Termites in Ethiopia: The Environmental Impact of Their Damage and Resultant Control Measures

Termites are abundant and widely distributed throughout tropical and sub-tropical regions of Ethiopia. Some species cause serious damage to certain crops, young forestry plantations and wooden buildings. Most species are not pests but are significant detritivores and important components of the ecosystem. Human perceptions of their pest status has led to expensive campaigns to control mound-building species, Macrotermes, on denuded and eroded rangeland where the primary problem is overgrazing.

INTRODUCTION

In 1984–1985, world attention focused on Ethiopia as a result of the drought and famine, mainly in northern parts of the country. Northern Ethiopia is consistently a food-deficit area and this situation is made many times worse during drought periods. During the last two decades the Ethiopian Government has been resettling people from the northern highland, drought stricken regions, mainly to the less populated western regions of Wellega and Illubabor, which are at lower altitudes (< 150 m), with a tropical climate and more reliable rainfall. However, in some of these resettlement areas there have been reports of serious termite damage to crops, forestry trees (particularly Eucalyptus) and rangeland. In some cases, the perceived damage causes measurable losses, in other cases there are no losses or the significant damage is due to other causes (1). The purpose of this paper is to indicate the overall environmental implications of termite damage and termite-control strategies in the context of perceptions in Ethiopia of the significance of termites as pests.

PERCEPTIONS OF THE TERMITE PROBLEM IN ETHIOPIA

The first report of damage, in 1938 from Kiltu Kara (near Ghimbi) (2), and a later report from Mendi (3) indicated that farmers were abandoning “desert without any vegetation ... and moving to the lowland, searching for new land”; denuded hillsides were heavily eroded and “the termite problem” was said to have worsened. The source of the problem was seen to be the numerous, large termite mounds (constructed by Macrotermes sp.) which numbered 3 to 5 per ha. Control was attempted by poisoning mounds with aldrin, phostoxin and other insecticides or by removing queens from mounds. Crop protection trials using aldrin seed dressings for teff, wheat, barley, beans and cotton showed promise...
but were never validated in spite of further recommendations (4). In 1983, the Ethiopian Ministry of Agriculture collaborated with the All Ethiopia Peasants Association to poison Macrotermes mounds in Menesibu and Jarso districts in Wellega. Over 600,000 termite mounds were poisoned using over 12,000 kg of 40% aldrin at a cost of over 200,000 man days and 163,000 Birr (12 Sterling is approx. 3 Birr). The effects of this campaign were not monitored although there were anecdotal reports of “improvement”. Whether improvements were real or imagined will never be known. At best they were temporary, since it was made abundantly clear during my visits to these areas, in January–February (5) and July, 1986 (6), that the “termite problem” was still the major concern of farmers and Ministry of Agriculture staff. However, my reports indicated that the problem is far more complex than was currently perceived. Some aspects of damage were underestimated and some were overestimated (see below), and the most damaging termites were not necessarily the obvious mound-building Macrotermes but in many cases, were one or more of the subterranean species.

It is quite clear that whether or not control measures are implemented, there are long-term consequences for the environment which have to be faced in both traditional and newly settled areas.

**TERMITES IN ETHIOPIA**

Termites are tropical insects, with a complex social organization. Their geographical distribution is limited by lower temperatures associated with higher latitudes and altitudes. Recent visits to Ethiopia have enabled fairly definitive statements to be made on the distribution of species in the country (7) and the damage they cause (1, 5–7).

**The dominant species in natural ecosystems belong to the subfamily Macrotermite, and include various species of Macrotermes, Odontotermes, Pseudacanthotermes, Anisotermes and Microtermes. Most of these termites are found throughout the savannas and wooded steppes of tropical Africa, below altitudes of 1800–2000 m. Above 2000 m there are fewer species, mainly soil feeders and a few Odontotermes. Clearing trees from such areas and subsequent cultivation usually destroys the nests of species building small mounds (e.g. Trinervitermes) and those with shallow, subterranean nests (e.g. many soil feeders). Species that depend on trees or woody litter (e.g. Coptotermes) also tend to disappear. However, species with deep, subterranean nests and with the ability to survive on crops and crop residues remain (e.g. Microtermes, Anisotermes), often increase in abundance and some may become crop pests (8–10). Although tractor-drawn cultivation destroys the large mounds of Macrotermes, hand-hoe or bullock drawn cultivation, characteristic of small-scale farming, has little effect and Macrotermes survive. Some of these surviving species have been implicated in damaging crops, newly planted exotc forestry trees, rangeland and rural dwellings and food stores.**

**EVALUATION OF TERMITE DAMAGE**

**Crops and Trees.** As elsewhere in Africa (1), damage is generally greater in rain-fed rather than irrigated crops, during dry periods or drought rather than periods of regular rainfall. In plants under stress (e.g. newly transplanted forestry tree seedlings) rather than healthy or vigorous plants and exotic (e.g. Eucalyptus, maize) rather than indigenous plants. Most damage is caused by the Macrotermite, Macrotermes.

