

Balance of costs and incomes at farm level of the Polyfarming system I. Costs

In a **model farm** in which the different elements of the Polyfarming system work, the balance of costs and incomes obtained at farm level has been calculated. The **annual costs** of the different elements are around €148,666, broken down into the following four categories: **labour (59.0% of the total, corresponding to 4.5 full-time workers), mechanisation (7.0%), external inputs (15.1%) and internal inputs (18.9%)**, which are inputs that need a certain element that come from another element within the farm itself.

■ A model farm to value the Polyfarming system

We have evaluated the main costs and incomes at the farm level of the Polyfarming system in a **model farm** in which the different elements of Polyfarming would operate. This **model farm consists of**: a) a 50-ha holm oak forest; b) a 7-ha dehesa obtained by intense forest thinning; c) a 7-ha pasture divided into plots where a herd of 10 cows and 20 calves graze (Pasture 1); d) a crop of 700 fruit trees (almond trees) already in production installed on the separation lines of the pasture plots; e) a pasture of 2 ha, where 960 rabbits and 2,400 chickens graze (Pasture 2); f) a 2-ha extensive crop in which there is an active perennial pasture in summer, and a winter cereal crop and g) a 1-ha no-tillage garden where there are two mobile poultry houses with 200 hens in total.

■ Costs of the different elements in the Polyfarming system

The **annual costs** of a farm like the one described are around €148,666. The costs have been broken down

into four categories (Table 1): **labour, mechanisation, external inputs and internal inputs from the farm itself.**

- **The labour costs** are €87,655, which represents 59.0% of the total annual expenses of the farm. In total they represent 4.5 workers hired full time.

- **The mechanisation costs** are €10,450, 7.0% of the total annual expenses. They include the tractor to remove the logs when the farm does not have one, the seeder for direct seeding and the combine harvester for extensive crops, and the transport and external slaughterhouse for calves.

- **The costs of external inputs** to the farm represent €22,497, 15.1% of the total. They include diesel and oil for the chainsaw, seeds, seedlings, forage, feed, grain and new-born chicks.

- Finally, **the costs of internal inputs** of the farm itself are €28,064, 18.9% of the total, mainly grass. They are expenses that are produced in elements of the farm itself, so they do not represent an additional cost.

By elements, the highest annual costs are those of the garden (€25,376), chickens (€22,269) and forest (€19,500), in all cases without counting the costs of internal farm inputs. On the other hand, the lowest costs are those of extensive crops (€682), dehesa (€1,218) and chicken and rabbit pasture (€2,508).

Labour (a)	Mechanisation (b)	External inputs (c)	Internal inputs (d)	Annual costs (a+b+c+d)
FOREST				
Log cutting, limbing and dragging: 2 workers * 100 days * 8 h/day * €12 ⁽¹⁾ /(h and worker) = €19,200	Tractor for dragging logs (if it not available on the farm): €50/day * 100 days = €5,000	Chainsaw gasoil: 1 tank/h * 0.37 l/tank * €1.2/l * 2.5 h/day * 100 days = €111 Chainsaw oil: 1 tank/h * 0.25 l/tank * €3/l * 2.5 h/day * 100 days = €188	0	€24,500 or €19,500 (not counting the tractor)
DEHESA				
Movement of animals (included in each animal) Reseeding (broadcast and every 5 years): 7 ha x 2 h/ha * €12(1)/h = €168	0	Seeds for reseeded: 7 ha * 5 kg/ha x €30/kg = €1,050 (every 5 years)	0	€1,218 (every 5 years)
PASTURE 1				
Movement of animals (included in each animal) Clearing of unconsumed vegetation (in the establishment phase): 1 h/plot * 365 plots of 1,000 m ² * €12/h ⁽¹⁾ = €4,380 Mowing with a brush cutter (when there is excess grass): 1.5 h/plot of 1,000 m ² * 40 plots/month * 3 months * €12/h ⁽¹⁾ = €2,160 Reseeding (broadcast and every 5 years): 7 ha x 2 h/ha * €12 ⁽¹⁾ /h = €168	Due to the size of the Pasture 1, it is not profitable to use a direct seeding seeder for reseeded, it must be done manually.	Seeds for reseeded: 7 ha * 5 kg/ha x €30/kg = €1,050 (every 5 years)	0	€7,758
PASTURE 2				
Movement of animals (included in each animal) Clearing of unconsumed vegetation (separating one ha for chickens and one ha for rabbits): 0.25 h/plot of 160 m ² * 80 plots/month * 3 months * €12/h ⁽¹⁾ = 720 Mowing with a brush cutter (when there is excess grass and separating one ha for chickens and one ha for rabbits): 0.5 h/plot of 160 m ² * 80 plots/month * 3 months * €12/h ⁽¹⁾ = €1,440 Reseeding (broadcast and every 5 years) 2 ha x 2 h/ha * €12/h ⁽¹⁾ = €48	Due to the size of the Pasture 2, it is not profitable to use a direct seeding seeder for reseeded, it must be done manually.	Seeds for reseeded: 2 ha * 5 kg/ha x €30/kg = €300 (every 5 years)	0	€2,508

