

# Combination of different elements: benefits of synergies between uses in Polyfarming

The Polyfarming system promotes **combinations between forest resources, livestock and crops**, based on at least two elements of different uses of the farm interacting in the same place. This sheet describes the different combinations that have been carried out in Polyfarming: grazing in the forest, fruit trees on pasture, cows on pasture, chickens on pasture, rabbits on pasture and chickens in the garden. **Its benefits and disadvantages are also shown.**

**Combining at least two elements in the same place** within the farm is always more **complex**, both in structure and on an economic or functioning level, than working with the elements separately. However, **the Polyfarming system actively promotes these practices, since they give rise to important synergies and only have some disadvantages**, which can be resolved. In Agroforestry, the combination requires trees to be included with agricultural crops and/or livestock simultaneously or sequentially (Mosquera-Losada et al 2009). However, in Polyfarming we include any combination that includes two individual elements, whether there are trees or not.

## ■ Combinations of different Polyfarming elements

- **Grazing in the forest.** According to Casals et al. (2009), forest grazing has historically been practiced in Mediterranean and montane forests and has usually been linked to a mountainous topography, in which the forest serves to maximise existing resources. In the Polyfarming system, **cattle grazing in the forest takes place at times of the year when there is little food, usually in winter or summer.** The resources provided by the forest are of lower quality than those provided by forage grasses. In Polyfarming, the cows, which are used to obtain milk, are not taken to the forest, whereas the calves that are raised to produce meat are taken to the forest at times of the year when grass is not abundant.
- **Fruit trees on pasture.** Fruit tree management in combination with pastures is one of the most **widespread agroforestry systems.** The trees can be fruit trees or high-quality wood and are distributed on the boundaries of pasture plots or in rows along the field. These **trees are combined with grasses that can be cut down and used as forage or grazed directly by animals.** If there are cattle, the fruit trees have to be protected during the first years, and they create better shade so that the cattle can protect themselves from the heat in summer.
- **Cows on pasture.** Pasture cow grazing developed in Polyfarming is characterised by using **high stocking densities in small spaces** with a very short stay and a **very long recovery period.** Each day, the herd of cows moves from the field in which it is located to another that is at the optimum grazing point, which is just before the plants reach maturity. Cows are herbivorous animals and, for a good part of the year, much of their food is obtained directly from the pasture (**Figure 1**).
- **Chickens on pasture.** The combination of chickens and pasture is found in a **pasture divided into corridors**, through which the **animals are moved daily** by means of a system of fences and mobile shelters. In this way, the chickens enjoy new pasture every day and, at the same time, the chickens' own movement activity allows the **pasture to be maintained at no additional cost.** Chickens consume a lot of grass and seeds, and they also get high amounts of live protein in the form of earthworms and meadow insects.
- **Rabbits on pasture.** The combination of rabbits and pasture is similar to the previous combination. In this case, rabbits feed almost exclusively on grass, since their **diet is 100% herbivorous.** As in the previous case, **the rabbits move daily to patches distributed in the pasture** by means of a system of fences and mobile shelters that do not require heavy machinery. The pasture is greatly impacted when the animals are present, but, after they have moved on, **the plots have a long time to recover.**
- **Hens in the garden.** The use of animals in an orchard can favour its functioning, since it creates a more complete ecological system. Using animals in the garden **contributes to adventitious plant control, fertilisation with excrement and the elimination of pests**, but runs the risk of them eating or damaging the crops. In Planeses, the hens are in the hen house at night and part of the day. The hen house is moved to the area where it has been decided that the hens will graze and meshes are placed to enclose some terraces where the hens stay for several hours.



**Figure 1.** In Planeses (Girona), where the Polyfarming system is implemented, cows obtain a large part of their feed from pasture.

## ■ Advantages and disadvantages of the different combinations

In general, the benefits of combining the different elements are very high, although some disadvantages must also be considered (Table 1).

