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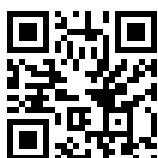
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Development of milk production in the EU after the end of milk quotas



Agriculture and Rural Development



Policy Department for Structural and Cohesion Policies
Directorate-General for Internal Policies
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Development of milk production in the EU after the end of milk quotas

Abstract

This report evaluates the challenges, opportunities and medium-term prospects for the EU dairy sector in light of milk quota abolition. It focuses on structural change in the sector, the dynamics of the dairy market, the need for environmental resilience and rural sustainability. The specific concerns of disadvantaged dairy regions are also addressed. The report offers policy recommendations for the European Parliament's consideration to bolster dairy farming and sustain rural communities effectively, while addressing the sector's sustainability requirements.

This document was requested by the European Parliament's Committee on Agriculture and Rural Development.

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LIST OF ABBREVIATIONS

AGRI	Agriculture and Rural Development Committee
ANC	Areas Facing Natural or other Specific Constraints
BD	Biodiversity Strategy
BISS	Basic Income Support for Sustainability
CAP	Common Agricultural Policy
CH₄	Methane
CIS	Coupled Income Support
CIS-YF	Complementary Income Support for Young Farmers
CMO	Common Market Organisation
COOP	Cooperation of Producers
COOL	Country of Origin Labelling
CO₂	Carbon Dioxide
CRISS	Coupled Redistributive Income Support for Sustainability
CSP	CAP Strategic Plan
EC	European Commission
EDA	European Dairy Association
EIP-AGRI	European Innovation Partnership for Agriculture Productivity and Sustainability
EU	European Union
FADN	Farm accountancy data network

FAO	Food and Agriculture Organisation of the United Nations
F2F	Farm-to-Fork Strategy
GHG	Greenhouse Gases
GM	Genetically-modified
INSTALL	Setting up of Young Farmers and New Farmers and Rural Business Start-up
INVEST	Investment Measures
KNOW	Knowledge Exchange and Dissemination of Information
LCA	Life Cycle Assessment
MS	EU Member State
N₂O	Nitrous Oxide
N₂₀₀₀	Natura 2000
OECD	Organisation for Economic Co-operation and Development

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EXECUTIVE SUMMARY

Overview

This study provides an overview of EU27 milk production prior to and following the abolition of milk quota in 2015, which marked the ending of a significant constraint on the development of the EU milk sector, permitting market forces to replace a supply constraint as a driving factor of milk supply. It takes into account, where possible, the changes observed at Member State (MS) level.

EU dairy production increased considerably over the last 20 years, partly driven by EU expansion and more recently by the elimination of the EU milk quota system. These market developments took place in a context of declining cow numbers, rising milk yields per cow, a reduced number of dairy farms and a larger average dairy farm size.

The abolition of milk quotas in April 2015, together with various CAP reforms have made the EU dairy sector more internationally competitive, both at farm and industry level, and have contributed to the growth of EU dairy product exports to the world market. However, this has also resulted in a more direct price transmission between world and EU dairy product markets, resulting in increased volatility in terms of both milk prices and farm incomes, to varying degrees across EU MS.

Key findings

The dynamics of the EU milk sector since the abolition of the quota regime

- At MS level, growth in milk production has been widespread, particularly so in a few MS, but on the other hand milk production has remained static or declined in several MS. These developments largely reflect the competitiveness of the dairy sector in the respective MS.
- The EU dairy sector remains heterogeneous given the varied production systems, product focus, climatic conditions and farm scales. The most competitive Member States (MS) are Belgium, Denmark, Luxembourg, Ireland and the Netherlands.
- The sector underwent a number of structural changes, including a very large reduction in the number of dairy farms, a general increase in the average dairy farm size (but a relatively small change in the total dairy land area) and a long-term decline in dairy cow numbers and offsetting increase in dairy cow yields.

Milk price evolution, volatility and competitiveness after 2015

- Dairy commodity price volatility is a feature of the global dairy market and the EU dairy market. Milk price volatility varies considerably across the EU MS, with

implications for the level of income price volatility experienced by dairy farmers in the various MS.

- EU farmers' milk supply responses seem to be more price inelastic in the post-quota period.
- Typically, MS with a greater export orientation have more volatile farm milk prices.
- Rapid growth in global dairy demand has led to a convergence of EU and world market prices, strengthening the outward orientation of the EU dairy processing industry. This convergence is due to increases in world market prices.

