed with the statement that they still prefer cultural practices over agrochemical use ($\bar{x}$ = 2.43; SD = 1.43), indicating a clear inclination toward chemical-based farming practices. This aligns with Apeh's (2018) view that farmers use agrochemicals to increase crop yields and food production.

The findings suggest that while farmers highly value agrochemicals for their effectiveness in enhancing productivity, reducing labour, and ensuring crop protection, they are also aware of the associated economic, health, and technical challenges. The strong positive perception may be attributed to the immediate and visible benefits of agrochemicals, particularly in achieving faster crop growth and higher yields. This aligns with the broader view that modern agriculture increasingly depends on agrochemical inputs to meet rising food demand (Apeh, 2018). However, the concerns raised highlight the need for targeted extension interventions focusing on safe handling, correct dosage, and cost-effective use to ensure sustainable and responsible agrochemical application.

Table 2: Farmers' perception of the use of agrochemicals

Perception statements	Mean ($\bar{x}$)	Std. deviation
Agrochemicals enhance rapid cucumber growth	4.85	0.38
Agrochemicals increase yield	4.79	0.47
Modern farming relies heavily on agrochemicals	4.78	0.52
Agrochemicals reduce the drudgery associated with farm operations	4.77	0.50

It takes care of pest attacks on crops	4.71	0.51
Agrochemicals are the answer to disease attacks	4.68	0.51
Agrochemicals are helpful for increased food production	4.66	0.79
Some are conveniently packaged in smaller units for easy purchase	4.51	0.86
It increases soil nutrients	4.45	0.92
They are used as soil conditioners	4.37	0.99
They are relatively expensive	4.38	1.17
Spraying kits and equipment are expensive	4.36	1.17
It has negative impacts on humans	4.19	0.81
Lacks knowledge of precise dosage to apply	4.11	1.31
Agrochemicals are complex to use	3.98	1.28
Agrochemicals are dangerous to handle	3.94	0.77
They are complex to apply	3.89	1.32
Agrochemical application is not for women due to its harmful effects	3.60	1.66
Its use is more common among wealthier farmers	3.56	1.67
Prefer cultural practice to agrochemicals	2.43	1.43

Source: Authors' construct

Training needs on agrochemical use.

The results in Table 3 show the training needs of cucumber farmers based on their agrochemical use skills and competencies. All the listed items recorded mean scores above the 1.50 cut-off point, indicating they are important training areas for the farmers. Among the identified needs, determining the appropriate timing of agrochemical application ranked highest ($\bar{x}$ = 2.64; SD = 0.75). This was followed by assessing the authenticity and quality of agrochemicals from retail outlets ($\bar{x}$ = 2.58; SD = 0.80), selecting suitable agrochemicals for specific production practices ($\bar{x}$ = 2.58; SD = 0.88), and ascertaining the correct dosage for field application ($\bar{x}$ = 2.58; SD = 0.85). Farmers also indicated the need for training on reading and interpreting label instructions ($\bar{x}$ = 2.52; SD = 0.99) and in proper mixing or dilution of agrochemicals ($\bar{x}$ = 2.47; SD = 0.95).

In addition, several safety-related competencies were identified as training needs. These include wearing protective clothing before spraying ($\bar{x}$ = 2.42; SD = 0.99), avoiding skin contact with agrochemicals ($\bar{x}$ = 2.41; SD = 1.03), safe storage practices such as keeping agrochemicals away from children ($\bar{x}$ = 2.40; SD = 1.04), and appropriate spraying techniques, including not spraying against the wind direction ($\bar{x}$ = 2.38; SD = 1.01). Other important areas include proper hygiene practices such as washing contaminated clothing separately ($\bar{x}$ = 2.37; SD = 0.99), use of protective equipment like nose shields ($\bar{x}$ = 2.34; SD = 1.05) and gloves/boots ($\bar{x}$ = 2.33; SD = 1.09), as well as preventing contamination of food and water during spraying ($\bar{x}$ = 2.33; SD = 1.12) and bathing immediately after application ($\bar{x}$= 2.32; SD = 1.06). Disposal of agrochemical containers also emerged as a training need ($\bar{x}$= 2.21; SD = 0.81), though it ranked lowest among the items.

The fact that all items exceeded the cut-off mean implies that farmers generally lack adequate competencies across the full spectrum of agrochemical use, including selection, application, safety, and post-application practices. This suggests a broad-based training gap rather than isolated skill deficiencies. The prominence of application timing as the most critical need underscores the importance of knowledge for effective agrochemical use. Proper timing ensures optimal absorption and effectiveness of agrochemicals while minimizing waste and environmental loss. For instance, applying herbicides shortly before rainfall can reduce their effectiveness due to wash-off, leading to economic losses and poor weed control.

The findings indicate that farmers require comprehensive training to enhance both the efficiency and safety of agrochemical use. This aligns with Bamigboye et al. (2024), who emphasized the need to strengthen farmers' competencies in agrochemical application for improved productivity. Similarly, Emodi et al. (2020) reported that inadequate knowledge of agrochemical handling and application remains a major constraint to effective crop production. The implication is that targeted extension interventions that focus on proper application techniques, safety precautions, and product selection are essential for reducing farmers' exposure to health risks, improving productivity, and promoting sustainable agricultural practices.