There are basically two types of damage. Macrotermes, Odontotermes and Pseudacanthotermes have large nests with long galleries leading to surface foraging holes from which termites emerge to remove dead grass and grass litter under cover of constructed soil sheeting. Termite foraging is particular obvious during the wet season when bare rangeland can have up to 55 foraging holes per m² (1). However, the primary cause of denudation is overgrazing. Livestock are resident during the wet season and were observed grazing green grass down to ground level. In one district in western Ethiopia with an estimated grass production of 2000 kg ha⁻¹, stocking rates were approximately 4.7 ha⁻¹ compared with recommended rates of 1 ha⁻¹ (5, 6). Studies elsewhere have shown that in the absence of overgrazing the grass consumed by termites is insignificant and has no effect on subsequent grass production (11).

**Environmental Impact of Termite Damage and Control**

**Termite Control**

The use of persistent organochlorine (cyclodiene) insecticides has been the cornerstone of termite control in the tropics. No other insecticides have the required persistence in the field to protect crops and forestry trees (12). The principal compounds are aldrin, dieldrin, chlordane and heptachlor, and in Ethiopia aldrin is the most widely used. The potential health and environmental hazards of these compounds are well known (13). These hazards can be minimized by observing recommended handling, application and storage procedures, although numerous galleries extending from deep in the soil towards the soil surface (Fig. 1). They damage plants by penetrating and excavating the roots and continuing the excavation upwards within the stem. This damage reduces the translocation of nutrients and water, but being cryptic is often overlooked unless the stem, usually towards maturity, is severely weakened, breaks and lodges. At this stage compensatory growth and yield response from unattacked plants is not possible.

**Rangeland.** This is undoubtedly the most immediately visible, but most contentious, aspect of the perceived termite problem in Ethiopia. Throughout tropical Africa several species of Macrotermitinae consume grass litter as a significant part of their diet and in Ethiopia the most common of these belong to the genera Macrotermes, Odontotermes and Pseudacanthotermes. Typical foraging is characterized by subterranean galleries leading to surface foraging holes from which termites emerge to remove dead grass and grass litter under cover of constructed soil sheeting. Termite foraging is particularly obvious during the wet season when bare rangeland can have up to 55 foraging holes per m² (1). However, the primary cause of denudation is overgrazing. Livestock are resident during the wet season and were observed grazing green grass down to ground level. In one district in western Ethiopia with an estimated grass production of 2000 kg ha⁻¹, stocking rates were approximately 4.7 ha⁻¹ compared with recommended rates of 1 ha⁻¹ (5, 6). Studies elsewhere have shown that in the absence of overgrazing the grass consumed by termites is insignificant and has no effect on subsequent grass production (11).

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the required standards of pesticide management are rarely achieved in developing countries. There is considerable pressure from national and international donors and from some governments in developing countries to ban, reduce or minimize the use of these compounds. Major aid donors are increasingly reluctant to subsidize their purchase by developing countries. Research is needed to search for and test possible alternatives, including non-chemical methods, for adoption by rural communities (14).

Termite Damage

Regular rebuilding of wood/straw thatch buildings leads to excessive clearing of native woodlands and forest, which is particularly obvious in many human resettlement areas in western Ethiopia: one estimate gave a life expectancy of 5-6 years for thatched roof houses and 8-9 years for corrugated iron roof houses with wooden supports (2).

Replacement of native woodlands with quick growing trees, particularly Eucalyptus, is widespread throughout Ethiopia. These exotic woodlands are used for fuelwood plantations and to stabilize already eroded land, such as denuded rangeland. They are increasingly used for rural dwellings as natural woodland become scarce. Failure to establish these plantations due to termite damage to transplanted seedlings leads to continued accelerated erosion, with consequent reduced area of farmland and increased silting and flooding of lowlands. In some areas losses of seedling trees to termites after transplanting in the field approach 100% (1, 4, 5).

Although foraging by Macrotermes, Odontotermes and Pseudacanthotermes in the dry season removes the little remaining dry grass and grass litter from overgrazed rangeland, leaving the soil bare and susceptible to accelerated erosion, farmers and government officials are reluctant to accept overgrazing as the primary and major cause of denudation. Instead they regard termites as the major problem, hence the repeated attempts to control them by mound-poisoning.

These deleterious (both real and imagined) environmental effects of termite damage and control associated with human mismanagement are common in other African countries (15, 16) although often less severe than in Ethiopia.

**Macrotermes** foraging holes (maximum diameter 5.0 mm) in overgrazed rangeland, Wellega, early dry season. Grass litter has been removed from around the holes and taken into the nest; litter removal continues throughout the dry season. Photo: T.G. Wood.

The interactions of the various facets of termite damage and the human response to damage are shown in Figure 2. The net effects are deforestation and, in combination with overgrazing, denudation and accelerated erosion; additional human health and environmental hazards arise from the use of cyclodiene insecticides.

**References and Note**


**Figure 2. Termite damage, human responses to damage and their environmental impact.**