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Research article

Understanding how milk-producing countries estimate costs of dairy production: A comparative review

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Abstract

Benchmarking milk cost of production (CoP) helps identify economic performance disparities, guide business decisions, and shape policy regulations across the dairy industry. However, the reliability of CoP data is heavily influenced by the methodologies employed. Comparisons remain challenging due to variations in farm business characteristics, accounting regulations, market dynamics, and political considerations. Therefore, this review aims to explore the diverse CoP methodologies to compare the cost frameworks and revenues of dairy enterprises in countries that are significant producers in the global market. The analysis includes countries from the EU27 (Germany, France, the Netherlands, Poland, Italy, and Ireland), along with the United States, Canada, Brazil, Australia, and New Zealand, in comparison with global dairy network benchmarks. The findings clearly demonstrate that methods for calculating milk CoP vary considerably among countries. In addition, discrepancies in CoP methods may distort the disparities in the economic performance of dairy operations. This study concludes that variations in cost frameworks across countries hinder effective cross-country comparisons of milk CoP, and that current harmonised frameworks provide decent estimations when compared to national calculations. To address this issue, it is recommended that global dairy networks develop harmonised methodologies that consider existing official national methods and local contexts, thereby enhancing policy relevance and improving comparison accuracy.

Keywords: Dairy farming, Milk price, Milk production, Production costs, Typical Farm Approach.
JEL codes: C81, Q12, Q14

Highlights:

- Key cost components, such as feed and labour, are defined differently in various countries.
- Countries differ in including cattle sales and subsidies in milk cost of production calculations.
- Low milk prices in most milk-producing countries fail to cover full production costs.
- The Typical Farm Approach is a decent method but tends to underestimate the cost of production in pasture-based milk-producing countries.

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1. Introduction

Cost of production (CoP) data provide valuable insights into the efficiency of agricultural production systems by illustrating the relationship between inputs and outputs (Hegazi, 2024). However, the reliability of CoP data is heavily influenced by the methodologies employed for its collection and interpretation (Langrell *et al*., 2012). Harmonising data from diverse sources into a unified database presents significant challenges, particularly in the absence of standardised international protocols (Hemme *et al*., 2014). A critical prerequisite for evaluating the suitability of existing CoP databases for comparative analysis is the understanding of the various methodologies and contexts across countries. Nations apply distinct methods to calculate CoP for agricultural commodities, yet the underlying principles remain consistent (Langrell *et al*., 2012). Although less globally tradable given the majority of global dairy products is consumed within the country of production (Ohlan, 2014), milk requires specialised CoP analysis due to the unique characteristics of the dairy industry. Milk production is regionally influenced by factors such as farm characteristics and management, feed resources, climate, and regulations (Britt *et al*., 2018; Stirm, St-Pierre, 2003), resulting in distinct cost structures. Unlike other commodities, the allocation of joint costs between livestock and crop enterprises, as well as between milk and beef production, further complicates cost calculations (Food and Agriculture Organisation of the United Nations [FAO], 2016; International Farm Comparison Network [IFCN] Dairy Network, 2022). In general, CoP methods are often influenced by political intentions (Belloin, 1998; Mykrantz, Bozic, 2022; Smith, 1974; Stanbury, 2002) and reflect national or organisational goals (Allain, Laurin, 2018; Quesado, Silva, 2021). Despite previous attempts to standardise methods at the regional level, substantial methodological differences persist, resulting in limited comparability of CoP data, even within geographically close regions. For example, the European Milk Board (EMB), a group of European dairy associations, has criticised the European Union (EU) Commission's harmonised CoP methods, arguing that they fail to capture the diversity of dairy production systems across Europe (EMB, 2021). Hence, comparing milk CoP valuations across countries remains a complex challenge, requiring greater collaboration and consensus among stakeholders at both the regional and international levels.

Efforts to harmonise CoP methods could enhance the comparability and relevance of milk CoP data at the global level. The IFCN, a global dairy network, has made strides towards this goal by collaborating with research partners to analyse typical dairy farming systems and report international production costs. The IFCN's methodology, however, lacks clarity in distinguishing between approaches. Previous research on milk CoP has focused on its unbiased measurements across countries (Belloin, 1998; Hemme *et al*., 2014) and the development of automated tool to efficiently benchmark dairy farms within countries (Freitas, Cabrera, 2025). While numerous scholars have broadly examined agricultural CoP (FAO, 2016; Langrell *et al*., 2012; Ronzon *et al*., 2014), these studies have not accounted for methodological differences specific to milk CoP. More specifically, three conceptual strategies have been proposed for global comparisons of CoP methods: (1) *minimalistic harmonisation*, which uses existing databases as-is to compare CoP data across nations with minimal adjustments; (2) *partial harmonisation*, advocating for a unified approach to data collection and CoP methods by governments; and (3) *full harmonisation*, aiming to establish global networks with standardised CoP methods and continuous refinement (Langrell *et al*., 2012).

Given the above background, this review aims to examine the differences and similarities in milk CoP calculations across selected countries, identifying the key national and international factors that influence these variations. While the primary focus is on CoP, farm revenue is also investigated to highlight disparities in economic performance. To achieve this, a minimalistic harmonisation strategy is first implemented using national-level databases for international comparisons, followed by a critical evaluation of a full harmonisation strategy based on current globally harmonised milk CoP methods. Then, economic performance is compared using two different conversion factors based solely on cost-revenue calculations. Finally, the implications of differing CoP methods on dairy trade policies are explored. This comprehensive approach may help identify fair comparisons, inform business decisions, and guide dairy trade policies.

2. Data sources and methodologies

2.1. Data sources for global comparative analysis and harmonisation methods

This review uses milk CoP data from multiple sources, as presented in Table 1. The inclusion of particular countries in this analysis is principally justified by their significant milk production volumes and the accessibility of comprehensive data relevant to the dairy industry under study. All datasets are made publicly available by government bodies, agricultural institutions, and dairy associations, thus ensuring a high level of transparency and reliability. For the sake of clarity, it is worth mentioning that differences in data collection, categorisation, and timeframes may affect the comparability of the data across countries. In addition, although these datasets are comprehensive, they vary in terms of representativeness: some of them cover a broad range of farms and others focus on specific regions or production systems.

Table 1. Milk cost of production data sources.

Country	Abbreviation	Sources
European Union	EU	Eurostat/ EU Commission
United States of America	US	United States Department of Agriculture (USDA)
Canada	CA	Canadian Dairy Commission (CDC)
Brazil	BR	Companhia Nacional de Abastecimento (CONAB)
Australia	AU	DairyAustralia
New Zealand	NZ	DairyNZ

Upon data collection, EU countries were classified as fully harmonised, as they have already reached a consensus on reporting milk CoP among member states. To ensure consistent comparison, minimised harmonisation for EU countries and others was applied to adjust disparities across the reviewed nations.

Full harmonisation

EU member states have made progress in standardising methodologies for calculating milk CoP, aiming for full harmonisation through uniform data collection and cost calculation systems. This effort involves restructuring national systems to standardise sampling strategies and to harmonise calculation frameworks. In this study, three full harmonisation methods are compared: the IFCN, the EMB, and the EU Commission. While the EMB and the EU Commission rely on standardised data from the Farm Accountancy Data Network (FADN), the IFCN uses primary data from its own surveys. The tilde symbol (~) is used to indicate approximate data from the IFCN. Regional data, where available, help highlight geographical variations in milk CoP, hence facilitating comparisons with the IFCN's Typical Farm Approach (TFA), the latter representing specific production systems, farm sizes, technologies, and milk volumes in each specific country/dairy region (CLAL.IT, 2024; Hemme *et al*., 2014). Regional milk CoP data for Canada is not available.