Prospects and challenges of the EU milk sector

- Environmental policy, enacted at either EU or MS level, is exerting an increasing influence over the EU dairy sector, with greater pressures on the dairy sector already emerging in a number of MS, regarding notably nutrient and greenhouse gases (GHG) emissions.
- Dairy farms in disadvantaged regions face additional sustainability challenges which need to be taken into consideration by policy makers.
- Generational renewal is particularly important in dairy farming, as the average age of dairy farmers continues to increase while the labour intensive nature of dairy farming makes it unattractive to young farmers.
- As price takers, dairy farmers occupy a vulnerable position in the dairy supply chain and must grapple with high levels of milk price and input price volatility. The challenges faced by dairy farmers are compounded by the lag in the transmission of prices along the dairy chain.

Policy interventions after the quota abolition

- EU dairy policy contains a rich framework of policy instruments, including market measures, farm income support and safety net provisions, which benefit EU dairy farmers and strengthen the sustainability and resilience of EU agriculture, including the dairy sector. Through the newly introduced National Strategic Plans, MS can further tailor policies to their MS needs. Additional consideration of instruments which could assist farmers in dealing with income volatility is required.
- Despite increased competitiveness, the reliance of net dairy farm income on EU income support payments is still substantial (close to 40% on average with differences across MS), signalling the importance of such income support policies.

Key recommendations

- The various challenges facing the dairy sector (e.g. price volatility, environmental and climate goals and generational renewal) require an adequate policy framework.
- Consideration should be given to mechanisms that incentivise or reward individual farmers for individual efforts made to reduce their farms greenhouse gases (GHG) emissions.
- Incentivising a reduction in GHG emissions through the adoption of mitigation technologies would be preferable to reducing emissions by cutting milk production. A

potential policy tool to deliver a reduction in dairy sector GHG emissions would be to initially grant farmers a quantity of emissions rights, which would then gradually be reduced year by year. A market would then be created to access emissions rights, placing a carbon price on these emissions. In theory, placing a price on the GHG emissions produced by the farm would incentivise the dairy farmer to adopt emission reduction technologies, if doing so is cheaper than the cost of buying emissions rights. Detailed estimation of GHGs produced by the dairy sector is required alongside detail on mitigation technologies adopted.

- Dairy processors must be made fully aware of the importance of monitoring the total amount of emissions generated by their milk suppliers rather than focusing solely on the carbon footprint of the milk produced.
- For carbon accounting reasons, the contribution dairy farmers can make to fossil fuel displacement does not reduce their farm's agricultural emissions. This accounting approach is unhelpful in incentivising dairy farmer action on renewable energy production.
- More support should be given for technological solutions that could reduce the labour requirement on dairy farms thereby delaying dairy farm exits (allowing older dairy farmers to remain in dairy farming where a successor is absent) and increasing the attractiveness of dairy farming for the younger generation, making generational renewal more likely.
- The promotion of organic dairy farming over conventional dairy production needs careful consideration. Some conventional dairy systems may deliver environmental benefits that are near equivalent to organic farming, with fewer of the challenges associated with organic farming (such as the sourcing of organic feed, the cost of organic certification).
- EU dairy policy contains a rich framework of policy instruments, including market measures, farm income support and safety net provisions, which benefit EU dairy farmers and strengthen the sustainability and resilience of EU agriculture, including the dairy sector.
- Fixed milk price contracts are a policy tool to help address milk price volatility and provide farmers with greater milk price certainty. Evidence from Ireland suggests that the tool has merit but is not without its flaws. Consideration should be given to a wider take up of this risk management tool across the EU dairy sector.

1. INTRODUCTION

1.1. Background

The EU is the second largest milk producer at global level, having delivered approximately 161 million tonnes of raw milk in 2021 (Eurostat, 2022). At EU level, dairy production is also a key pillar of the agricultural sector, representing more than 12% of total agricultural output (European Parliament, 2018). From a historical perspective, the EU dairy sector has undergone notable changes in its policy framework over time. The most significant recent change was the **abolition of the EU milk quota** system in April 2015 (Requillart et al., 2008; Jongeneel and Van Berkum, 2015). The milk quota system, which was introduced in 1984, provided national production quotas at Member State (MS) level and individual quotas fixed for each producer or purchaser, with a levy payable (the '*super-levy*') for those exceeding their quota (Jongeneel and Gonzalez-Martinez, 2022a). For more than three decades, the quota regime regulated the EU milk supply and addressed the oversupply that characterised the EU dairy sector in the 1970s and early 1980s.

