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## RESEARCH ARTICLE

# Study on the Prevalence and Farmers Managements Practices of Termites on Maize (*Zea mays* L.) in Eastern Wollega

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## ABSTRACT

*The physiological workload is a personal monitoring device that allows one to measure one's heart rate in real-time or record the heart rate for later analysis. It is important to note that heart rate fluctuates easily and is affected by multiple elements such as work, stress, hydration, nutrition, smoking, caffeine, exercise, and health conditions. In the current study, the heart rates of two different sector female workers were assessed i.e., weeding activity under agricultural sector and packaging activity under industrial sector. An exploratory research design was adopted to conduct the study in which heart rate monitor was used to assess physiological workload of the workers. Weeding and packaging are two different activities that require different levels of energy expenditure, different working postures, and physical resources. The findings showed that the cost of physiological workload was more for weeding activity compared to packaging activity which implies that weeding activity is laborious.*

**Keywords:** Physiological Workload, Heart Rate, Task, Posture.

## INTRODUCTION

In Ethiopia, termites are one of the major threats to agricultural crops, forest trees and buildings in western part of the country [1]. Termite attacks caused up to 36% reduction in yields of maize respectively in the region [2, 3 &4]. This devastating insect pest also causes soil degradation by reducing vegetation and leaving the soil surface barren and exposed to erosion [3&4]. As a result, farmers are forced to abandon their farmlands and migrate to other places [5]. In addition, the consequences of termite infestation reduced farm productivity, increased land degradation and vulnerability of resource poor farmers [4 &6].

In Ethiopia, maize is an important staple food crop ranking first in total production and yield per ha among the cereal. The crop is used for feed of animals and grain used industrially for starch and oil extraction. Agriculture in Ethiopia remains less productive despite its over all importance in the nationally economy and potential for future growth [7]. The Productivity of maize in Ethiopia remains low due to several biotic and abiotic constraints. Among the biotic stress to maize production in the country, insect pests are the most important ones. Among insect pests termites are the most important and widely distributed pest in Ethiopia [8]. Most termite species are not pests, but are significant important component of ecosystem. Human perception of their pest status has led to an expensive campaign to control mound

building species [3]. Termites damage the stem and root, which is especially serious in seedlings; often they cut the base of the plant at ground level. Tree trunks or plant stems are covered with runways composed of plant fragments, soil and saliva. Under this protect cover they on the tree bark tree. There is a growing interest in evaluating the level of damage that termites can cause to major crops such as *Zea Mays*, *Eragrostis teff*, *Sorghum Bicolor* and range land [9].

Chemical control of termites in plantations and farms is expensive and require skilled labour [10] and may not be effective in all cases [11]. The excessive application of termiticides causes environmental pollution and may result in the death of non-target organisms as reported by [12] which necessitated the ban of some chemical control measures Though the termite problem in western Ethiopia is important, its status only known in few places like the Manasibu district of West Wollega Zone, Thus, the current study was initiated with the following objective:-

- To quantify the termite problem in the Eastern Wollega zone
- To know farmer practice in combating the termite problem
- To make a recommendation on future termite management in Eastern Wollega

## MATERIALS AND METHODS

### Description of study area

The study was conducted in 2011-2012 in Sasiga, Guto-Gida and Diga district which are located the Easter Wollega zone of Oromiya Regional state. The Sasiga district climatically classified mid consisted of highland (60%) and lowland (40%) with an altitude of 1500-1960m.a.s.l with average temperature of 27<sup>o</sup>c and 1000mm annual rainfall. The Guto-Gida district has located an altitude of 1300-2500m.a.s.l and the district has minimum, maximum and average temperature 16, 24 and 32<sup>o</sup>c, respectively. The Diga district has located an altitude of 1500-2000 m.a.s.l. minimum, maximum and average air temperature 24, 29 and 30<sup>o</sup>c respectively. The study Kebeles were Gadisa Oda from Guto Gida district, Oda Gudina from Sasiga district and Arjo Gota Bula from Diga district which are selected three localities were

selected randomly.

### Methods of data collection

Primary and secondary sources were used for this study. Primary sources were collected through a case study with farmers and experts in three district while secondary information was collected through desk study. Primary data was collected through focus group discussion, semi-structured interview, key informant Interview, Participatory Rural Appraisal (PRA) and observation.

### Survey procedure

Surveys were conducted at maturity stages of maize and termite attacked plants were rated as high, medium and low based on the damaged prevalence. Totally 75 fields were assessed in the survey. Termite damage incidence was evaluated by diagonally walking in the field. To know the number of plant infested by termite per field, five quadrant 10mx 10m (one from the center and four from edges of field). In each quadrant termite damaged maize plants and total plants were counted from which percent termite infested maize plants per quadrant per field were computed. Prior to field visit, background information and secondary data were collected from each district Agricultural and Rural Development.