Minimalistic harmonisation

A minimalistic harmonisation approach for milk CoP uses existing databases without modifying national data collection systems. In this study, several adjustments are applied to make the data comparable across countries, including currency differences, milk cost units, inflation factors, and standardised milk quality (Table A.1). This approach is cost-effective and practical because it utilised existing data and minimises institutional changes (Langrell *et al*., 2012). Table A.1 presents the adjustments made to standardise milk CoP data, as the original datasets use various calculation units. First, weight units such as tons, hundredweight (cwt), hectolitres (hl), and litres were converted into kilograms (e.g., 1 cwt equals 45.359 kg). For data from Australia and New Zealand, 1 kg of milk solids was multiplied by the sum of fat and protein percentages divided by 100 to estimate the total milk weight. Second, the original currencies were converted into U.S. dollars (USD) to ensure comparability, utilising exchange rates from CLAL.IT (2024) and purchasing power parity (PPP) conversion factors from the World Bank (2025). PPP provides insights into the relative economic burden within countries by adjusting for cost of living and inflation, making it suitable for structural economic analysis. In contrast, the exchange rate method is more aligned with real-time financial conversions and international trade dynamics. However, using nominal exchange rates can be strongly misleading in cross-country price comparisons (Amat *et al*., 2014; Pant, Fisher, 2007). Thus, this study employed both methods to provide complementary perspectives. Third, milk units were standardised to energy-corrected milk (ECM) based on percentage of fat (% fat) and crude protein (% crude protein) using the formula (IFCN Dairy Network, 2018):

$$ECM\ (kg) = Milk\ (kg)\ \times\ ((0.383\ \times\ Fat\ \%)\ + (0.242\ \times\ Crude\ Protein\ \%)\ +\ 0.7832)/3.1138$$

Finally, the producer price index (PPI) data from FAOSTAT (2025) were used to remove inflationary effects from nominal values, yielding real values of milk CoP in USD per 100 kg ECM, excluding the global milk farm gate price comparisons. In this study, the proportional and total milk CoP are presented as averages from 2018 to 2021, unless stated otherwise. Averaging the data minimises the effects of outliers and short-term fluctuations, providing a clearer understanding of regional cost structures by smoothing annual variations (Conigliani, Tancredi, 2009; Negrín, Vázquez-Polo, 2008).

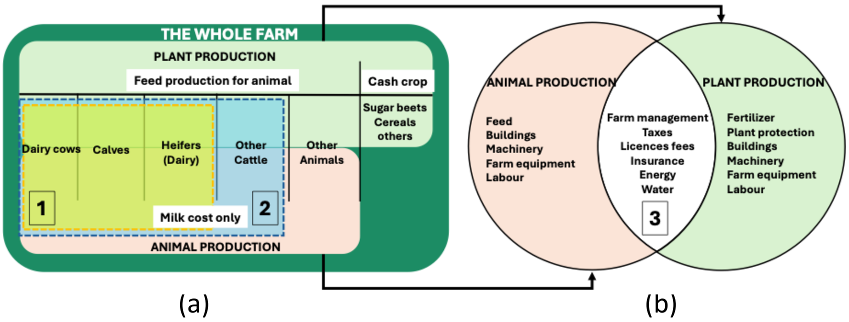
2.2. Reporting practices and financial year considerations

Dairy operations may be based on different financial years for reporting, which can affect the comparability of financial data. Typically, the financial year for dairy operations aligns with the calendar year, such as January 1 to December 31 in the EU, the United States, and Brazil. Dairy operations follow a different financial year in Canada (August 1 to July 31) (Canadian Dairy Commision, 2024), Australia (July 1 to June 30) (Australian Bureau of Agricultural and Resource Economics and Sciences [ABARES], 2024), and New Zealand (April 1 to March 31) (DairyNZ, 2024). This variation in financial year reporting introduces a potential source of inconsistency in milk CoP data. For example, in cases where the financial year does not align with the calendar year, milk cost publication reports may state 2018/2019 because their calculations include portions of both 2018 and 2019. Therefore, this study assumes that the 2018/2019 milk CoP data from the reviewed countries reflects the year 2018, and similarly for other years. This assumption is based on the consistent seasonal patterns in milk production and minimal year-over-year variation observed in Canada, Australia, and New Zealand.

2.3. Methods for allocating joint farm costs

Joint cost allocation methods are commonly employed on mixed-use dairy farms to distribute costs among outputs such as milk and beef, which are derived from shared resources. Panel (a) on Figure 1a highlights yellow (1) and blue (2) areas representing different dairy animals included in the milk cost of production (CoP) calculation, which share feed production. Panel (b) shows the intersecting (3) and distinct resources utilised by animal and plant production, which share feed and cash crop costs. These methods vary by country and can impact the final milk CoP figures. For example, most countries consider only dairy cows (Figure 1a, number 1), while the EMB includes both dairy cows and other cattle (Figure 1a, number 2) when allocating feed costs, recognising that milk and beef are inseparable outputs. However, certain costs, such as farm management and energy (Figure 1b, number 3), remain difficult to allocate, regardless of the method used. Enterprise accounting methods can provide a more accurate allocation of these costs. On the other hand, the residual value method, which involves subtracting non-milk revenues (e.g., cattle sales) from total costs, or the proportional cost methods, which allocate costs based on revenue or specific cost items to calculate "milk cost only", often lack clear justification and can introduce variability into the CoP calculations. Nevertheless, due to the minimalistic approach employed and the lack of detailed information provided by the data sources for each country, no harmonisation of joint farm cost allocation was applied.

Figure 1. The structure of a mixed-use dairy farms: animal production (1) and plant production (2) and its intersecting (3).



Source: Modified from and FAO (2016) and IFCN Dairy Network (2022).

2.4. Cost component categorisation

In this study, cost components refer to the various categories of expenses, such as feed cost, labour cost, or depreciation, that collectively contribute to the total cost of milk production. The color-coding scheme in Table A.2, guided by expert judgment and relevant references, distinguishes between homegrown feed (dark green), purchased feed (light green), hired labour and imputed owner (dark blue), dairy related expenses (grey), general expenses (purple), and other expenses (orange). This approach simplifies comparisons. Variations in costing methodologies (e.g., full costing vs activity-based costing), however, introduce some degree of complexity. Activity-based costing allocates costs to activities before tracing them to specific cost objects (Quesado, Silva, 2021), while some countries group costs differently depending on their national accounting systems. For example, some countries categorise fuel and oil as part of homegrown feed, while others classify them as separate expenses under the general expenses group (fuel and oil expenses).

3. Dairy farm characteristics

Accurate comparisons of milk CoP across countries require understanding key dairy farm characteristics like breed, milk yield, farming structures, and practices (Parzonko *et al*., 2024). Disparities in milk production efficiency, farm structure, and per-cow yield are evident, as shown in Table 2. The EU, contributing 19% of global milk production (CLAL.IT, 2024), has numerous small farms with extensive herds (Arendonk, Liinamo, 2003), while the United States achieves the highest per-cow milk yield, with Canada showing similar productivity despite fewer farms. The TFA farm size does not represent the average farm size in the respective country (Table 2). Instead, it reflects the sample farm size used by the IFCN in specific regions for cost estimation (see further up in the paper, Figures 3 and 4). This value is part of a model that standardises farming practices, ensuring that the actual average farm size is not misinterpreted as representing the entire country. Brazil, with no more than 8% of the global dairy cow population (CLAL.IT, 2024), has the lowest per-cow yield due to traditional practices and limited technology (Bernardes, Rêgo, 2014). New Zealand and Australia focus on large-scale operations, but they present moderate per-cow productivity due to extensive grazing systems (Luo, Ledgard, 2021).

