Economic indicators for the sustainability assessment of the MilKey project

WP4

Description of selected indicators and their scales for the economic assessment of MilKey dairy farm systems

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Summary

Economic Indicators

This document describes the indicators applied in the economic sustainability assessment. These are presented in table 1 and figure 1. The indicators and their formulas were selected based on expert opinion of the MilKey economic assessment subgroup and retrieved from a combination of sources, including European Union (EU) Farm Accountancy Data Network (FADN) reports and technical documents (European Commission, 2018a, b, 2020), and the Teagasc National Farm Survey (NFS) 2019 sustainability report (Buckley and Donnellan, 2020). The variables used in the calculations were derived from the FADN methodology (European Commission, 2020)[1]. Finally, for each indicator, the scale of qualitative scores was constructed following a quantile method based on the distribution of FADN country averages for EU specialized dairy farms (European Commission, 2019).

Table 1: Economic indicator list

Indicators	Unit
Farm gross output per unpaid labour input	**€/hrs**
Farm gross margin per unpaid labour input	**€/hrs**
Farm net income (before depreciation) per unpaid labour input	**€/hrs**
Dairy product sales per dairy cow	**€/cow**
Market orientation	**%**
Loan repayments per farm gross margin	**€/€**
% of dairy gross output in the farm gross output	**%**
Liabilities-to-assets ratio	**€/€**
Liabilities-to-current assets ratio	**€/€**
Farm net worth per utilised agricultural area	**€/ha**
Direct production costs per farm gross output	**€/€**
Direct production costs per utilised agricultural area	**€/ha**
Labour input per farm gross output	**Hrs/€**
Labour input per utilised agricultural area	**Hrs/ha**
Milk produced per cow	**kg/ha**

[1] Please note that the farm income measure used in the current study does not take into account asset depreciation. This stands in contrast with farm income indicators used in the FADN reporting (European Commission, 2020, 2018a, 2018b).

