



## FARMERS' PERCEPTION OF AGRONOMIC IMPORTANCE OF TERMITES AND INDIGENOUS CONTROL PRACTICES IN ETHIOPIA

OLJIRA KENEA<sup>1\*</sup>, KEBEDE GEMECHU<sup>1</sup> AND PICHIAH GOMATHINAYAGAM<sup>2</sup>

<sup>1</sup>Department of Biology, College of Natural and Computational Sciences,  
Wollega University, P.O. Box 395 Nekemte, Ethiopia

<sup>2</sup>Department of Plant Science, Faculty of Agriculture, Wollega University, P.O. Box 38 Shambu, Ethiopia

\*Email: qabanef2015@gmail.com (corresponding author); ORCID ID 0000-0002-4618-7853

### ABSTRACT

This study explores the complex relationship between termites and agriculture in Ethiopia. Termite activity (mound density and foraging) was measured across grazing lands, farmlands, and forests. Farmers were also interviewed about their perceptions of termites and traditional control methods. Despite evidence of termite activity, most farmers (84%) viewed them solely as pests, overlooking their potential benefits for soil health. Surprisingly, a majority (66%) were unaware of the fertilizing properties of termite mound soil (TMS) and did not utilize it. The study identified various indigenous control methods used by farmers, including queen removal and flooding. These findings highlight a critical gap in knowledge. Educating farmers about the dual role of termites and promoting the use of TMS could significantly improve agricultural practices. Additionally, developing sustainable termite management strategies is crucial.

**Key words:** Agronomic importance, ethno-ecological knowledge, food security threat by termites, indigenous control practices, integrated termite management (ITM), *Macrotermes subhyalinus*, termite infestation

Termites (*Macrotermes subhyalinus* Rambur) play a complex role in Ethiopian agriculture, acting as both destructive pests and beneficial soil contributors (Mulatu and Emana, 2015). Their destructive side is well documented, with termites causing significant damage to crops, buildings, and landscapes, leading to substantial economic losses (Nhiuane et al., 2022). High infestation rates (IOT) often indicate underlying problems like land degradation and poor soil fertility, often caused by human activities such as overgrazing and deforestation (Legesse et al., 2013; Kabeh, 2016). These degraded lands struggle to support livestock, further threatening food and water security (Taye et al., 2013). On the other hand, termites can also be beneficial. Their burrowing and mound-building activities improve soil aeration, drainage, and nutrient content (Ayana et al., 2018; Wakbulcho and Kenea, 2021). This termite mound soil (TMS) is a valuable resource in some parts of Africa, used by cash-strapped farmers as a natural fertilizer alternative (Sileshi et al., 2009; Nhiuane et al., 2022). Ethiopia faces a particular challenge with termites, with a severe and long-standing infestation problem concentrated in the western regions (Wakbulcho and Kenea 2021; Nhiuane et al., 2022). This infestation not only reduces crop yields but also damages natural vegetation, leading to land degradation, livestock feed insecurity, and biodiversity loss (Taye et al., 2013; Nhiuane et al., 2022). Traditional control

methods using physical, biological, and chemical means have proven largely ineffective (Gute, 2018; Nhiuane et al., 2022).

Due to the complex nature of termite impact, a more nuanced approach is needed. Local farmers' knowledge and practices offer valuable insights. Studies have documented various indigenous termite control methods employed by Ethiopian farmers, such as disturbing mounds to remove the queen, flooding mounds, and using natural repellents (Beyene and Kenea, 2020). Integrating this ethno-ecological knowledge with non-chemical and ecologically friendly methods holds promise for a more sustainable Integrated Termite Management (ITM) strategy (Beyene and Kenea, 2020). This study focuses on the Ebentu district, a Nile Basin region facing significant termite challenges. Here, the impact of termites on agriculture remains largely undocumented. To develop effective and sustainable termite management strategies, this study aims to assess the current level of infestation, understand farmers' perceptions of termites, and document their traditional control practices. This information will be crucial for formulating a successful ITM approach specific to the Ebentu district.

### MATERIALS AND METHODS

The study was conducted in Ebentu district East

Wollega Zone of Oromia National Regional State, Western Ethiopia. 9°55'-10°15'N, 36°17'- 36°34'E, 2100 masl. The district relies heavily on farming for income (97%), making termite infestation a significant threat. Researchers examined termite presence and farmers' practices from August to December 2020. To assess termite prevalence, field surveys were conducted in three land-use types: forest, grazing land, and farmland. An area of size 500m x 500m plots were established within each area, totaling 170,000 square meters, and counted termite mounds and foraging holes. This methodology aligns with previous studies by Meyer et al. (1999), Debelo and Degaga, (2014) and Wakbulcho and Kenea (2021). Understanding farmers' perspectives on termites was another crucial aspect of the study. This experiment targeted five kebeles (administrative units) known for severe termite problems. A random sample of 278 household heads were selected from a pool of 905 using Yamane's formula (Nibrate et al., 2020). A semi-structured questionnaire gathered data on demographics, farmers' views on the beneficial and detrimental roles of termites, crops susceptible to termite damage, and traditional control methods employed. Focus group discussions and interviews with key informants provided deeper insights into these topics.

The data collected encompassed: 1. Termite mound and foraging hole densities across different land-use types; 2. Crops most affected by termites; 3. Farmers' perceptions of termites (pests vs. beneficial); 4. Traditional methods used to manage termites; and 5. Whether farmers utilize termite mound soil. The data was analyzed using SPSS software (version 24) to identify relationships between termite presence, land use, and farmers' practices. Descriptive statistics was used to summarize the findings and presented in tables for clear visualization.