Breed and management practices influence milk yield, with Holsteins predominant in Germany, France, Italy, and Ireland, achieving over 8,000 kg per lactation (Coffey *et al*., 2016; Probo *et al*., 2024). In Poland, Holstein imports have boosted the daily yield by 62% since 2004 (Ziętara *et al*., 2024). Crossbreeding in Ireland has improved milk solids, while grazing systems in the Netherlands have maximised productivity (Coffey *et al*., 2016; Weigel *et al*., 2001). Holsteins and Jerseys are common in the United States, Canada, Australia, and New Zealand, with Holsteins offering higher yields and Jerseys producing more butterfat (Hagan *et al*., 2021; Harris, 2005; Lozada-Soto *et al*., 2022; Nguyen *et al*., 2017; Oliveira *et al*., 2019). In Brazil, crossbreeding Zebu with Holstein enhances yields (Freitas *et al.*, 1998). A once-a-day (OAD) milking frequency in pasture systems, such as those in Ireland (Murphy *et al*., 2023) and New Zealand (Jayawardana *et al*., 2023), can reduce labour but may not be universally feasible (Edwards, 2020; Lazzarini *et al*., 2018). Twice-a-day (TAD) milking remains more common, yielding higher milk production despite higher feed costs (Correa-Luna *et al*., 2021), although OAD raises concerns about animal health and welfare (Murphy *et al.*, 2023).

Table 2. Cross-country comparison of dairy production performance in 2020.

Country	Annual milk production[1] (thousands of tons)	Number of dairy cows[1] (thousands of heads)	Number of dairy farms[1]	Typical Farm Approach farm size[2] (heads)	Milk yield per cow per year[1] (quintals)
EU27	160,785	20,523	826,170	NA	78.3
Germany	33,165	3,921	54,310	154	84.6
France	25,235	3,406	56,200	74	74.1
Netherlands	14,522	1,569	15,730	103	92.5
Poland	14,503	2,126	174,290	52	68.2
Italy	12,712	1,638	36,230	154	67.9
Ireland	8,542	1,456	17,500	91	58.7
United States	101,292	9,442	1,992,820	80	107.3
Canada[3]	9,620[3]	1,401[3]	10,095[3]	66	66.7[3]
Brazil	36,376	15,954	1,822	180	22.8
Australia	9,064	1,388	5,055	307	63.6
New Zealand	22,351	4,904	6,046	397	44.6

Note: NA, not available.
Source: [1] CLAL.IT (2024); [2] IFCN Dairy Network (2022); [3] Canadian Dairy Commission (2024).

4. Estimation of milk CoP and revenue

4.1. Milk CoP framework and typologies

Overview of milk CoP frameworks

The milk CoP framework for each country is detailed in Table A.2, with notations (e.g., A, B, C) to facilitate identification of calculations while preserving original cost item names. The EMB methodology adjusts for input costs using the "production value of beef" (Code B) and excludes non-dairy revenues but includes Common Agricultural Policy (CAP) payments to capture subsidy impacts. In contrast, the EU framework incorporates imputed family labour and opportunity costs (Code J). The IFCN methodology emphasises opportunity costs and "entrepreneurship's profit" (Code G), incorporating unpaid labour, land rent, and capital use for global benchmarking and profitability analysis. The U.S. framework incorporates unpaid labour and land opportunity costs in its profit calculations, while Canada includes government rebates and Brazil details tropical-specific input costs. New Zealand focuses on "freight and general" costs, reflecting its export orientation. Canada and Brazil prioritise milk CoP and exclude revenue sources, assuming milk prices as the sole income.

Opportunity cost in milk production refers to the benefits a farmer forgoes by dedicating resources, such as land, labour, or capital, to milk production instead of other activities (Mykrantz, Bozic, 2022). The IFCN Dairy Network (2022) defines it as costs related to using owned resources, including land and family labour. U.S. methodologies integrate unpaid labour and land opportunity costs into their financial assessments, while Canadian and Brazilian frameworks adjust for policy and tropical-specific costs. Cost typologies vary by farm scale and financial needs, with small farms focusing on direct, cash, and variable costs, and large farms addressing fixed and capital costs (Inna *et al*., 2024). Financial management distinguishes between cash and non-cash costs, while economic approaches incorporate opportunity costs to reflect alternative values, in contrast to accounting approaches that focus on actual payments (FAO, 2016; Ronzon *et al*., 2014).

Key milk CoP components

The key cost components of milk production, including feed, labour, imputed owner costs, and depreciation, are critical to the overall cost structure and profitability of dairy farming (Chamberlain, 2012). These components are categorised differently across countries, as outlined in Table A.2. Feed costs are divided into the home-grown and purchased categories. Home-grown feed includes grazed feed and harvested feed like silage and haylage, which incur costs for pasture planting, maintenance, and storage. Purchased feed includes green fodder and dry fodder, which are bought externally, as well as concentrates, which may be produced on-farm or purchased (Reeson *et al*., 2008). In Australia and New Zealand, agistment or support block costs, referring to external grazing land rental or on-farm land maintenance, are also considered part of the feed costs (Table A.2).

Labour costs are classified into hired and unpaid labour, with most countries accounting for both, although Brazil and Australia may exclude unpaid labour (Table A.2). Hired labour is valued at market wage rates, while unpaid labour, typically family labour, is valued differently depending on working hours, willingness to pay, or regional wages (FAO, 2016). Capital investment is valued variably across frameworks, with the IFCN and the United States using opportunity costs, the EU using imputed family factors, reflecting market wages or the payment based on willingness to pay (Agricultural & Applied Economics Association [AAEA], 2000). Brazil calls it factor income, and Australia labels it imputed owner costs (Table A.2). Depreciation, which accounts for the reduction in the useful life of assets such as machinery and breeding animals, also plays a significant role in cost structures. It is typically calculated using the straight-line method to align costs with long-term milk production (Berg, Moore, 1989; Williamson, Stutzman, 2016).

4.2. Proportional analysis of milk CoP components

Table 3 shows the average cost structure per kilogram of milk ECM from 2018 to 2021, offering a stable comparison of cost components across regions. Each country follows its own calculation method, as detailed in Table A.2. New Zealand and Australia, with their pasture-based systems, allocate a larger share of costs to home-grown feed, reducing overall production costs but also exposing them to risks from weather conditions or seasonal variations (Kamal, Noy, 2023). In contrast, Italy and Australia report the highest proportions of purchased feed and concentrate costs, making them more vulnerable to global commodity price fluctuations. These variations in feed costs illustrate the value of international comparisons and underscore the impact of production systems and market dependencies on cost structures (Ozawa *et al*., 2005).

Labour cost distributions vary across regions, reflecting differences in farming practices. Brazil has the highest proportion of labour costs, while the Netherlands and France report much lower labour costs due to efficient feed use and high milk production per cow (Thomassen *et al*., 2009). These differences highlight how labour efficiency influences milk CoP and profitability. Imputed owner costs also reveal structural differences in farming operations, with Poland and Canada showing higher proportions due to family-owned farms, while the United States reports lower imputed owner costs (Tian *et al*., 2020). General expenses, which reflect technological adoption and infrastructure, are highest in Germany and France, indicating substantial investments in farm efficiency (Ruzzante *et al*., 2021). These differences in cost structures impact regional competitiveness, resilience to economic shocks, and global market positioning (Beber *et al*., 2021).

Table 3. Proportional percentage (%) contribution of each cost component to the total milk cost of production, based on average data from 2018 to 2021.