Mano de obra (a)	Mechanisation (b)	External inputs (c)	Internal inputs (d)	Annual costs (a+b+c+d)
EXTENSIVE CROPS				
Seeding: 2 ha * 2h/ha * €12/h ⁽¹⁾ = €48 Harvest: 2 workers * 1 h * €12/(h and worker) ⁽¹⁾ = €24	Direct seeding seeder: 2 ha * 0.5 days/ha * €350/day = €350 Combine harvester: 2 ha * 0.5 h/ha * €100/h = €100	Seeds (with half density) 2 ha * 4 kg/ha x €20/kg cereal = €160	0	€682
FRUIT TREES				
Plantation: 0.1 h/ fruit tree * 700 fruit trees ⁽²⁾ * €12/h = €840 Pruning (annual pruning + collection of remains) (0.25 h+0.1 h)/fruit tree * 700 fruit trees * €12/h ⁽¹⁾ = €2,940 Harvest (manual, with rod and canvas): 0.15 h/fruit tree * 700 fruit trees * €12/h ⁽¹⁾ = €1,260	Excavator (renting): 0.08 h/fruit tree * €45/h * 700 fruit trees = €2,520	Seedlings (almonds): €12/fruit tree * 700 fruit trees = €8,400	Log beds (production): 0.25 m ³ (1 trunk of 20 cm diameter and 2 m length)/ fruit tree * 700 fruit trees * €60/m ³ = €10,500	€4,200 (without plantation) €22,260 (only plantation)
GARDEN CROPS				
Irrigation (preparation): 0.5 h/100 m * 7,500 m * €12/h ⁽¹⁾ = €450 Planting: 0.66 h/100 plants * 24,200 plants ⁽³⁾ * €12/h ⁽¹⁾ = €1,916 Adventitious plant control: (three times per plantation) (on the roads) 2 min/(line and day) * 100 lines * 6 days * 1 h/60 min * €12/h = €240 (in the ditch or between crops) 60 min/(line and day) * 100 lines * 6 days * 1 h/60 min * €12/h ⁽¹⁾ = €7,200 Application of BRF and biofertilisers: (BRF) 0.75 h/line * 100 lines * €12/h ⁽¹⁾ = €900 (biofertilisers) 0.06 h/(line and time) * 100 lines * 20 times (once every two weeks) * €12/h ⁽¹⁾ = €1,440 Harvest: (mean estimation between May and December): 4 h/day * 200 days * €12/h = €9,600	0	Seedlings €15/100 plants * 24,200 plants = €3,630	BRF (production): 0.5 m ³ /line of 75 m*100 lines * 3 h/m ³ BRF * €12/day = €1,800	€27,176 (counting internal inputs) €25,376 (without counting internal inputs)
COWS				
Functioning: 3 h/day including movement (0.5 h/day), feeding (0.5 h/ day, several months), clearing the plot (1 h/day), milking (1 h/day) * 365 days * €12/h ⁽¹⁾ = €13,140	0	Forage: ⁽⁴⁾ 10,746 kg/DM * ((0.6 * 1 bale/150 kg DM grasses * €35/bale) + (0.4 * 1 bale/200 kg DM alfalfa * €60/bale)) = €2,794	Grass: 12.5 kg DM/(cow and day) ⁽⁵⁾ * 365 days * 10 cows * ((0.6 * 1 bale/150 kg DM grasses * €35/bale) + (0.4 * 1 bale/200 kg DM alfalfa * €60/bale)) ⁽⁶⁾ = €11,862	€27,796 (counting internal inputs) €15,934 (without counting internal inputs)
CALVES				
Functioning: movement (0.5 h/day) * 365 days * €12/h ⁽¹⁾ = €2,190	Transport and slaughterhouse (external): €500/calf * 10 calf = €5,000	0	Grass (calves in Pasture 1, dehesa and extensive crops): 200 kg weight/calf * 0.025 kg DM/(kg weight and day) ⁽⁷⁾ * 20 calves * 365 days * 1 bale/150 kg DM grasses * €35/bale = €8,516	€15,706 (counting internal inputs) €7,190 (without counting internal inputs)
