

Costs and key points of producing and applying trunk beds

Producing and applying trunk beds mainly has two types of costs: (1) **costs of obtaining the base material**, which are logs of more than 20 cm cut to the appropriate size; (2) **costs of laying in the field**, which includes the transport of the logs from the cutting area to the field and their distribution on the ground, which is different if it is done in a fruit tree plantation or in the garden.



Figure 1. Placement of the trunk beds on the garden plot. Photo: AV Video.

■ Quantification of the costs of producing and applying trunk beds

The quantification of the production and application of trunk beds (**Figure 1**) is based on calculating two different types of costs:

1. **Cost of obtaining the base material of the trunk beds.**
2. **Cost of laying the trunk beds on the ground.**

Next, we will describe the different alternatives that we have analysed for each of these processes, indicating the costs they represent and their variability (**Table 1**).

1. **Cost of obtaining the base material of the trunk beds.**

This cost includes obtaining the logs that will be used as raw material. All the necessary **materials for felling** (chainsaw, etc.) are already available on the farm, otherwise the corresponding costs will have to be included. In principle, it is understood that the logs are obtained from a traditional forest harvest, so that **the cost of cutting them can be considered 0**, since it is a work included in the cutting itself. However, since the large logs used for trunk beds could otherwise be used as firewood, the cost of not selling them **must be considered as obtaining the base material for the trunk beds**. This cost depends on the volume used in each case and the price of firewood in each location.

2. Cost of transport and placement of the trunk beds on the ground. This cost includes the transport of logs from the felling area to the field and their distribution on the ground.

- As regards transport, the **cost depends on the time spent loading the trailer, moving the logs, and unloading the logs in the application area**. In our case, the trailer has a capacity of 2 m³. The average time to fill the log trailer is 0.33 h. Each trip is loaded with about 24 logs 2 m long and around 15 cm in diameter. To this cost should be added the **transport time** (which varies with distance) and the time to unload the logs, which can be considered the same as loading them. The time is always calculated for two workers. It is considered that the farm has a jeep with a trailer, otherwise it is necessary to include the costs of renting it.

- As regards the application, it is essential that the vehicle arrives right next to the field, so that the transport of the logs with a wheelbarrow to the application area is very quick.

- A hole to plant a fruit tree has an approximate volume of 0.5x0.5x0.5 m³, in which between 4-5 trunks of 40-50 cm are introduced at the bottom. This means that with **each 2-m**

log we prepare the bed of a fruit tree. The average time used to transport and **place the logs is 0.1 h (6 minutes)**, although it varies with the distance from the fruit tree to the pile of logs. The rest of the calculations referring to the hole for the fruit tree are given in the corresponding file.

- In the orchard, digging the furrow where the logs will be placed to make the wooden bed requires several activities. Let's consider the values for 100 linear m of furrow. First, a worker spends twice as long making the ditch with a rented **motor trencher (€250/day)**, he walks at a normal walking speed (5-6 km/h, 1 km every 10 min), i.e. it takes a minute to travel 100 m. The average 50-m long log are then carried along the 100-m line, and 3-4 standard logs 2 m long are placed every 2 m. This makes about **200 trips over an average distance of 50 m** (10,000 m in total), in total about 100 minutes. Finally, it

takes half a minute to cover the logs of every 2 m, i.e. in total 25 minutes to cover the entire line.

■ Quantification of the costs of producing and applying trunk beds

We must consider the following **key points** in the production and application of trunk beds:

- In the case of **planting fruit trees, the calculation depends on whether the ground is stony** and, therefore, it takes more or less time to make the holes.
- The calculations of the fruit trees are based on the fact that the trunks are cut and close to the holes. **Their transportation can be a significant cost.**

From these considerations, we can establish a series of simple calculations to estimate the **total costs of applying trunk beds in agricultural farms. The calculations obtained are based on 1 m³ of logs.** The application cost depends on whether it is applied to fruit trees (1, data per fruit tree) or the orchard (2, data per 10 linear m of furrow). The total cost is the sum of both costs after correcting the amount required in each case:

$$C_{\text{total}} = C_{\text{obtaining}} + C_{\text{placing}}$$

Obtaining the base material of the trunk beds (per 1 m³):

$C_{\text{obtaining}} = 1 \text{ m}^3 \text{ logs} \times \text{€ } 60 / \text{m}^3 \text{ firewood}$ (price of firewood that is not sold to make wooden beds)

Transport and placing of the trunk beds, the sum of two costs:

$C_{\text{transport}} = 0.33 \text{ hours} \times \text{Salary} / (\text{hour and worker}) \times 2 \text{ workers} \times 2$ (loading and unloading of logs) + $N \text{ hours} \times \text{Salary} / (\text{hour and worker}) \times 2 \text{ workers}$ (transport, variable according to the distance to the cutting area)

$C_{\text{placing (fruit trees)}} = 0.1 \text{ hours} / \text{fruit tree} \times \text{Salary} / \text{hour}$ (per fruit tree)

$C_{\text{placing (orchard)}} = 100\text{m} \times 0.03 \text{ hours} / 100 \text{m} \times \text{Salary} / \text{hour}$ (make the 100 m trench) + $2 \text{ hours} \times \text{Salary} / \text{hour}$ (place and cover the logs) + 2 h (approximately) $\times 250 \text{ €} / 24\text{h}$ (rent motor ditcher)

Parameter	Unit	Value used	Variability and causes
Cost of logs for firewood	€ / m ³ firewood	60	It is a totally indicative price, it depends on the place and the species, with a range of €50-80/m ³
Time to load the trailer with logs	hour/2 workers	0.33	It may depend on the distance of the log stacks
Time of transfer of the logs from the forest to the field	hour	-	It depends on the distance
Time for transporting, cutting and placing the logs in a fruit tree hole	hour	0.1	It is very fast, but the logs have to be transported to the hole
Renting the motorised machine to make furrows in the orchard	€ / day	250	The price may depend on the specific offer in the area
Time to dig a furrow in the orchard (100-m line)	min	2	The time it takes to walk 100 m twice (two trips)
Time to place the logs and cover them in the orchard (100-m line)	hour	2	There is the time to transport the logs (100 min) and another to cover the trench (25 min) in the 100 m considered. These are guide values

Tabla 1. Parameters used to calculate the production and application costs of the bed trunks, indicating the values used in Polyfarming and any variability that can occur in these values.