However, the **global demand** for dairy products has increased considerably over the last two decades. Simultaneously, international dairy product prices, which had been low relative to EU prices, increased considerably. This development meant that the EU dairy sector became increasingly competitive at the global level in the 2000s. However, given the existence of the milk quota, export opportunities for the EU dairy sector remained limited in the 2000s.

The abolition of the milk quota system marked the ending of a significant constraint on the development of the EU milk sector, permitting market forces to replace a supply constraint as a driving factor of milk supply (Jongeneel and Gonzalez, 2022b). In order to facilitate this transition, the European Commission first introduced a '***soft landing policy***' in 2009 to allow an adjustment towards a market determined level of milk supply. This policy provided for the gradual expansion of milk quotas by 1 percent per annum until 2015.

In the aftermath of milk quota abolition in 2015, there is evidence that the experience of the dairy sector across EU MSs has not been uniform. For most MSs, the gradual increase in milk quotas led to a gradual phasing out of its impact on production (European Commission, 2012). As reported by Jongeneel and Gonzalez-Martinez (2022a), in April 2015 only 12 out of the then 28 MSs effectively still faced quotas which constrained milk supply. This group of MSs included Austria, Belgium, Cyprus, Denmark, Estonia, Germany, Ireland, Italy, Luxembourg, the Netherlands, Poland and Spain. Elsewhere in the EU, by the time of its elimination in 2015, the milk quota had already ceased to limit milk production, as milk supply in other MSs was below the milk quota level.

Against this background, the AGRI Committee of the European Parliament has commissioned the present study, aiming at: (i) describing the structure and functioning of the EU dairy sector; (ii) understanding its historical development since the abolition of the milk quota regime; and (iii) providing an overview of upcoming challenges and future prospects for the sector.

1.2. Sectoral concerns

Despite the **important contribution of dairy farming to EU agricultural production**, the **sector is facing some challenges** which are expected to continue in the coming years. Ensuring sustainable and sufficient farm income is a key issue since currently many dairy farmers are dependent on income support.¹ In some cases, the low profitability of dairy grazing farms means that incomes lag behind those of other systems. The sector is also challenged by issues such as poor competitiveness and the weak position of dairy farmers in the value chain. Looking at the evolution of productivity, milk yield growth is expected to slow down in the coming years reflecting a stronger focus on health and longevity of dairy cow populations, as well as other developments such as an increased share of organic production, **environmental constraints**, etc. However, productivity is still an important element to ensure the economic viability of the sector. **Output price and input price volatility**, as well as **labour availability** and **generational renewal** also bring additional uncertainty for the future of dairy farming.

Changes in consumer preferences could also arise, reflecting **animal welfare issues**, the uptake of plant-based alternatives to milk and other dairy products, an increasing demand for organic dairy products or societal concerns regarding the use of GM inputs in the production process, i.e. by farmers. Another element that could alter demand for EU dairy products is increasing consumer interest in local production (short supply chains) as a response to the issue of “food miles” and the wish to contribute to the preservation of local landscapes. At international level, **uncertainties about future demand for EU dairy exports from significant net importers such as China** could also play an important role in shaping market prospects for EU dairy products.

Environmental concerns (e.g. reducing nutrient surpluses, ammonia emissions) are growing as water quality and biodiversity are under pressure in various dairy regions. **Climate change** and related policies such as national/EU greenhouse gas (GHG) emission reduction targets, together with a wider range of environmental policy objectives, e.g. Farm to Fork (F2F), Biodiversity Strategy (BD), etc., could impose further constraints on the development of the dairy sector. Farmers located in MSs or regions considered to be environmental hotspots could face the largest climate and

¹ The average share of EU direct payments in farm income for the (extensive) dairy and beef sector varies from 70 to 100% (Ecorys, forthcoming).

environmental policy challenges. Another concern related to climate change is the increase in the **frequency and intensity of heat stress episodes** which can negatively impact on cow productivity. This may require additional resources to mitigate the impacts on the herd. Adverse weather conditions may require measures to deal with the related impacts on pasture and roughage production.

