ORGANIC FERTILIZERS AND THEIR USAGE

INTRODUCTION

The EU endeavours to follow the principles of sustainable agriculture and highlights the significance of soil protection. Our most important natural resource is the soil that is why it is crucial to save and protect it considering the present and also the future. It is the task of the farmer to preserve the humus topsoil and maintain of increase its organic matter contents, to improve the nutrient providing ability and carry on an environment-friendly nutrient management.
To reach the above-mentioned goals the usage of organic fertilizers came to the forefront again as opposed to the excessive use of chemicals. They have particular importance in ecological (organic) farming, because the use of chemicals is forbidden there.

AIM

The objective of the curriculum is to present the organic manures (based on their classification and their characteristics) as well as their use in agricultural production.

TRAINING HOURS

There are three classes for teaching the theory of the topic.

EXPECTED RESULTS

When having got acquainted with the usage of organic manures farmers are expected to apply more soil-protective methods and nutrient-replenishment technologies in plant production and that will load the environment less.

CONTENTS AND BEST PRACTICES

The organic fertilizers might as well be considered as soil improving matters, since they increase the macro and micro element contents in the soil as well as the organic matter and humus contents, the biological activity and improve the physical-chemical characteristics. These effects are especially conspicuous in poor quality soils, but the best quality chernozem soils need them too.

The organic fertilizers can be grouped as follows:
1. Manures and composts
2. Green manures
3. Plant, stubble and root residues
4. Other fertilizers

1. Manures and composts

Out of the organic fertilizers the good quality *manures*, which consist of the solid and liquid faeces and litter, are at the first place. The fresh manures from the stock-yards cannot be used immediately, because the good quality is provided by the suitable storing and curing. The purpose of curing (fermentation) is to humificate the components of the manure, the straw would decay, and the manure would be a homogenous, loose mass to ensure even distribution. Fermentation is done by micro-organisms and during the process the high temperature sterilise the manure, at the same time the contents will get more favourable indicated by the adequate (20:1) ratio of C:N as well as the water content reduced down to 60-70 %. At the beginning the manure is harmful for man, animals and environment this is why its fermentation and storage are regulated by strict laws in the EU member states. These also apply to transport and distribution. Besides the physical-chemical-biological effects the absorbable nutrient contents cannot be neglected either.

Here is an example for good quality cattle manure (kg /10 t):

	N	P_2O_5	K_2O
First year	15	20	40
Second year	15	15	20
Total	30	45	60

In addition a significant amount of mezo- and micro-elements get into the soil (15-40 kg Ca;10-30 kg Mg and S; 2-4 kg Fe; 0.5-1 kg Mn, Zn and B, 0.1 kg Cu), the artificial supplement of which would be very expensive.

The manure of the different species can be composted or dehydrated as well; the latter is particularly frequent in case of poultry manure.

In case of water-rinse animal keeping where no litter is used, *slurry* is formulated. The slurry is harmful for health and environment even after the compulsory treatments this is why its use is possible only after keeping some strict regulations.

Compost can be produced from the waste originated from food industry, industry or agriculture as well as organic materials from farms and also from peat. During closed system composting biogas can be extracted.

Composts do not nearly reach the nutrient contents of manures, but the physical-chemical and bio-dynamical effect on the soil is more powerful.

Worm humus can also be mentioned here.

2. Green manure

Green manures have a past of several thousand years; however they were effaced by the spreading use of manures in the 19th and by chemical fertilizers in the 20th century. Due to the objectives mentioned in the *Introduction* the significance of green manures increased again in the third millenary. Certain EU supports even determine the use of green manures as a prerequisite (e.g. agri-environmental supports)

Green fertilizing is a method of organic fertilizing when a plant is produced for the purpose of turning its whole mass into the soil as a fertilizer before it begins to bloom. It can be grown as primary or secondary crop. As a result warming and drought due to climate changes the secondary crop does not always produce a sufficient quantity of fresh mass, although its effectiveness depends on that.

Any plant is suitable for green manure that gives a sufficient amount of fresh mass under given climate and soil circumstances and the sowing seeds are not too expensive. Using Nitrogen collecting plants *Papilionacea* has a particular advantage, since they help to distribute as much organic material and Nitrogen into the soil as 10-16 t/ha manure could provide. These plants can be *Lupinus alba, Melilotus albus, Vicia ssp. and Lotus corniculatus***.** The *Cruciferae* (e.g. *Raphanus sativus L. convar. oleiferus, Brassicae*, *Canola)* are soil protective with deep taproots leaving the growing layer back in excellent physical and biological condition. Mentioning other plants, *Phacelia tanacetifolia* is very popular in vegetable growing, because it has, similarly to the *Raphanus sativus L. convar. oleiferus,* an eelworm-killing effect.

