

# GUIDE TO THE REUSE OF PRUNING REMAINS IN MEDITERRANEAN AGROSILVOPASTORAL SYSTEMS

**LIFE REGENERATE** (LIFE16 ENV/ES/000276)




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**Guide to the reuse of pruning remains in Mediterranean agrosilvopastoral systems**

The dehesa is an agroforestry system resulting from the clearing of the Mediterranean forest with the aim of favoring the production of pastures and acorns, the main food resources for livestock; and firewood for fuel. It constitutes the most characteristic and representative agrosilvopastoral system in Europe with 3.5 million hectares.

The trees are an essential component of the dehesa with very diverse functions that can be classified into two large groups: functions with a stabilizing purpose of the system and productive functions. Thus, the trees are a source of food for livestock (acorns and leaves) and forest products such as firewood and cork.

Forestry commercial productions, such as cork and firewood, show a decreasing trend as sources of income for the land owner. Tree pruning and scrub cutting also tend to disappear: they have evolved from being a traditional product that generated income for the dehesa owners, to being a by-product that is difficult to manage and market.

Pruning generally provide three types of usable products:

- Thick firewood: used as fuel, it is the product with the highest economic value, although its price has progressively decreased due to the existence of other, more convenient sources of energy. Its destination is the sale or own consumption for heating.

- Fine firewood: traditionally used for the manufacture of "picón", with domestic use as fuel in rural areas. Its production has practically disappeared today. The most viable alternative is its use as a source of biomass for heating boilers.

- Sprigs: it is offered in situ and fresh to ruminants, especially cattle, for them to consume the leaf and, at the same time, facilitate the elimination of remains. Once used, traditionally the remains are piled up and eliminated, generally by burning, although sometimes it is chipped or for use.

## What possible uses does the pruning remains have?

- Composting.
- Production of biochar.
- Reduction of erosion by surface runoff.
- Helps in the regeneration of trees.
- Production of edible mushrooms.

## 1. COMPOSTING

### What is compost?

Compost is a product obtained from different degradable organic waste, such as leaf litter, pruning remains and other treatments of vegetation, manure and other droppings, animals, straw and old hay, remains of fruits and vegetables, etc.

### How is it made?

There is commercial compost on the market, however, the acquisition of compost for farms with agrosilvopastoral systems is not necessary, because with the same manure and pruning waste generated on the farm, compost can be made, reducing the costs derived from the purchase of fertilizers and management for the elimination of pruning remains and manure from the farm. To speed up the composting process, the pruning remains can be chipped using specific machinery: if this is not available or the cost is high, smaller sized pruning remains should be used.





*Figures 1 to 3: Chipping of pruning remains with specific machinery.*

Plastic composters can be purchased at specialty garden stores, but composters can also be built from wooden pallets.




*Figures 4 and 5: Composters; compost ready for use.*

The time required to obtain compost with fine pruning remains is long, normally greater than 7 - 8 months. Once it is ripe and no undecomposed material can be seen, its texture is earthy and its color is dark.

### What is it for?

It is used as a natural fertilizer in order to enrich the soil with organic matter and essential nutrients for the growth and development of plants, since it provides mineral elements (nitrogen, phosphorus, potassium, etc.) in addition to favoring the water retention capacity.





*Figures 5 and 6: Application of compost on farmland*

## 2. PREPARATION OF BIOCHAR

Pruning remains, which until recently were considered a problem for producers, have become a valuable resource to make solid biofuels in the form of pellets, briquettes or chips. However, often the difficulty of accessing machinery to crush or transport these remains is high or very expensive.

### What is Biochar?

remains or forest cleaning and other organic waste that contains carbon: These plant remains are introduced into a deep cone-shaped oven that allows the charcoal to be produced over an open fire, which guarantees a very pure burning with few smoke emissions. The minimal presence of oxygen (pyrolysis) and high temperatures (between 500º and 700º) minimize carbon losses from the process. This characteristic makes biochar considered a carbon sequestration element.

### What are biochar applications?

Its applications in livestock, agriculture and as a soil improver are diverse:

• As litter or bedding for livestock, reducing odour, humidity and the presence of insects.

• As a manure treatment, reducing decomposition and the presence of pathogens in the slurry ponds.

• Applied to soil, it increases the efficiency of fertilizers and improves the quality of pastures; reduces compaction, improves soil structure and serves as a store of water and nutrients for plants.

