Fertilisation with organic matter : soil enrichement for the pasture

Fertilising using organic matter recycles animal waste (manure or liquid manure) or plant waste back into the soil, while restricting the need to use chemical fertilisers. Autumn is the best time to enrich pastures with organic matter. Winter humidity will help the organic matter spread on the fields to penetrate the soil. Organic enrichment improves the structure of the soil, and brings fertilising elements for the future development of plants.

by **Pauline DOLIGEZ** | 14.11.2016 |

Technical level

Fresh compost maturing (100 % horse manure) © IFCE

Definition of organic enrichment

What is organic matter ?

Mature compost, horse manure
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Organic matter is made up of carbon molecules (C : Carbon) associated to the folowing chemical elemnts : H (hydrogen), O (oxygen), N (Nitrogen). Organic matter is produced by animals and plants, and is made up of decomposing residual waste from animals and plants, or macro-molecules from structurally evolved matter such as humus

What is organic soil enrichment ?

Organic enrichment is a stable product from composting, or from a mixture of plant waste, and fresh more or less stabilised products such as farm effluents (liquid manure, manure….)

Soil enrichement = fertiliser for the soil

Fertiliser= Fertilising elements for the plant

Why provide the soil with organic enrichement ?

The action is threefold :

- **Soil enrichement** : The effect is to add structure to the soil. It increases the Capacity of Exchange of Cations (CEC) and the useful reservoir (Capacity of the soil to retain water). It contributes to soil fertility.
- **Fertilising** : It provides the elements N, P and K, as well as the micro-nutrients the plant needs to develop and grow.
- **Living matter** : it is composed of micro-organisms (bacteria, fungus,….) which will contribute by mineralising organic matter, i.e transforming it into nutritive ions (NO^{3-}, HPO_4^{2-}) for the plant.

Manure is best spread on mowed fields used for hay, as fodder exports mineral elements, whereas grazing animals will restitute organic matter in the form of droppings and urine.

What type of enrichement should be provided ?

The main humus-rich enrichements which can be spread on fields, are manure and manure compost. The level of decomposition of plant or animal waste used as soil-enrichement is variable. A laboratory chemical analysis (~30 to 50 €) is advisable, to have a good idea of the agronomical worth of the product to be spread.

Spreading manure

Heterogenous manure © IFCE

Manure is a heterogenous compound of droppings and straw, more or less soaked in urine. The composition, and fertilising value depends on the type of bedding used, the proportion of straw, the way the horse is stabled, and the way the manure is stored in a manure pit.

Spreading manure entails less work than implementing a compost heap. Nevertheless there are more drawbacks :

- The produit has not been de-odorised. It can contain pathogens (eggs of digestive parasites).
- Ammonia loss when spreading manure is greater than when spreading compost.
- It is difficult to break down manure in a homogenous fashion, and straw decays slowly on the ground. This can give rise to a deterioration of the plant cover, and loss of palatability for the animals. The distance from third party dwellings is regulated to 50m.

Spreading compost

Fresh compost maturing (100 % horse manure) © IFCE

Compost is a soil enrichment made up from stable humus and fertilising elements (N, P, K, Ca, Mg). It is de-odorised and there are no problems relating to palatability of the pasture for animals. Animals can be returned to the pasture 3 weeks after spreading.

It is also exempt from pathogens (such as Parascaris and Rhodococcus) and seeds from weeds. This is due to sanitising which occurs through increased temperatures, and the fermentation process.

Compost has a finer texture, which allows for regularity in spreading, and fast penetration into the soil. Compost is less bulky,and easier to spread than manure.

Value maximisation of organic matter through composting

Appropriate type of horse manure for compost

Horse manure is the only manure suitable for composting, providing it contains enough fecal waste (« Ripe » manure, soaked in urine and droppings)

If there is a lot of straw in the manure, it will either need dousing down, or mixing with other more fermentable matter (mown grass, liquid manure….) before composting, in order to obtain the required C/N and water content necessary for efficient composting.

Manure containing a lot of straw, Composting difficult without adding anything © IFCE

« Ripe » Manure, efficient composting, no addition needed © IFCE

Examples of agronomical values of horse manure and horse manure compost

	Manure (per gross kg)		Compost (per gross kg)		
	With high straw content	« Ripe » from a week's accumulated stabling	Minimum	Maximum	Average
DM (dry matter	66,4	42,1	38	45	41
OM (organic matter)	54,6	18,4	11	17	14
pH	7,6	8	7,7	8	7,7
C/N	37,2	17,7	14	18	16

Total N (nitrogenous fertiliser)	8,7	6,2	4,1	6,2	5,2
P_2O_5 (phosphorous)	3,7	3,1	2,9	4,6	3,7
K_2O (potassium)	17	12,2	5,4	10,3	7,9
MgO (magnesium)	1,8	1,1	1,2	2,1	1,6
CaO (calcium)	6,7	6,9	7,7	16,4	12,1

Windrows of manure in a field after two months in the manure pit (end of winter) © IFCE

Turn the manure twice with a composter© IFCE

Spreading in Autumn © IFCE

Example of compost utilisation on a field

Spreading 15 to 20 tons/ha of manure or compost is required to cover the needs to upkeep average natural pasture land, producing 6 tons of dry matter. This is for a compost based on horse manure, with the following agronomical values (kg per ton of gross product) :

- N : 5,2
- P : 3,7
- K : 7,9
- Ca : 12,1
- Mg : 1,6

When spreading 15 tons per hectare, the value measured in agronomic units is the following :

Fertilising worth	Number of units added (kg/ton)	Equivalence / chemical fertilisers, and notes
N	78 units	• In organic form freed progressiveley • **10 - 20 units** are avilable in the first year, **then 10** units available the second year • The carry-over effects will increase mineralisation of organic matter. This enhances biological functionning of the soil. • Ammonitrate fertilisers (Chemical N) can therefore be used in the first two years.
P	55 units	• Equivalent to the agronomic value of **120kg of monocalcium phosphate superphosphate 45 %**
K	120 units	• Equivalent to the value of **200 kg potassium chloride**
Ca Mg	180 units 24 units	• Equivalent to the agronomic value of **400 kg calcium carbonate** (CaO = 50 - 55%), Mg included.

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