Working with SOIL
Inspired by the work of Friedrich Wenz

By Peter Brown

As a farmer with cattle one has to learn how to care for a cow, what it needs to eat and drink and to ensure it has sufficient throughout the year, through all the seasons. It helps to know that a cow has a majestic system of four stomachs which enables her to eat roughage, such as hay and grass, and that she will soon die if fed on too much wheat or other cereals. This is because the rumen of a cow is full of bacteria, which digest the roughage, and the cow then digests and lives on the bacteria, a delicate balance that can easily be upset by feeding fast fermenting grain!

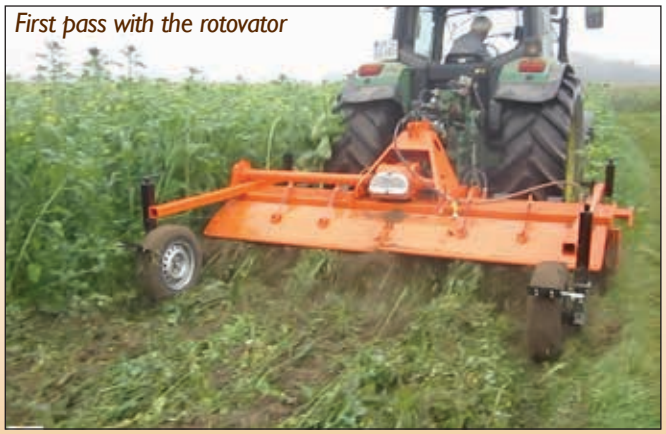
The same goes for beehives, one has to learn to think and care for the needs of the bees. One does not have to feed them like a cow but one should ensure that they have enough to forage on through the seasons of the year by planting appropriate crops and for the long term even trees.

We all have soil. We all have to learn to care for the soil like any other living thing and tend to its needs. Just as it helps to understand the principle of how the rumen works to care for a cow by feeding her appropriately, it helps to have some understanding of soil and how it works, that we can feed it appropriately too. One can look at the soil as simply a substrate to which one adds specific chemicals, not to feed the soil but to directly feed plants growing in it; or one can look at it, like a cow, knowing that the more and better you feed her the healthier and more productive she will be, the healthier and more productive will be the plants growing in that soil.

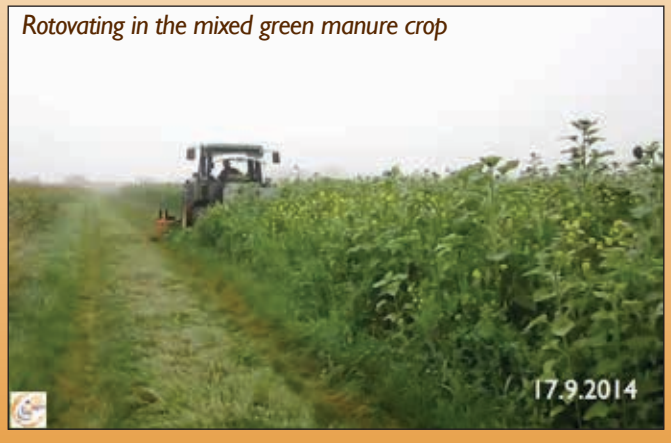
Friedrich Wenz and his father have farmed a 30ha arable farm for many years in Germany. Originally farmed conventionally, using chemicals and ploughing, the resulting problems they experienced then led them on a journey of first becoming organic and then biodynamic and completely changing and evolving their cultivation methods. This led to the development of the Eco-dyn, a minimum tillage machine and seed sower in one. The development journey of how best to care for the soil continues. Friedrich describes how not a season goes by when he has not made a mistake from which he has learnt something important. Despite having no livestock on the farm and not bringing in fertilisers from off the farm, their crops become ever better, bigger and healthier as the soil fertility continues to increase. This is a wonderful example of what can be achieved; producing high yields of the very best quality and without bringing in fertility from off the farm; truly sustainable biodynamic farming.

This is what all farmers want to achieve and I would like to share some of what I learnt from the presentation and workshops at this year's biodynamic conference

Friedrich Wenz standing in a green manure crop.



First pass with the rotovator



Rotovating in the mixed green manure crop

Showing how shallow the rotovator is being used.

'Biodynamic Agri-Culture: A Matter of Life'.