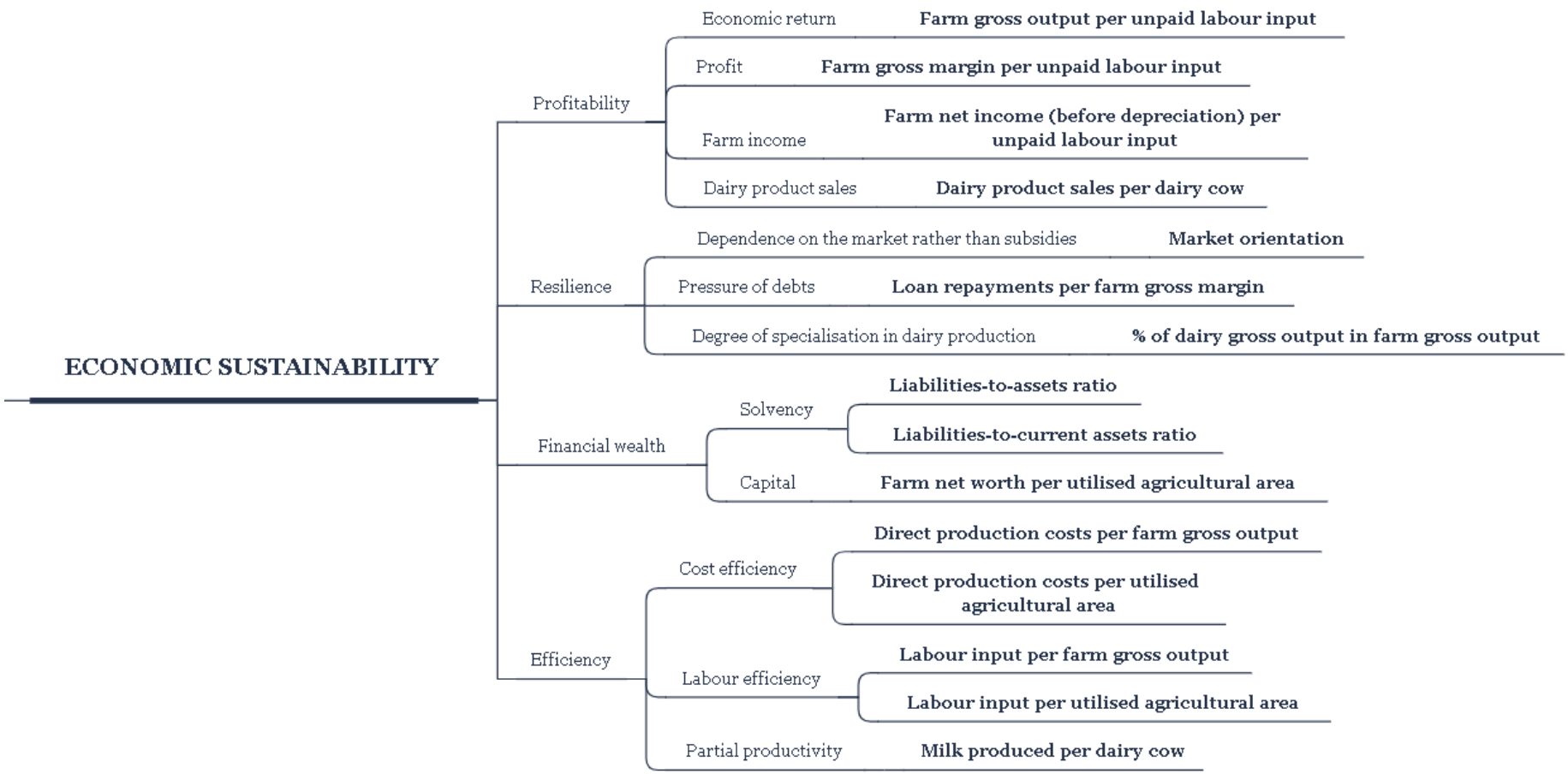

Figure 1: Economic branch of the sustainability assessment

Farm gross output per unpaid labour input

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability : Profitability: Economic return

Description:

- This indicator calculates the total production value (i.e. gross output), where all farming enterprises are taken into consideration. It is equal to the total value of crops and crop products, livestock and livestock products, and earnings from gainful activities (e.g., biogas production, commercial forestry).
- Farm gross output is divided by unpaid labour input to represent the economic value of unpaid family labour.

Indicator calculation:

$$\frac{\begin{array}{c}[(Sales\ and\ use\ of\ crops\ and\ crop\ products, and\ livestock\ and\ livestock\ products)\\ +(Changes\ in\ stocks\ of\ crop\ and\ livestock\ products)\\ +(Changes\ in\ valuation\ of\ non\ breeding\ livestock)\\ -(Purchases\ of\ livestock)\\ +(Earnings\ from\ other\ gainful\ activities)]\end{array}}{Total\ hours\ worked\ by\ unpaid\ family\ members}$$

Unit: €/hrs

Indicators interpretation: Higher values indicate larger output levels and thus better economic performance.

Scale proposition:

Scales	**Values (€/hrs)**	**Dexi interpretation**		**References**
>=75th percentile	>= 101.63	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[58.65; 101.63[	Medium to high		
[25th percentile; median[	[20.38; 58.65[	Medium to low		
< 25th percentile	< 20.38	Low	-	

Farm gross margin per unpaid labour input

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability : Profitability: Profit

Description:

- Farm gross margin describes the farm's profitability by comparing the total production value to the costs directly involved in producing output. It is equal to the farm gross output minus direct production costs, where all farming enterprises are taken into consideration.
- Direct production costs include:
    - The costs of crop-specific inputs (e.g., seeds and plants, fertilizers, crop protection products, soil analysis);
    - The costs of livestock-specific inputs (e.g., feed, veterinary fees and reproduction costs, milk tests); and
    - The costs associated with other gainful activities (e.g., biogas production costs, product processing, forestry-specific costs).
- Farm gross margin is divided by unpaid labour input to represent the profit available to pay unpaid family labour.

Indicator calculation:

$$\frac{(Farm\ gross\ output) - (Direct\ production\ costs)}{Total\ hours\ worked\ by\ unpaid\ family\ members}$$

Unit: €/hrs

Indicators interpretation: Higher values indicate larger margins over operating costs and thus better economic performance.

