



Farmers' Perception of Termites and Their Impact on Crop Production in Zuru Local Government Area, Kebbi State, Nigeria

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Abstract

The occurrence of termites (*Macrotermes bellicosus*) is one of the most destructive agricultural pests in Sudan-Sahel agro-ecological zone of Nigeria but little is known of farmers' perception of its occurrence in Zuru Local Government Area (LGA) of Kebbi State. The study focused on the socio-economic characteristics of farmers and farmers' perception of termites as a problem in crop production and identified the crops most affected. Descriptive survey design was employed and 120 respondents were drawn from six villages in six districts of Zuru LGA by using multistage sampling technique. A structured questionnaire was used for data collection and frequencies and percentages were used for analysis. The results indicate that farmers were mostly male (65%) and young (57.5%), smallholders (50.83%) and that 35% of them had no formal education, while 50% had farming experience of 21 years or more. 55% reported termites as harmful pests while 34.17% recognised both harmful and beneficial. Maize (30%) and sorghum (25%) respectively were the most attacked and damaged crops, which occurred at all stages of their growth (46.67%) and 65% of respondents observed termites to have severe destruction on those crops, while 35.83% estimated crop losses of 31-50%. Major factors identified as being a driver to intensification include dry season and drought (25%) and climate change (19.17%). Most Farmers about 40.83% considered termites as the second most serious insect pest while 46.67% indicated that termite problem has increased during the last decade. The findings of the study indicate that termites are a serious and increasing issue in cereal production in Zuru, partly due to climate variability, and call for specific farmer education, drought mitigation measures and development of termite resistant cultivars. Termites are a major problem in Nigeria, as well as in other parts of the world.

Keywords: Termites; farmers' perception; crop damage; *Macrotermes bellicosus*.

INTRODUCTION

The termites (*Blattodea*, order *Isoptera*) play important roles in the decomposition of organic matter, the aeration of soil and the recycling of nutrients in tropical and subtropical ecosystems, Bignell *et al.*, 2011. In the world there are more than 3000 species of termites, only 10% of which are agricultural pests that damage crops, timber and infrastructure (Rouland-Lefèvre, 2011). Termites play a positive role in soil fertility in sub-Saharan Africa by building mounds and turning over the organic matter, but also cause 20-50% reduction in crop losses in affected areas Sileshi (2019). Termites are a significant problem for smallholder agriculture in Nigeria, especially in the semi-arid regions of the Sudan-Sahel in the north. The farming systems in Kebbi State including Zuru LGA are mixed with predominance of cereals (millet, sorghum, maize, rice) and legumes (groundnuts, cowpeas). The percentage infested by maize and sorghum in recent field surveys in Zuru were up to 33% and 10% respectively, with *Macrotermes* spp. mainly responsible. (Shindi *et al.*, 2025). Farmers' perceptions of termites are often a dichotomy, mostly negative because of their destructive effects on roots, stems and stored produce, but also some positive aspects as an indicator of soil fertility (Loko *et al.*, 2017). Ethiopia (Mugerwa *et al.*, 2011) and in rangelands of Uganda (Mali *et al.*, 2018). In Africa, termites are a major economic problem in agriculture, causing damages valued in the billions of dollars (Rouland-Lefèvre, 2011; Khan and Ahmad,

2018). Farmers in Zuru reported being aware of the threat of termites (53%) but despite intervention, some farmers reported that the damage from termites was recurring (47%), reflecting a lack of efficacy in termite management (Shindi *et al.*, 2025). In semi-arid regions such as Zuru, infestations are likely to increase in droughts and there is limited localised information on perceptions of and impacts from climate variability. Shōndi *et al.*, 2025. This study therefore focused on the socio-economic profile of the farmers in Zuru community and their impact on their perceptions of termites and the crops most affected by the termite infestation and the associated socio-economic impacts.