Combination	Benefits	Disadvantages
Grazing in the forest	<ul style="list-style-type: none"> <li>• Beef cattle and horses <b>adapt well to mountainous topography</b> and lower quality food sources provided by the forest at times of year when no other food is available.</li> <li>• <b>Calves</b> (or beef cows if applicable) consume felling waste and help <b>maintain the understory</b>, reducing vulnerability to fire.</li> <li>• The presence of animals in the forest facilitates the decomposition and <b>incorporation of logging remains in the soil</b>, improving its fertility.</li> <li>• Feeding of calves or cows in the forest <b>reduces the cost</b> of buying feed at times when no other resources are available.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Dairy cows cannot be brought into the forest</b> because their feed requirements cannot be met by forest resources.</li> <li>• It is not practical to keep cows in the forest if they need to be milked in the stable every day.</li> </ul>
Fruit trees on pasture	<ul style="list-style-type: none"> <li>• The presence of trees in the meadow <b>increases the total carbon stored</b> on the farm, both in the soil and in the plants.</li> <li>• <b>Biodiversity</b> in integrated fruit tree and pasture systems also increases due to the presence of more soil organisms under the trees.</li> <li>• Trees, when they grow, provide <b>shade for livestock</b> that feed on the pasture.</li> <li>• Livestock excrement helps to <b>improve soil fertility</b> in the area of fruit trees.</li> <li>• The integrated management of fruit trees and pastures <b>generates more income</b> and improves the profitability of farms.</li> </ul>	<ul style="list-style-type: none"> <li>• Fruit trees and pasture use <b>common resources</b> such as nutrients and water, so competition can be established between them.</li> <li>• If there are animals feeding on the pasture, <b>protection is required for the fruit trees</b>.</li> <li>• In general, it is necessary to wait several years to reach maximum fruit tree production. During this time, the fruit trees need various types of care without providing a significant benefit.</li> </ul>
Cows on pasture	<ul style="list-style-type: none"> <li>• The cows' own movement activity allows the <b>pasture to be maintained</b> without additional costs.</li> <li>• In this way, the <b>pasture produces the maximum</b> for each season and the animals consume it at the best time.</li> <li>• Livestock excrement helps <b>improve soil fertility</b> by increasing organic matter and nutrients.</li> <li>• Animals don't spend long on the plot to avoid having a compaction effect on the soil.</li> <li>• This system produces meat and milk with a <b>higher nutritional value</b> than the conventional system.</li> </ul>	<ul style="list-style-type: none"> <li>• The system requires a <b>large area</b> to place the plots so that it can function for much of the year.</li> <li>• In a system divided into plots <b>it can be limiting</b> and complicated to bring water to each plot.</li> </ul>
Chicken on pasture	<ul style="list-style-type: none"> <li>• Chickens get <b>30-40% of their diet from the pasture</b>, both grass and insects or seeds.</li> <li>• This system favours the <b>control of crop pests</b>, since chickens consume many insects that can be harmful.</li> <li>• Their presence in the pasture helps to <b>prevent chicken diseases</b> and practically eliminates the use of drugs.</li> <li>• Chickens help to regenerate the soil and obtain quality pastures thanks to their droppings.</li> <li>• Animals have a permanently <b>healthy environment</b> with fresh grass every day.</li> <li>• The system makes it possible to produce chickens with a <b>high nutritional value</b>.</li> <li>• With the chicken-pasture system, the profitability of the farm increases, because the equipment and functioning of the system only requires a <b>small investment</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• When chickens get older, their droppings make the pasture dirtier, so it will take longer for them to return to the same plot.</li> <li>• Chickens do not normally consume all the grass and, once they have moved on, it is often best to <b>clear the pasture to even out the grass</b>.</li> <li>• Under these conditions, chickens are more <b>susceptible to predation</b> by birds of prey and mammals such as foxes.</li> </ul>
Rabbits on pasture	<ul style="list-style-type: none"> <li>• Rabbits get almost <b>100% of their diet from the pasture</b>.</li> <li>• They have a permanently healthy environment with <b>fresh grass every day</b>.</li> <li>• Raising rabbits in the meadow <b>reduces, almost eliminates, the use of antibiotics</b> and only vaccines are used for viral diseases.</li> <li>• The rabbit meat obtained has a <b>high nutritional value</b>, with a higher content of vitamins (A, D and K) and quality fats (Omega 3).</li> <li>• The investment required to put this system into operation is small compared to conventional projects.</li> </ul>	<ul style="list-style-type: none"> <li>• Rabbits in these conditions are <b>exposed to predators</b>, so they must be well protected, even from the dogs that watch in the field.</li> <li>• Rabbits are also very <b>exposed to inclement weather</b>, so shelters must be designed to be able to protect them sufficiently.</li> </ul>
Hens in the garden	<ul style="list-style-type: none"> <li>• The presence of hens helps to <b>eliminate insects and pests</b> that are harmful to crops.</li> <li>• Hens also help <b>reduce the presence of adventitious plants</b>.</li> <li>• The excrement of the hens contributes to <b>fertilising the garden</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• If they remain in the garden for a long time, the hens can <b>disturb the soil excessively</b> and attack some crops.</li> <li>• After planting, it is not a good idea to put hens in the garden because they <b>step on and damage the plants</b>.</li> </ul>

**Table 1.** Main benefits and disadvantages of the different combinations of elements of the Polyfarming system.