Scale proposition:

Scales	**Values (€/hrs)**	**Dexi interpretation**		**References**
>=75th percentile	>= 51.15	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[30.22; 51.15[	Medium to high		
[25th percentile; median[	[10.65; 30.22[	Medium to low		
< 25th percentile	< 10.65	Low	-	

Farm net income (before depreciation) per unpaid labour input

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

Economic sustainability: Profitability: Farm income

Description:

- Farm net income gives an indication of the capacity to remunerate the farm's own production factors such as unpaid family labour, capital, and land. It equals farm gross output minus all farm costs (i.e., direct production costs, overhead costs and external costs), minus farm taxes, plus all direct subsidies. All farming enterprises are taken into consideration.
- Overhead costs include:
    - Machinery and building costs (e.g., costs of current upkeep of equipment and buildings, costs of land improvements, purchase of minor equipment, car expenses, insurance of buildings);
    - Energy costs (e.g., motor fuels and lubricants, electricity, heating fuels);
    - Expenditure on contract work (e.g., costs linked to work carried out by contractors and to the hire of machinery); and
    - Other costs in the following categories: water, agricultural insurance (except for buildings and accidents at work), accountants' fees, advisory fees, and telephone charges.
- External costs include:
    - Wages, social security charges and insurance of wage earners;
    - Rent paid for farmland and buildings and rental charges; and
    - Loan repayments.
- Subsidies include:
    - Coupled direct payments for crops and livestock;
    - Total support for rural development (e.g., environmental subsidies, subsidies on environmental restrictions, subsidies for less favourite areas (LFA) and areas facing natural or other specific constraints, other rural development payments);
    - Subsidies on direct production costs and overhead costs;
    - Subsidies on external factors; and
    - Subsidies on investments (also known as capital grants).
- Farm net income is divided by unpaid labour input to represent the ability to pay for unpaid family labour. This figure is likely to play an important role in the decision to continue operating the farm for members of the farming household.

Indicator calculation:

$$\frac{[(Farm\ gross\ margin) - (Overhead\ costs) - (External\ costs) - (Farm\ taxes) + (Subsidies)]}{Total\ hours\ worked\ by\ unpaid\ family\ members}$$

Unit: €/hrs

Indicators interpretation: Higher values indicate greater ability to remunerate unpaid family labour, as well as other production factors (e.g., land, capital) and thus better economic performance.

Scale proposition:

Scales	**Values (€/hrs)**	**Dexi interpretation**		**References**
>=75th percentile	>= 29.13	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[21.71; 29.13[	Medium to high		
[25th percentile; median[	[9.56; 21.71[	Medium to low		
< 25th percentile	< 9.56	Low	-	

As a summary, the formulas used to calculate farm gross output, farm gross margin, and farm net income are represented in figure 2.

