



A Study of Farmers' Perception and Usage of Different Fertilizers and Their Reported Effect on Crop Yield

Zakari, Y.^{1*}, Mansur, U. B.¹, Saddam, D. A.¹, Sadiq, I. A.¹, Muhammad, I.³, Tasiu, M.¹, Garba, J.¹, Alhassan, A. A.², Ishaq, B.³, Kajuru, J. Y.¹, Aliyu, Y.¹, Muhammad, N. I.¹, Sani, N. M.¹, Ishaq, A. I.¹, Falgore, J. Y.¹, Ismaila, S. A.¹, & Muhammad, M. K.¹

¹Department of Statistics, Ahmadu Bello University, Zaria, Nigeria

²Department of Mathematical Science, Ibrahim Badamasi Babangida University, Lapai, Nigeria

³Department of Statistics, Binyaminu Usman Polytechnic, Hadejia, Nigeria

³Department of Military Science, Nigeria Defence Academy, Kaduna, Nigeria

*Correspondence: yahzaksta@gmail.com

Abstract

Fertilizer application plays a vital role in enhancing agricultural productivity and ensuring food security. Understanding farmers' perceptions and fertilizer use patterns is essential for promoting sustainable farming practices and improving crop yield. This study examined farmers' perceptions and usage of different fertilizers and their reported effects on crop yield in Ikara Local Government Area (LGA), Kaduna State, Nigeria. A descriptive survey research design was adopted, and data were collected from 150 farmers using a structured questionnaire. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data, while Chi-square tests and an independent samples *t*-test were employed to test the study hypotheses. The findings revealed that inorganic fertilizers were more widely used than organic fertilizers and were perceived as more effective and readily available. However, no significant differences were found in farmers' perceptions regarding the harmfulness and cost of organic and inorganic fertilizers. The study also found no significant relationship between farmers' educational level and fertilizer choice. Furthermore, a significant difference was observed in the reported crop yields of farmers using organic and inorganic fertilizers, with inorganic fertilizer users reporting higher average yields. The study concludes that although inorganic fertilizers provide greater short-term yield benefits, integrating organic and inorganic fertilizers offers a more sustainable approach to improving agricultural productivity and maintaining long-term soil fertility.

Keywords: Farmers' Perception, Fertilizer Usage, Crop Yield, Organic and Inorganic Fertilizers, Ikara Local Government Area

1. Introduction

The family is universally recognised as the primary social institution responsible for nurturing children's physical, emotional, cognitive, and social development (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). It constitutes the earliest environment in which children learn acceptable behaviours, internalise cultural values, develop interpersonal relationships, and acquire the emotional competencies required for successful adjustment in society (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). Within this environment, parents perform indispensable roles by providing affection, protection, supervision, guidance, and material support that collectively shape children's developmental trajectories (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). Consequently, the quality of the family environment has long been regarded as one of the strongest determinants of children's personality development and psychosocial well-being (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). Contemporary developmental research emphasises that family processes, particularly supportive parent-child relationships, exert a greater influence on children's developmental outcomes than family structure alone (Ofodile *et al.*, 2025; Akintola *et al.*, 2025).

Personality development refers to the gradual formation of relatively stable patterns of thoughts, emotions, attitudes, and behaviours that distinguish individuals and influence how they interact with their environment (Anaya & Pérez-Edgar, 2019). It encompasses important psychological characteristics such as emotional stability, behavioural adjustment, self-esteem, confidence, resilience, empathy, and social competence (Anaya & Pérez-Edgar, 2019). These characteristics begin to develop during early childhood and continue to evolve throughout adolescence under the combined influence of biological, psychological, and environmental factors (Anaya & Pérez-Edgar, 2019). Among these influences, the family environment occupies a central position because it provides the first opportunities for emotional attachment, behavioural modelling, communication, and social learning (Anaya & Pérez-Edgar, 2019).