Table 3: Training needs on agrochemical use

Agrochemicals use skills and competence	**Mean ($\bar{x}$)**	**Std. deviation**
Determining the appropriate timing for agrochemical application	2.64	0.75
Assessing the authenticity and quality of agrochemicals from retail outlets	2.58	0.80
Selecting suitable agrochemicals for specific production practices	2.58	0.88
Ascertaining the appropriate dosage to apply in the field	2.58	0.85
Reading the instructions on the label before use	2.52	0.99
Mixing/dilution of agrochemicals	2.47	0.95
Wearing protective clothing before spraying	2.42	0.99
Avoid skin contact with agrochemicals	2.41	1.03
Keeping agrochemicals under lock and away from children	2.40	1.04
Do not spray agrochemicals against the wind direction	2.38	1.01
Separately washing clothes used for spraying from other clothes	2.37	0.99
Wearing a nose shield to avoid inhalation	2.34	1.05
Wearing protective gloves/boots	2.33	1.09
Covering food and water during spraying to avoid contamination	2.33	1.12
Bathing with soap and water immediately after use	2.32	1.06
Disposal of agrochemical containers/cans	2.21	0.81

Cut-off point = 1.50

Source: Authors' construct

Constraints to the use of agrochemicals

Table 4 shows the constraints faced by cucumber farmers in the

use of agrochemicals. All the major constraint variables recorded mean scores above the decision benchmark (≈2.00), indicating that they are significant barriers to effective agrochemical use. The most severe constraint identified was inadequate funds for purchasing agrochemicals ($\bar{x}$ = 2.90; SD = 0.35), followed by the high cost of agrochemicals ($\bar{x}$ = 2.74; SD = 0.59) and weather-related challenges ($\bar{x}$ = 2.73; SD = 0.58). Other prominent constraints included the perceived toxicity of agrochemicals ($\bar{x}$ = 2.65; SD = 0.58) and the health hazards associated with their use ($\bar{x}$ = 2.59; SD = 0.59). These findings suggest that both economic and health-related concerns strongly influence farmers' decisions regarding agrochemical use.

Production-related and technical challenges were also evident. These include large farm size ($\bar{x}$ = 2.55; SD = 0.70), complexity of label instructions ($\bar{x}$ = 2.47; SD = 0.76), inadequate information ($\bar{x}$ = 2.46; SD = 0.75), and poor knowledge of application techniques ($\bar{x}$ = 2.43; SD = 0.79). In addition, institutional and market-related constraints such as lack of instruments for assessing agrochemical quality ($\bar{x}$ = 2.34; SD = 0.87), unavailability of agrochemicals ($\bar{x}$ = 2.33; SD = 0.87), irregular supply ($\bar{x}$ = 2.32; SD = 0.83), and long distance to purchase points ($\bar{x}$ = 2.17; SD = 0.83) were also identified. Inadequate extension education ($\bar{x}$ = 2.15; SD = 0.92) further underscores knowledge and information gaps among farmers. Unpleasant odor ($\bar{x}$ = 1.96; SD = 0.88) and poor quality of agrochemicals ($\bar{x}$ = 1.93; SD = 0.96) were the constraints with the least mean scores.

The dominance of financial constraints, particularly inadequate funds and high input costs, underscores the critical role of capital in agricultural production. Given the relatively low average income of farmers (Oseghale *et al*., 2023), their ability to procure agrochemicals is significantly limited. This finding implies that even when farmers are aware of the benefits of agrochemicals, economic barriers may hinder optimal utilization. Furthermore, the presence of knowledge-related constraints, such as difficulty understanding label instructions and inadequate application knowledge, suggests that farmers may not be using agrochemicals efficiently or safely. Weather-related challenges also highlight the vulnerability of agrochemical effectiveness to environmental conditions, which can reduce efficiency and increase production risks.

The findings indicate that constraints to agrochemical use are multi-dimensional, encompassing financial, technical, health, and institutional factors. This supports the findings of Nwakile et al. (2020), who reported that the high cost of agrochemicals limits their adoption among smallholder farmers. The implication is that improving agrochemical use among farmers will require a holistic approach, including financial support mechanisms, strengthened extension services, improved input supply systems, and farmer education on safe and effective usage practices.