Green manure growing often serves soil protection on loose or aslope soils. For this purpose the wintering plants such as rye *(Secale cereale)* or a mixture of rye *(Secale cereale)* and *Vicia villosa* are particularly suitable.

Using green manure do not increase the nutrient contents of the soil (except *Papilionacea* plants), but the crop-increasing effect is clearly justified. The biological culture condition, the structure and the physical-chemical characteristics of the soil are improved. Green manures provide protection against weeds, and the deep roots improve the water balance of the next plant sowed in that soil.

The *green fallow (fallow covered with vegetation)* also must be mentioned as a process with the purpose of conditioning the soil for one or several years. Mostly a special seed mixture is sown and the *green fallow* at the harvest has the same features as the green manure. The *green stubble* and the *volunteer seedlings* are also beneficial for the soil in case they produce a sufficient amount of fresh mass.

3. Plant, stubble and root residues

Out of the fertilizing materials listed here it is the root residues that have the greatest importance. The roots of cultivated plants play a significant role in the maintenance of the fertility, digestion of nutrients and improving the structure of

the soil. They have a great advantage on the organic manures that they homogenously net in the soil and in this way the organic material distribution is even. The digested nutrients keep transforming and they are continuously available for the plants. The amount of the root residues is considerable, in the upper 200 mm layer of the soil expressed in dry matter per hectare the values are the following: autumn cereals 1200kg, spring cereals 900kg, peas 600kg, maize 2500kg, sunflower 3900kg, alfalfa 2 year 8300kg and alfalfa 4 year 10200kg.
Beside the roots the stem residues also have a remarkable role. The amount is influenced by the sowing density and the stubble height. On average, the stubble residues come up to 30-50 % of the dry matter in the roots.
It is the root and stubble residues of the perennial *Papilionacea* that is especially valuable, it equals a whole dose (30-40 t/ha) manure. The organic residues of the annual *Papilionacea* also have favourable effects, although their quantity is smaller than that of the perennial ones, however, due to their good quality (wide N:C ratio), they equal half a dose of manure.
Plant residues can be the straw, corn stem, sunflower stem etc, when they are turned into the soil. Previously they were utilised as litter of food for animals or used for heating; today bio energy can be gained from these by-products.
In those countries, where the animal stocks are decreasing there is no sufficient amount of manure. Even in case of production technologies using chemical fertilizers it is necessary to provide organic material supplement and for this purpose the locally provided by-products are most suitable. One important principle is after the harvest the organic materials that remained back have to be turned into the soil as soon as possible.

4. Other fertilizers

Turf (peat) is also suitable for organic fertilizing but primarily to correct the harmful characteristics of manures and sub serve composting. Its advantages are the great hygroscopic ability and bactericidal effect, which facilitate the use of malodorous materials and the considerable decrease of the number of pathogens. Turf also diminishes the nitrogen loss of the manure. The exploitation of peateries are allowed only under strict regulations.
The *sludge* gained from communal wastewater by purification is also valuable organic fertilizer in case it does not contain harmful materials. Its use is impeded by its great water content that is the reason why it is sold mixed with turf and composted. Turf disinfects it as well.
The inhabitants of the coasts have been using the nutrient supply of the *algae* (*fucaceae* and *sea-weed*) to improve the soil for centuries. The N, P, K contents of the algae is 1-2 % but their micro-element content is valuable. There are two types of algae-products sold in Europe: one is *calcareous algae*, the other is a liquid product made of dried *green and brown algae*. The ordinary dose of *calcareous algae* is 400-600 kg/ha, with the effect of an average 10-15 % increase of the crop. Fresh green and brown algae contain a great number of

micro-elements, growth hormones and vitamins. They are available in shops as foliar fertilizers such as *Bioplasma*.
Bacterial fertilizers are not novel, however brilliant achievements of science. Their principle is to beneficiate the flora of the free living, nitrogen-fixing bacteria in the soil, so the use of chemical fertilizers containing nitrogen is unnecessary.
One well-known product is the *BioNitroPhos*, which has the following advantages:

- the bacteria-product contains cellulose- and lignin-degrading fungi
- lignin is the main component of humus, this is why it is important to degrade stem and root residues,
- it is produced weekly only on order, so it can preserve its quality,
- environmentally friendly solution,
- improves soil structure,
- phosphorus digestion according to demand,
- 50-60kg nitrogen active agents develop in the soil when applying a dose of 10 l/ha; this amount from a chemical fertilizer would cost twice as much.

The secret of the effectiveness of bacterial fertilizers is in their freshness (living products) and in their immediate turning into the soil (they are UV sensitive).

REFERENCES

The pictures below are about the various types of organic manures.

Phacelia (green manure)

Lupine (green manure)

Oil radish (green manure)

Bulk compost