### Data analysis

Data was analyzed qualitatively. All data collected through individual interviews, Focus Group Discussion, Key Informant Interviews and observations were organized by theme and entered into Microsoft Excel programme daily from the beginning day of the data collection. The organized data was grouped, summarised, discussed and interpreted by theme based on the findings from

## RESULT AND DISCUSSION

### Farmer's problem in maize production study sites

Table 1 demonstrated problems associated to maize production in the study areas. According to data recoded in table 1 termite problem ranked first and wild animal ranked 6<sup>th</sup> implying that

termite problem is the important factor limiting the production of maize in eastern Wollega zone.

**Table 1:** Problem ranking on the three district of East Wollega zone

No	Agriculture problem	Gadis Oda	Arjo Gote Odaa	Oda Gudina
1	Termite	1 <sup>st</sup>	1 <sup>st</sup>	1 <sup>st</sup>
2	High fertilizer price	3 <sup>rd</sup>	3 <sup>rd</sup>	7 <sup>th</sup>
3	Plant and livestock diseases	2 <sup>nd</sup>	4 <sup>th</sup>	2 <sup>nd</sup>
4	Land degradation	4 <sup>th</sup>	5 <sup>th</sup>	3 <sup>rd</sup>
5	Soil erosion	7 <sup>th</sup>	2 <sup>nd</sup>	5 <sup>th</sup>
6	Lack of draught power	5 <sup>th</sup>	6 <sup>th</sup>	6 <sup>th</sup>
7	Wild animal	6 <sup>th</sup>	7 <sup>th</sup>	4 <sup>th</sup>

Source (own)

### Biotic constraints of maize production

65% of considered termites as the most serious problem maize production in Eastern Wollega. According to our study, other insect pests included in limiting maize production were: - stem bore, weevil, shoot fly and cut worms. Weeds like *cyndon dactylon*, *Gizota Scabra* and *Digitaria* occasionally problematic in maize culture. Wild animal like ape and monkey damaged maize field (Table 2).

**Table2:** Biotic constraint production at study sites

No	Constraint of maize production	% of respondents
1	Termite	65
2	Insect pests	20
3	Plant Diseases	6
4	weed	4
5	Vertebrate pest	4

Source (own)

### Farm size, cropping sequence, land preparation and farming system of the study sites

#### Farm size

Farm size and cropping pattern of the study sites are presented in Table 3. According to result presented in table the average farm size 3(three) ha and cropping pattern is mono cropping which has great effect in terms of termites and other pests prevalence. Thus, this could be one of the reason why termites problem in alarming in

Eastern Wollega.

**Table 3:** Farm size cropping system of maize in the study areas

Kebele	Average farm size	Cropping season		
		2009	2010	2011
Gadisa oda	2.87	Sorghum	Sorghum	maize
Oda Gudina	2.91	maize	maize	maize
Arjo qote bula	2.91	maize	maize	maize

Source (own)

### Land preparation

Farmers in study areas plough frequency of their land one – three times (Table 4). Termite infestation highly influenced by ploughing frequency particularly the subterranean termites. Hence, less frequency of land prep ration increase termite infestation in study areas.

**Table 4:** Plough frequency in study areas

Kebele	Plough frequency		
	1 times	1-3 times	4- 5 times
Gadisa oda	1.3		
Oda Gudina		2.3	
Arjo qote bula		2.3	

### Farmer indigenous knowledge towards termite control

Farmers used several cultural practices to reduce the damage caused by termites. Traditional methods are simple to follow and conduct and, cost effective. [13] Argues that the use of traditional methods should be complemented with the conventional methods to achieve great results. Farmers use different strategies to minimize the effect termite on maize;-

- use high density : to compensate for damage by termite farmers used higher seed rate per area for planting
- Re planting (Re sowing) in Oda Gudina , Arjo Gudatu and G/odda kebele farmers controlled when faced with unexpected crop failure on early planted of maize
- Farmers can remove crop residue and plough the land immediately after harvest to depurative their food

- Hand weeding or ridging soon after rain is also considered beneficial for destroying the foregoing galleries that run near the soil surface and disturbing termites that are foraging [14].
- smoking mounds using pepper pods a eucalypts tree leaves to surface and killed termites with the mounds
- dusting ashes around hose and in the fields to protect termite damage

## CONCLUSION

A basic understanding of termite diversity and biology is a prerequisite for adequate management of termite problems. Termite control for use by resource poor farmers should mainly depend on non-chemical technical, which include mechanical method, cultural practice, biological control, use resistance variety, crop rotation and other measurement should be important termite control.

In general the study strongly reflected termites as the most serious problems and it was becoming the main cause for reducing maize production, feed shortage for livestock and decline of soil fertility whereas termites issue problems in study sites.

## Recommendation

Participatory research on improvement and promoting indigenous knowledge of local farmers. Farmers from in each kebeles practice different methods to protect their crops building from termite damage. These practice do not give fully control of termites some good practice may need further development. Therefore, evaluating these indigenous knowledge and integrated them for their effective control should conducted. Integrated termite management (ITM) to facilitate participatory community sustainable termite control should be applied in each study site. Finally, awareness creation for termite's prevalence, management and damage caused should give for every farmer

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