Adolescence represents one of the most sensitive stages of human development. During this period, young people experience rapid physical growth, emotional changes, cognitive maturation, and increasing social responsibilities (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). They begin to establish personal identity, develop independence, and form meaningful relationships beyond the immediate family (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). Despite these developmental transitions, parents remain the most influential source of emotional security and psychological support (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). Adolescents who perceive consistent parental warmth, encouragement, monitoring, and effective communication generally demonstrate higher levels of self-esteem, better emotional regulation, stronger social competence, and fewer behavioural problems than those who experience inadequate parental involvement (Ofodile *et al.*, 2025; Akintola *et al.*, 2025). Conversely, limited parental support has been associated with anxiety, depression, aggression, social withdrawal, low self-worth, and poor educational adjustment (Ofodile *et al.*, 2025; Akintola *et al.*, 2025).

The concept of the family environment extends beyond the physical composition of the household to include the quality of interactions, emotional climate, communication patterns, parenting practices, family cohesion, conflict resolution mechanisms, and the availability of emotional and social support (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025). A positive family environment is characterised by warmth, mutual respect, trust, effective communication, and active parental involvement in children's lives. Such an environment promotes emotional security, confidence, and adaptive behaviour, thereby facilitating healthy personality development (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025). Conversely, family environments characterised by persistent conflict, neglect, inconsistent parenting, poor communication, or emotional deprivation may hinder children's psychological adjustment and increase their vulnerability to behavioural and emotional problems (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025). Recent evidence from Nigeria indicates that supportive family environments are associated with improved adolescent self-esteem and healthier psychosocial outcomes (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025).

Among the various dimensions of the family environment, parental support has consistently emerged as one of the most important predictors of child and adolescent development (Guo *et al.*, 2025; Umar *et al.*, 2025). Parental support refers to the emotional, psychological, educational, and practical assistance that parents provide to facilitate their children's overall growth and well-being (Guo *et al.*, 2025; Umar *et al.*, 2025). It encompasses expressions of affection, acceptance, encouragement, supervision, guidance, responsiveness, and involvement in children's educational and social activities (Guo *et al.*, 2025; Umar *et al.*, 2025). Supportive parenting enables children to develop positive self-perceptions, effective coping strategies, resilience, and constructive interpersonal relationships (Guo *et al.*, 2025; Umar *et al.*, 2025). In contrast, inadequate parental support may reduce children's confidence, weaken emotional regulation, and contribute to maladaptive behaviours that persist into adulthood (Guo *et al.*, 2025; Umar *et al.*, 2025). Global and Nigerian studies consistently demonstrate that perceived family support is positively associated with self-esteem, psychological well-being, and academic and social adjustment among adolescents (Guo *et al.*, 2025; Umar *et al.*, 2025).

Although parental support is beneficial across different family settings, it may be compromised by circumstances such as marital conflict, separation, divorce, death of a parent, prolonged parental absence, economic hardship, or other forms of family instability (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025). These circumstances can reduce the quantity or quality of parental involvement available to children (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025). However, contemporary evidence suggests that family structure alone does not determine children's developmental outcomes; rather, the quality of parenting and the level of support children receive remain the more critical determinants of healthy psychological development (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025). Consequently, children from broken homes may still achieve favourable developmental outcomes when they receive adequate emotional support from parents or other caregivers, whereas children living in two-parent households may experience adverse outcomes if parental relationships are characterised by conflict, neglect, or inadequate involvement (Ofodile *et al.*, 2025; Adeniyi *et al.*, 2025).

The family environment plays a fundamental role in shaping children's emotional, behavioural, social, and psychological development. Through parental care, guidance, supervision, and emotional support, children develop the personal and social competencies necessary for healthy personality development. However, recent socioeconomic changes, increasing marital instability, economic hardship, migration, and changing family structures have altered traditional parenting practices, thereby affecting the quality of parental support available to many children.