1.3. Structure of the report

The remainder of this report is structured as follows. **Chapter 2** presents the approach and methodology applied in this study. **Chapter 3** elaborates on the structure and functioning of the EU milk sector, providing a high-level review of the EU's position within the global dairy market, illustrating the importance of the global dairy market for EU milk price developments. The chapter also examines the structure of the EU dairy processing sector. **Chapter 4** describes the key production trends and price dynamics of the EU milk sector in aggregate and at the MS level since the abolition of the quota regime. **Chapter 5** provides greater farm level detail, examining the competitiveness of the EU dairy sector. The chapter also looks ahead and provides some prospects for the EU milk sector, while identifying the key challenges and opportunities for EU dairy farming. **Chapter 6** examines the EU/national policy interventions after the quota abolition to identify key measures and examples of good practices. **Chapter 7** provides some conclusions and policy recommendations. A list of references and an annex are also included to provide further details.

2. APPROACH AND METHODOLOGY

KEY FINDINGS

- The methodological approach used for this study combines a review of the existing literature on milk production, a descriptive analysis based on the statistical data and a consultation with key dairy stakeholders in the EU.
- This study covers the EU27 as a whole, by analysing how primary milk production has developed, paying special attention, where relevant, to developments at Member State level. International market developments are also considered due to their influence on dairy trade.
- The main focus is on the developments which have taken place since the milk quota was eliminated in April 2015. Nevertheless, the developments related to the implementation of the soft landing policy since 2009 are also considered.
- The stakeholder consultation has explored issues such as the implementation/abolition of the quota system as their impacts, as well as the potential effects for dairy farming of the most recent pieces of EU legislation. Other topics addressed during the consultation were the role of organic production, the impacts of price volatility for dairy products and the potential consequences of mandatory and voluntary labelling.

2.1. Preliminary considerations

This study relies on a **mixed approach** which combines the analysis of data on dairy production, consumption, trade flows, farm income, farm size, etc., with the insights gathered by means of a literature review of scientific publications and grey literature, e.g. reports by national governments, international organisations, representative organisations etc. The insights delivered by this combined approach will lead to a better understanding of the implications of those policy changes that have affected the EU dairy sector in the recent past. Both the literature review and the analysis of statistical data take a broad perspective in which socio-economic factors, regional aspects and environmental issues are taken into consideration. All of these findings are supplemented by the insights delivered by a consultation with key stakeholders.

2.2. Coverage of the study

Focusing on the **geographical dimension**, this study covers the **EU27** as a whole, by analysing how primary milk production has developed, paying special attention, where relevant, to developments at MS level. For the analysis of dairy product production, a

regional or product based approach is most suitable, distinguishing 3 or 4 regions and considering the key dairy products produced in the EU27.

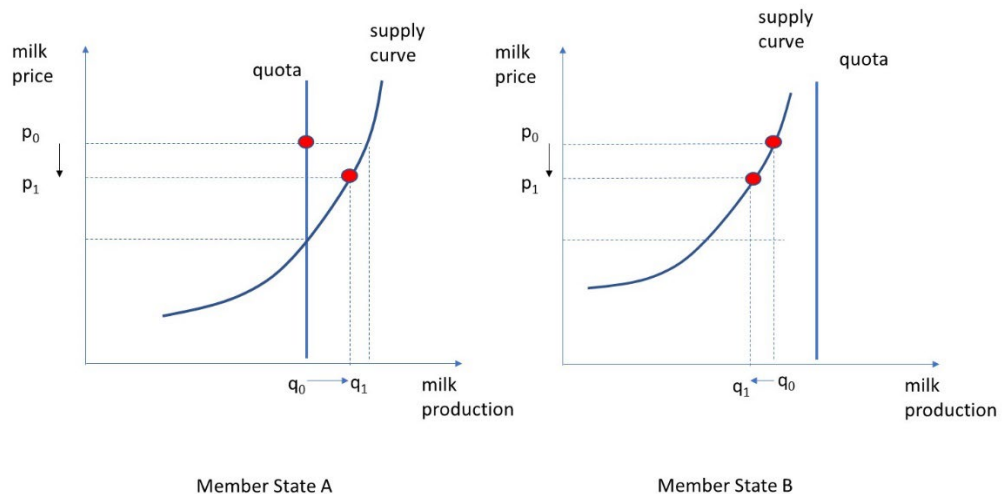
Nevertheless, while the primary focus is within the EU, it is also important to understand the interplay between the EU and other key dairy production/export regions at global level, especially those that are perceived to be competitors. Therefore, developments in the United States, New Zealand and South America are considered where necessary, as these regions, in particular, compete with the EU on the global dairy market. While the focus is largely on the supply side in this study, the demand side cannot be ignored. From a demand-side perspective, the study focuses firstly on the demand for dairy products within the EU. Nevertheless, the evolution of the Chinese market and (following Brexit) the UK market are also taken into consideration to provide a better understanding of the demand-side of the global dairy market and its influence on EU dairy trade.

