

Mulch

A home for insects

Sam Adams

One of the ways in which farmers can protect their soils is through the use of mulch. When the soil is covered with a thick layer of organic matter, it is protected from extreme rainfall, winds or drought. Mulch also serves as a home for insects, helping attract many species which significantly improve soil texture and soil fertility.

The greatest resource that a farmer has is the soil. It is the soil that gives life. It provides the nutrients for plants to grow, which in turn feed humans and animals. One can confidently say that, without arable soils, human populations would find it impossible to survive. With this in mind, it would be logical to assume that farmers do their utmost to protect their most precious asset. Tragically, this is not the case. Bad farming practices are devastating soils around the world. The long term negative effects of this are yet to be fully realised, but if this continues one can anticipate widespread food shortages.

While ploughing makes the soil easy to plant, it weakens the soil structure. Repeated ploughing breaks the soil down into fine particles, which are easily blown or washed away during wind and heavy rain. Research suggests that Africa is losing soil to this form of erosion at a rate of 30 tons per hectare per year. It is sadly joked that soil is Africa's biggest export. In the United States of America the situation is not much better: researchers have estimated that the annual losses of soil to erosion are worth US\$ 300 million. This is no small matter. Erosion is quite literally washing away the farmer's greatest asset. This is where mulch can have a significant beneficial impact.

A significant impact

Much of my work involves teaching farmers and home-scale gardeners to use mulch, presenting it as a solution to the problems mentioned above. Running workshops and teaching organic and conservation farming practices in the Cape Town area, South Africa, I challenge farmers to be part of a "mulch revolution". In October last year, we ran our first agricultural academy with nine students from across South Africa. Students saw at first-hand how to prepare and apply mulch and had discussions with farmers who regularly mulch their fields, and who have experienced massive increases in soil health and therefore in yields and profits.

So what is mulch? Put simply, it is the name given to any covering of the soil. Some call mulch "God's blanket" as it can be observed



Uganda farmers prepare the mulch

Insects play a key role in breaking down mulch, converting it into rich humus.

occurring naturally beneath plants and trees in wild areas. Natural mulches are made of straw, grass, leaves, crop residues, wood chips or bark, although some farmers use artificial mulches (such as plastic sheets, which are used by strawberry farmers in the municipality of Stellenbosch). In Khayelitsha and other South African townships, it is common to see old cloth and carpets being used.

In the Cape Town area the hottest months of the year are dry, often with strong winds - some reaching 50 km/h. The Mediterranean climate is a harsh environment for farming food crops. This is why many farmers focus on grapes and olives that are processed into juice, wine and olive oil. Those farmers who decide to grow vegetables and grass crops have a difficult time in the hot and dry summer. On our training farm, as elsewhere, the soil looks like the sand on a beach. This is where mulch is most valuable as it adds mass and body to the loose particles of sand. As it decomposes, we find the soil is full of valuable humus and organic matter. Einstein Sibanda, one of the farmers we work with, comments that mulch "keeps the temperature equal, so it keeps the ground warm, but not hot...and it preserves the water for a long time in the ground." The mulch ensures water retention in the soil, as it insulates the soil from the dry wind and hot sun.

An insect reservoir

In addition to the benefits generally seen (see box), mulch contributes to farming by repelling certain pests. Snail and slugs,



Farmer applies mulch to his field

for example, like to crawl along smooth surfaces, such as exposed soil. Covering the soil with dry and coarse mulch, such as crushed shells, oak tree leaves or wood chip, discourages these pests.

In addition to repelling pests, mulch also attracts beneficial insects. As mulch forms a warm, dark and damp blanket across the surface of the soil, it is an ideal habitat for beneficial insects. Without insects, the mulch would still have a beneficial effect through water retention, but insects play a key role in breaking down mulch, converting it into rich humus and improving the soil fertility, texture and structure. These benefits are clearer when looking at a farm where pesticides are used. Farmers who use chemical pesticides will find their mulch breaking down very slowly, remaining as a separate layer above the soil. By killing the insects the potential for mulch to enrich the soil is significantly diminished.

Together with earthworms (or annelids), the larva and adults of many insect species may be seen as a farmer's greatest ally. As they burrow down into the soil, they create tiny paths for water and air to travel to the plant roots, increasing aeration and water infiltration. Insects also create a system of tiny underground tunnels which carry rainwater down to the roots. These tunnels have a positive effect on the soil health, and help the development and growth of plants, particularly in heavy clay-based soils. In waterlogged clay soils, the tunnels help drain away excess water. The tunnels also carry oxygen to plant roots and to aerobic bacteria in the soil.

At a micro-level, the insects are constantly turning the soil and enriching it. One could argue that, after a few years of farming without artificial pesticides, the insects would be doing all of the fertilizing and ploughing, saving farmers much hard work and money as well as providing considerable environmental benefits.

Different benefits

Farmers recognise six major benefits in using mulch. Firstly, mulch protects the soil from erosion. Heavy rain is absorbed by the mulch, slowing down the water so that it can penetrate the soil gradually. This means that more water is absorbed by the ground and to a deeper soil depth. Plants then receive more water. Secondly, mulch protects the soil from temperature extremes and evaporation in hot weather. Mulch insulates the soil from both hot and cold temperatures. By using mulch, farmers can decrease the evaporation rate by as much as 40%, a huge saving.

Thirdly, the mulch protects the soil from "baking" in high temperatures and forming a hard crust. This means the soil always remains loose and friable, making ploughing less necessary. Mulched soil is light and rich in humus and organic matter. Fourthly, as mulch stops light from reaching the soil, it discourages the germination of weed seeds. This means there are fewer weeds to remove from the ground, again ensuring water and nutrients go straight to the crops and that there is less work to be done on the farm.

Fifthly, natural mulches will slowly break down and feed the soil with nutrients, increasing the soil fertility. It is like applying a layer of compost across the soil that slowly releases nutrients to the plants. Finally, mulch attracts insects to the soil, as the insects enjoy the moist warm space beneath the mulch that is rich in food.

A larger biodiversity

Like insects and earthworms, centipedes are another beneficial group that live in the mulch. These tiny creatures eat caterpillars, slugs and fly larvae, naturally protecting crops without using any expensive and harmful pesticides. Finally, mulch also encourages the growth of millions of micro-organisms in the soil. These microscopic "insects" are constantly breaking down organic matter and enriching the soil. One example is a group of beneficial nematodes or "non-segmented round worms" which occur naturally (and which in some cases are also commercially available). These beneficial nematodes live in the soil beneath the mulch and kill harmful insects such as fleas, termites and cutworm.

As part of our work we are looking at ways to measure these benefits. There is no doubt, however, that mulch is critically valuable for farmers as it decreases erosion, decreases water loss, and improves soil health. By covering the soil with a layer of organic matter, farmers are also creating a new habitat where beneficial insects can prosper. These insects, together with many other species of earthworms or centipedes, aid soil aeration, soil enrichment, and natural pest control. The Cape Town farmers who adopt mulching experience increased soil health, higher yields and higher profits, while farming in a way that is harmonious with beneficial natural systems.

◆
Sam Adams (info@startlivinggreen.co.za) runs a food security consultancy in Cape Town. He works across Southern Africa teaching conservation farming and sustainable agricultural systems to both rural and urban farmers.