In Nigeria, concerns have continued to grow regarding the increasing prevalence of behavioural problems, emotional instability, low self-esteem, poor social adjustment, school misconduct, substance abuse, and juvenile delinquency among adolescents. Although these problems have frequently been attributed to broken homes, existing evidence suggests that family structure alone may not adequately explain children's developmental outcomes. Rather, the quality of the family environment, particularly the level of parental support, appears to be a more important determinant of children's personality development.

Several previous studies have examined the influence of broken homes on children's academic performance, behavioural adjustment, and psychological well-being. However, relatively few studies have quantitatively investigated how parental support influences multiple dimensions of personality development, including emotional stability, behavioural tendencies, social skills, and self-esteem, within the same analytical framework. Furthermore, empirical evidence on these relationships remains limited in Funtua Town, Katsina State, despite increasing social concerns regarding adolescent behavioural and emotional adjustment.

The absence of local empirical evidence limits the ability of parents, educators, counsellors, and policymakers to design evidence-based interventions aimed at improving adolescents' psychological well-being. Understanding the extent to which parental support contributes to personality development is therefore essential for developing effective family-based counselling programmes, educational interventions, and social policies that promote healthy child development.

Against this background, this study statistically examines the role of parental support within the family environment in influencing children's personality development among adolescents in Funtua Town, Katsina State. Specifically, the study applies descriptive statistics, Pearson correlation analysis, and regression analysis to provide empirical evidence on the relationships between parental support and selected dimensions of child personality development.

The main aim of this study is to statistically analyse the role of parental support within the family environment on children's personality development among adolescents in Funtua Town, Katsina State, Nigeria. The specific objectives of the study are to: describe the levels of parental support, emotional stability, behavioural tendencies, social skills, and self-esteem among adolescents in the study area; examine the relationships between parental support and emotional stability, behavioural tendencies, social skills, and self-esteem; determine the extent to which parental support predicts emotional stability, behavioural tendencies, social skills, and self-esteem among adolescents; and evaluate the interrelationships among emotional stability, behavioural tendencies, social skills, and self-esteem.

The study seeks to answer the following research questions: what are the levels of parental support, emotional stability, behavioural tendencies, social skills, and self-esteem among adolescents in the study area? What relationships exist between parental support and adolescents' emotional stability, behavioural tendencies, social skills, and self-esteem?; to what extent does parental support predict emotional stability, behavioural tendencies, social skills, and self-esteem among adolescents?; and what relationships exist among emotional stability, behavioural tendencies, social skills, and self-esteem?

The following null hypotheses were tested at the 5% level of significance: H_{01} : there is no significant relationship between parental support and adolescents' emotional stability. H_{02} : there is no significant relationship between parental support and adolescents' behavioural tendencies. H_{03} : there is no significant relationship between parental support and adolescents' social skills. H_{04} : there is no significant relationship between parental support and adolescents' self-esteem. H_{05} : parental support does not significantly predict adolescents' emotional stability, behavioural tendencies, social skills, and self-esteem.

The findings of this study are expected to contribute to the existing body of knowledge on the relationship between the family environment and children's personality development. By providing empirical evidence on the influence of parental support, the study will enhance understanding of the mechanisms through which the family environment shapes adolescents' emotional, behavioural, and social outcomes.

The study will be beneficial to parents by highlighting the importance of consistent emotional support, effective communication, supervision, and involvement in promoting healthy personality development among adolescents. It will also provide useful information for teachers, school counsellors, psychologists, and social workers in identifying adolescents who may require additional emotional and behavioural support.

The findings will assist policymakers and non-governmental organisations in developing family-centred intervention programmes aimed at strengthening parenting practices, improving adolescent mental health, and reducing behavioural problems among young people. Furthermore, the study will provide evidence that can inform the design of community-based counselling programmes and family support initiatives within Funtua Town and similar communities.

From an academic perspective, the study contributes to the growing literature on family environment and adolescent development by employing quantitative statistical techniques, including descriptive statistics, Pearson correlation analysis, and regression analysis, to examine the relationships between parental support and multiple dimensions of personality development. The findings may also serve as a valuable reference for future researchers interested in family studies, developmental psychology, education, public health, and applied statistics.