## RESULTS AND DISCUSSION

This study investigated termite activity and farmers' perception in Ebentu district, Ethiopia. The termite mound density and foraging hole density measured across three land-use categories revealed that Grazing land had the highest overall termite mound density (77) and the highest overall foraging hole density (59). This translates to a mean of 3.08 termite mounds and 11.80 foraging holes/ ha in grazing land. Farmland had a moderate density of termite mounds (62) and foraging holes (48) with a mean of 2.48 mounds and 9.60 holes/ ha. Forest land had the lowest overall density of both

termite mounds (50) and foraging holes (40) with an average of 2.00 mounds and 8.00 holes/ ha. These densities are lower than previous reports from western Wollega, likely due to regional variations. Compared to other African studies, termite mound densities in this study were higher. This variation highlights the influence of environmental factors on termite populations (Meyer et al., 1999; Yamashina, 2010; Senessa and Mathewos, 2024). Wakbulcho and Kenea (2021) found termite foraging activity was highest in grazing land. This could be due to less competition for food sources in forests and fewer grazing animals on farmlands during cropping seasons. These findings align with studies by Abdulahi (1990) who reported increased termite activity in overgrazed areas.

Most farmers perceived termites solely as pests (Table 1). This aligns with previous Ethiopian studies (Taye et al., 2013; Nhuiwane et al., 2022) and highlights a knowledge gap regarding the potential benefits of termites. There's a need for education on the dual role of termites in agriculture, balancing their detrimental and beneficial effects. The majority of farmers were unaware of the fertilizing properties of TMS and did not use it as found in the Table. This finding is consistent with other studies in western Ethiopia (Aliyi Abdulah, 2017; Chimdi et al., 2021) and parts of West Africa (Yeyinou Loko et al., 2017). However, some studies in eastern Ethiopia and other African regions report TMS use as fertilizer (Sileshi et al., 2009; Miyagawa et al., 2011; Mugerwa et al., 2011; Debelo et al., 2014). This suggests geographical and cultural variations in farmers' knowledge. TMS has been shown to be a promising organic fertilizer for crops like teff and sweet potato (Debelo et al., 2014; Chimdi et al., 2021). Promoting TMS use as a sustainable and cost-effective alternative fertilizer could benefit farmers.

Farmers reported maize, teff, finger millet, and sorghum as the most susceptible crops to termite damage as detailed in the Table. These findings are consistent with previous studies in Ethiopia and Africa (Sileshi et al., 2009; Ibrahim and Adebote, 2012; Maayiem et al., 2012; Taye et al., 2013). Further research is needed to assess the impact of termite abundance and diversity on specific crops to develop targeted control strategies. Farmers primarily employed traditional control methods like queen removal, followed by chemical controls, flooding mounds, and applying boiled water, wood ash, and red pepper. These methods, except chemical control, are common practices in Ethiopia and other African regions (Orikiriza et al., 2012; Taye et al.,

Table 1. Farmers' perception of termites and management practices in Ebentu district, Ethiopia (2020)

Item	Variables	Frequency	%
<b>Termite Benefits and TMS Use:</b>			
Do termites have any benefit for your agricultural production?	1) Yes	45	16.0
	2) No	233	84.0
	3) I don't know	-	-
If yes, what are the benefits?	1) Mound for soil fertility	28	10.0
	2) Medicine	-	-
	3) Feed for livestock	17	6.0
	4) I don't know	233	84.0
Do you use termite mound soil (TMS) for managing soil fertility?	1) Yes	28	10.0
	2) No	184	66.0
	3) I don't know	66	24.0
<b>Termite Damage and Control Methods:</b>			
Is there termite infestation problem (damages) on your crop land?	1) Yes	264	95.0
	2) No	14	5.0
Crops severely damaged by termites:	1) Maize	92	33.0
	2) Teff	75	27.0
	3) Sorghum	61	22.0
	4) Finger Millet	49	18.0
Have you tried to control infestation of termites on your farm?	1) Yes	264	95.0
	2) No	14	5.0
What controlling strategies have you used?	1) Queen removal	148	53.2
	2) Boiled water	23	8.2
	3) Chemical	39	14.0
	4) Wood ash	19	6.8
	5) Red pepper	14	5.0
	6) Flooding	35	12.6

2013; Yeyinou Loko et al., 2017). Introducing mound drilling technology for queen removal and promoting an Integrated Termite Management (ITM) approach that combines traditional and modern methods could be beneficial. ITM strategies are crucial as there's no single effective control method for termites (Aliyi Abdulah, 2017; Nhiuane et al., 2022; Senessa and Mathewos, 2024). This study revealed higher termite activity in grazing lands and a general perception among farmers of termites as solely pests. There's a critical need to educate farmers on the dual role of termites and the potential benefits of TMS as fertilizer. Promoting sustainable ITM practices and raising awareness about the advantages of termites can lead to improved agricultural practices in the region.

#### ACKNOWLEDGEMENTS

The authors thank the Ebentu District Agriculture Office for their cooperation. Special thanks go to Wollega University for providing field facilities.

#### FINANCIAL SUPPORT

The work not supported by any funding sources.

#### AUTHOR CONTRIBUTION STATEMENT

OK planned and designed this study. KG analysed data. PG drafted and revised original manuscript.

#### CONFLICT OF INTEREST

No conflict of interest.

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(Manuscript Received: July, 2023; Revised: April, 2024;

Accepted: April, 2024; Online Published: April, 2024)

Online First in [www.entosocindia.org](http://www.entosocindia.org) and [indianentomology.org](http://indianentomology.org) Ref. No. e24487