MATERIALS AND METHODS

Study Area

The study was carried out in Zuru LGA of Kebbi State, Nigeria in the Northwest of the country between the latitude of 11°25'N to 11°45'N and the longitude of 4°50'E to 5°15'E in an area of 653 km² of the Zuru population as calculated from the 2006 Population Census. Zuru LGA has six (6) administrative divisions namely; Dabai, Rikoto, Rafin Zuru, Manga, Senchi and Ushe Lami *et al.*, 2019. The area is situated in the Sudan-Sahel agro-ecological zone, with a semi-arid climate, well-defined wet (May–October) and dry (November–April) seasons, an annual rainfall of 700–1,000 mm, and temperatures of 28–35°C, peaking at 40°C, which are favourable for termites to forage and construct their mounds (Jouquet *et al.*, 2017). Soils are mainly sandy-loam and have a low organic matter content of 0.5–1.5%. More than 80% of the population is involved in smallholder crop production, mostly cereals and legumes, frequently intercropped. The population of Zuru LGA is estimated at approximately 165,547 (NPC, 2009), with the Lelna (Dakarkari), Hausawa and Fulani ethnic groups being the major population groups.

Research Design

The descriptive survey design which involved both quantitative and qualitative methods was used to gain insights into the perceptions, infestation patterns, and socio-economic factors of the farmers (Creswell and Creswell, 2018). The mixed methods enabled triangulation of quantitative data on infestation and qualitative narratives as in similar termite perception studies of Africa (Loko *et al.*, 2017; Hassan and Disina, 2020).

Population and Sampling

The target population consisted of farmers seriously involved in crop production and had experienced termite problem in Zuru LGA which were about 20,000 farming families, with more than 50% of them experiencing termite problem, Shindi *et al.*, 2025. The 120 respondents were selected based on a multistage sampling technique, namely, all six districts were purposively studied because of termite incidence reported (Stage 1), one village was randomly selected from each district (Stage 2) and twenty farmers in each village were randomly selected in consultation with the village heads (Stage 3). Farmers aged 18 years and older who had at least two years of experience in crop farming, living in the selected communities were included.

Table 1: Selected Villages and Sample Size (n = 120)

District	Village	No. of Respondents
Dabai	Semi Yala	20
Rikoto	D'koto	20
Rafin Zuru	Rafin Mose	20
Manga	Amanawa	20
Senchi	Tajaye	20
Ushe	Elembelu	20
Total	6 villages	120

Source: Field survey, 2025.

Instrument and Data Collection

The methods used to gather the instruments and data for the study are described in this section. A structured questionnaire, 'Farmers' Perception and Indigenous Utilization of Termites Questionnaire' (FPIUTQ) was used to collect data, which was complemented by semi-structure key-informant interviews (12 informants, two per district). This paper used data from Section A (socio-economic characteristics; 10 items) and Section B (perceptions of termites in agricultural production; 15 items on Likert scale) of the instrument (Hassan and Disina, 2020). The instrument was translated into C'lela/Hausa for accessibility and pilot tested for cultural relevance. Face-to-face interviews conducted by the researcher for three months (February - April 2026) were used to collect data.

Method of Data Analysis

Data were analysed using descriptive statistics frequencies, percentages and presented in tables for ease of interpretation, consistent with the analytical approach used by (Loko *et al.*, 2017) and Hassan and Disina (2020).

Ethical Considerations

Permission was obtained from village heads and community leaders prior to data collection. Informed consent was obtained from all respondents, participation was voluntary, and no personal identifiers were collected to protect respondent confidentiality (Creswell and Creswell, 2018).

RESULTS

3.1 Socio-economic Characteristics of Respondents

Table 2: Socio-economic Characteristics of Respondents (n = 120)

Variable	Frequency	Percentage (%)
Gender: Male	78	65
Gender: Female	42	35
Age 18-30 years	33	27.5
Age 31-40 years	36	30
Age 41-50 years	29	24.17
Age 51-60 years	15	12.5
Age 61 and above	7	5.85
No formal education	42	35
Primary education	13	10.83
Secondary education	18	15
Tertiary education	25	20.83
Adult education	22	18.33
Full-time farmers	63	52.5
Farming + other jobs	47	39.17
Retired but farming	10	8.33
Farm size 1-5 ha	61	50.83
Farming experience 21 yrs and above	60	50
Land inherited	66	55
Annual income ₦500,000 or less	84	70
Cooperative membership	29	24.17

Source: Field survey, 2025.

Table 2. The males dominated the land ownership and the production of crops in northern Nigeria where 65% of the respondents were males. Most (57.5%) were aged 18-40, suggesting a young and dynamic farming population who are able to adapt to new termite management practices. But 35% had no formal education which means extension messages should be disseminated in local language using practical demonstrations. The majority of the farmers (52.5%) were full-time farmers who possessed an experience of at least 21 years, which indicated good indigenous knowledge of termite behaviour. The total area was mainly occupied by smallholder (50.83% of the area cultivated 1-5 ha) while land was primarily acquired through inheritance (55%). Income was low with 70% making a yearly income of ≤N500,000, with only 24.17% involved in cooperatives, which is an indicator of limited access to training and subsidised inputs.