2. Materials and Methods

2.1 Study Area

The study was conducted in Ikara LGA, Kaduna State, Nigeria, located between latitudes 11°10' and 11°30'N and longitudes 8°10' and 8°30'E, and covering approximately 1,146 km². The area lies within the Sudan Savanna agro-ecological zone, with unimodal rainfall of 600-800 mm annually and a growing season of 150-180 days that supports maize, sorghum, rice and groundnut production. Over 80% of the population is engaged in smallholder farming on predominantly sandy-loamy soils that require regular fertilizer input to sustain productivity under continuous cropping.

2.2 Research Design and Sampling

A descriptive, cross-sectional survey design was adopted. The target population comprised the approximately 12,000 registered smallholder farmers in Ikara LGA who use fertilizer, based on records of the Kaduna State Agricultural Development Agency (KADA) as of 2024. A multi-stage sampling technique was used: five of the ten administrative wards in Ikara LGA with the highest concentration of agricultural activity were purposively selected; two farming communities were then randomly selected within each ward, giving ten communities in total; and farmers were subsequently drawn from each community by proportionate sampling based on the registered farmer population. Sample size was determined using Yamane's (1967) formula for finite populations at a 95% confidence level (margin of error = 0.05), with data ultimately obtained from a final sample of 150 farmers.

2.3 Data Collection Instrument

Data were collected using a structured questionnaire administered through Google Forms, chosen for its low cost, offline data-capture capability suited to areas with unreliable internet connectivity, and direct export of responses for statistical analysis. The instrument comprised four sections: (i) socio-demographic characteristics (age, gender, education level, farm size and farming experience); (ii) perceptions of fertilizers, measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) covering efficiency, harmfulness, accessibility and cost; (iii) fertilizer usage patterns, including type, frequency, application rate and method; and (iv) self-reported crop yield for the most recent farming season, linked to the fertilizer type used. The instrument was reviewed by agricultural statistics experts and piloted with a small group of farmers before full deployment. Participation was voluntary, informed consent was obtained, and responses were treated as anonymous and used strictly for research purposes.

2.4 Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), with Microsoft Excel used for preliminary data organization. Descriptive statistics (frequencies, percentages, and means) summarized socio-demographic characteristics, usage patterns, and perceptions. The chi-square test of independence was used to test associations between fertilizer type and farmers' perceptions (efficiency, harmfulness, accessibility, cost), and between education level and fertilizer choice. An independent samples t-test was used to compare reported crop yield between users of organic and inor-

ganic fertilizer, with Levene's test applied to check the equality-of-variance assumption. Statistical significance was set at $p < 0.05$.

3. Results and Discussions

3.1 Socio-demographic Characteristics of Respondents

Of the 150 farmers sampled, the majority (34.0%) were aged 46-60 years, followed by those aged 15-30 years (26.0%), indicating that farming in Ikara LGA is dominated by middle-aged farmers, with notable participation by younger farmers. Most respondents were male (82.7%), reflecting the area's cultural pattern of male-dominated land ownership, although female participation (17.3%) was not negligible. Regarding education, 28.0% of farmers had secondary education, 24.7% had primary education, and 22.0% had no formal education, suggesting that most farmers have at least basic literacy, which could support the adoption of improved practices. Farming experience was concentrated between 4 and 9 years (56.7% combined), indicating a generally experienced respondent base whose reported perceptions and practices can be considered reasonably informed.

