

# Complementarity of products and labour between uses in Polyfarming

The Polyfarming system proposes an **integrated system of forestry, livestock and agricultural uses** (including fruit trees and orchards) that interact and complement each other. At farm level, this is achieved through: **a) a complementarity of products** that (i) cuts costs, since what is left over from one use is applied to another, and (ii) obtains more products in the same area; and **b) a complementarity of jobs and labour**, since (i) if a job in the same place serves two activities at the same time, the costs go down, and (ii) if the labour can be shared temporarily performance is much more optimised.

The integrated system that Polyfarming proposes requires a precise knowledge of each exploitation: what elements it produces, what labour it requires and when it is needed. At farm level, the spatial and temporal planning of the different uses makes it possible to complement **products and labour (Figure 1)**, with the aim of reducing the necessary external resources and production costs and increase the efficiency of the system.

## ■ Complementarity of products

Combinations connecting various uses at farm level almost always led to significant synergies. Among them, the **complementary of products** that are obtained stands out, which offers two great advantages:

**a) It allows cost savings**, since the external resources for the functioning of a certain use are obtained without a cost from the resources generated by other uses, which leads to a reduction in the farm's costs.

**b) It allows to more products to be obtained in the same area:** fruit and meat, forage and milk, vegetables and eggs, etc. Obtaining different products in the same area requires some extra work, such as protecting the fruit trees from the livestock, but there are also additional benefits, such as fertilizing the soil with animal droppings.



**Figure 1.** Polyfarming worker at the Planeses farm (Catalonia), where the Polyfarming system is implemented. Photo: Angela Justamante.

**Table 1** shows the **complementarity of products between different uses**. These products of one use applied to another use **reduce the farm's overall costs**. Examples of this are the forest trunks that are used to make log beds in the crops, the BRF and biochar to make the compost of the garden, forest leaves and pasture for feeding the animals, or grain and forage of the extensive crops for feeding chickens and cows. There are also more intangible 'products', such as the shade of fruit trees for livestock, livestock excrement as fertilisers for the pasture soil or the removal of the understory of the forest to reduce the risk of fire.

		Receives			
		Forest	Livestock	Fruit trees and pasture	Garden and extensive crops
Contributes	Forest		It provides material (stakes) for mounting the fences. It allows feeding of calves in months of scarce resources.	It provides material for electric fences and the protection of fruit trees. It provides logs for wooden beds.	It provides logs for crops on wooden beds. It produces BRF and biochar to form compost that is applied to the garden.
	Livestock	It manages the understory to facilitate access and reduce the risk of fire.		It allows the pasture to be maintained without external inputs. It maintains soil fertility with its excrement	It activates BRF and biochar that are used as compost in the garden. It helps to eliminate pests and weeds in the garden (hens).
	Fruit trees and pasture	--	They offer pasture for livestock. They provide shade at warmer times of the year.		--
	Garden and extensive crops	--	They contribute to the feeding of the hens. They produce grain and fodder for chickens and cows.	--	

**Table 1.** Complementarity of products between the different uses.

In Polyfarming, there can also be **complementarities even with the same use**. Some examples would be: (i) the presence of legumes in the pasture increases **nitrogen fertilisation of fruit trees**; (ii) the successive presence of cows and calves in the pasture makes it possible to obtain **milk and meat in the same area**; (iii) the first presence of rabbits (herbivores) and then chickens (omnivores) in the same pasture helps to manage it better, **obtaining two different products**; (iv) in cereal crops on permanent pastures (pasture cropping) the grain of the cereals and the forage of the pastures are obtained with the same use.

## ■ Complementarity of jobs and labour

In the Polyfarming system, work and **labour complement each other in time and space**. This entails clear benefits at farm level: a) if a job performed for one activity also serves another at the same time, **overall costs are reduced**; b) if labour can be temporarily shared between uses, **resources are optimised**. For this reason, it is essential to analyse what labour is needed and when it should work in the different activities of the farm.

**Table 2** summarises the calendar of the need for labour in the different activities of the different uses throughout the year. **The activities of the forest and the orchard can be seasonally compatible** since, due

to legal limitations, **the activities in the forest can only be carried out in the months without a risk of fire** (from November to March), while in the orchard, the labour force is important from April to November. However, both uses require a large amount of labour concentrated over time: in the forest a minimum of two people working is required, while in an orchard like that of Planeses (around 1.5 ha), it takes between 2 and 3 workers throughout the day. **The activities of livestock and fruit trees are compatible daily**, since they are located in the same area and do not occupy the whole day. In the case of fruit trees, significant labour is required at key times, such as pruning or harvesting. In the case of cattle, labour is essential throughout the year (**Table 2**) and every day. Total daily dedication depends on the types of animals on each farm, rather than the number of animals of each type: thus, the daily work required to move a herd of 10 cows is not very different from that required to move one of 60.

ACTIVITY	J	F	M	A	M	J	J	A	S	O	N	D
Forest exploitation												
BRF production												
Biochar production												
Production of biofertilisers												
Calf management in the dehesa												
Cow movement and feeding												
Milking cows and collecting milk												
Calf movement in the pasture												
Rabbit movement												
Collection of rabbits for sale												
Chicken movement and feeding												
Collection of chickens for sale												
Hen movement and feeding												
Egg collection												
Fruit tree pruning												
Fruit tree treatments and monitoring												
Harvesting the fruit of fruit trees												
Sowing extensive crops												
Grain harvest in extensive crops												
Forage harvest in extensive crops												
Irrigation preparation for the garden												
Garden planting												
Removal of adventitious plants from the garden												
Biofertiliser and manure application												
Harvesting the products from the garden												

**Table 2.** Calendar of the need for labour in the different activities throughout the year.