Table 4: Constraints to the use of agrochemicals

Variables	Mean ($\bar{x}$)	Std. deviation
Inadequate funds for purchasing agrochemicals	2.90	0.35
High cost of agrochemicals	2.74	0.59
Weather-related challenges	2.73	0.58
Perceived poisonous nature of agrochemicals	2.65	0.58
Health hazards associated with agrochemicals	2.59	0.59
Large farm size	2.55	0.70
Complex label instructions on how to use agrochemicals	2.47	0.76
Inadequate information about the use of agrochemicals	2.46	0.75
Inadequate knowledge of the application	2.43	0.79
Unavailability of an instrument to ascertain quality	2.34	0.87
Unavailability of agrochemicals in my area	2.33	0.87
Irregular supplies	2.32	0.83
Long distance from the point of purchase	2.17	0.83
Inadequate extension education on agrochemicals	2.15	0.92
Unpleasant odor of most agrochemicals	1.96	0.88
Poor quality of agrochemicals	1.93	0.96

Source: Authors' construct

Socioeconomic factors influencing agrochemical use by farmers

Table 5 reveals the influence of selected socioeconomic characteristics of cucumber farmers on their use of agrochemicals. The model produced an R^2 value of 0.21, indicating that approximately 21% of the variation in agrochemical use is explained by the independent variables included. The adjusted R^2 value of 0.15 suggests a moderate explanatory power after accounting for the number of predictors in the model. The overall model was statistically significant ($F = 3.70$; $p < 0.05$), implying that the set of explanatory variables jointly influenced agrochemical use among the farmers.

Among the variables considered, age and membership in a social organization were the only factors that significantly influenced agrochemical use at the 5% level. Age had a significant negative effect ($\beta = -0.02$; $t = -1.90$; $p < 0.05$), indicating that older farmers were less likely to use agrochemicals than their younger counterparts. This suggests that younger farmers are more inclined to adopt agrochemical practices, possibly due to greater openness to innovation, better access to information, and a stronger motivation to improve productivity and income. Younger farmers may also be more receptive to extension messages and modern farming techniques, which often promote the use of agrochemical inputs for enhanced crop performance. This finding is consistent with Li and Jin (2022), who reported that age significantly influences pesticide use decisions, and with Okwuokenye and Petu-Ibikunle (2021), who found an inverse relationship between age and agrochemical use among cucumber farmers.

Membership in a social organization had a positive and significant influence on agrochemical use ($\beta = 0.38$; $t = 2.08$; $p < 0.05$). This implies that farmers who belong to social or farmer-based

organizations are more likely to use agrochemicals than non-members. Social organizations often serve as platforms for information exchange, peer learning, and access to inputs and extension services. Through group interactions, farmers are exposed to new ideas, recommended practices, and shared experiences, which can enhance their awareness and adoption of agrochemical use. This underscores the importance of social capital in shaping farmers' production decisions.

Other variables such as years of schooling, household size, farming experience, farm size, quantity harvested, and annual income did not show statistically significant effects on agrochemical use. This suggests that, within the context of this study, these factors were less influential in determining farmers' decisions to use agrochemicals. In general, the findings indicate that agrochemical use among cucumber farmers is primarily driven by demographic and social factors, particularly age and group membership. The implication is that interventions aimed at improving agrochemical use should leverage farmer organizations as channels for training and information dissemination, while also targeting older farmers with tailored extension approaches to enhance their adoption of recommended practices.

Table 5: Socioeconomic factors influencing agrochemical use

Variables	Unstandardized coefficient		
	β	Std. Error	T
(Constant)	5.25	0.60	8.78
Age (years)	-0.02	0.01	-1.90*
Number of years spent in school	0.02	0.02	1.04
Household size (persons)	0.05	0.04	1.37
Farming experience (years)	0.01	0.04	0.33
Farm size (hectare)	-0.24	0.36	-0.67
Quantity of cucumber harvested last season (kg)	0.00	0.00	0.60
Annual income (naira)	-5.961E-007	0.00	-0.48
Membership in a social organization	0.38	0.18	2.08*
R Square	0.21		
Adjusted R	0.15		
F-value	3.70		

Note: * is significance at 5%
Source: Authors' construct

Conclusion and Recommendations

The study revealed that cucumber farmers had a generally positive perception of agrochemical use, recognizing its role in enhancing crop growth and yield and reducing labour. Despite this positive disposition, the findings revealed substantial training needs across key agrochemical use competencies, including correct application timing, dosage, selection, handling, storage, and disposal. The study further showed that farmers were primarily constrained by financial limitations, particularly inadequate funds and the high cost of agrochemicals, which limited optimal utilization. In addition, the regression results indicated that age and membership in social organizations significantly influenced agrochemical use, with younger farmers and those in farmer groups more likely to adopt agrochemical practices. The findings point to a gap between farmers' positive perceptions and their practical capacity to use agrochemicals effectively and safely. This gap is largely driven by limited technical knowledge and inadequate access to resources. Without proper training, farmers may misuse agrochemicals, thereby posing risks to human health, food safety, and the environment.

Based on these findings, the study recommends that agricultural extension services, particularly through the Enugu State Ministry of Agriculture and Natural Resources, should intensify farmer training programmes. Such programmes should focus on the types and selection of agrochemicals, identification of genuine products, appropriate timing and dosage of application, and safe handling, storage, and disposal practices. In addition, efforts should be made to strengthen farmer-based organizations as platforms for disseminating knowledge and facilitating access to inputs. Addressing financial constraints through input support schemes or credit facilities will further enhance farmers' capacity to utilize agrochemicals effectively and sustainably.

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