A fertile soil is all about building up and maintaining plenty of humus and that is all about the soil biology. It is important to see though that the biology is like the top part of a triangle which is built on the two solid legs of the soil chemistry and the soil physics, of its physical properties. If they are not right then the biology does not work properly; like a house it has to be built on good foundations.

SOIL CHEMISTRY

The soil chemistry, the balance of minerals in the soil, cannot be ignored and should be checked properly. This is not just about the major elements but also the trace elements. Again it is not just about the amount of individual minerals but also their proportions and relationships to one another, not just about deficiencies but also surpluses. If there is a problem with these then they have to be corrected in some way. Friedrich gave the example of sulphur which is a key element in the soil and particularly needed when growing legumes. Their soil had a bad deficiency of it and when they added just 25kg per ha the yield of their soybeans increased by 1,500kg per ha. Friedrich was not suggesting fertilising regularly out of the bag but of becoming aware of the problem and then finding a way to treat any deficiencies. This can be done by adding certain minerals or rock dusts to the soil or growing certain plants, but it cannot be ignored.

SOIL PHYSICS

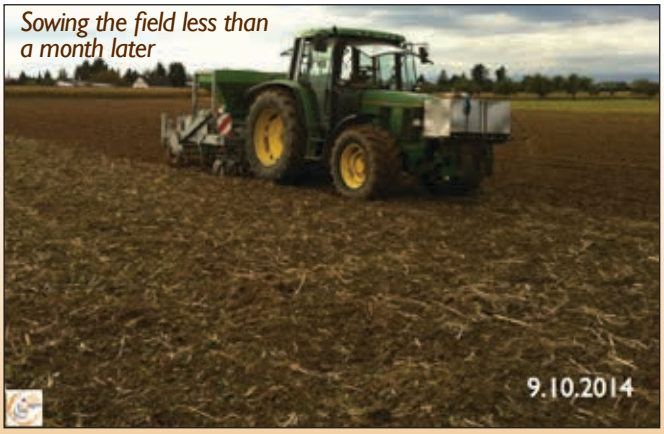
Different soils have different physical consistencies depending on their sand and clay content and how they are treated. A good soil has to have sufficient oxygen in it in for the microbiology and plant roots, which means having enough pore space in the soil and no compaction. A lack of air in the soil will lead to anaerobic conditions, which will cause the petrification of organic matter rather than the build up of humus and soil biology.

Soils lacking air or compacted can be caused by a number of things that have to be avoided, such as using too heavy machinery and high tyre pressures, using bad tillage techniques at the wrong time such as when it is too wet, chemical imbalances such as an excess or deficiency of lime and extreme weather conditions such as flooding.

SOIL BIOLOGY

Once we have established that the chemistry and physics are OK then we have the basis of creating a good soil biology. If we consider that a good biologically active soil has about 10 tons of soil life in the top 80 cm of soil, half of which we cannot see with the naked eye, it gives a good idea of what is involved in feeding it. 10 tons is equivalent to about 20 cows per ha when an average farm only keeps 2 cows per ha!

The big question is thus: With what and how do we feed this soil life?



Sowing the field less than a month later

The same on a larger scale!


A small scale harvester and muck spreader collecting mulch


Spreading grass/clover mulch on planted potatoes

Pictures @ Friedrich Wenz

This is what we are going to look at. It takes a lot of energy to feed the soil and it is provided by both living plants and dead plant residues. They feed the whole soil food web of different organisms including bacteria and fungi. They create the humus which stores the nutrients in a readily available form for the plants but without 'polluting' the soil water with nutrients.

Plant roots are crucial to feeding the soil life. The roots of plants do not just simply absorb food from the soil but they also secrete what are called root exudates into the rhizosphere, the immediate area around the roots. These exudates are complex and can be produced in large amounts and are different for each type of plant and even stage of plant growth. They feed the soil biota and can change the balance of the soil life communities and scientists still have a lot to learn as to how it all works. What is clear is that it plays a key role in the creating of humus in the soil as large quantities of nutrients are put into the soil by the plants, which have in turn produced them through the process of photosynthesis. Thus the sun's energy is converted into humus in the soil.

