Session 3: SUSTAINABLE PRACTICES

Objectives
1. To understand the basis of sustainable agricultural practices.
2. To understand why soil needs care and feeding.

Sustainable agriculture does not mean new agricultural practices but rather putting in place practices that were being used before the introduction of chemical fertilisers and synthetic pesticides. By joining the knowledge of farmers and scientists these indigenous ideas are constantly being improved.

Adding organic matter to the soil

You might have experienced or heard that the high yields of conventional farming tend to decline after a few years. The reason for this is usually the loss of organic matter in the soil. The presence of organic matter in the soil is fundamental in maintaining soil fertility. Therefore, we need to add organic matter to the soil as a first step to increasing productivity of the soil.

What is organic matter in the soil?

Organic matter in the soil consists of fresh organic matter and humus. Fresh organic matter is plant and animal waste that has not yet decomposed such as roots, crop residues, animal excrement and cadavers. The fresh organic matter is transformed by organisms living in the soil into humus.

What is humus?

Humus is organic matter that has been broken down in such a way
that the original material cannot be recognised anymore. Humus gives
the soil a darker colour and can hold a lot of water and nutrients.
Together humus and the fresh organic matter are what we call the
organic matter in the soil.

Humus is the home of many forms of life. In humus you will find
organisms such as fungi, bacteria, insects and worms.

**Why is humus important?**

The organisms in humus are all involved in the breaking down of
organic matter and the building of humus. This life is necessary for
a healthy root development of the plant. When plant roots are
healthy, the leaves, fruits and seeds will also be healthy.

It is the presence of humus that gives soil its tilth and fertility. When
soil is rich in humus we observe a large amount of soil sticking to the
root hairs. This shows the interaction of the root hairs with the soil
in which the microbes are active. Without humus, soil is lifeless, hard
and unproductive. When soil lacks humus, we see that only a little
soil sticks to the roots.
<table>
<thead>
<tr>
<th>Soil with humus</th>
<th>Soil without humus</th>
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<tr>
<td>will hold more water, much longer and it will stay crumbly when wet.</td>
<td>will grow plants that are more easily diseased and attacked by insects.</td>
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<tr>
<td>A soil that lacks humus dries out fast.</td>
<td>A soil that lacks humus tends to become waterlogged under wet conditions.</td>
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**What are microbes?**

Microbes are living organisms so small that they cannot be seen by the naked eye. Microbes can also be called micro-organisms. Without the microbes the roots can not dissolve nutrients from the soil particles. Humus is the home of microbes. When we apply humus to the soil, we increase and enrich the home of microbes. In such an environment microbes will multiply abundantly and they will be active in dissolving plant nutrients and food in soil particles, store it in the humus and then pass it on to the plant roots.

**Why are microbes important?**

In short, microbes help make the nutrients in the organic matter available to the plants.
Why is it important to have organic matter in the soil?

The presence of organic matter in the soil is necessary for maintaining soil fertility. Each time the organisms break down organic matter there is a release of nutrients. Organic matter also has a great capacity to hold nutrients and water. This means that in dry periods more water is available for the plants for a longer time. Organic matter is especially important in sandy soils because sandy soils hold very few nutrients and little water.

Organic matter can also improve the soil structure. This is important for both sandy and clay soils because they have poor structure.

Why must organic matter be added to the soil?

Each time there is a break down of organic matter there is less organic matter in the soil. This means that the first step in maintaining soil fertility should be directed at maintaining the organic matter of the soil.

How can organic matter be maintained in the soil?

Soil fertility and organic matter can be improved by:

• Adding compost to soil.

• Crop rotation and intercropping: Growing soil improvement plants, shrubs and trees – especially legumes.

• Liquid fertilisers: Adding leaf or manure tea to soil.

• Mulching: Covering the ground with organic material such as crop residues, straw or leaves.
Why use organic fertilisers instead of chemical ones?

Chemical fertilisers can restore the soil fertility very quickly because the nutrients are available to the plants as soon as the fertilisers are dissolved in the soil. However, these fertilisers do not improve soil structure. They correct a specific nutrient deficiency. It is true that it takes much longer before organic matter is transformed into humus and before nutrients are released, but on the other hand, organic matter continues to improve soil fertility and soil structure for a long time.

Chemical fertilisers are also easily leached out of the soil. It is in fact a waste of money to apply chemical fertiliser on soil that is poor in organic matter if it is not done in combination with measures to increase the level of organic matter in the soil. Money is actually a strong reason for producing your own organic fertilisers. Chemical fertilisers are expensive to produce and therefore expensive for you to buy.

Another strong reason for using organic fertilisers is the care for the environment. When chemicals leach, they lead to pollution of wells, rivers and dams. Some fertilisers also kill the good soil organisms, the earthworms and fungi that produce humus. Crops produced in poor soil also lack the natural health and resistance, therefore ever-increasing quantities of pesticides are needed to protect them. The loss of organic matter in the soil may also lead to soil erosion. In such a situation, ever increasing amounts of synthetic fertilizers are needed if production has to go on. These practices are at the expense of the soil, people and the environment as they lead to pollution.

The quick fix of chemical fertilisers can also become a problem for the quality of your produce. If you apply too much chemical fertilisers your plants might grow too fast. Too much nitrogen will encourage vegetative growth at the expense of fruiting. Leafy plants also tend to be more susceptible to pests and diseases.
Pest and disease control

Many plant diseases are related to poor soil fertility. If soil fertility is poor, crops lose their vigour (health) and become susceptible to diseases and pests. By improving the soil, you reduce the losses to pests and diseases.

Another way of increasing production is by controlling pests. This can be done by encouraging the growth of trees and bushes in areas that will not be cultivated. Here insects, lizards, bats and birds will find a suitable place to live. These good predators help in pest control, as insects are part of their diet. If you control pests, you also reduce diseases because pests are also responsible for spreading diseases.

It should be noted that the use of insecticides may kill the useful predators as well as the harmful insects. Therefore, all forms of insecticides should be reduced or totally eliminated. This Study Circle will be looking at ways of controlling pests and diseases without the use of harmful chemicals.

Observation

Observation is an important farm management tool as it forms the basis upon which all decisions on the farm are made. A good farmer must take time to observe what is going on so that he or she can make sound decisions. This will ensure that farming not only becomes interesting, but also rewarding as you take an interest in what is changing around you. A slow walk around the farm will ensure that swarms of insect pests do not take you by surprise as you monitor their numbers and it will make it easier for you to know when to spray or completely remove the crop. Observations should be recorded/written down where it is possible as the information might prove to be useful in the future. For example, if you are using natural pesticides, you may want to know later how well they worked and against which pests.
Good predators

The figure above shows four good predators and where they live. Identify them and give examples of the pests each predator helps to control.

1. **What happens when you grow maize continuously on the same field?**

2. **What changes do you notice in the soil?**

3. **Is the presence and incidence of diseases and pests changing over time?**