Lessons learned after the implementation of the Polyfarming system I. Forest, pastures and crops

From our own experience and from interactions with other researchers and producers, **the Polyfarming team has acquired extensive knowledge** over the years about each of the elements that intervene in the system and their joint functioning. This sheet summarises the **main lessons learned about the forest, pastures and crops**, including installation and functioning aspects and the combinations between elements.

Figure 1. Wood extraction works in the forest. Photo: AVVideo.

Lessons learned about the different elements of Polyfarming

This file summarises **the most outstanding aspects and lessons learned** after having applied different techniques of the Polyfarming system in the forest, pasture and crops, both woody and herbaceous. Thus, from the monitoring and studies carried out at the Planeses farm and taking advantage of the exchanges of valuable information with other researchers and producers, both ranchers, farmers and foresters, we have been able to extract the following lessons.

Forest

• The main characteristic that determines forest use is the **quality of the forest**. In low-quality forests, the intervention on the stand is of **low intensity, with the aim of achieving a decrease in density**. In **high-quality forests, intervention on the stand is done by identifying the trees of the future** and intervening to improve their growing conditions.
• Forest exploitation requires a **minimum of two full-time workers** during the winter months.
• The **network of tracks** is essential to determine if the exploitation is viable or not. If the network of tracks is not enough, clearing the logs may not be feasible.
• **Wood extraction** (**Figure 1**) represents an export of biomass, which if performed without destroying the conditions of the system is recovered naturally.
• In the Polyfarming system, there are also **BRF and biochar outlets** (obtained from the small branches), large logs for the wooden beds and humus from the forest floor to obtain biofertilisers.
• The resources provided by the forest for livestock are of lower quality than those provided by forage grasses, so it **plays a secondary role in feeding the animals**.

Dehesa

• **The density of trees that must be left in an area destined for pasture must be low** because otherwise it is difficult to establish the pasture in high shade conditions.
• The main problem with establishing a pasture in the dehesa is the **damage caused by wild boars**, which usually lift the soil where the pasture is beginning to settle.
• Even if there is no pasture, **calves can do a good job of keeping the understory of the dehesa at low levels**, if they visit it regularly.

Pasture

• **The initial installation of pasture requires an adaptation of the terrain, weed control, seeding at the right time and**

Figure 2. Garden without tillage in Planeses (Girona), where the Polyfarming system is carried out. Photo: Ángela Justamante.

irrigation, when possible. Quality grass can take several years to form.
• When the pasture has been established, it is **livestock management that should consolidate and improve the pasture**. If the management is carried out respecting the functioning principles of the pasture, the system recovers in a natural way from the outputs linked to uses.
• With the **intensive grazing planned at specific times the pasture produces the maximum in each season.** Using this method, the grass is subjected to a significant impact when the animals are present, but once they have move on, the plots have a long time to recover.
• The level of labour that the pasture requires once established is low, since it is maintained by the grazing of animals and there is only minor clearing or reseeding work every several years.
• A lack of water can be a limiting factor of the system, since it conditions the growth of the pasture. At Planeses, depending on the annual rainfall, the cattle can pass through each plot up to seven times in rainy years and less than five in dry years.

Fruit trees on pasture

• Fruit trees are **planted in spring** and require a **good irrigation system** and individual protection for each tree.
• When there are livestock, **individual protection is essential for each tree**, in order to avoid damage that the animals may cause.
• When the animal used is large, **a tall fruit tree should be chosen, such as walnut, apple or chestnut trees**. When medium or small animals are used, the grazing height is not so high and shorter fruit trees can be planted.
• **Placing trunk beds at the base of the fruit trees during planting** improves the environment of the fruit trees, as logs offer a reserve of water and microorganisms to keep the soil alive and increase the soil carbon content.
• The fruit tree plantation should have an **extended irrigation system that drips into each tree**, especially in the first few years and later in drier seasons.

Extensive crops

• In extensive crops there are no outside inputs, because fertility is maintained with the **incorporation into the soil of the plant remains** of the species that grow in the field and the presence of legumes as nitrogen fixers.
• To achieve greater production and biological activity of the system, **associations and rotations of species are used in time and space**, such as that of cereal crops on permanent pastures with which cereal grain and pasture forage are obtained.

Garden without tillage

• An orchard without tillage (**Figure 2**) **improves the content of organic matter and the structure of the soil**, with a reduction in the cost of fertilisation and water consumption.
• In a no-till garden, **all structures can be permanent**, they can be maintained from one year to the next.
• The garden beds consist of a series of elements: the permanent path through which the garden workers can move, the groove through which the main hose passes that leads the water to the plants, and the two rows of plants of the crop.
• It is best to **fill the irrigation ditch with BRF or compost**, since this way the water does not escape and, in addition, the hose is protected from the sun.
• **Planting is a slow process** because a planter cannot be used, since the soil is not loose, it is not ploughed.
• **Adventitious plant control is one of the most expensive jobs** in managing a garden without tillage and is done only by cutting, without pulling the plants.
• The **contributions of organic matter** in an orchard without tillage are produced with the cut part of the **adventitious plants, the BRF and biochar, and the vegetable fertilisers**, both green and dry.