BEST PRACTICE GUIDE FOR PLANTING AND MAINTENANCE IN MEDITERRANEAN AGROSILVOPASTORAL SYSTEMS

LIFE REGENERATE (LIFE16 ENV/ES/000276)

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Best practice guide for planting and maintenance in mediterranean agrosilvopastoral systems

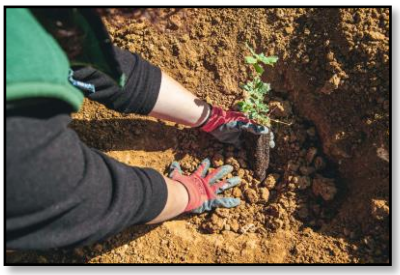
How to plant?

When planting it is very important to ensure that **adequate soil preparation** has been carried out for both the size of the seedling and planting method.

We have considered the following **4 essential steps** for adequate planting:

1º Step

Make sure that the **soil** in the hole is **not compacted** and there are no big stones, as the roots of the plant will grow better if the soil underneath is not compacted.



2º Step

Place the plant in the centre of the hole and cover it with soil up to the base of the stem. The **roots** (seedling) must be completely **covered,** and the **plant** must be **straight**.

3º Step

Compact the soil around the plant to ensure that the roots do not get in contact with the air. Make sure it is well planted by pulling the plant by the bottom of the stem and checking that **it does not move**.

4º Step

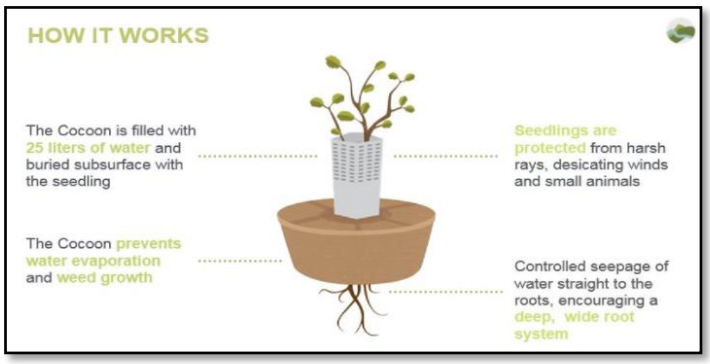
Place the protector around the plant and secure it with a **stick** to keep it straight. Place the holey part upwards. This will help the correct tree ventilation. With the extra soil, build a small 'wall' to help water/rain retention and add a layer of **"mulch"** (you can use dry leaves, small branches, or grass).

Picture 1. Step-by-step planting process and protection with plastic protectors. Own source.

How and when to use Cocoons?

The **Cocoon** is designed to support the seedling during its critical first year. The Cocoon **provides water and shelter** to the plant, while stimulating the development of a healthy and deep root structure. In this way, the Cocoon produces strong, independent trees that are **not dependent on external irrigation** and can survive in extreme conditions.

The **Cocoo**n consists of a **water reservoir** that is made of **cellulose**, crop or grass residues and other enhanced organic compounds to ensure **impermeability** during the first survival period. It is only filled once during the planting process. Water is transported to the plant in a spaced and controlled way.



Picture 2. Operation of a Cocoon. Source: www.volterra.bio

Picture 3. Cocoon planting guide. Source: www.thegreenlink.eu

As the reservoir degrades and empties over time, the superficial basins serve **to collect rainfall water**. Additionally, the degraded reservoir becomes organic substrate that improves the soil. It also has a cylindrical protective cover that is placed around the tree to **protect it from the sun**, winds dry and animals that feed on young plants.

Planting with Cocoon is different from planting by the traditional method explained in the previous point. In the "Cocoon planting guide" (Picture 3) developed in the framework of the European project **The Green Link**, you can find the steps to follow to plant properly with Cocoons.

How to protect the plantation and natural regeneration?

After the planting process has been completed, it is important to **protect** the plants from **herbivore pressure**. Many animal species are willing to eat the youngest plant stems, including natural regeneration. Despite plant adaptations to this type of herbivore pressure, such as the development of thorns or sharp leaves, animals such as **ungulates (deer, wild boars, etc.) or rodents (rabbits)** have shown that these adaptations are not enough to avoid being consumed.

There are several **protection methods** that, if successfully carried out, can be used to prevent the damage of our plantation. The most common types of shelter next to grazing fencing are explained below.

Types of protectors

To individual plant protection, there are two basic models:

The first model of **protecto**r is made of **rigid plastic** material (Picture 4), with a cylindrical or prismatic shape, which is fixed to the ground with the help of a **metal or wooden stick**.

The second model is the **cactus protector** (Picture 5). These protectors are made of a **metallic mesh** of better resistance than the previous ones. Its external part is covered by final sections of the mesh (**sharp ends**) that avoid the predation and the browsing of different animal species. It is the most **recommended** protector for planting in land where **livestock** are present.

Pictures 4 y 5. Plastic protector (left). Own source. Cactus protector. (right) Source: www.protectorcactusworld.com

Benefits of using protectors

- **Protection** against **predation** and browsing.
- Reduction of luminosity (not in cactus type).
- Water supply by condensation (not in cactus type).
- Modification of the aerial part of the plant, providing **slenderness**.
- Increase of the longitudinal development in the first years.
- Protection against **wind** and other dangerous precipitation during the first years.
- They create a more saturated atmosphere that generates a **reduction** in plant **transpiration** and soil water evaporation in the areas closest to the root (not in the cactus type).
- They generate a higher overall growth and a lower number of weeds.
- The protectors are **reusable** (especially the cactus type).