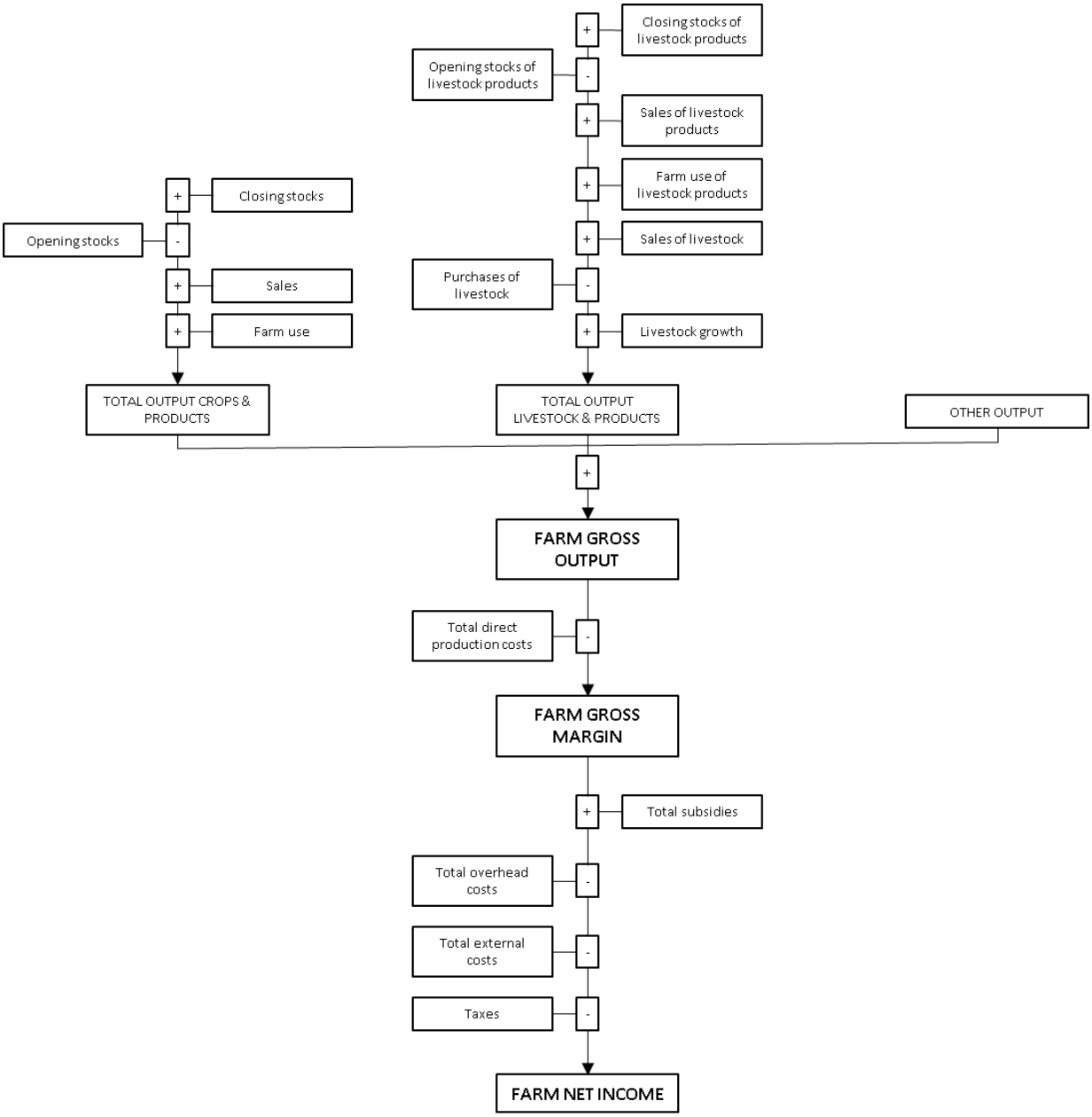

Figure 2: Formulas to calculate farm gross output, farm gross margin, and farm net income

Dairy product sales per cow

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

Economic sustainability: Profitability: Dairy product sales

Description:

- Dairy product sales represents the value of milk and milk products sold off farm. It is specific to the dairy enterprise.
- The measure is divided by the total number of dairy cows to account for differences in herd size.

Indicator calculation:

$$\frac{Sales\ of\ milk\ and\ milk\ products}{Average\ herd\ size}$$

Unit: €/cow

Indicators interpretation: Higher values indicate larger quantity and/or quality of dairy production and thus better economic performance.

Scale proposition:

Scales	**Values (€/cow)**	**Dexi interpretation**		**References**
>=75th percentile	>= 2758.59	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[2505.32; 2758.59 [	Medium to high		
[25th percentile; median[	[1856.53; 2505.32[	Medium to low		
< 25th percentile	< 1856.53	Low	-	

Market orientation

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Resilience: Dependence on the market rather than subsidies

Description:

- This indicator refers to the percentage of farm earnings derived from the market rather than subsidies. It takes into account all farming enterprises and is equal to farm gross output divided by the sum of farm gross output and subsidies.

Indicator calculation:

$$\frac{Farm\ gross\ output}{(Farm\ gross\ output) + (Subsidies)} * 100$$

Unit: Percentage

Indicator interpretation: Higher values indicate greater dependence on the market rather than on subsidies, and thus better resilience capacity and economic sustainability.

Scale proposition:

Scales	**Values (%)**	**Dexi interpretation**		**References**
>=75th percentile	>= 89.94	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[84.38; 89.94[	Medium to high		
[25th percentile; median[	[77.37; 84.38[	Medium to low		
< 25th percentile	< 77.37	Low	-	

Loan repayments per farm gross margin

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Resilience: Pressure of debts

Description:

- This indicator is equal to the ratio of loan repayments to farm gross margin and gives an indication of the share of farm profits utilised to pay off loans. It takes into consideration all farming enterprises.