• As a carbon sequestrant in agricultural soils, both in crops and pastures.





*Figures 7 and 8. Preparation of biochar in an oven with pruning remains.*

## 3. FIGHT AGAINST EROSION

### What is erosion

Erosion is the wearing away of the earth's surface by the action of natural forces. It is a common phenomenon that occurs regularly in most areas dedicated to agriculture. It can be of various types (hydro, wind, gravitational), although the most frequent in the Mediterranean basin is hydro. Water erosion depends on precipitation patterns, soil properties, slope and vegetation cover. In general, the most serious erosion occurs when the rains are of relatively short duration, but of high intensity. The strong action of raindrops added to an amount of water greater than the soil can infiltrate can produce large volumes of surface runoff and soil loss.

### How can it be avoided or minimized?

To reduce these soil losses, the land can be covered with organic plant debris such as straw, leaves and pruning remains, which dissipate much of the kinetic energy of raindrops, reducing the separation effect of soil aggregates, reduces the speed of water flow over the ground and favors sediment retention. In areas affected by surface runoff, smaller pruning remains and

sprigs already used by livestock can be used to "fill in" gullies: the remains spreads along the bottom and side walls of the gully: this ensures that animals do not enter the gully, reducing the erosion generated by trampling and allowing the grass to grow (since it cannot be consumed by livestock) and its root system provides greater support to the ground. In addition, the organic remains decompose, increasing the organic matter of the soil and its capacity to retain carbon and water.





*Figures 9 to 11: Gully in which remains of pruning have been deposited.*

## 4. HELP IN THE REGENERATION OF TREES.

The natural renewal of trees in the dehesa is a complex, slow and unpredictable process due to multiple factors, but fundamentally grazing and occasional agricultural use. It is thought that regeneration does not occur because the cattle consume all the acorns and seedlings, but the exclusion of the cattle to promote regeneration does not always guarantee it, since there is an additional limitation related to the dissemination of acorns: in the dehesas the acorns are not moved to safe places because they do not exist (scrub areas) or because there are no animals that spread them, dying under the canopy.

In areas where there is little or no scrub, the pruning remains can be used to make artificial bushes, either protecting the scarce natural regeneration, or planting acorns (from the farm's own oaks, if possible) preferably pre-germinated and impregnated with repellent substances to prevent consumption by rodents.




*Figures 12 and 13: Acorns impregnated with repellent to prevent consumption by rodents inside shelters made with pruning remains (right)*

## 5. PRODUCTION OF EDIBLE MUSHROOMS

The use of medium-sized trunks from clearing or pruning as a substrate for the production of edible mushrooms is an adequate system of use that can also generate economic income for the land owner.

The trunks chosen must have adequate dimensions for handling (10-20 cm in diameter and 100-120 cm in length) and come from healthy parts of the tree. The fungal species chosen must be able to grow on plant debris (saprophytic).

Some of the edible and medicinal species that are most used in these crops are: shiitake (*Lentinula edodes*), oyster or poplar mushroom (*Pleurotus ostreatus*), lion's mane (*Hericium erinaceus*), reishi (*Ganoderma lucidum*) or turkey tail (*Trametes versicolor*).





*Figures 14 and 15: Inoculation of mycelium in oak trunks from pruning.*

The pure inoculum of the chosen fungus is introduced into the trunks as a seed to facilitate its colonization, normally drilling holes into which the mycelium is introduced, then plugging them with wax (bee or cheese wax) to prevent them from drying out.

Next, the mycelium must colonize the trunk: this phase is known as incubation, and can last up to a year depending on the characteristics of the wood used and the conditions of asepsis, humidity, sunlight and ventilation.




*Figures 15 and 16: Incubation of the inoculum by burial; colonization of the trunk by the mycelium.*

Once the logs have been completely colonized by the fungus mycelium (it must be checked visually), they are placed in a cool and humid area, and this humidity will be maintained by periodic watering.

Once the mushrooms of the first flowering (production) have been collected, the trunks will be left to rest for about 3 months before submerging them again in water (about 24 hours). The trunks of the densest woods (holm oak and other oaks) can produce for up to 4 years with 2 or 3 blooms per year.



*Figure 17: Flowering of shiitake grown on logs. Source: Agribusiness*

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