Therefore the way to increase the soil biology as much as possible is to produce as much of the exudates as possible which is to have as great a surface area of roots in the soil as possible. This can be done by having as many different plant species growing together creating plant communities so that the soil is penetrated to a good depth by both shallow rooting and deep rooting plants and their roots. One has to find what plant communities do best in a particular location, both for intercropping of the main crops but also for growing catch crops or green manures between harvests. It is important, for instance, to utilise the sun as much as possible for building up the soil by planting the green manure mixtures immediately after harvest. These will be worked into the soil before planting the next crop. A technique for this now being used is to use a rotovator with special 'L' shaped blades, but only going about an inch into the soil. A two or three foot high crop can be worked into the soil in this way.

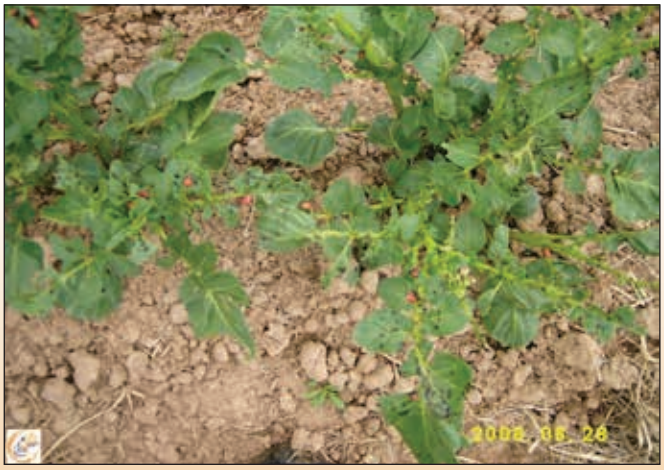
As well as the root exudates from the living plants there is also the organic matter from dying back roots and the green manures, which feeds the soil biology.

A biologically active soil is not only highly complex but is also a self regulating system. We can influence it to an extent by choosing the plant communities we sow, the methods of tillage but also by using for instance the biodynamic preparations or specific compost or plant teas.

THE AMAZING EFFECTS OF MULCHING

A fascinating part of Friedrich's presentation was about mulching. This was not about mulching in the sense of simply using physical material like paper or old straw to cover the earth to stop water evaporating or weeds growing but providing a high quality plant material which feeds microflora and fungi and indirectly the plants growing in the mulch. Coming back to the analogy of the cow, your cow will not give you much milk if you only feed her on old straw but if you feed her the best possible grass/clover mixture she will give plenty. Similarly, if you use a mulch of the best grass/clover mixture it will really feed the soil life and roots well and the crops growing in it will be extremely healthy. Frie-

Spread mulch after a few days



Potatoes with no mulch being eaten by Colorado beetles

2015 International Year of Soils

A field of healthy potatoes!

drich had a series of photographs, some of which are shown here, which show the mulching of part of a potato field with such a mulch spread by a large muck spreader. Where the potatoes had no mulch they were riddled with the Colorado potato beetle and yet where the mulch was, there was no beetle to be seen except where tractor tracks from the muck spreader had driven on a row causing compaction. The potatoes also had a better colour and the losses in the potato store over winter were almost nil compared to the potatoes without a mulch. Another benefit was that after planting the potatoes and putting on the mulch and the BD preparations nothing further had to be done to the field in the form of weeding etc. until they went in to harvest the potatoes in the autumn.

The effects of such a mulch on the soil fertility lasts for more than that year, but it needs the harvest of a cut of grass/clover from about 3ha to give sufficient mulch for 1ha of potatoes.

Friedrich also showed another example of mulching with good quality clover/grass, but this time in polytunnels on very poor soil. The tomatoes planted in the mulch were outstanding, completely disease free and with no fungal problems despite the watering being done from overhead. A drip system of watering does not work when using such a 'feeding' mulch, because one needs the moisture between the soil and the mulch to allow the fungi and bacteria and soil roots to do their job.

Although I have been farming and gardening for many years I learnt a lot from the workshops and went away keen to try out some of what I had learnt.

Learning to deal with soil as a living entity is just like learning to make good compost and is an art, but one that we can learn without too much effort, particularly if we understand on a basic level how it works. This is very different to treating soil as a chemistry set on an industrial scale.

We are intending to bring Friedrich Wenz over to the UK this 'Year of the Soil' to give us some workshops for interested gardeners and farmers. Keep an eye on our website for dates.

The same crop on 12.6.05

The crop on 8.9.05

Tomato plants transplanted into a grass/clover mulch.

The crop on 10.7 and 26.7.05