TERMITES: FRIEND OR FOE?

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INTRODUCTION

Termites have a reputation of being significant range pests, in some cases well deserved. Many farmers can recount horror stories of harvester termites (*Hodotermes mossambicus*) stripping the veld of grass, leaving nothing for domestic livestock to eat. A colony of mound-building termites of the genus *Macrotermes*, for their part, consumes as much food as a large ungulate, and stock farmers calculating stocking rates must count each termite mound on their property as equivalent to one domestic livestock unit. In the light of this, the question naturally arises: would the elimination of these termite competitors not leave more forage for revenue-generating domestic grazers? In short, are termites the farmer's friend or foe?

The answer to the question is almost certainly "friend". Far from competing with domestic stock for forage, termites may actually enhance veld productivity (Figure 1).

Figure 1. A population of *Macrotermes michaelseni* termites in an open field on the Omatjenne Research Farm. The population in this field is about four colonies per hectare. Despite the abundant termite population, there is still ample grass.

There are three likely reasons for this:

Nutrient fountains

A termite mound contains two to three cubic metres of soil, drawn from deep soil horizons and transported up into the mound by worker termites. This soil eventually erodes onto the surface of the ground. Maintaining the mound in the face of this continual loss of soil commits the colony to an ongoing, additional upward movement of soil, which can be as high as 200 kg annually. The typical density of termite mounds in Namibia's semi-arid savannas is about 1,6 colonies per hectare. In open grassy areas, such as the one shown in Figure 1, densities can exceed three colonies per hectare. Thus, termite-driven soil turnover rates can exceed 600 kg per hectare per year. As this soil is brought to the surface, enriched in organic nutrients, fixed nitrogen, calcium and clay, it is spread over the ground surface in a broad outwash pediment. This process has been likened

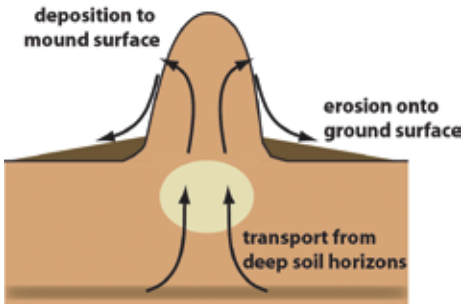

Figure 2. The termite mound as nutrient fountain. Termite workers gather soil from deep soil horizons. This soil is eventually brought to the mound surface. As this soil erodes from the mound, it is spread over the ground surface.

to a "nutrient fountain", a focal upwelling of nutrients that would otherwise be unavailable to plants. Far from being net consumers of veld productivity, termites actually enhance it.

Figure 4. *Hodotermes mossambicus*, the harvester termite.

Figure 3. A *Macrotermes michaelseni* mound with a *Boscia albitrunca* embedded in it.

Water management

Termites are physiologically intolerant of dry conditions. Yet in Namibia, termites inhabit very dry environments. The mound-building *Macrotermes*, for example, can range into areas with mean annual rainfalls as low as 250 mm. Termites survive in such areas because they closely manage the nest environment. During dry seasons, they forage deeply in search of ground water (as deep as 40 m), which they gather and carry up to the nest. In wet seasons, they move excess water from the nest up into the mound, where it is deposited onto the mound surface to evaporate. Managing the nest's moisture has interesting implications for veld ecology. *Boscia albitrunca*, also known as the shepherd's tree, inhabits arid zones throughout southern Africa. This tree maintains green leaves throughout the year, most likely because it can tap deep water reservoirs. In very dry areas, these trees may provide the only available forage for domestic stock. *Boscia albitrunca* is often found in association with termite mounds, bound by a mutual interest in water. In the early stages of a colony's life, the tree's tap roots provide a 'highway' for the termites to follow to the deep reservoirs of water they so avidly seek. For their part, the termites provide the tree and other plants with a zone of reliable moisture near the surface that can readily be tapped. Again, the end result is an enhanced net productivity.