Country	Home grown feed	Purchased/ concentrate Feed	Hired labour cost	Imputed owner	Dairy-related expenses	General expenses	Other expenses	Total
EU27	*9.7*	*22*	*5.3*	*17.4*	*0.6*	*33.1*	*12*	*100*
Germany	*7.6*	*19.6*	*6.8*	*15.8*	*0.8*	*36.8*	*12.7*	*100*
France	*8.1*	*19.1*	*2.5*	*13.5*	*0.4*	*39.3*	*17.2*	*100*
Netherlands	*6.9*	*22.7*	*1.7*	*17.4*	*0.5*	*34*	*16.9*	*100*
Poland	*14.2*	*17.3*	*3.8*	*28.6*	*0.9*	*30.2*	*5.1*	*100*
Italy	*13.7*	*32.2*	*5.7*	*19.6*	*0.7*	*19.9*	*8.2*	*100*
Ireland	*9.8*	*20.8*	*3.6*	*23.7*	*0.8*	*32.9*	*8.5*	*100*
United States	*15.3*	*32.2*	*9.2*	*7.9*	*4.2*	*29.4*	*2*	*100*
Canada	*4.2*	*23.4*	*4.9*	*29*	*2.3*	*23.4*	*12.8*	*100*
Brazil	*10.2*	*20.5*	*17.8*	*16.6*	*5*	*19.2*	*10.8*	*100*
Australia	*15.8*	*32.9*	*11.7*	*13.3*	*7.7*	*14.1*	*4.5*	*100*
New Zealand	*15.8*	*15.3*	*9.2*	*9.7*	*8.3*	*18.3*	*23.4*	*100*

4.3. Global variations in total milk CoP

The EU shows significant internal variation in average milk CoP from 2018 to 2021, with notable contrasts between Western and Eastern Europe (Table 4). Poland reports lower costs compared to the Netherlands, Italy, Germany, and France, due to differences in farm practices, labour costs, and technological adoption (Table 3). American producers generally face higher costs, with Canada notably impacted by high feed, labour, land, and machinery costs (Hemme *et al*., 2014). In contrast, Brazil’s milk CoP is lower, reflecting intensive production methods and advanced technology use, while the United States remains more competitive. Oceania presents diverse profiles, with Australia maintaining relatively lower costs due to deregulation and economies of scale dynamics (Dobson, Wagner, 2000; Phillipov, Loyer, 2019), while New Zealand experiences higher costs due to rising input prices and tax policies (Frengley, Johnston, 1992; Kamal, Noy, 2023).

Table 4. Contribution of each cost component to total milk cost of production (CoP) in U.S. dollars (USD)/100 kg energy-corrected milk (ECM), averaged from 2018 to 2021.

Country	Home grown feed	Purchased/ concentrate feed	Hired labour cost	Imputed owner	Dairy related expenses	General expenses	Other expenses	CoP_1	CoP_2
EU27	5	11.4	3	8.9	0.4	18.1	6.5	53.3	N.A.
Germany	4	10.2	3.6	8.3	0.4	19.3	6.7	52.5	31.8
France	4.1	9.5	1.2	6.8	0.2	19.7	8.6	50.1	31.5
Netherlands	4.0	13.0	1.0	9.9	0.3	19.4	9.6	57.2	37.1
Poland	6	7.3	1.6	9.3	0.4	12.8	2.2	39.6	58.3
Italy	6.3	14.9	2.6	9.1	0.3	9.2	3.8	46.2	25.0
Ireland	4.6	9.7	1.7	11.1	0.4	15.4	4.0	46.9	32.4
United States	7.6	16.0	4.6	3.9	2.1	14.6	1.0	49.8	49.8
Canada	2.8	15.3	3.2	18.9	1.5	15.3	8.4	65.4	102.4
Brazil	5.3	10.3	9.1	9.2	2.6	10	5.7	52.2	508.0
Australia	6.9	14.4	5.1	5.8	3.3	6.2	2.0	43.7	88.4
New Zealand	8.3	8.0	4.8	5.1	4.4	10.1	11.7	52.4	112.1

Note: CoP_1 refers to the total milk cost of production calculated using exchange rate calculation. CoP_2 refers to the total cost based on the purchasing power parity (PPP) approach calculation.

Source: Data and calculations are based on the European Commission (2021) for the EU27, USDA (2024) for the United States, the Canadian Dairy Commission (2024) for Canada, CONAB (2020) for Brazil, DairyAustralia (2024) for Australia, and DairyNZ (2024) for New Zealand.

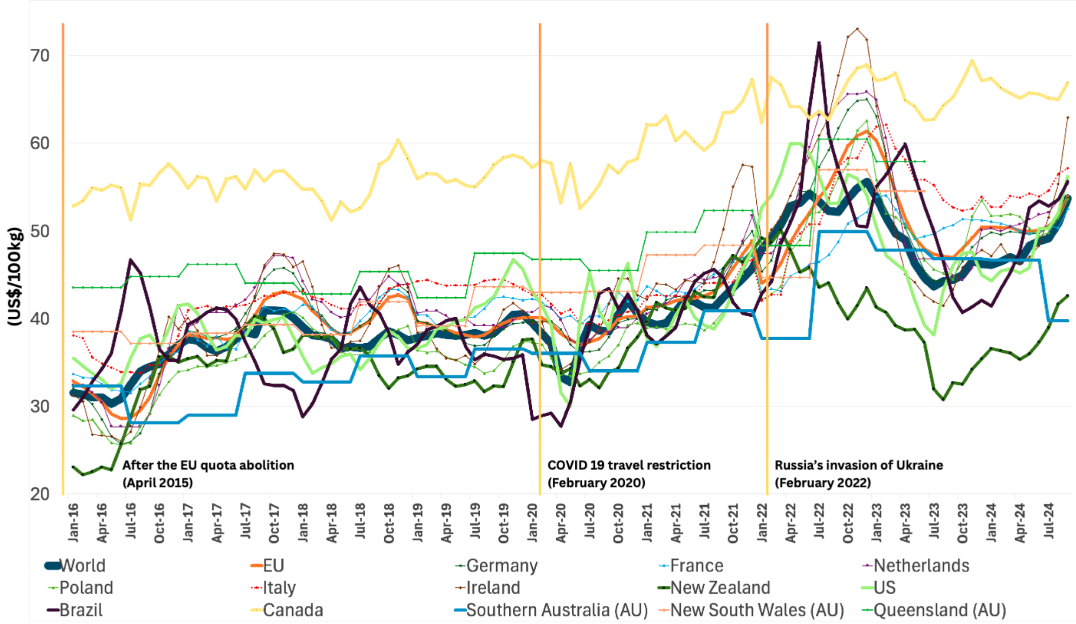
Moreover, milk CoP calculated using the PPP approach is significantly lower than when using exchange rates, with differences ranging from 10 to 20 USD/100 kg ECM in EU countries. This discrepancy arises because nominal exchange rates fluctuate around their PPP values rather than precisely reflecting them (Sercu *et al*., 1995). Consequently, calculations based on exchange rates may overvalue production costs, especially in countries with a higher proportion of non-tradable inputs and elevated general price levels, as these rates do not accurately capture local purchasing power. By comparing PPP-adjusted costs, we can evaluate the relative efficiency of milk production across countries (Biesebroeck, 2009; Bureau, Butault, 1992). Lower PPP-adjusted costs may suggest more efficient production processes or favourable economic conditions (McNown, Wallace, 1989), as observed in most EU countries in this study, excluding Poland (Table 4). However, it is understandable that Brazil exhibits extremely high milk PPP-adjusted costs due to its economy with high inflation (McNown, Wallace, 1989).

4.4. Farm gate milk price comparisons

In this section, we analyse prices from the milk trader's perspective, where nominal values reflect current market prices and provide a direct snapshot of price competitiveness and market dynamics, which are key for assessing trade positions and pricing strategies in global markets. Farm gate milk prices experienced fluctuations but stabilised after the EU abolished its milk quota in 2015, averaging 42.87 USD/100 kg ECM from 2016 to 2024 (Figure 2). Prices within the EU varied significantly, with Poland recording the lowest average price, reflecting its production efficiency (40.55 USD/100 kg ECM) (Ziętara *et al*., 2024), while Italy reported higher average prices (45.28

USD/100 kg ECM), influenced by consumer preferences for local and differentiated products (Bimbo *et al*., 2016). From February 2020, farm gate milk prices began to rise due to supply concerns linked to coronavirus 2019 (COVID-19) restrictions, with a sharp peak following the Russia-Ukraine conflict in February 2022. Disruptions in Ukraine, a key supplier of agricultural inputs, further increased costs (Brunk, Hakimi, 2022). By 2023, milk prices declined due to adjustments in global supply and demand.