Table 1: Selected Socio-demographic Characteristics of Respondents (N = 150)

Characteristic	Category	Frequency	Percent (%)
Age (years)	15-30	39	26.0
	31-45	35	23.3
	46-60	51	34.0
	Above 60	25	16.7
Gender	Male	124	82.7
	Female	26	17.3
Education level	Uneducated	33	22.0
	Primary	37	24.7
	Secondary	42	28.0
	Tertiary	23	15.3
	Vocational	15	10.0
Farming experience (years)	1-3 years	29	19.3
	4-6 years	42	28.0
	7-9 years	43	28.7
	Above 9 years	36	24.0

Fertilizer Usage and Crop Production Patterns

More than half of the farmers (54.7%) used inorganic fertilizers, while 45.3% used organic fertilizers, indicating that both fertilizer types are prevalent in the study area, though inorganic fertilizers are somewhat more widely adopted, likely reflecting government distribution support and their comparatively rapid visible effect. Maize was the dominant crop (60.0%), followed by rice (20.0%), consistent with the nutrient-demanding nature of cereal production that typically drives fertilizer use. In terms of application rate, 38.7% of farmers applied approximately 400 kg per season based on farm size, while a notable share under- or over-applied fertilizer relative to recommended rates, a pattern that may partly explain variability in reported yield outcomes.

Table 2: Fertilizer Type and Crop Type Used by Respondents (N = 150)

Variable	Category	Frequency	Percent (%)
Fertilizer type	Organic	68	45.3
	Inorganic	82	54.7
Crop cultivated	Maize	90	60.0
	Sorghum	12	8.0
	Rice	30	20.0
	Beans	7	4.7
	Soybeans	11	7.3

Farmers' Perceptions of Fertilizers

Chi-square tests of independence were used to assess whether farmers' perceptions of fertilizer efficiency, harmfulness, accessibility, and cost were associated with the type of fertilizer they used. Perceptions of efficiency differed significantly by fertilizer type ($\chi^2 = 30.098$, $df = 4$, $p < 0.001$): most organic-fertilizer users disagreed that their fertilizer was highly efficient, whereas most inorganic-fertilizer users agreed or strongly agreed, indicating that farmers clearly regard inorganic fertilizers as more effective for boosting yield. Perceptions of accessibility also differed significantly ($\chi^2 = 11.451$, $df = 4$, $p = 0.022$), with inorganic fertilizers rated more accessible, plausibly reflecting government distribution channels, while organic fertilizer access depends largely on what farmers can produce locally.

In contrast, perceptions of harmfulness ($\chi^2 = 8.069$, $df = 4$, $p = 0.089$) and cost ($\chi^2 = 3.562$, $df = 4$, $p = 0.469$) did not differ significantly by fertilizer type. Although not statistically significant, the harmfulness pattern suggested organic fertilizers were viewed as somewhat less harmful to the environment than inorganic fertilizers, consistent with general awareness of chemical-input effects on soil health. Both fertilizer types were widely perceived as costly, indicating that affordability is a shared concern among farmers regardless of the type used.

Table 3: Chi-square Test Results for Farmers' Perceptions of Fertilizer Type

Perception Variable	χ^2 Value	df	p-value	Decision
Efficiency	30.098	4	0.000	Significant
Harmfulness	8.069	4	0.089	Not significant
Accessibility	11.451	4	0.022	Significant
Cost	3.562	4	0.469	Not significant

Relationship Between Education Level and Fertilizer Choice

A chi-square test found no significant association between farmers' Education level and their choice of fertilizer type ($\chi^2 = 0.529$, $df = 4$, $p = 0.971$). Farmers across all education levels, from uneducated to tertiary-educated, used both organic and inorganic fertilizers in broadly similar proportions. This suggests that fertilizer choice in Ikara LGA is driven more by factors such as availability, cost, and tradition than by formal educational attainment.

Effect of Fertilizer Type on Crop Yield

An independent samples t-test compared reported crop yield between organic-fertilizer users ($n = 68$) and inorganic-fertilizer users ($n = 82$). Inorganic-fertilizer users reported a significantly higher mean yield category (mean = 2.30, SD = 1.00) than organic-fertilizer users (mean = 1.69, SD = 0.80), $t(148) = -4.090$, $p < 0.001$. Levene's test indicated unequal variances ($F = 5.361$, $p = 0.022$), and the result remained significant under the corresponding correction ($t = -4.177$, $df = 147.75$, $p < 0.001$). This finding is consistent with farmers' own perceptions of inorganic fertilizer as more efficient, and indicates a measurable reported-yield advantage associated with inorganic fertilizer use in this study population, while not precluding a longer-term role for organic fertilizer in sustaining soil health.