Perception of Termites and Crops Affected

Table 3: Farmers' Perception and Crops Affected (n = 120)

Variable	Frequency	Percentage (%)
Observed termites on farm: Yes	101	84.17
Perception: Harmful pests	66	55
Perception: Beneficial insects	13	10.83
Perception: Both harmful and beneficial	41	34.17
Most attacked crop: Maize	36	30
Most attacked crop: Sorghum	30	25
Most attacked crop: Millet	19	15.82
Most attacked crop: Rice	17	14.17
Most attacked crop: Groundnut	18	15
Growth stage attacked: All stages	56	46.67
Growth stage attacked: Maturity	26	21.67

Source: Field survey, 2025.

A total of 84.17% of the farmers observed the presence of termites on their farms as shown in Table 3. 55% saw termites as destructive pests and 34.17% saw both destructive and constructive functions of termites, showing indigenous ecological knowledge. Cereals were the main hosts with maize (30%) and sorghum (25%) being most attacked. Damage was noted in all growth stages (46.67%) with the maturity stage (21.67%) being most critical for grain loss.

Severity, Loss and Contributing Factors

Table 4: Severity, Estimated Loss, and Factors Influencing Termite Damage (n = 120)

Variable	Frequency	Percentage (%)
Severity: Very severe	33	27.5
Severity: Severe	45	37.5
Severity: Moderate	35	29.17
Severity: Mild	7	5.83
Estimated crop loss 31-50%	43	35.83
Estimated crop loss 51-70%	22	18.33
Estimated crop loss above 70%	15	12.5
Major factor: Dry season/drought	30	25
Major factor: Climate change	23	19.17
Major factor: Continuous cropping	19	15.83
Major factor: Proximity to bush/forest	19	15.83
Termites improve soil fertility: Yes	57	47.5

Source: Field survey, 2025.

Table 4: Damage was severe and very severe with 65% of farmers rating the damage severe to very severe. The estimated losses were significant with 35.83 per cent of the farmers reporting a loss of between 31-50 per cent and 6.67 per cent of the farmers reporting a loss of between 0-10 per cent. Damage was increased by dry season/drought (25%), climate change (19.17%), proximity to bush/forest (15.83%), continuous cropping (15.83%), poor soil fertility (12.5%) and late planting (11.67%).

Perceived Importance and Trends

Table 5: Farmers' Perception, Ranking, and Trends of Termite Infestation (n = 120)

Variable	Frequency	Percentage (%)
Observed winged termites/swarmers: Yes	107	89.17
Swarmers seen as seasonal insects	38	31.67
Swarmers seen as signs of active mounds	29	24.17
Swarmers seen as indicators of good farming season	26	21.67
Rated very important/important pest	87	72.5
Ranked 1st or 2nd most serious pest	81	67.5
Damage to wooden tools/structures (occasional-frequent)	105	87.5
Trend: Increased in last 10 years	56	46.67
Overall perception: Enemies	52	43.33
Overall perception: Both enemies and useful	46	38.33

Source: Field survey, 2025.

Farmers demonstrated strong indigenous knowledge of termite biology, with 89.17% having observed winged termites or swarmers, most commonly interpreted as seasonal insects (31.67%) or signs of active mounds (24.17%). Termites were rated important to very important pests by 72.5% of farmers and ranked 1st or 2nd most serious pest by 67.5%. Damage to wooden structures was reported by 87.5% of farmers. Concerning trends, 46.67% reported that termite problems had increased over the last 10 years, a pattern potentially linked to climate change and drought. Overall, 43.33% perceived termites as enemies, while 38.33% viewed them as both enemies and useful insects.

