Balance of costs and incomes at farm level of the Polyfarming system II. Incomes and balance sheet

In a model farm in which the different elements of the Polyfarming system operate, **the annual income** from the outputs of the different elements is around €214,415. The total balance sheet at farm level between **income and total costs** is positive **whether the intermediate products** produced in elements of the farm itself are included (+ €65,749) **or not** (+ €93,773). These results are based on optimal yields that allow minimising expenses and maintaining the expected income in all the elements, but **they can be greatly modified** when not all the elements proposed are available or when climatic variations occur that can affect the mortality of animals and plants.

◼ Incomes in the different elements of the Polyfarming system

The expected annual income from the outputs of the different elements of the Polyfarming system reaches a total of €214,415 (**Table 1**). In some cases, estimates have been made based on information published in the literature, since they have not yet been measured at the Planeses farm. **By type of output**, the highest incomes are those from vegetables from the garden (€53,515), milk from cows (€42,000), chicken meat (€33,600), fruit from fruit trees (€28,000) and firewood from the forest (€24,000). In addition to external outputs, **there are a number of intermediate products,** mainly grass, but also grain, which are produced on the farm and used on the farm itself. These represent a total of €23,918 that must not be bought externally.

◼ Balance of costs and incomes at farm level

The total balance sheet for the entire model farm is the difference between the **total costs** (calculated in the previous sheet) and the **total income** (calculated in the previous section). If all the costs that the farm would have incurred are included, **including those of intermediate products** that are produced in elements of the farm itself to be consumed in other elements of the farm, the balance sheet is as follows:

$$\text{Farm}_{balance} = \text{Farm}_{incomes} - \text{Farm}_{costs} = €214,415 - €148,666$$

$$= €65,749$$

Element	Output	Quantity in time (a)	Number of times per period (b)	Price per unit (c)	Annual income (a*b*c)
Forest	Firewood	4 Tm/day	100 days	60 €/Tm	€24,000
Dehesa	Forage	3000 kg MS/month [1]	3 months	Grasses: €35/150 kg DM	€2,100
Pasture 1	Forage	62,379 kg DM annually [3]	1 year	Grasses (60%): bale €35/150 kg MS Legumes (40%): bale €60/200 kg MS	€16,218
Pasture 2	Forage	17,822 kg DM/ha annually	1 year	Grasses: bale €35/150 kg DM	€4,158
Extensive crops	Forage	,719 kg DM/ha * 2 ha	1 time	Grasses: bale €35/150 kg DM	€802
Extensive crops	Grain (wheat)	1,000 kg/ha [3] * 2 ha	1 crop	€0.32/kg	€640
Fruit trees	Fruits (almonds)	110 kg/tree with irrigation[4] * 700 trees	1 crop	€4/kg [5]	€28,000
Garden crops	Vegetables	The amounts by crops are in Table 2 [6]	6 months	€8,919/month	€53,515
Cows	Milk	7 l/cow and day * 10 cows (one milking per day)	300 days (10 months per year)	€2/l [7]	€42,000
Calves	Meat	0 calves/year * 400 kg/calf * 0.33[8]	1 year	€10/kg meat	€13,200
Chickens	Meat	200 chicken/month * 2 kg/chicken	12 months	€7/kg meat	€33,600
Rabbits	Meat	80 rabbits/month	12 months	€10/rabbit	€9,600
Hens	Eggs	200 hens * 180 eggs/hen per year	1 year	€3.5/12 eggs	€10,500

[1] Only the amount consumed by the calves during the months they spend in the dehesa is counted.
[2] The amount of grass produced in the meadow by adding the production of each of the seven periods per year and using the following equation for each one: Production (kg DM/ha) = 52.7 + 1.6 * Pasture height (cm).
[3] The average production of wheat in rainfed ranges between 2,800 and 3,000 kg/ha. One third of this harvest is given because the sowing is done at one third density.
[4] Average production of 10 to 15 kg of almonds per tree, in irrigated fields or in fresh drylands.
[5] Average price of the Lonja de Reus in November 2020.
[6] Table 2 details the indicative quantities of the different crops installed in the orchard, their prices and the income obtained from each one.
[7] This is the sale value for the subsequent production of yogurt, it is not the sale value of milk directly.
[8] Carcass live weight yield is estimated at 50% (although it can reach 60% with great differences according to breeds and weights at the time of slaughter) and finally 33% of the meat remains.

Table 1. Expected annual income from the outputs of the different elements of the Polyfarming system in the model farm described in the previous sheet. Intermediate products that are not sold, but are used in other elements of the farm are in red.