Indicator calculation:

$$\frac{Loan\ repayments}{Farm\ gross\ margin}$$

Unit: €/€

Indicator interpretation: Higher values indicate larger pressure of debts, and thus lower resilience capacity and economic sustainability.

Scale proposition:

This variable will be scaled following the quantile method on the data obtained from the MilKey case study farms.

% of dairy gross output in farm gross output

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability : Resilience: Degree of specialization in dairy production

Description:

- This indicator gives an indication of the level of farm diversification. It calculates the percentage of gross output coming from the dairy enterprise, i.e., percentage of dairy gross output in farm gross output.

Indicator calculation:

$$\frac{\left[\begin{matrix}(Sales\ and\ use\ of\ dairy\ products\ and\ dairy\ animals)\\ -(Purchases\ of\ dairy\ animals)\end{matrix}\right] * 100}{Farm\ gross\ output}$$

Unit: Percentage

Indicators interpretation: Higher values are generally associated with lower resilience capacity and thus economic sustainability.

Scale proposition:

Scales	**Values (%)**	**Dexi interpretation**		**References**
< 25th percentile	< 63.18	High	+	Based on the Teagasc NFS data distribution for Irish specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[63.18; 77.68[	Medium to high		
[median; 75th percentile[	[77.68; 84.37[	Medium to low		
>=75th percentile	>= 84.37	Low	-	

Liabilities-to-assets ratio

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Financial wealth: Solvency

Description:

- This indicator refers to the share of the assets that are financed through debt. It gives an indication of the farm's ability to meet obligations in the long term and repay all liabilities if all assets are sold.
- The indicator is calculated by dividing the value of liabilities by the value of all assets.
- Liabilities and assets are valued at the end of the calendar year.
- Fixed assets include:
    - Agricultural land (including land improvements and permanent crops);
    - Forest land;
    - Farm buildings;
    - Machinery and equipment (e.g., tractors, motor cultivators, lorries, vans, major and minor farming equipment); and
    - Breeding livestock (e.g., breeding heifers, dairy cows, suckler cows, other breeding animals such as goats and ewes).
- Current assets include:
    - The stock of crop products and livestock products;
    - Non-breeding livestock (e.g., animals for fattening);
    - Inventories of (purchased or homegrown) products owned by the holding that can be used either as inputs or held for sale (e.g., feedstuff, fertilizers, veterinary supplies, crop protection products); and
    - Circulating capital.

Indicator calculation:

$$\frac{Total\ liabilities\ at\ closing\ valuation}{(Fixed\ assets\ at\ closing\ valuation) + (Current\ assets\ at\ closing\ valuation)}$$

Unit: €/€

Indicator interpretation: Higher values indicate larger ratios of debts to assets and thus lower economic sustainability.

Scale proposition:

Scales	**Values (€/€)**	**Dexi interpretation**		**References**
< 25th percentile	< 0.054	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[0.054; 0.18[	Medium to high		
[median; 75th percentile[	[0.18; 0.34[	Medium to low		
>=75th percentile	>= 0.34	Low	-	

Liabilities-to-current assets ratio

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Financial wealth: Solvency

Description:

- This indicator refers to the farm's ability to meet obligations in the short term and repay all liabilities if all current assets are sold.
- The indicator is calculated by dividing the value of liabilities by the value of current assets.
- Liabilities and current assets are valued at the end of the calendar year.

Indicator calculation:

$$\frac{Total\ liabilities\ at\ closing\ valuation}{Current\ assets\ at\ closing\ valuation}$$

Unit: €/€

Indicator interpretation: Higher values indicate larger ratios of debts to current assets and thus lower economic sustainability.

Scale proposition:

Scales	**Values (€/€)**	**Dexi interpretation**		**References**
< 25th percentile	< 0.40	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[0.40; 0.89[	Medium to high		
[median; 75th percentile[	[0.89; 1.96[	Medium to low		
>=75th percentile	>= 1.96	Low	-	

Farm net worth per utilised agricultural area

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Financial wealth: Capital

Description:

- This measure gives an indication of the financial wealth of the farm business. It is defined as the difference between the value of total assets and of total liabilities, divided by utilised agricultural area (UAA) to account for the variation in farm size.
- Liabilities and assets are valued at the end of the calendar year.