In terms of its **historical focus**, this study mainly considers developments since the milk quota was eliminated in April 2015. However, for some aspects the analysis extends back to 2009 or earlier. This longer timescale is relevant when exploring impacts associated with the implementation of the EU's 'soft landing' dairy policy which preceded the final elimination of the milk quota system or when trying to detect longer-run patterns and trends. When discussing the **future prospects** for the sector, a short-run to medium-run perspective is adopted. For this the focus is on the expected challenges and opportunities in the coming 5 years, taking us beyond the end point of the current CAP.

2.3. Analytical framework

In order to assess the impacts of quota abolition, a micro and sectoral economic framework is used. Figure 1 provides a graphical analysis of how the abolition of the milk quota in 2015 affected MSs milk production in different ways, depending on whether their milk production was constrained by the quota system and the impact of the relaxation of the policy (e.g. **the soft landing**) on milk production. The two stylised cases represent firstly a situation in which a MS faced a binding milk quota (milk production was at the quota level), and they were 'off' their **supply curve** in the quota period (see **MS A**-panel) and secondly a situation in which the milk quotas have not been binding (milk production was below the milk quota level (e.g. some eastern EU MSs), or no longer were binding at the moment the milk quota were abolished (see **MS B**-panel).

Figure 1: A stylised presentation of the impacts of milk quota abolition on MS milk production depending on the different regime they are in (binding / non-binding quota)



Source: Own elaboration

When the milk quota ended, it was possible that milk production could increase in some MSs and fall in others. From the perspective of milk price developments, what is important is the net change in EU milk production when the change in production at MSs level are aggregated. Other things being equal, an increase in overall EU milk production following milk quota elimination, should lead to a fall in milk prices to some extent.

As Figure 1 shows, in the **MS A-case** one would expect milk production to expand due to the removal of the quota constraint, even though the overall EU milk price may decline. The magnitude of the milk production increase depends on the **shape (slope) and position** (e.g. milk quota rent; competitive position) of its supply curve. In reality, as MS A produced off its supply curve, the information on the shape and position of this curve is largely unknown, as the supply curve did not play a direct role in the quota period. A question therefore is how this supply curve can be determined and what characterises its shape and **responsiveness to the milk price** and other factors (e.g. input prices and capital cost). See Jongeneel and Gonzalez (2022a and b) for an estimation of '**recovered**' supply functions at EU MS level.

For the **MS B-case** one would expect a decline in their milk production following milk quota elimination, as these MSs are already producing along their supply curve and would face a contraction in production due to the decline in the EU milk price (that might have been caused by the net expansion of EU milk production due to the type-A MSs). Figure 1 not only explains how different MSs may exhibit different supply

responses as a reaction to the EU's quota abolition, it also signals that 'below' the EU aggregate there may be different and **diverging developments** at individual MS level, that require identification and need to be studied in order to understand what drives the EU dairy sector as a whole.

The challenges faced by the EU dairy sector are likely to persist, and some may intensify, but there may also be opportunities to be capitalised upon. Recognising and understanding these challenges and opportunities is vital, so that EU policy is supportive of desirable sustainable outcomes in the dairy sector. In this evolving context, it is therefore important to draw relevant insights and recommendations to inform the policy making process. From a **market production perspective**, the sector is characterised by higher price volatility and stronger exposure to international dairy product and input price fluctuations than in the past, with resulting implications for farm profitability (Gołaś, 2017). Taking a **demand side perspective**, evolving consumer preferences and trade opportunities need to be considered. From the **policy perspective**, the European Green Deal, F2F and BD Strategies, will require fundamental changes to EU agriculture, including in the dairy sector.