How to maintain the plantation?

- **Review.** They should be carried out periodically, especially after an event that may have damaged the plants (heavy rains, snowfalls, storms or strong winds, long drought, possible pest attack, etc.).

- **Removal of protectors.** Protectors should be removed when it is perceived that they may difficult the growth of the tree or shrub, i.e., before protector has too close contact with the trunk. This usually happens a few years after planting, although it varies significantly among species. The protectors in good condition can be reused in other plantations and those that are not, should be recycled.

- **Watering.** Plants should be watered punctually, especially during the first three summers. This significantly increases their survival rate and, therefore, the success of the plantation.

- **Pruning.** When the trees reach a larger size, it will be necessary to carry out specific pruning, to guide the tree in its growth and to establish a strong trunk with a vigorous crown (some species may even need > 10 years before this operation). When the plants are mature and well formed, maintenance pruning will be necessary. It is suitable to clean the crown and thin out branches, especially those in poor condition that may be detrimental to the health of the rest of the plant.

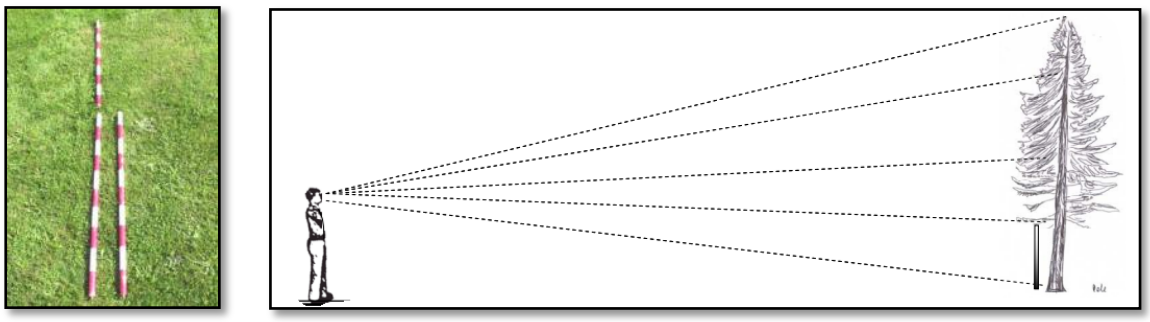
- **Treatment and/or removal of diseased and/or dead plants.** In extreme cases, when a pest or disease attacks certain plants, their elimination is necessary to guarantee the survival of the rest.

How to analyse the growth of our plantation?

The growth of trees and shrubs depends on **internal factors**, such as **physiological** and **genetical** of each species and sampling, and **external factors**, which are those related to seasonal conditions or treatment (Serrada, 2011).

The **methods** of **measuring** the height of trees and shrubs can be classified into:

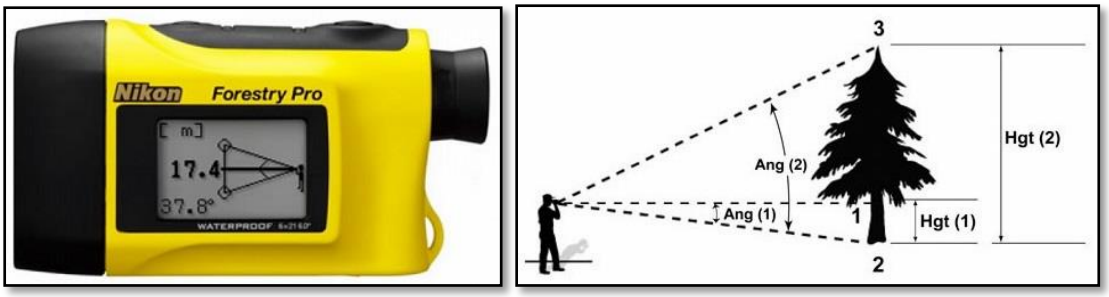
- Direct methods (**telescopic poles**). These are rods made of different materials (aluminium, steel, wood, fiberglass) that are divided into alternating white and red strips of about 25 cm (different sizes). These poles are the most used in areas where there is a lot of undergrowth or steep slopes. To do this, the pole is placed in front of the tree, parallel to its axis. If the tree is small, an estimation can be made with alternating strips. If the tree is larger, we will move away from the tree to a position where we can see well the apex of the tree (end of the crown) and the base of the tree to know how many times the height of the tree contains the pole. Less accurate method.



Picture 6. Telescopic pole with attachable sections (left). Source: Diéguez-Aranda, 2005. Scheme of measurement with distance pole (right). source: López Peña, C. (UPM).

Picture 7. Total height measurement with telescopic pole (left) and detail of the telescopic pole reader (right). Source: Diéguez-Aranda, 2005.

- Indirect methods (**hypsometers**). The laser hypsometer is able to measure the height from 3 points (horizontal distance, angle with the crown and angle with the base). Measurements appear on the external display of the device and have a measurement range of 10 to 50 m, so it is useful to use it on mature trees. Most accurate method.



Picture 7. Laser hypsometer device (left) and scheme of the instrument's measurement calculation ((right). Source: www.technometrik.com.

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