Figure 2. Farm gate milk nominal price (without inflation adjustment) from 2016 to 2024, with key global events highlighted.



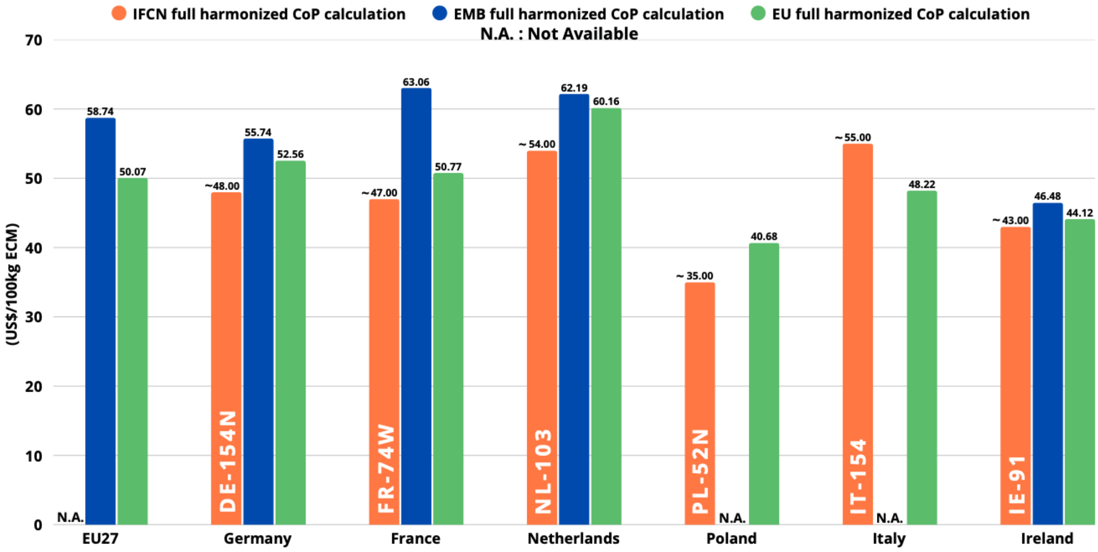
Source: Based on data from ABARES (2024); Canadian Dairy Commission (2024); CLAL.IT (2024); Dairy Australia (2024); Dairy NZ (2024); USDA (2024).

Globally, the average milk price was 41.55 USD/100 kg ECM, with notable regional variations (Figure 2). New Zealand's price of 36.82 USD/100 kg ECM reflects its export-oriented, grass-based system but also highlights its vulnerability to market and climatic fluctuations (FAO, 2023; Kamal, Noy, 2023). The United States averaged 42.24 USD/100 kg ECM, while Canada recorded the highest price at 59.59 USD/100 kg ECM, due to its supply management system, which balances stable farmer income with reduced international competitiveness. Brazil's price of 41.87 USD/100 kg ECM is competitive, driven by cost advantages in inputs, although it still faces infrastructure challenges. In Australia, milk prices remained relatively stable due to alignment with the dairy financial year, with regional variations including 37.64 USD/100 kg ECM in Southern Australia, 43.62 USD/100 kg ECM in New South Wales, and 47.84 USD/100 kg ECM in Queensland (Figure 2). These regional differences are influenced by climatic conditions and operational practices (ABARES, 2024), reflecting how local factors impact overall farm gate milk prices.

4.5. Quantitative insights into cost and revenue margin estimates

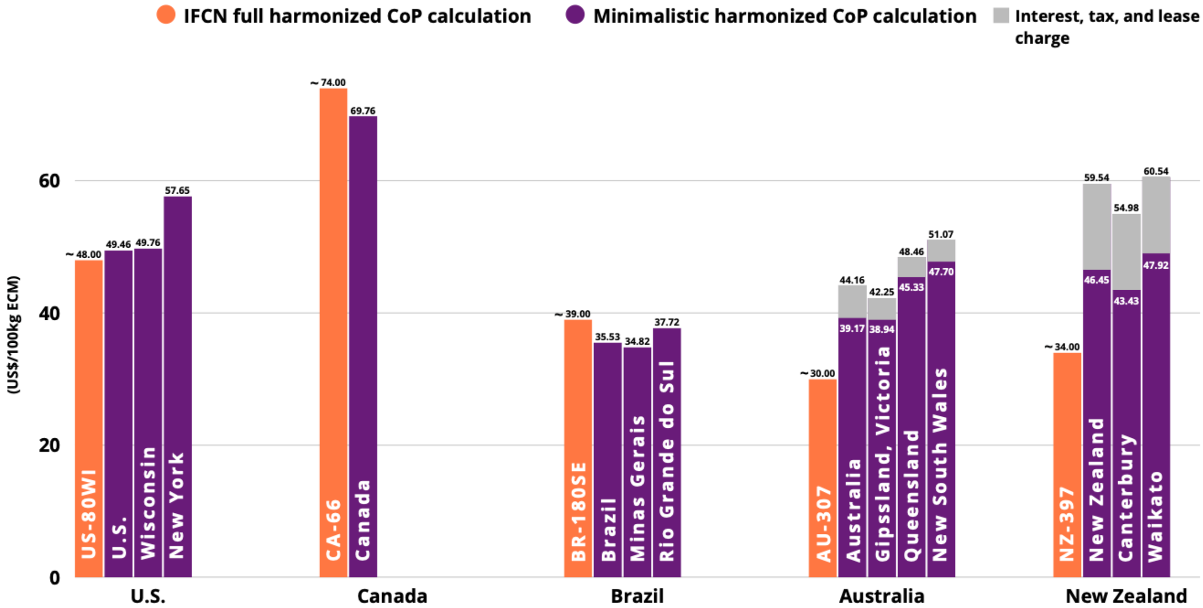
The comparison of 2021 data using the IFCN, EMB, and EU Commission milk CoP methodologies reveals both consistent patterns and significant disparities (Figure 3). The EMB consistently reports higher milk CoP, with France at 63.06 USD/100 kg ECM, compared to 50.77 USD/100 kg ECM reported by the EU Commission and 47 USD/100 kg ECM reported by the IFCN. These differences reflect the varying methodologies, such as the EMB's inclusion of additional cost factors (e.g., other livestock roughage eaters). The IFCN methodology consistently yields the lowest CoP, except in Italy, while higher CoP results are seen in the Americas, particularly in Canada and Brazil (Figure 4). These discrepancies underline the impact of the methodology on CoP estimates, which can affect farmers' understanding of their cost structures. Such international comparisons are crucial for assessing regional competitiveness and understanding local influences on CoP.

Figure 3. Comparison of milk cost of production (CoP) across five European Union (EU) milk-producing countries in 2021 using different fully harmonised CoP calculation methods.