Table 4: Independent Samples t-Test of Fertilizer Type and Reported Crop Yield

Fertilizer Type	N	Mean Yield (category)	SD	t	Df	p-value
Organic	68	1.69	0.80			
Inorganic	82	2.30	1.00	-4.090	148	0.000

Note: Yield was recorded on an ordered self-reported harvest-level scale (approximately 1,200-4,000 kg/ha across four bands); the mean values in Table 4 refer to this coded scale rather than to raw kilograms.

4. Conclusion

This study found that farmers in Ikara LGA hold distinct and statistically differentiated perceptions of different fertilizers, with inorganic fertilizers viewed as more efficient and more accessible, while perceptions of harmfulness and cost did not differ significantly by fertilizer type. Fertilizer choice was unrelated to farmers' education level, suggesting that availability, cost and tradition are the more influential drivers of choice in this context. Farmers using inorganic fertilizer reported significantly higher yields than those using organic fertilizer, confirming a measurable link between fertilizer type and reported productivity outcomes. These findings support a role for integrated fertilizer-use strategies that combine the short-term productivity benefits of inorganic fertilizers with the longer-term soil-health benefits associated with organic fertilizers, and point to a need for extension programmes and subsidy policies in Kaduna State that make both fertilizer types more accessible and appropriately applied.

References

- Adebayo, O. and Olayemi, J. (2014). Fertilizer Use and Agricultural Productivity in Nigeria. *African Journal of Agricultural Research*, 9(24): 1832-1840.
- Aruya, E. I., Yusuf, Y. O. and Yusuf, R. O. (2019). Nature of Crop Waste and Management in Ikara Local Government Area of Kaduna State, Nigeria. Department of Geography and Environmental Management, Ahmadu Bello University, Zaria.
- Hiikyaa, N. A. (2024). Assessment of Nutrient Flows in Maize-based Farming System by Smallholder Farmers for Sustainable Production in Ikara, Kaduna State. *Science World Journal*, 19(1): 9-12.

- Issa, F. O., Kagbu, J. H. and Abdulkadir, S. A. (2016). Analysis of Socio-economic Factors Influencing Farmers' Adoption of Improved Maize Production Practices in Ikara Local Government Area of Kaduna State, Nigeria. *Agrosearch*, 16(2): 15-24.
- Liverpool-Tasie, L. S. O., Omonona, B. T., Sanou, A. and Ogunleye, W. O. (2017). Is Increasing Inorganic Fertilizer Use for Maize Production in Sub-Saharan Africa a Profitable Proposition? Evidence from Nigeria. *Food Policy*, 67: 41-51.
- Musa, S. and Ibrahim, A. (2020). Adoption of Organic Fertilizers in Ikara LGA. *Nigerian Journal of Agricultural Extension*, 15(2): 78-85.
- Olayemi, J. and Adenuga, O. (2018). Fertilizer Use Among Smallholder Farmers in Kaduna State. *Journal of Sustainable Agriculture*, 10(1): 22-30.
- Vanlauwe, B., Descheemaeker, K., Giller, K. E., Huising, J., Merckx, R., Nziguheba, G., Wendt, J. and Zingore, S. (2016). Integrated Soil Fertility Management in Sub-Saharan Africa: Unravelling Local Adaptation. *Soil*, 1: 491-508.
- Verma, B. C., Pramanik, P. and Bhaduri, D. (2019). Organic Fertilizers for Sustainable Soil and Environmental Management. In: *Nutrient Dynamics for Sustainable Crop Production*. Springer, Singapore, pp. 289-313.
- Yamane, T. (1967). *Statistics: An Introductory Analysis*. 2nd Edition, Harper and Row, New York.
- Yang, X. and Fang, S. (2015). Practices, Perceptions, and Implications of Fertilizer Use in East-Central China. *Ambio*, 44(7): 647-652.