DISCUSSION

Men's dominance (65%) in the crop ownership and age (57.5%) of farmers are representative of the cultural control of land and farming decisions in northern Nigeria, where men dominate the land ownership. This is in line with Hassan and Disina (2020) in Bauchi State, which attributed the male dominance to the claims of inheritance and labour demand, and Shindi et al. (2025) in Zuru, which declared that male dominance was due to inheritance and labour demand. The youthful age structure indicates high physical ability and willingness to embrace new practices (Meijer *et al.*, 2015; Loko *et al.*, 2017). But 35% lacked formal education; in line with other findings of low literacy level of rural farmers in the area (Hassan and Disina, 2020), extension agents should use local languages and demonstrations and the low literacy would limit farmers ability to read pesticide labels and dosage (Beyene and Kenea, 2022; Hassan and Disina, 2020). The

farmers who have a long experience of farming (21+ years, 50%) possess strong indigenous knowledge of termite behavior and weather patterns which explains why 34.17% of them perceived both negative and positive effects of termites (also observed in Benin, Loko *et al.*, 2017; in Ethiopia, Mugerwa *et al.* 2011; in Uganda Mali *et al.* 2018). The smallholder farm size (1-5 ha, 50.83%) and low income (52.5% earning ₦100,001-₦500,000) coupled with poverty are a limiting factor for accessing chemicals and robust choice of labour-intensive control methods as reported by Khan and Ahmad (2018) and Kebede and Urga (2024). The low cooperative membership (24.17%) also contributes to low access to training and inputs (Shindi *et al.*, 2025; Meijer *et al.*, 2015). Maize (30%) and sorghum (25%) were the most attacked crops, which corroborates the findings of Shindi *et al.* (2025), Hassan and Disina (2020), and Loko *et al.* (2019) that cereals are preferred hosts for *Macrotermes bellicosus* in the Sudan Savanna. Cereals are vulnerable due to their high starch content and low silica content (Siddiqui *et al.*, 2023). Damage at all growth stages (46.67%), particularly at maturity (21.67%), is important as feeding at grain-filling results in real yield loss without any compensatory growth (Rouland-Lefèvre, 2011). The main factors contributing to higher damage, confirmed in Benin by Loko *et al.* (2017), were drought (25%) and climate change (19.17%). As reported by 52.5% of farmers with income of only ₦100,001-₦500,000 per annum and 66.66% of the farmers estimating losses exceeding 30%, termites are a serious threat to food security, in line with (Siddiqui *et al.*, 2023), (Akutse *et al.*, 2012), and Negessa and Sileshi (2017), which reported up to 40% loss of yield on degraded soils in Ethiopia. The ranking of termites as the second most serious pest (40.83%) further validates their economic importance as compared to other pests in sub-Saharan Africa (Siddiqui *et al.*, 2023; Sileshi, 2019). The farmers' perception of swarmer emergence for ecological and seasonal predictions is based on traditional knowledge systems similar to that described in (Loko *et al.*, 2017) and (Sileshi *et al.*, 2009). The observed rise in termite issues in the past decade (46.67%) is consistent with (Jouquet *et al.*, 2017) and Sileshi (2019) who attributed the greater termite management problems in agricultural systems to climate change and drought.

CONCLUSION

The farmers of Zuru LGA are mainly males, young people, mostly uneducated, and low income, yet with a significant farming experience. Socio-economic factors influence the perception of termites as a destructive pest as 55% of respondents mentioned them as destructive, while 34.17% reported seeing termite as destructive and beneficial, indicating experience-based knowledge on termites. Crops such as Maize and sorghum are most impacted, with damage at every growth stage and 65% of farmers rating damage as severe to very severe, with more than a third estimating a 31-50% loss in yield. The primary drivers of infestation are dry season/drought and climate change; and farmers report an increasing trend of infestation over the last 10 years. It is therefore not surprising that termite becomes a big problem and an emerging threat to cereal production and food security in Zuru LGA.

RECOMMENDATIONS

- i) Farmer field schools should be established to utilize the ecological knowledge of experienced farmers (21+ years) as local resource persons
- ii) Agricultural extension agencies design termite-awareness and management training that is based on local languages and practical demonstrations, as 35% of farmers did not receive any formal education
- iii) Farmers should be encouraged to adopt early planting and moisture-conservation practices to minimize termite infestation due to drought
- iv) Research institutions develop and promote termite-tolerant maize and sorghum varieties, as 55% of farmers' attacks were reported to be on maize and sorghum; and
- v) Kebbi State Ministry of Agriculture strengthen farmer cooperatives to bring about good farmer participation in termite training and access to climate-adaptive inputs, as farmers' cooperatives have only 24.17% participation.

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