

Name:

Profitability per hectare.

Definition:

The net farm income is an indicator defined by the OECD (2001) as the difference between the gross income and all the expenses incurred through the operation of a farm, including the depreciation of fixed capital assets used on the farm.

The net farm income is a summary of income and variable expenses that occurred during a specified accounting period. In fact, this will be, with slight differences, the concept that will be used for the measurement of net income of producers.

Calculation method:

Crop income, such as agricultural subsidies established by Common Agricultural Policy, is necessary in order to calculate the gross farm income. On the other hand, variable expenses related to agricultural activity are seeds, fertilizers, energy, wage labour, etc.

The value of this indicator shall be calculated as explained below:

$$\text{Indicator} = \frac{\sum_i [(CY_i \times P_i) - VC_i] S_i + Sub_i}{A_t}$$

Where:

CY_i: Crop yield (T/ha) of each plot

P_i: Production prices / selling price of a product (€/T)

VC_i: Variable crop costs (€/ha)

A_i: Area assigned to the crop/plot

Sub_i: Agricultural subsidies

A_T: Total area considered (ha). Useful agricultural area (UAA).

The alternative calculation without taking into account the amount received by the subsidies

$$\text{Indicator} = \frac{\sum_i [(CY_i \times P_i) - VC_i] A_i}{A_t}$$

Where:

Rto_i: Crop yield (T/ha) of each plot

P_i: Selling price of a product (€/T)

CV_i: Variable crop costs (€/ha)

S_i: Area assigned to the crop/plot

Subv_i: Agricultural subsidies

S_T: Total area considered (ha). Without counting set aside areas.

Interpretation:

The analysis of different measures of the indicator taken over time allows an analysis of the financial viability of the farm. Given repeated negative results, it could be concluded that the activity is not economically sustainable.

When introducing the subsidies, these can distort the effect of the management of the farm, although some of them will affect its management and therefore its possible productive potential. For example, when applying for a farm subsidy that implies the maintenance of a set aside area on the holding, it also leads to a reduction in crop production. If we received an agricultural subsidy that requires to keep part of the parcel fallow or with a cover, it would mean a decrease in production.

To compare management systems without the implication of the subsidies, the same formula is applied without counting the subsidies and using only the cultivated area.

Information source:

Data obtained through a survey to farmers

- CY_i: Crop yield (T/ha) of each plot. Data obtained through a survey to farmers
- P_i: Selling price of a product (€/T). Data obtained through a survey to farmers
- VC_i: Variable crop costs (€/ha). The costs depend on operations on the plot and following means:
 - Fuel consumption cost (Fidalgo, 2005)
 - Cost of seed
 - Cost of fertilizers and plant protection products
 - Labor costs
 - Machinery Equipment cost
- A_i: Area assigned to the crop/plot. Data obtained through a survey to farmers
- Sub_i: Agricultural subsidies. Data obtained through a survey to farmers
- A_T: Total area considered (ha). Data obtained through a survey to farmers.

Fuel consumption

The Spanish Institute for Energy Diversification and Saving (IDAE), based on studies of consumption of agricultural machinery, proposes the calculation of hourly consumption (l/h) of tractor fuel in agricultural work according to the following equation:

$$Ch = A \times T \times P \times M \times 0,6 \times (n_m / 2400) + 0,04 \times 0,333 \times N$$

Where:

- C_h = Hourly consumption in l/h.
- n_m = engine speed (rpm)
- 0,333 = Average coefficient of specific consumption of tractors (l/kW·h).
- N = Rated power of the tractor (kW).
- A = Implement factor. It is the value given in the following table which corresponds to implements of high requirements (subsoiler, mouldboard plough, chisel, spring

cultivator and direct seeder), medium requirements (plow, milling machine, cultivators, harrows, single drill, atomizer, mower conditioner, full trailer) and low requirements (roller, seed drill, locating fertilizer, centrifugal fertilizer, manure distributor trailer, hydraulic sprayer, rotary mower, swather rake, packer and empty trailer). The division has been made according to the hourly consumption in average conditions of each tested farming implement device.

T = Texture factor. It has the value given in the following table which corresponds to loose textures (sandy loam), medium (medium loam and clay loam) and strong (clay loam) textures.

P = Depth factor. It has the value given in the following table which corresponds to surface work (work on the surface of the land or depth less than 5 cm), low depth (below average tillage conditions), medium depth and high depth (above average tillage conditions).

M = Gear factor. It has the value given in the following table and corresponds to short gears (1st, 2nd, 2^{1st}), normal gears (3rd, 4th, 4^{1st}) and long gears (5th, 6th and 7th).

The hourly consumption of fuel can help us calculate the surface consumption (l/ha), using the following equation: $Cha = C_h \times 10 / (a \times v)$

Where:

A = width of the farming implement device (m).