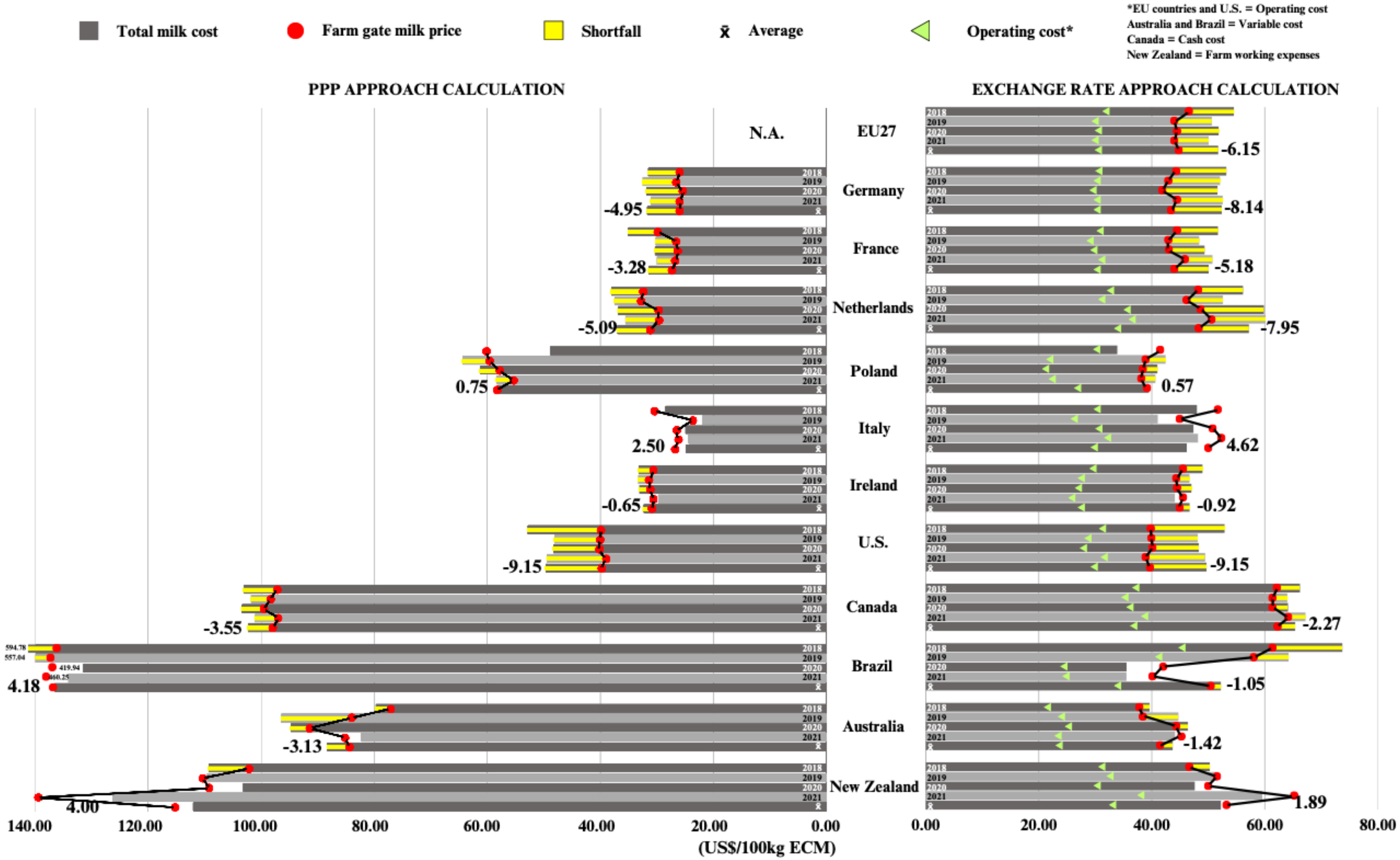
In Australia and New Zealand, excluding financial components like interest and taxes creates discrepancies compared to the IFCN estimates. For example, in Canterbury, excluding these charges reduces CoP from 54.98 USD/100 kg ECM to 43.43 USD/100 kg ECM (DairyNZ calculation), whereas the IFCN estimate is lower at 34 USD/100 kg ECM. New Zealand's milk production costs, driven by feed, wages, and interest charges, reflect additional financial burdens placed on farmers (Kamal, Noy, 2023; Ozawa *et al.*, 2005). These regional variations in cost structures provide valuable insight into the factors influencing CoP across diverse dairy systems.

Figure 4. Comparison of milk cost of production (CoP) across non-European Union (EU) milk-producing countries in 2021, and the IFCN's Typical Farm Approach (TFA) data.



The disparity between milk CoP and farm gate prices reveals significant financial challenges in the dairy sector (Figure 5). Most regions experience persistent shortfalls in covering production costs, although New Zealand and Italy manage to align prices with or exceed CoP, offering better profitability. New Zealand's grass-based system helps keep costs low, while Italy's premium dairy products, such as specialty cheeses, drive higher prices (Chatellier, 2021). In contrast, the United States faces the largest shortfall of 9.15 USD/100 kg ECM from 2018 to 2021, indicating significant cost pressures. When using PPP-adjusted costs, the discrepancies in milk cost and price are smaller, with Brazil showing a positive margin, suggesting that in real terms, Brazilian producers may achieve profitability. This comparison demonstrates how different CoP methods, including or excluding cost items, may distort the disparities in the economic performance of dairy operations. Further, this study highlights the potential bias interpretation in the dataset used for CoP estimates, which should be considered a limitation (Figure 5). Indeed, the choice between typical farms and farm samples can impact both costs and revenues, while structural efficiency and milk prices vary significantly across farms. This variability may explain the apparent profitability of milk production in countries like Italy, despite a decline in production and farm closures in recent years (European Commision, 2021).

Figure 5. Development of dairy farm economic performance from 2018 to 2021.



Source: Data and calculations are based on the European Commission (2021) for the EU27, USDA (2024) for the United States, the Canadian Dairy Commission (2024) for Canada, CONAB (2020) for Brazil, DairyAustralia (2024) for Australia, and DairyNZ (2024) for New Zealand.

5. Discussion and concluding remarks

The diversity in cost categorisations complicates global comparative analysis and policy development, as inconsistencies across countries arise from differences in the components of each cost category. For example, Canada's "total cash costs" focus solely on direct monetary outflows, excluding non-monetary costs (Canadian Dairy Commision, 2024), while Brazil's "total variable cost" includes financial aspects (CONAB, 2020). New Zealand's "farm working expenses" cover a wide range of variable costs (DairyNZ, 2024), while Australia's "variable costs" are tied to milk production levels (DairyAustralia, 2024) and the "operating costs" in the United States define all the costs of expendables be allocated to the generic group (AAEA, 2000). The EU's "operating cost" includes both specific and non-specific expenses, aiding in the calculation of gross margins for different production types (European Commision, 2021). These differences highlight that direct comparisons of milk CoP across countries are not feasible without fully harmonised CoP methods to standardise cost typologies.

The categorisation of key cost components, such as feed, hired labour, capital, and depreciation, varies significantly across countries (Table A.2), reflecting differences in economic and agricultural contexts. Feed costs, which account for at least 28% of total milk CoP (Atzori *et al*., 2021), are a key indicator of dairy farm performance. Hired labour costs are important for assessing farm competitiveness (Antonioli *et al*., 2023), while capital and depreciation provide insights into technology adoption (Upton *et al*., 2015). Based on these discrepancies, caution is needed when comparing milk CoP across countries, as differing frameworks result in divergent cost assessments.

This review reveals contrasting approaches to valuing land resources and unpaid labour. The IFCN, U.S., and EU frameworks incorporate opportunity costs, while others prioritise real expenditures based on actual transactions. The U.S. approach links opportunity cost pricing to more stable milk prices and reduced regulatory costs (Mykrantz, Bozic, 2022), whereas in the EU, opportunity costs lead to significant regional differences in farming income (Špička, Dereník, 2021). These costs may also misrepresent the viability of small-scale farms reliant on family labour and owned resources (Viira *et al*., 2009), while overlooking non-financial motivations and policy concerns (Ocean, Howley, 2023). Incorporating opportunity costs provides a more accurate representation of farm economics, addressing regional factors that influence decision-making (AAEA, 2000; European Commision, 2021; IFCN Dairy Network, 2022). This approach is critical for understanding the true cost of decisions, including the opportunity cost of resources used in milk production.

The inclusion of cattle sales and subsidies in milk CoP calculations introduces further complexity. For example, the EU includes herd renewal costs and subsidies but excludes cattle sales from milk revenue, while the United States includes cattle sales and omits subsidies (Table A.2). These structural differences affect CoP outcomes, as the EMB consistently reports higher CoP across EU countries due to the inclusion of additional livestock roughage eaters (Figure 3). Moreover, regional differences in the economic significance of cattle sales and subsidies are highlighted by regions reliant on dual-purpose breeds, where cattle sales offer a more comprehensive representation of farm economics (Zanon *et al.*, 2020, 2023). This is particularly relevant in regions with high beef prices, where dual-purpose systems integrate milk and meat production more cost-effectively (Krupová *et al*., 2016).