Indicator calculation:

$$\frac{[(Fixed\ assets\ at\ closing\ valuation) + (Current\ assets\ at\ closing\ valuation) - (Total\ liabilities\ at\ closing\ valuation)]}{UAA}$$

Unit: €/ha

Indicator interpretation: Higher values indicate larger wealth and thus better economic sustainability.

Scale proposition:

Scales	**Values (€/ha)**	**Dexi interpretation**		**References**
>=75th percentile	>= 14545.81	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[8488.02; 14545.81[	Medium to high		
[25th percentile; median[	[3356.18; 8488.02[	Medium to low		
< 25th percentile	< 3356.18	Low	-	

As a summary, the formulas used to calculate farm net worth is represented in figure 3.

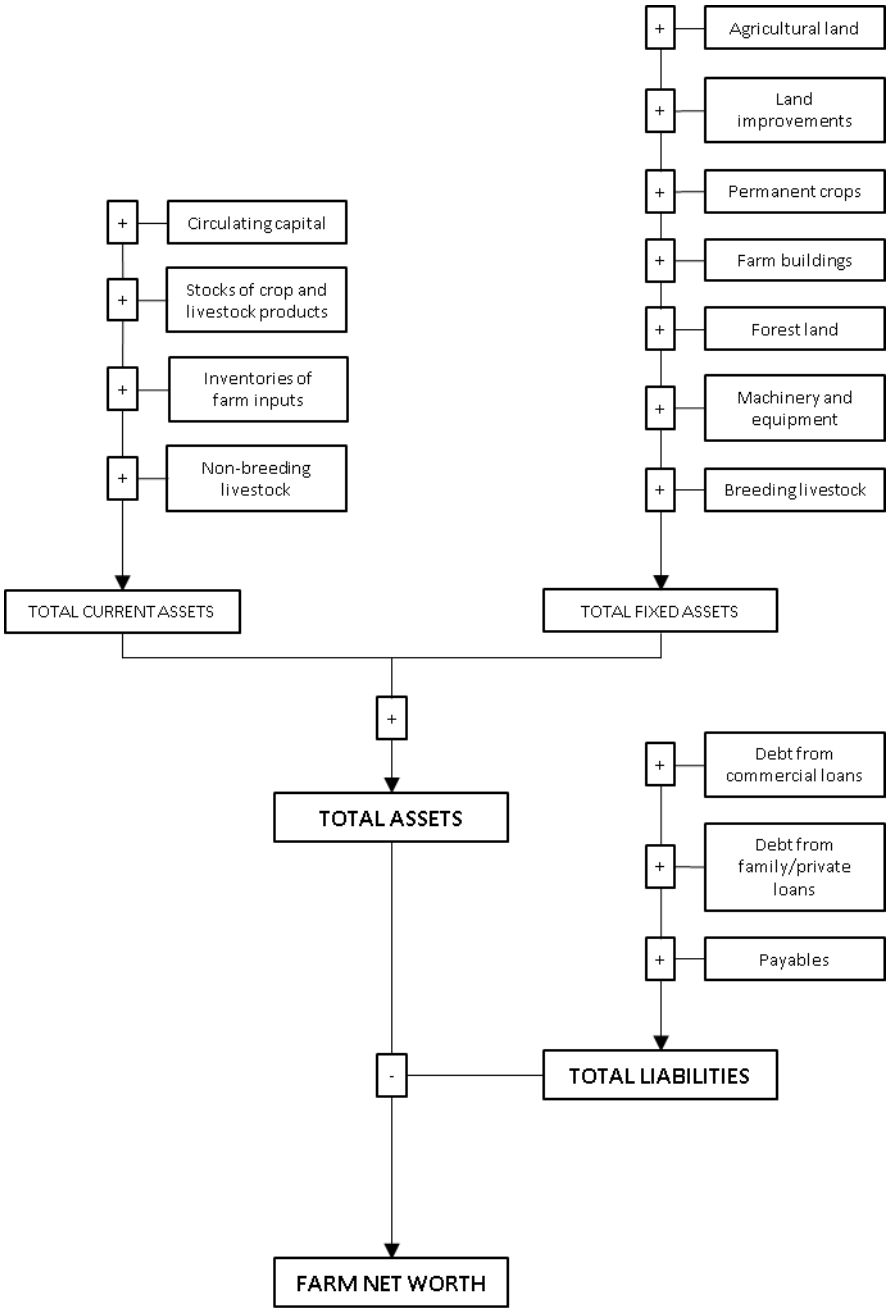

Figure 3: Formula to calculate farm net worth

Direct production costs per farm gross output

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Efficiency: Cost efficiency

Description:

- This indicator is equal to the ratio of direct production costs to farm gross output, where all farming enterprises are taken into consideration.