V = working speed (km/h). The working speed (km/h), can be estimated, according to the following table:

IMPLEMENT FACTOR (A)		TEXTURE (T)		DEPTH (P)		GEAR (M)		V(km/h) 1500-2000-2500 rpm
Low requirement	0.56	Medium	1.00	Surface	1.00	Short	0.84	1.5-2.7-3.8
						Normal	0.96	3.6-4.7-5.9
						Long	1.11	5.7-6.8-8.0
				Baja	0.89	Short	0.82	1.5-2.7-3.8
						Normal	1.10	3.6-4.7-5.9
						Long	1.26	5.7-6.8-8.0
				Media	1.02	Short	0.84	1.5-2.7-3.8
						Normal	1.02	3.6-4.7-5.9
						Long	1.29	5.7-6.8-8.0
				Alta	1.14	Short	0.79	1.5-2.7-3.8
						Normal	1.02	3.6-4.7-5.9
						Long	1.21	5.7-6.8-8.0
Medium requirement	0.82	Loose	0.92	Surface	1.00	Short		1.5-2.7-3.8
						Normal		3.6-4.7-5.9
						Long	0.96	5.7-6.8-8.0
				Baja	0.75	Short		1.5-2.7-3.8
						Normal	0.96	3.6-4.7-5.9
						Long	1.02	5.7-6.8-8.0
				Media	1.08	Short		1.5-2.7-3.8
						Normal	0.94	3.6-4.7-5.9
						Long	1.05	5.7-6.8-8.0

IMPLEMENT FACTOR (A)		TEXTURE (T)		DEPTH (P)		GEAR (M)		V(km/h) 1500-2000-2500 rpm		
				High depth	1.26	Short		1.5-2.7-3.8		
						Normal	0.92	3.6-4.7-5.9		
						Long	1.08	5.7-6.8-8.0		
		Medium	1.02	Surface	1.00	Short	0.71	1.5-2.7-3.8		
						Normal	1.04	3.6-4.7-5.9		
						Long	1.23	5.7-6.8-8.0		
				Low depth	0.79	Short	0.85	1.5-2.7-3.8		
						Normal	0.98	3.6-4.7-5.9		
						Long	1.11	5.7-6.8-8.0		
				Medium	1.08	Short	0.74	1.5-2.7-3.8		
						Normal	1.06	3.6-4.7-5.9		
						Long	1.08	5.7-6.8-8.0		
				High depth	1.11	Short	0.78	1.5-2.7-3.8		
						Normal	1.04	3.6-4.7-5.9		
						Long	1.17	5.7-6.8-8.0		
		Strong	1.17	Surface	1.00	Short	0.46	1.5-2.7-3.8		
						Normal		3.6-4.7-5.9		
						Long		5.7-6.8-8.0		
				Low depth		Short		1.5-2.7-3.8		
						Normal		3.6-4.7-5.9		
						Long		5.7-6.8-8.0		
				Medium	0.92	Short	1.00	1.5-2.7-3.8		
						Normal		3.6-4.7-5.9		
						Long		5.7-6.8-8.0		
				High depth	1.14	Short		1.5-2.7-3.8		
						Normal	1.00	3.6-4.7-5.9		
						Long		5.7-6.8-8.0		
		High requirement	1.02	Loose	0.96	Surface		Short		1.5-2.7-3.8
								Normal		3.6-4.7-5.9
								Long		5.7-6.8-8.0
						Low depth	0.86	Short	0.69	1.5-2.7-3.8
								Normal	0.98	3.6-4.7-5.9
								Long	1.29	5.7-6.8-8.0
						Medium	1.04	Short	0.98	1.5-2.7-3.8
								Normal	1.02	3.6-4.7-5.9
								Long	0.87	5.7-6.8-8.0
High depth	1.23			Short		1.5-2.7-3.8				
				Normal	0.94	3.6-4.7-5.9				
				Long	1.11	5.7-6.8-8.0				
Medium	0.96			Surface	1.00	Short		1.5-2.7-3.8		
						Normal	0.70	3.6-4.7-5.9		
						Long	1.05	5.7-6.8-8.0		

IMPLEMENT FACTOR (A)		TEXTURE (T)		DEPTH (P)		GEAR (M)		V(km/h) 1500-2000-2500 rpm
				Low depth	0.93	Short	0.70	1.5-2.7-3.8
						Normal	1.02	3.6-4.7-5.9
						Long	1.20	5.7-6.8-8.0
				Medium	1.00	Short	0.75	1.5-2.7-3.8
						Normal	1.02	3.6-4.7-5.9
						Long	1.17	5.7-6.8-8.0
				High depth	1.14	Short	0.67	1.5-2.7-3.8
						Normal	1.04	3.6-4.7-5.9
						Long	1.26	5.7-6.8-8.0
		Strong	1.29	Surface		Short		1.5-2.7-3.8
						Normal		3.6-4.7-5.9
						Long		5.7-6.8-8.0
				Low depth		Short		1.5-2.7-3.8
						Normal		3.6-4.7-5.9
						Long		5.7-6.8-8.0
				Medium	1.00	Short	0.60	1.5-2.7-3.8
						Normal	1.12	3.6-4.7-5.9
						Long	1.05	5.7-6.8-8.0
				High depth	1.11	Short		1.5-2.7-3.8
						Normal		3.6-4.7-5.9
						Long	0.99	5.7-6.8-8.0

Bibliography and references:

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OECD - Organization for Economic Co-operation and Development (2001): Environmental indicators for agriculture. Volume 3 - Methods and Results, París.