Our study illustrates how milk CoP methods differ among milk-producing countries and how these differences may impact business decisions and dairy trade policies. The price competitiveness of dairy trade is heavily impacted by cost assumptions. In Canada, assuming a low local cost structure turns Canada into a major exporter under free trade, while high-cost assumptions suggest losses and contraction (McLachlan, Van Kooten, 2022). Countries that exclude capital, opportunity, or compliance costs may appear artificially competitive, affecting their resistance to tariff cuts and driving demands for special protection in trade negotiations (Langley *et al.*, 2006; McLachlan, Van Kooten, 2022). For example, the EU imposes a 40% tariff on Canadian dairy products, while Canada applies a 230.38% import tariff on EU products (Sanjuán *et al.*, 2023). Furthermore, subsidies also play a crucial role in boosting trade by making dairy exports seem more efficient. However, when subsidies are viewed as cost reductions rather than revenue support, they may mask dependence on public funds, distorting the World Trade Organization’s Aggregate Measure of Support calculations and influencing subsidy reform debates (Kondaridze, Luckstead, 2023; Langley *et al.*, 2006; Milić *et al.*, 2023).

Non-tariff measures (NTMs), such as sanitary and phytosanitary (SPS) measures, represent significant costs, with an average 10% *ad valorem* equivalent (AVE; the percentage increase in import costs due to trade barriers) in EU dairy trade (Sanjuán *et al.*, 2023). These measures, designed to protect health and safety, can distort trade when exporters include or exclude SPS compliance costs in their price calculations, so AVE estimates and perceptions of “too strict” NTMs are not comparable (Kondaridze *et al.*, 2025; Sanjuán *et al.*, 2023). Though harmonising with EU rules may reduce SPS costs, it benefits only highly competitive exporting countries (Sanjuán *et al.*, 2023). Furthermore, efficiency and investment decisions in the dairy sector are influenced by trade liberalisation, which shifts production towards low-cost, pasture-based systems, such as those in New Zealand and Ireland (Dillon *et al.*, 2008; Langley *et al.*, 2006). If countries miscalculate inefficiencies (i.e., by assuming the inclusion of full cost items), they may over-invest in protection or fail to design effective stabilising measures (Biden *et al.*, 2020). For example, Serbia’s low milk prices, aimed at consumer protection, were regulated by importing dairy products from the EU under free trade agreements, leading to protests from farmers (Milić *et al.*, 2023).

Given the methodological disparities, global comparisons of milk CoP require careful consideration of local contexts and farm systems. The IFCN’s TFA aligns well with national calculations in many regions, but its limitations are evident in areas with distinct farm systems, such as Australia and New Zealand (Figure 4). Indeed, further refinement of the TFA is necessary to better capture regional variations and to make rankings of low- versus high-cost regions more meaningful for trade and investment decisions. While standardisation is important for policy and benchmarking, harmonising an entire country’s CoP methods is expensive. Therefore, we argue that existing CoP methods from global dairy networks, such as the IFCN, which have developed harmonised methodologies alongside national approaches and local contexts, could serve as a valuable alternative to the PPIs provides by the FAO. This approach may enhance future studies on international competitiveness and help prevent distortions in international dairy trade by utilising consistent data, rather than relying on country-specific accounting practices.

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Author Contributions

AT: methodology, investigation, data curation, formal analysis, writing (original draft), and visualization; TZ: conceptualization, supervision, formal analysis, data curation, methodology, investigation, writing (review and editing), funding acquisition, and visualization; MC: data curation, methodology, and writing (review and editing); CF: formal analysis, data curation, methodology, supervision, funding acquisition, and writing (review and editing); MG: conceptualization, supervision, project administration, funding acquisition, writing (review and editing), and visualization.

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Appendix

Table A.1. Standardized adjustments for milk CoP data for minimalistic harmonization.

Country	Currency	Milk cost unit	Year	USD Exchange	%Fat	%CP	PPI	PPP
EU27	EUR	ton	2018	0.848	*4.02*	*3.47*	102.56	N.A.
			2019	0.893	*4.06*	*3.47*	104.08	N.A.
			2020	0.880	*4.09*	*3.43*	102.49	N.A.
			2021	0.846	*4.10*	*3.43*	114.11	N.A.
Germany	EUR	ton	2018	0.848	*4.06*	*3.68*	111.95	0.70
			2019	0.893	*4.13*	*3.66*	109.09	0.70
			2020	0.880	*4.13*	*3.47*	109.47	0.70
			2021	0.846	*4.15*	*3.46*	115.43	0.70
France	EUR	ton	2018	0.848	*4.01*	*3.38*	104.22	0.80
			2019	0.893	*4.06*	*3.46*	108.32	0.70
			2020	0.880	*4.07*	*3.27*	107.24	0.70
			2021	0.846	*4.09*	*3.27*	111.83	0.70
Netherlands	EUR	ton	2018	0.848	*4.37*	*3.55*	99.91	0.80
			2019	0.893	*4.42*	*3.57*	101.08	0.80
			2020	0.880	*4.42*	*3.58*	92.30	0.70
			2021	0.846	*4.45*	*3.59*	101.83	0.70
Poland	EUR	ton	2018	0.848	*3.95*	*3.26*	111.76	1.70
			2019	0.893	*3.98*	*3.26*	112.34	1.70
			2020	0.880	*4.05*	*3.31*	114.75	1.70
			2021	0.846	*4.10*	*3.31*	130.28	1.70
Italy	EUR	ton	2018	0.848	*3.71*	*3.37*	100.57	0.70
			2019	0.893	*3.65*	*3.36*	107.83	0.60
			2020	0.880	*3.77*	*3.45*	98.87	0.60
			2021	0.846	*3.76*	*3.44*	103.44	0.60
Ireland	EUR	ton	2018	0.848	*4.10*	*3.58*	116.15	0.80
			2019	0.893	*4.17*	*3.65*	111.46	0.80
			2020	0.880	*4.20*	*3.55*	112.93	0.80
			2021	0.846	*4.23*	*3.55*	131.26	0.80
US	USD	cwt	2018	N.A.	*3.89*	*3.00*	84.78	1.00
			2019	N.A.	*3.92*	*3.37*	97.02	1.00
			2020	N.A.	*3.95*	*3.18*	95.04	1.00
			2021	N.A.	*4.01*	*3.20*	96.55	1.00
Canada	CAD	hectoliter	2018	1.298	*3.96*	*3.30*	96.28	1.20
			2019	1.327	*4.03*	*3.30*	101.31	1.20
			2020	1.344	*4.05*	*3.32*	101.98	1.20
			2021	1.254	*4.07*	*3.34*	104.14	1.20
Brazil	BRL	liter	2018	3.666	*3.90*	*3.30*	100.86	2.20
			2019	3.943	*3.90*	*3.30*	107.54	2.20
			2020	5.137	*3.90*	*3.30*	142.85	2.30
			2021	5.397	*3.90*	*3.30*	173.01	2.40
Australia	AUD	kg MS	2018	1.343	*4.00*	*3.30*	102.39	1.50
			2019	1.438	*3.83*	*3.35*	96.67	1.50
			2020	1.460	*4.04*	*3.39*	96.94	1.40
			2021	1.332	*4.01*	*3.40*	102.30	1.40
New Zealand	NZD	kg MS	2018	1.450	*4.86*	*3.87*	120.71	1.50
			2019	1.517	*4.82*	*3.89*	114.42	1.40
			2020	1.548	*4.84*	*3.92*	123.44	1.40
			2021	1.415	*4.84*	*3.92*	128.90	1.50

Table A.2. The framework of milk CoP and revenue in reviewed countries.

