Multicriteria assessment of the intrinsic quality

The 'One Quality' of animal products encompasses two dimensions: the production system and the product's intrinsic quality. While tools exist to assess the environmental impact and animal welfare implications of production systems, no universally accepted tool is available to evaluate intrinsic product quality on-farm, before processing. This quality encompasses four dimensions (sensory, nutritional, technological, and health-related) assessed through numerous compounds whose data must be aggregated to provide an overall evaluation.

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Development of a common assessment framework and methodology for three animal products:

Semi-skimmed UHT milk, Beef striploin steak and Chicken breast

The assessments were designed to be generic, i.e., applicable to any European dairy cattle, beef cattle, and broiler farms. They also had to be transparent and accessible to European users.
Product quality was assessed at the farm gate and therefore represents potential quality. As milk and beef quality fluctuate seasonally, their assessment covered a full year.

The development of each product assessment involved six steps:

1. **Definition of principles** (also referred to as quality components).

2. **Definition of criteria** (one or more criteria are used to characterize each principle).

3. **Definition of indicators** (a measured or calculated variable used to characterize each criterion).

4. **Interpretation of indicators** (conversion of raw values obtained through analyses or calculations into scores ranging from 0 to 10).

5. **Weighting of indicators and criteria** within each principle (weights expressed on a 100-point scale).

6. **Weighting of the principles** relative to one another.

Steps 1 to 5 were carried out by European scientific experts, while step 6 was conducted by European stakeholders.

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How to obtain an intrinsic quality score?

To obtain an intrinsic milk quality score, the following steps are required:

1. to carry out samples and analyses of the chemical and physical composition of bulk tank milk.

Five samples of tank milk are taken over a year: three during the summer season and two during the winter season. For each sample, physicochemical and microbiological analyses are required to provide the data needed to calculate the indicators used in the multicriteria assessment.

2. to transform the raw values of the indicators into a quality score.

For a given analysis, the results by season are averaged. Converting raw values into scores requires using the threshold values defined for each indicator.

Indicator	Raw values (unitless)	Score (between 0 and 10)		
			Threshold 1	Threshold 2
		Value	7.87	0.68
		Score	0	10
Ratio C18:2n-6/C18:3n-3	2.19	7.90		

3. to aggregate indicators, criteria and principles scores.

The criteria and principles scores are obtained taking into account the weightings.

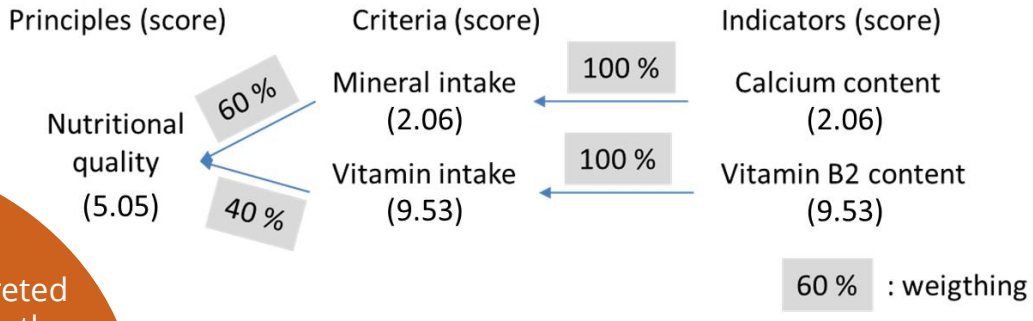

Fig. 1: Aggregation from indicators to principle score. Example of the nutritional quality

The indicators were interpreted based on the variability in the results obtained for the different quality indicators from the farms monitored within the INTAQT project.

These multi-criteria assessments is well suited to the context of the INTAQT project. Adjustments will be required if other livestock farming systems are investigated or if European regulations change. These assessments are therefore designed to be adaptable and evolving.

4. to assess the annual score of intrinsic milk quality.

The annual score of intrinsic milk quality is determined by the quality scores for the winter and summer periods, weighted according to the duration of each period.

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What are these assessments used for?

These assessments can be used to diagnose the intrinsic quality of an animal product at the farm level, by identifying the components responsible for a low quality score.

These assessments can also be used to compare the impact of production systems along an intensification gradient. As part of the INTAQT project, 7 rearing systems with an intensification gradient were defined for the EU dairy farms (Caumette et al., 2026) :