CROP	LINES	PLANTATION	PRODUCT	PRICE PER UNIT	TOTAL INCOME
Lettuce	10	Every 25 cm, 300 per line, 3,000 overall	3,000 units	€0.9/unit	€2,700
Tomato	10	Every 40 cm, 190 per line, 1,900 overall	4 kg/plant	€1.8/kg	€13,680
Pea	5	Every 40 cm, 190 per line, 950 overall	1 kg/plant	€4.3/kg	€4,085
Broad bean	5	Every 60 cm, 125 per line, 625 overall	2 kg/plant	€1.7/kg	€2,125
Aubergine	10	Every 40 cm, 190 per line, 1,900 overall	2 kg/plant	€2.2/kg	€8,360
Bean	5	Every 40 cm, 190 per line, 950 overall	1 kg/plant	€4.5/kg	€4,275
Cabbage	20	Every 60 cm, 125 per line, 2,500 overall	2,500 units	€1.3/unit	€3,250
Celery	5	Every 50 cm, 150 per line, 750 overall	5 u/ bunch	€0.9/bunch	€135
Beet	10	Every 25 cm, 300 per line, 2 per hole, 6,000 overall	5 u/ bunch	€1.2/bunch	€1,440
Chard	5	Every 25 cm, 300 per line, 2 bunches per plant, 3,000 overall	0.5 kg/bunch	€1.0/bunch	€1,500
Pumpkin	20	Every 100 cm, 75 per line, 1,500 overall	3 units of 1.5 kg each	€1.4/kg	€9,450
Leek	5	Every 20 cm, 375 per line, 2 per hole, 3,750 overall	5 units/bunch	€1.5/bunch	€1,125
Onion	5	Every 10 cm, 750 per line, 2 per hole, 7,500 overall	7 units/kg	€1.3/kg	€1,390

Table 2. Indicative quantity of plants installed in the orchard of the different crops throughout a year, and annual incomes obtained from each one. The prices per unit have been obtained from the catalogues of the farmers' associations Xarxa Pagesa and Hortec for 2020.

However, the balance sheet **not considering the cost of these intermediate products** is quite different, as seen below:

$$Farm_{balance} = Farm_{incomes} - Farm_{costs} = €214,415 - €120,642 = €93,773$$

Considering the **different elements** that have a product that is sold outside the farm separately, we obtain the following:

- In the case of the **forest**, and considering that the farm has a tractor, so its rent does not have to be recorded, the income from firewood (€24,000) considerably exceeds the annual costs (€19,500).
- The balance of the **fruit trees** is very positive, since the annual income (€28,000) is much higher than the expenses (€4,200), although it must be taken into account that the initial planting costs are very high (€22,260) and that the fruit trees take quite a few years to enter production.
- In the case of the **garden**, the costs are very high (€25,376), but they are offset by high income too (€53,515).
- The balance sheet of the **cows** is clearly positive between income from milk (€42,000) and costs (€15,934), even if the grass they consume was counted (€11,862).
- Calves also have a positive balance **sheet** between income (€13,200) and costs (€7,190), although without accounting for the grass they consume (€8,516).
- In the case of **rabbits**, the expected income from the sale of meat (€9,600) exceeds the annual costs (€6,222), provided that the costs of the grass they consume in the meadow (€6,048) are not counted.
- Regarding **chickens**, the expected income from the sale of meat (€33,600) considerably exceeds the annual costs (€22,269), and in this case the costs are not greatly increased by internal inputs (€1,680).
- Finally, for hens, the expected income from eggs (€10,500) also considerably exceeds the annual costs (€4,760).

■ Aspects to consider about variations in the balance sheet at farm level

The above values are based on optimal returns that allow us to minimise expenses and maintain expected incomes in all elements of the farm. However, in many cases the internal or **external conditions of the farm do not allow the project to be developed in optimal conditions:**

- First, it must be considered that **only production costs have been included**, but that a farm has other management and marketing expenses that, in this case, have not been taken into account. The costs until the production of the raw material have been considered, the possible costs of processing the products have not been included, which also have a different sale price. Furthermore, all products have been considered to be sold at the proposed price, which is often not possible.
- **Frequently, it is not possible to have all the elements** proposed in this pilot farm and, on occasions, not all are in production due to various circumstances. Depending on which is not in operation at a certain time or a certain farm, the result of the balance is obviously different.
- On the other hand, **the possible climatic variations** that may occur, such as periods of extreme heat or extreme cold that can greatly affect the survival and growth of animals, or periods of extreme drought that can limit the growth of plants, mainly those of the pastures, should be considered. Major natural catastrophes like the recent Gloria storm can also cause significant facility losses.

In any case, the results of costs, income and balances of Polyfarming as a whole and of the different elements separately allow us to quantify the factors that can modify them and to know that it can be more or less profitable for the farm, depending on the situation that arises at each moment. These calculations incorporate the idea that, in Polyfarming, with the same staff, work is optimised in time and space, and, in addition, the by-products of one element are used for others within the farm.