RABBITS				
Functioning Rabbits: movement (in combination with the transport of chickens) 0.5 h/day * 365 days * €12/h = €2,190 Young rabbits: feeding and cleaning of breeding individuals 8 h/(25 cages and month) * 12 months * €12/h ⁽¹⁾ = €1,152 Slaughterhouse (own): 1 h/6 rabbits * 960 rabbits * €12/h ⁽¹⁾ = €1,920	0	Feed (breeding individuals, both males and females): €0.5/kg * 8 kg feed/month and rabbit * 12 months * 20 rabbits = €960	Grass (rabbits in pasture 2): 2 kg weight/rabbit * 0.15 kg DM/(kg weight and day) ⁽⁸⁾ * 960 rabbits * 60 days * 1 bale/150 kg DM grasses * €35/bale = €4,032	€10,254 (counting internal inputs) €6,222 (without counting internal inputs)
CHICKENS				
Functioning Chickens: movement, feeding 1.5 h/day * 365 days * €12/h = €6,570 Chicks: feeding and cleaning 0.25 h/day * 155 days * €12/h ⁽¹⁾ = €465 Slaughterhouse (own): 2,400 chickens * 1.5 €/chicken = €3,600	0	Feed (chickens): €0.58/kg * 7 kg/chicken * 2,400 chickens = €9,744 Feed (chicks): €0.36/kg * 0.75 kg/chick * 3,000 chicks = €810 Chicks (of one day): €0.36/chick * 3,000 chicks = €1,080	Grass (30% of the diet of chickens in pasture 2): 3 kg DM/chicken * 2400 chickens * 1 bale/150 kg DM grasses * 35 €/bale = €1,680	€23,949 (counting internal inputs) €22,269 (without counting internal inputs)
HENS				
Functioning: opening to the garden, feeding 0.5 h/day * 365 days * €12/h ⁽¹⁾ = €2,190	0	Grain: 0.32 €/kg * 0.11 kg/hen and day * 365 days * 200 hens = €2,570	0	€4,760

⁽¹⁾ A salary of €9/h (plus Social Security) is considered for an agricultural worker.

⁽²⁾ The fruit trees are distributed every 10 m along the separation lines of the plots, in a density of about 100-120 per ha, in total 700 trees.

⁽³⁾ Sum of the annual planting of all the products broken down in Table 2 of the following sheet.

⁽⁴⁾ It is the forage necessary to complete the feeding of cows and calves in times when there is not enough grass in the meadow.

⁽⁵⁾ Value obtained from Wattiaux (1996) for 500 kg cows and a production of 10 l of milk per day.

⁽⁶⁾ Dairy cows are fed a 60:40 ratio of grass and legume forage (alfalfa). When bales are supplied, grass bales weigh about 350 kg and are priced around €35/bale, while alfalfa bales weigh about 400 kg and are priced around €60/bale.

⁽⁷⁾ In Perramón (2016) it is indicated that each calf consumes 2.5% of its weight in kg of DM every day.

⁽⁸⁾ In the FAO report (1996) it is indicated that each adult rabbit consumes 15% of its weight in kg of DM every day.

Table 1. Expected costs for labour, mechanisation, external inputs and internal inputs of the different elements of the Polyfarming system in the model farm described in this sheet.