EMB

Code	Variable
	Purchased feed
	Fodder production
	Seeds
	Fertilizers
	Plant protection products
	Livestock costs
	Veterinary costs
	Insemination
	Building & machinery upkeep
	Energy
	Contract work
	Wages paid
	Other farming overheads
	Rent paid
	Depreciation
	Interest and taxes
A	**Total input costs**
B	Production value of beef
C	**Paid costs of milk production (milk only) (A-B)**
D	Income variable (labor costs)
E	**Total costs (C+D)**
F	CAP Payments
G	**Milk Production costs (E-F)**
H	Net Investments
I	**Milk Production costs inc net investments (G+H)**

IFCN

Code	Variable
	Crop and home grown feed related expenses
	Dairy related expenses
	General expenses
	paid land rent
	paid wages
	paid interest on liabilities
A	**Total expenses**
	Dairy receipts
	Milk
	Cull cows, calves, etc
	Government payments (coupled)
	Other (manure, etc)
B	**Total receipts**
C	**Net cash farm income (B-A)**
	Depreciation
D	**Non-cash adjustments**
E	**Farm income (C-D)**
	Interest on own capital
	Cost for own quota
	Rent on land
	Cost for own labor
F	**Total opportunity costs**
G	**Entrepreneurship's profit (E-F)**

EU Countries

Code	Variable
	Feed
	Homegrown feed
	Purchased feed
	Herd renewal purchases
	Other specific costs
	Milk levy
A	**Total specific costs**
	Machinery and building upkeep
	Energy (fuel, electricity)
	Contract work
	Taxes
	Other direct inputs
B	**Total non specific costs**
C	**Total operating costs (A+B)**
	Price
	Coupled payments (incl. Art.69)
D	**Total revenues from milk**
E	**Gross margin with coupled payments (D-C)**
F	**Gross margin (Excl-coupled payments)**
	Depreciation
	External factors
	Wages
	Rent
	Interest
G	**Total depreciation and external factors**
H	**Net margin with coupled payments (E-G)**
I	**Net margin (F-G) (Excl-coupled payments)**
	Family labor costs
	Own capital unpaid cost
J	**Total imputed family factors**
K	**Net economic margin with coupled payments (H-J)**
L	**Net economic margin (I-J) (Excl-coupled payments)**

U.S.

Code	Variable
	Total feed costs
	Purchased feed
	Homegrown harvested feed
	Grazed feed
	Veterinary and medicine
	Bedding and litter
	Marketing
	Custom services
	Fuel, lube, and electricity
	Repairs
	Other, operating costs
	Interest on operating capital
A	**Total operating costs**
	Hired labor
	Opportunity cost of unpaid labor
	Capital recovery of machinery and equipment
	Opportunity cost of land
	Taxes and insurance
	General farm overhead
B	**Total allocated overhead**
C	**Total costs (A+B)**
	Milk sold
	Cattle
	Other income
D	**Total gross value of production**
E	**Value of production less operating costs (D-A)**
F	**Value of production less total costs (D-C)**

Homegrown feed (dark green), purchased feed (light green), hired labour and imputed owner (dark blue), dairy related expenses (grey), general expenses (purple) and other expenses (orange).

Table A.2. *Continued*

CANADA

Code	Variable
	Purchased feed
	Artificial insemination
	Promotion, transportation, and fees
	Machinery, equipment repairs
	Fuel and oil
	Costum work
	fertilizer and herbicides
	Seed and plants
	Other Misc. (Professional fees)
	Other Misc. (Animal costs)
	Other Misc. (Crop costs)
	Land and building repairs
	Property taxes
	Hydro and telephone
	Hired labor
	Purchase or sale of animals
	Dairy inventory value adjustment
A	**Total cash costs**
	Interest paid
	Building depreciation
	Machinery and equipment depreciation
	Return on equity
B	**Total capital cost**
	Direct labor
	Return to management
C	**Total producer labor**
D	**Government rebates and others**
E	**Total production costs (A+B+C+D)**
	Milk Sales
F	**Total gross income**
G	**Gross margin (F-E)**

BRAZIL

Code	Variable
	Labor hired for herd management
	Specialized Services
	Pasture maintenance
	Weeding maintenance
	Sugarcane field maintenance
	Silage
	Concentrates
	Calf milk
	Mineral salt
	Medicines
	Hormones
	Milking equipment
	Milk transport
	Energy and fuel
	Artificial insemination
	Taxes and fees
	Repairs of improvements
	Machine repairs
	Other costing expenses
	Administrative expenses (5% of the cost)
A	**Total cost expenses**
	Interest
B	**Total financial expenses**
C	**Total variable cost (A+B)**
	Depreciation of improvements/facilities
	Depreciation of machinery and implements
	Depreciation of service animals
	Depreciation of non-annual forages
D	**Total depreciation**
	Foremanship fee
	Social charges
	Fixed capital insurance
E	**Total other fixed costs**
F	**Total fixed cost (D+E)**
G	**Operating cost (C+F)**
	Expected remuneration on fixed capital
	Land
H	**Total factor income (H)**
I	**Total cost (G+H)**
	Milk price
J	**Total revenue**
K	**Profit (J-I)**

AUSTRALIA

Code	Variable
	Feed cost
	Forage costs/Home grown feed
	Fertliser
	Fuel and oil
	Pasture and crop cost
	Irrigation costs
	Hay and silage making cost
	Agistment
	Other feed cost
	Concentrates and supplements/Purchased feed
	Grain and concentrates
	Fodder, silage and hay
	Other purchase feed
	Feed inventory (+/-)
	Herd costs
	Animal health
	Herd improvement
	Calf rearing
	Shed costs
	Dairy shed - power
	Dairy shed- supplies
A	**Total variable costs**
	Employed labor costs
	Other overheads
	Repairs & maintenance
	Motor vehicle expenses
	Rates
	Farm insurance
	Depreciation
	Imputed owner
B	**Total overhead costs**
C	**Total costs (A+B)**
	Milk revenue
	Fresh milk sales
	Other farm income
	Livestock sales less purchases (dairy)
	Feed sales
	Other farm cash income
D	**Total gross income**
E	**EBIT (D-C)**
	Interest costs
	Land lease costs
F	**Total interest and lease charges**
G	**Net farm income (E-F)**

NEW ZEALAND

Code	Variable
	Net feed made, purchased, cropped
	Weed & pest
	Regrassing
	Irrigation
	Fertiliser (incl Nitrogen)
	Winter cow grazing
	Support block lease
	Young & dry stock grazing
	Farm dairy
	Calf rearing (excluding labor)
	Animal health
	Breeding & herd improvement
	Wages
	Vehicles
	Fuel
	Electricity
	Repairs & maintenance (land & building)
	Repairs & maintenance (plant & equipment)
	Freight & general
	Administration
	Insurance
	Accident Compensation Corporation (ACC)
	Rates
A	**Farm working expenses**
	Value of change in dairy livestock
	Labor adjustment (unpaid)
	Labor adjustment (management)
	Feed inventory adjustment (+/-)
	Owned support block adjustment
	Depreciation
B	**Net adjustments**
C	**Dairy operating expenses (A-B)**
	Milk sales
	Net livestock sales (sales - purchases)
	Other dairy cash income
D	**Net dairy cash income**
E	**Cash operating surplus (D-A)**
F	**Dairy operating profit (D-C)**
	Rent (excl support block)
	Interest
	Tax
G	**Total interest, tax and lease charges**
H	**Net cash operating surplus (E-G)**
	Net non-dairy cash income
	Net off-farm income
I	**Total additional income**
J	**Discretionary Cash (H+I)**
K	**Net farm income (F-G+I)**

Homegrown feed (dark green), purchased feed (light green), hired labour and imputed owner (dark blue), dairy related expenses (grey), general expenses (purple) and other expenses (orange).