BEST PRACTICE GUIDE FOR COMPOSTING IN MEDITERRANEAN AGROSILVOPASTORAL SYSTEMS

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Best practice guide for composting in mediterranean agrosilvopastoral systems

What is compost?

Compost is a **product** obtained from different **degradable organic wastes**. It is used as a natural fertilizer to enhance the soil quality with organic matter and key nutrients for plant growth and development. Compost is obtained from a process called composting.

Composting is an **aerobic biological process** that, under conditions of aeration, humidity, and controlled temperatures, combining mesophilic (medium temperature and humidity) and thermophilic (temperature above 45ºC) phases, transforms degradable organic waste into a **stable and sanitized product** that can be used as fertilizer or substrate (Negro, 2000).

For composting, degradable organic waste can be used, for example, pruning waste, leaf litter or other plant residues, manure, old straw and hay, fruit and vegetable waste, etc.

What are its benefits?

Among the benefits of the composting process, we can highlight:

Soil quality improvement:

Compost is generally used as an organic amendment, providing an increase in the soil's organic matter content. Similarly, this increase generates some soil improvements such as: improve abundance and diversity of edaphic microfauna, better substrate stability, increase its permeability and water retention capacity, increase the levels of macronutrients (NPK) and micronutrients (many already assimilable by plants), decrease the carbon/nitrogen (C/N) ratio stabilizing nitrogen content, better cation exchange capacity of the soil, enhance the biological activity and the appearance of humus which means general improvement of soil fertility.

Easy handling

Compared to the handling of other products, compost has qualities that facilitate its use and application, such as: low weight, volume and quantity of water, absence of bad odors, low possibility of contamination by nitrates and possibility of application at any time of the year due to its storage capacity without degradation of its qualities.

Destruction of pathogens and decrease of plant competition:

During the development of compost, the high temperatures reached during its thermophilic phase generate the elimination or destruction of pathogenic bacteria, parasite eggs and weed seeds present. The result is a natural product (humus) which provides greater fertility and stability to the soil, in many cases acts as a bactericide and fungicide without containing chemical compounds.

Economical:

There is a large market for the sale of this product. However, the purchase of compost for farms with agrosilvopastoral systems is not necessary, since compost can be made from the same manure and pruning wastes generated on the farm. In addition, this leads to a reduction in the costs derived from the purchase of fertilizers for the soil and the management for the disposal of pruning and manure residues from the farm.

How is compost made?

Composter

To generate compost, we need a compost bin in which we can pile the organic waste and facilitate the composting process. Plastic compost bin can be purchased in specialized gardening stores, but it is also possible to **build a compost bin from pallets** (Picture 1).

Picture 1. Pallet compost bin. Own source.

The compost bin should have a good ventilation system and a top closure system or cover to prevent flooding from rain. In addition, it is worth **to locate it in a place of easy access and under a tree**, so that the shade of the tree protects the compost from the sun in summer and from the cold in winter.

Compost

Composting is a process in which a series of **oxidative biotransformations** like those occurring in the soil take place. These biotransformations act on organic matter by mineralizing the portion that is more easily assimilable by microorganisms and also by humidifying the compounds that are more difficult to process.

To facilitate these processes, it is desirable to make a **varied mixture of organic materials**, as **shredded** as possible (especially pruning wastes). It is important to place in the first layer a bed of branches and straw that permits the **aeration** of the compost and the access of microorganisms. The ratio between wet and dry material inside the compost bin should be 2/1 and whenever new waste is introduced it should be mixed with the old waste. In the same way, the more often the whole pile is mixed, the faster the process will advance, because we will be facilitating the aeration.

The **result** is a partially mineralized and humified product that can experience successive slower mineralization once incorporated into the soil (Peña, 2002).

Composting phases:

Mesophilic phase:

Initially, the waste is at air temperature, then the microorganisms grow, and the temperature rises considerably, after a few days it reaches 40ºC and decomposition of soluble compounds occurs during the first 2 or 3 days.

Thermophilic phase:

There is a constant increase in temperature because of the intense biological activity, it can reach a maximum of approximately 70 or 80 ºC. At this phase most of the cellulose is degraded, the initial microorganisms die and are replaced by others resistant to that temperature. From 60 ºC, thermophilic fungi stop their activity, and the reaction is carried out by spore-forming bacteria and actinomycetes. Next to this phase, the heat generation equals the rate of heat loss at the surface of the piles, marking the end of the thermophilic phase.

Cooling phase:

Period in which the rate of decomposition decreases and the temperature decreases, stabilizing at values close to that of the environment; then there is recolonization of the compost by organisms that cannot resist heat (ants, worms, etc.).

Maturation phase:

The temperature is equalized to the environment temperature.

We can determine that the **composting process** has been carried out **successfully** when we observe that: the bad odor has been lost and the current **odor** is similar to **wet soil**, when the **color** of the final product has **darkened** with respect to the initial one and the temperature has **stabilized** (Picture 2). This determination is based on a simple physical test; however, there are numerous tests of greater complexity that more accurately determine the end of the composting process.

Picture 2. Fresh compost that can be applied to the soil. Own source.

How is it applied?

Compost is usually applied **on the soil**. **Spring and autumn** are the optimum periods for its application (Picture 3). Compost can be placed around plants as a mulch or buried on the surface as a green fertilizer when tilling the soil. It can also be mixed with soil and sand as a substrate for seedlings or for planting trees and shrubs by applying it in the planting hole.

To carry out the application of compost it is important to take into account factors related to the land. It is not suitable to apply it on land with a steep slope or in places where a stream can cross and wash away all the nutrients. These measures are taken in order to avoid fertilizer losses and to allow the fertilizer to remain in the soil long enough to adequately feed the plant species.

Ilustración 3. Aplicación de compost en campo de cultivo. Fuente propia.

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