

Termites and mulch work together to rehabilitate soils



In semi-arid areas such as the Sahelian zone of Africa, many soils have become severely degraded. One extreme form is the bare and crusted soil, which is virtually productively “dead”. In Burkina Faso, farmers have responded by applying mulch to attract termites that then help to rehabilitate the soil. A research project shows the importance of termites in breaking up hardened soil and increasing water infiltration. The land became productive enough to farm within months.



Elisée Ouédraogo, Abdoulaye Mando and Lijbert Brussaard

In the semi-arid Sahel, the combined effect of organic matter depletion due to overgrazing, continuous cultivation, and adverse climatic conditions has resulted in severe soil degradation, the most spectacular being completely bare and crusted soils. Water runoff on these soils may be close to 100 percent, and the deteriorated soil structure does not permit the establishment of any vegetation. The common name used by farmers to describe such soils is *zipella*, meaning “bare soils” or “dead soils”.

Farmers in northern Burkina Faso have developed many strategies to improve the physical condition of soils. The use of heavy machinery is usually inappropriate, whether due to the high cost of this technology, seldom within the financial reach of farmers, or due to the weak structure of certain soils given their low organic matter and clay content. The most popular and appropriate technology used by farmers turns out to be the application of mulch.

Our research built on this practice. Mulch application, besides physically protecting the soil surface against rainwater impacts and reducing potential runoff, also triggers termites to rework the soil and refill it with life. We wanted to understand how important termites are in the rehabilitation of degraded soils. In our research trials, we distinguished between the role of termites and the direct impact of mulching through two types of plots: first, a mulched bare plot, treated with pesticides in order to exclude the activity of termites; and a second plot with mulch and no pesticides.

Mulching the soil

Northern Burkina Faso is characterised by two main seasons: the rainy season (June to September) and the dry season (lasting eight months). Between March and May, towards the end of the dry season, farmers collect various types of mulch from the

remaining bush. The mulch consists of dry straw and shrubs applied usually at the rate of two to four tonnes per hectare on the bare impenetrable soil.

In our trials, the mulch triggered termite activity in the untreated plot within a few months. The termites opened many burrows through the sealed surface of the soil. Throughout the soil profile, big pores with irregular shapes and different diameters were created. Soil structure, aggregation and other physical properties slowly improved, as were water infiltration and drainage. In the untreated plot, the termites therefore created conditions necessary and sufficient for both woody vegetation and herbs to re-establish from one season to the next. In the plot treated with pesticides, the mulch remained undecomposed and vegetation establishment was very poor, woody vegetation failing completely to grow.

Farmers do not think all termite activity is helpful, as they sometimes suffer from their crops being destroyed by these soil fauna. However, experience shows that, in general, termite species attracted by dry mulch (as mentioned in the Box) will not destroy fresh crops in the field. The termite species that destroy crops are mainly root feeders whose occurrence does not depend on mulch application, and these do not occur in the area.

Soil fauna such as termites are a key consideration for land rehabilitation in countries where water infiltration on degraded soil is a problem. Rather than using mechanical methods like soil tillage to control crusting, applying mulch is a more sustainable and affordable option for farmers. Also, management practices such as pesticides lead to the elimination of important soil life that help maintain soil quality.

Elisée Ouédraogo. Head of Agroecology Department, Centre Ecologique Albert Schweitzer-Burkina Faso (CEAS-BF), 01 BP 3306 Ouagadougou 01, Burkina Faso. E-mail: oelisee@hotmail.com; ceas-rb@fasonet.bf

Abdoulaye Mando. International Center for Soil Fertility and Agricultural Development (IFDC), Division Afrique, BP 4483, Lomé, Togo. E-mail: amando@ifdc.org

Lijbert Brussaard. Wageningen University, Department of Soil Quality, P.O. Box 47, 6700 AA Wageningen, the Netherlands. E-mail: lijbert.brussaard@wur.nl

References

- Mando A., L. Brussaard and L. Stroosnijder, 1999. **Termite-and mulch-mediated rehabilitation of vegetation on crusted soil in West Africa.** *Restoration Ecology*, 7: 33-41.
- Mando A., 1997. **Soil-dwelling termites and mulches improve nutrient release and crop performance on Sahelian crusted soil.** *Arid Soil Research and Rehabilitation*. 12:153-164.
- Mando A, L. Stroosnijder and L. Brussaard, 1996. **Effects of termites on infiltration into crusted soil.** *Geoderma* 74: 107-113.
- Ouédraogo E., A. Mando and L. Brussaard, 2006. **Soil macrofauna affect crop nitrogen and water use efficiencies in semi-arid West Africa.** *European Journal of Soil Biology* 42: S275-S277.

What are termites?

Termites are soil animals of the order Isoptera. The species of termites found in the area are the *Odontotermes smeathmani*, *Microtermes lepidus* and *Macrotermes bellicosus*. They are social insects which live in nests (termitaria) of their own construction. On the basis of nesting behaviour two main groups are found: soil nesting termite species including mound building species and subterranean species (having subterranean nests), and non-soil nesting species (such as tree-nesting species in Amazonia).