Indicator calculation:

$$\frac{Direct\ production\ costs}{Farm\ gross\ output}$$

Unit: €/€

Indicator interpretation: Higher values indicate lower cost efficiency and thus poorer economic performance.

Scale proposition:

Scales	**Values (€/€)**	**Dexi interpretation**		**References**
< 25th percentile	< 0.42	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[0.42; 0.48[	Medium to high		
[median; 75th percentile[	[0.48; 0.54[	Medium to low		
>=75th percentile	>= 0.54	Low	-	

Direct production costs per utilised agricultural area

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Efficiency: Cost efficiency

Description:

- This indicator is equal to the ratio of direct production costs to UAA, where all farming enterprises are taken into consideration.

Indicator calculation:

$$\frac{Direct\ production\ costs}{UAA}$$

Unit: €/ha

Indicator interpretation: Higher values indicate higher direct production costs per ha and thus poorer economic performance.

Scale proposition:

Scales	**Values (€/ha)**	**Dexi interpretation**		**References**
< 25th percentile	< 849.71	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[849.71; 1321.99[	Medium to high		
[median; 75th percentile[	[1321.99; 1972.27[	Medium to low		
>=75th percentile	>= 1972.27	Low	-	

Labour input per farm gross output

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Efficiency: Labour efficiency

Description:

- This indicator is equal to the ratio of total hours worked to farm gross output, where all farming enterprises are taken into consideration.

Indicator calculation:

$$\frac{Total\ hours\ worked\ on\ the\ farm}{Farm\ gross\ output}$$

Unit: hrs/€

Indicator interpretation: Higher values indicate lower labour efficiency and thus poorer economic performance.

Scale proposition:

Scales	**Values (hrs/€)**	**Dexi interpretation**		**References**
< 25th percentile	< 0.018	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[0.018; 0.026[	Medium to high		
[median; 75th percentile[	[0.026; 0.051[	Medium to low		
>=75th percentile	>= 0.051	Low	-	

Labour input per utilised agricultural area

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Efficiency: Labour efficiency

Description:

- This indicator is equal to the ratio of total hours worked to UAA, where all farming enterprises are taken into consideration.

Indicator calculation:

$$\frac{Total\ hours\ worked\ on\ the\ farm}{UAA}$$

Unit: hrs/ha

Indicator interpretation: Higher values indicate larger amounts of hours worked on the farm per ha and thus poorer economic performance.

Scale proposition:

Scales	**Values (hrs/ha)**	**Dexi interpretation**		**References**
< 25th percentile	< 59.15	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[25th percentile; median[	[59.15; 82.40[	Medium to high		
[median; 75th percentile[	[82.40; 164.02[	Medium to low		
>=75th percentile	>= 164.02	Low	-	

Milk produced per cow

Type of indicator:

- Quantitative

Relative dimension and aggregated criteria:

- Economic sustainability: Efficiency: Partial productivity

Description:

- This indicator measures milk yield per dairy cow and is equal to the ratio of total milk produced to average herd size. It is specific to the dairy enterprise.

Indicator calculation:

$$\frac{Total\ milk\ produced}{Average\ herd\ size}$$

Unit: kg/cow

Indicator interpretation: Higher values indicate larger milk yields and thus better economic performance.

Scale proposition:

Scales	**Values (€/cow)**	**Dexi interpretation**		**References**
>=75th percentile	>= 7819.23	High	+	Based on the FADN data distribution for EU specialised dairy farms. Quantile method, 2016-2018 data.
[median; 75th percentile[	[7167.66; 7819.23[	Medium to high		
[25th percentile; median[	[5921.56; 7167.66[	Medium to low		
< 25th percentile	< 5921.56	Low	-	

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