Competitive suppression

If any termite species is a foe to the stock farmer, it is the harvester termite (*Hodotermes mossambicus*). Harvester termites forage specifically for grass, and they are very hardy: they are one of the few termite species that can forage in open sunlight. Unlike *Macrotermes*, whose deep-ranging activities make them major agents of soil building, *Hodotermes* occur in shallow dispersed colonies that perturb soil only to a depth of a few tens of centimeters. This can have beneficial effects: like *Macrotermes*, the extensive shallow tunnel networks created by harvester termites can enhance percolation of rainfall into shallow soils, where it can be available for the shallow roots of grasses. In addition, these termites' practice of dumping soil onto the surface provides

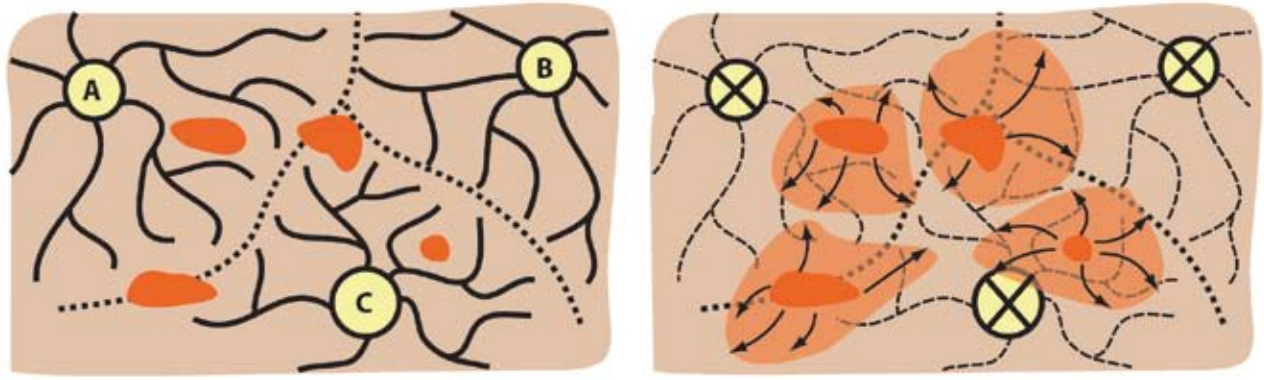

Figure 5. Possible mechanism for competitive suppression of *Hodotermes* colonies. In a territory occupied by *Macrotermes* colonies A, B and C, *Hodotermes* colonies (orange outlines) are confined to the narrow zones that are unoccupied by *Macrotermes* foraging tunnels. If the *Macrotermes* colonies die and the foraging tunnels are left unpatrolled (heavy dashed lines), *Hodotermes* colonies can spread rapidly.

a limited turnover of soil nutrients that can be exploited by plants with shallow root systems, particularly grasses.

However, *Hodotermes* becomes a serious veld pest when populations explode. In large numbers, harvester termites can completely denude the veld of grass. It is not clear what causes a *Hodotermes* population to explode. Drought may play a role, as might overgrazing. One factor that does, however, keep a *Hodotermes* population in check, is a healthy population of *Macrotermes* colonies.

Macrotermes colonies gather food through an extensive network of underground foraging tunnels. This network can extend as far as 75 m from the colony, and the tunnel networks of a stable population of *Macrotermes* colonies can cover nearly the entire available area of a field. *Macrotermes* colonies are also very territorial, and when other termites begin to encroach on a colony's territory, its workers will suppress the interlopers.

Under these conditions, *Hodotermes* colonies lead a precarious existence, able to survive only in patches that are not close to any *Macrotermes* foraging tunnels. Where there is a healthy population of *Macrotermes*, those patches are rare. However, if the *Macrotermes* are eliminated, the checks on *Hodotermes* are lifted, which allows their populations to explode.

FRIEND OR FOE?

Termites can be either friend or foe to the stock farmer. The role they play depends upon whether the farmer is prepared to work within the well-functioning savanna ecosystem in which termites have evolved. If he is, termites can be the stock farmer's best friend. If not, termites can turn on the farmer quickly and relentlessly.

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