

# Managing an orchard without tillage. II.

## control of adventitious plants, use of forest products, biofertilisers, manure, grazing

When **managing an orchard without tillage**, it is essential to **control adventitious plants**, from which the aerial part must be cut and left as organic matter in the soil. Other **contributions of organic matter** can be obtained from forest resources in the form of **BRF, biochar or log beds**, and using vegetable manures, both green and dry. **Biofertilisers** are also used to provide **essential nutrients** at different times in the crop cycle. The garden's function is completed with the presence of animals, such as laying hens.

The **transformation to an orchard without tillage** improves the content of organic matter and the **structure of the soil**, cutting fertilisation and water consumption costs. This conversion **requires a significant contribution of organic matter**, which can be obtained from forest resources in the form of **BRF, biochar or log beds**, and using **vegetable manures**, both green and dry, to improve soil fertility. Biofertilisers are also used to promote crop growth, and **good management of adventitious plants is essential**.

### ■ Controlling adventitious plants

Controlling adventitious plants is one of the most expensive jobs in managing a garden without tillage but, unlike a conventional garden, it is a job that has a **double benefit**: on the one hand, **it encourages the arrival of light to crops** and, on the other hand, it is a way of **returning organic matter to the soil**. In an untilled orchard one of the important characteristics is the presence of continuous soil cover (in space and time) (**Figure 1**). Therefore, plants are never uprooted. Adventitious plants **are managed by cutting the aerial part and using different covering systems** that reduce their growth, such as pre-composted BRF covers, straw and other plant materials. One of the objectives is to change the composition of these adventitious plants, in this way **they will end up dominating the legumes**, which will provide an important input of nitrogen to the orchard.

**Depending on where the adventitious plants appear, they will be managed differently.** Plants that **come out on main roads can be left**, only if they are too tall for the crops are, they then cut to incorporate them as green manure or as straw. **The adventitious plants that are in the paths of the crop lines are cut with a brush cutter.** Plants that come out in the ditch or between crops should be removed with small tools such as scissors so as not to disturb the crops.

There are **two criteria to decide when the best time to cut adventitious plants** is: (1) just **before** they begin to **harm crops**, especially due to competition for light, since, in principle, if there is irrigation there are no water problems; and (2) when, from a practical point of view, they are **easy to eliminate**, given that at a certain moment they start to grow a lot and it costs more to remove them.



**Figure 1.** In the non-tillage garden, crops and adventitious plants coexist. Photo: Ángela Justamante.

### ■ Use of forest products to improve crop production

**A series of products can be obtained from the remains of forest harvesting**, which are used to improve the production of crops in the garden.

- **BRF.** BRF is the **chipping of small branches from trees**, which are left in the forest or in the field for a few months in which they undergo a **fungal decomposition** process led by basidiomycetes. Thus, a precomposed BRF is achieved that is **a stable, long-lasting humus**. The BRF can contribute to the orchard in two ways: (i) in the Polyfarming system, it is applied in the **trenches of the crop lines**, covering the hoses from insulation; (ii) it can also be applied **superficially without any work on the soil**, providing a layer about 5 cm thick over the entire surface of the orchard. As it is a significant amount of **BRF**, this contribution is made by areas, so that every 4-5 years the entire orchard is covered with BRF and the process is restarted.

- **Biochar.** Biochar, a **charcoal** produced from the pyrolysis of vegetable biomass, **improves the structure of the soil**. It is not applied directly in the garden, but it is previously activated, i.e. it is loaded with nutrients and microorganisms that are actually used by plants. This activation is achieved **by incorporating the biochar into the chick litter**. Like BRF, the compost that is obtained is **applied in the trenches of the crop lines**, covering the hoses. This is how it is done in

the farm where the Polyfarming system is applied, Planeses (Girona, Catalonia). **Biochar can also be applied directly to the soil in the garden.**

- **Cultivation on log beds.** Cultivation on log beds **supposes a very important incorporation of carbon into the soil**, at the same time as allowing to **retain water** and **create areas with a lot of biological activity**. This technique is mainly used for planting **multi-annual** and **permanent species**. The design of the orchard must take into account that these areas cannot be passed with the transport systems used in the crop lines, so they are normally **placed at the ends of the orchard**.

## ■ Biofertilisers

Biofertilisers are fertilisers of different origins that **serve to nourish and strengthen plants, without blocking the biological processes that occur in a healthy soil**. All crops go through different stages of growth, flowering and fruiting. **At each moment of the cycle, plants have nutrient needs** that should be favoured. Thus, in the **vegetative period**, when plants develop roots and stems, they require mainly **carbohydrates and nitrogen**. This is especially important in the weeks after planting, because the roots of the plant are still limited in growth and do not benefit from the natural fertility of the soil. At the time of **flowering** they need **phosphorus compounds**. In the period of **growth and maturation of fruits**, plants **accumulate carbohydrates**, and need potassium to develop their colour. For plants to obtain all these nutrients, it is necessary to supply **different types of biofertilisers**.

## ■ Vegetable manures

**Chemical fertilisers are not used in regenerative agriculture.** However, the orchard has a high production and, therefore, high outputs from the system that have to be compensated. **This requires gradually incorporating inputs from the garden itself or from the farm's other uses.** Different types of products can help fertilise the garden:

- First, dry or **crushed organic matter**, such as BRF, or **composted**, such as chick litter, is incorporated into the soil. This organic matter **helps to structure the soil**, since it will **gradually be available** to feed the crops, while it **favours the aeration of the soil** and the functioning of the **trophic network**.
- Another option is to **plant green manure** in the fall, which is cut in spring and left on the surface of the soil. If the sowings are legumes, such as white clover or alfalfa, an additional supply of nitrogen is also achieved.

- **The remains of crops and adventitious plants** that are cut are left green or dry on the ground and represent a contribution of organic matter without having to transport it from outside the orchard.

- Finally, the **excrements of the animals** that graze in the garden, such as chickens and ducks, can also contribute nutrients to the system.

## ■ Grazing with laying hens

To create a complete ecological system that encourages the garden to function animals should be present. **Using animals in the garden contributes to controlling adventitious plants, fertilisation with excrement** and the **elimination of insects, snails and slugs**. However, **the risk of using animals** in the garden is that they can **eat the crops**, especially just after planting. Therefore, animals should be chosen that have significant positive effects and whose negative effects can be easily controlled. Chickens and ducks can meet these requirements if the garden design allows them to be moved to where they are needed.

In Planeses the garden has a central north-south path. Two mobile laying hens coops are located on this path. During the night and part of the day, the hens are in the hen house, which is the space where food is given to them and where they lay their eggs. **Every day the hen house moves up to the height of the crop lines where it has been decided that it is most appropriate for the hens to graze.** Meshes are placed from the hen house that enclose two or three crop lines. **Every day the hen house is opened so that the hens can go out to these crop lines for 2-3 hours (Figure 2).** If they stay much longer, they may disturb the soil excessively and attack some crops such as cabbage, which they do not normally touch but which they could damage if they are there longer than indicated.



**Figure 2.** Laying hens grazing on the crop lines of the Planeses garden. Photo: MJ Broncano.