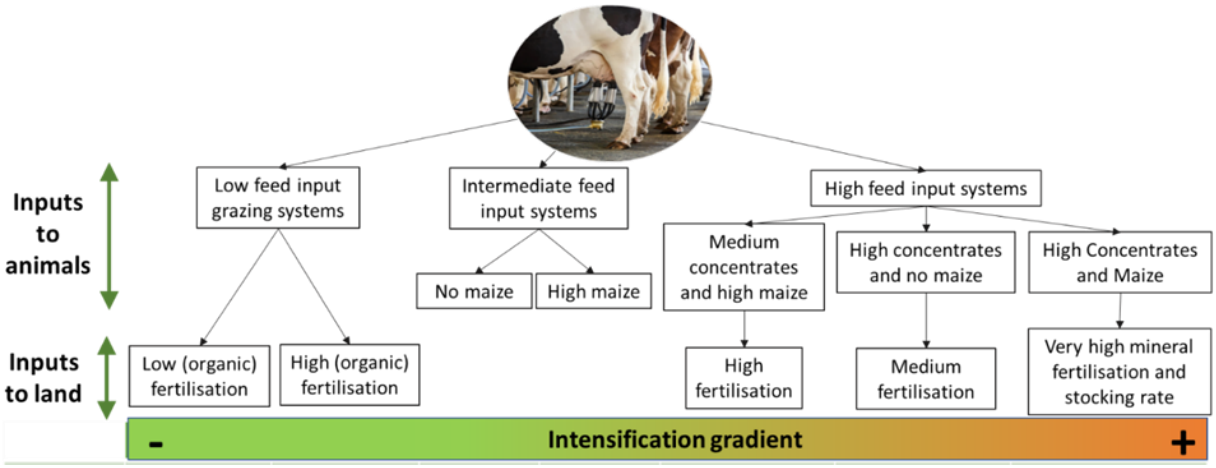
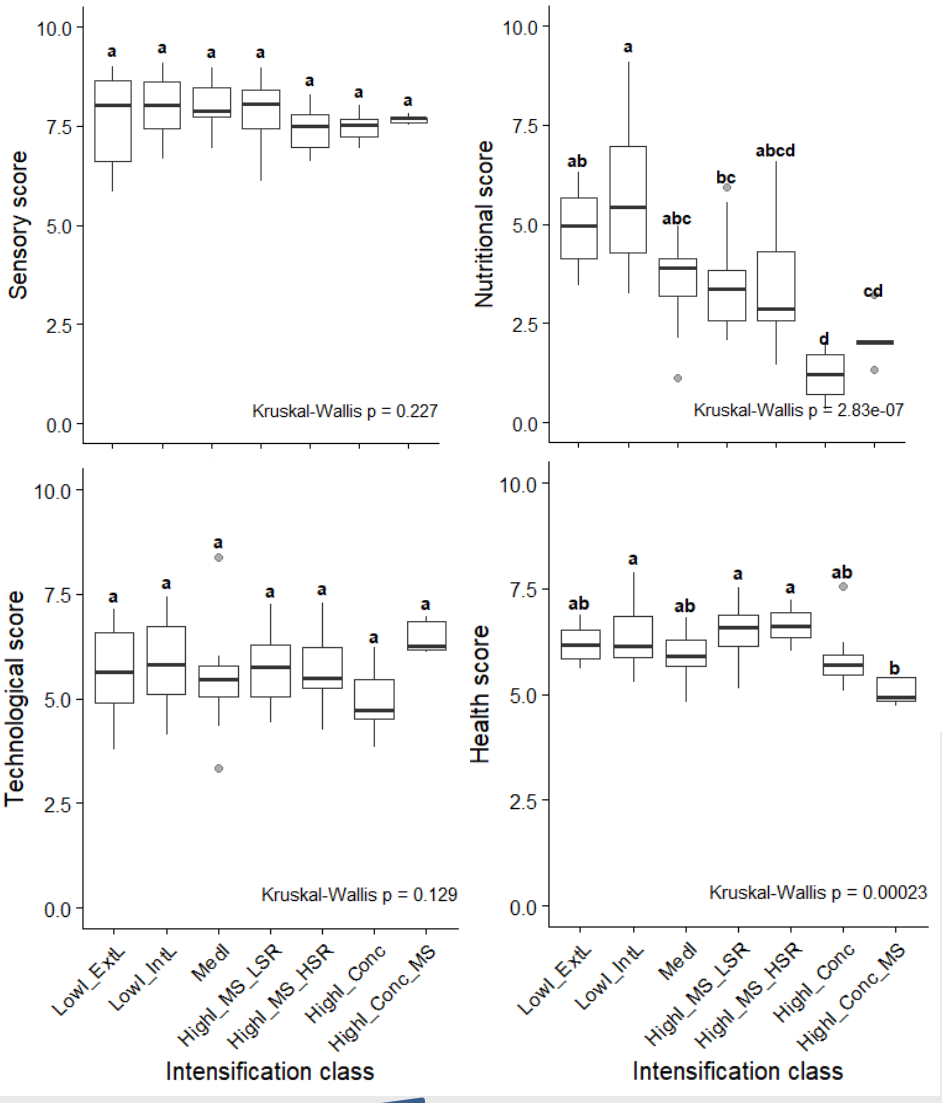


Fig. 2: Typology of dairy farms along a gradient of intensification



The intensification gradient of production systems did not affect the sensory or technological milk quality scores (Rey-Cadilhac et al 2026).

However, nutritional quality scores decreased as the level of intensification increased. Finally, health-related quality scores were not associated with the intensification gradient, although significant differences were observed between the different farm classes.

Legend :

LowI_ExtL: Low feed input and extensive land management dairy systems;
LowI_IntL: Low feed input and intensive land management dairy systems;
MedI: Medium feed input dairy systems;
High_MS_LSR: High feed input dairy systems relying on maize silage and lower stocking rate on pasture;
High_MS_HSR: High feed input dairy systems relying on maize silage and higher stocking rate on pasture;
HighI_Conc: High feed input dairy systems relying on concentrates;
HighI_Conc_MS: High input dairy systems relying on concentrates, maize silage and mineral fertilisation.

Different letters (a, b, c, d) mean a significant difference (P ≤ 0.05)

Fig. 3: Effect of intensification gradient of dairy farming systems on the intrinsic milk quality scores

Caumette et al. (2026). Agricultural systems, 238, 104871.
Rey-Cadilhac. et al. (2026). 77e EAAP Annual meeting, 2026.

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