2.4. Methods

The approach used in this study consists of the following elements:

- **A review of the existing literature** including academic publications, as well as 'grey' literature published by policy makers, industry representative bodies, consultancies and others in civil society. Some examples of the type of documents reviewed are: market outlook reports from the OECD and the European Commission, sector reports published by dairy processor/producer organisations, academic articles published in peer reviewed journals such as Agriculture, the Journal of Dairy Science, the International Dairy Journal, etc.
- **Descriptive analysis based on statistical data.** An inventory of data sources and an overview of the type of variables that have been collected from each of these is provided in the Annex (Part I).
- **Stakeholder input** gathered by means of a **consultation with key actors in the EU dairy market** (European Dairy Association, Eucolait) and interactions with dairy farmer organisations and dairy industry representatives. This element allows the collection of additional market and sectoral insights to validate the findings delivered by the literature review and the statistical analysis. This consultation has also delivered further insights regarding the future prospects and upcoming challenges and opportunities for the sector.
- This report also includes **text boxes to highlight issues and challenges that are of importance for future policy reflections.** Topics that are highlighted in this way include dairy in disadvantaged regions, animal welfare, interesting risk management approaches and specific environmental issues (e.g. GHGs and ammonia emissions) related to dairy in environmental hotspot regions.

2.5. Data sources

Several statistical sources (see Annex, Part I) have been consulted to gather the data required to carry out the descriptive analysis which supports the findings of this report. Publicly available data from official statistical providers have been used for transparency and easy replicability of the analysis.

2.6. Literature review

In order to identify key resources that could be consulted to gather relevant qualitative as well as some quantitative data, the search terms used are listed in Table 1:

Table 1: Key search terms for literature review

Broad topic	Key terms
Milk prices	Milk prices, price formation in dairy sector, dairy market volatility, Skimmed Milk Powder (SMP) price, Whole Milk Powder (WMP) price, butter price, cheese price
Trade	Milk trade, SMP trade, WMP trade, butter trade, cheese trade, dairy intra-trade, dairy trade agreements
Milk supply	Milk supply, milk production, raw milk, organic dairy, conventional dairy
Milk consumption	EU dairy consumption, dairy per capita consumption, healthy diets, protein transition
Milk quota	Soft landing policy, milk quota, abolition milk quota
Policy framework	CAP, environmental policy, phosphate quota, dairy policy, income support dairy, milk package, nitrogen crisis
Others	Dairy farming, farming EU, dairy farming emissions, farming in rural areas, aging dairy farmers, aging farmers EU, generational renewal farming, extreme weather events, challenges for dairy, prospects for dairy production, future dairy production, dairy risk management, animal welfare, disadvantaged areas, mountainous regions, short food supply chains, sustainability, food labelling.

Source: Authors

The findings of this literature review are not presented in a dedicated section of this report. Instead, they are integrated into Chapters 3-6.

2.7. Stakeholder consultation

A **consultation with selected key dairy sector experts** from various places and backgrounds in the EU has been carried out to gather 'insights into the topic going beyond the current state of scholarship'. The consultation was carried out under the Chatham House Rules. Therefore, the outcomes of the discussion have been anonymised and are presented in this report together with the findings of the literature review and data analysis. The rationale behind this consultation is that, for the first time since quota elimination, there are some prospects of stagnation in production in the EU dairy sector, as indicated by the EU agricultural outlook 2022-32 (European Commission, 2023a). These prospects represent a projected new trend in future developments, which should be further investigated and subject to interrogation by dairy market participants. This set of interviews has focused on major MS processors or their representative organisations although it still applies an EU-wide perspective. During the consultation, participants were asked to identify and rank what they perceive to be the key challenges and opportunities for the dairy sector.

3. STRUCTURE AND FUNCTIONING OF THE EU MILK SECTOR

KEY FINDINGS

- At a global level, the EU and New Zealand are the main exporters of dairy products, both having a market share of about 24%. The US is also an important player in the international market, having a market share of around 13%. This situation is expected to continue in the coming years.
- The UK is an important destination for EU exports of dairy products. In 2022, more than 422 thousand tonnes of cheese were exported to the UK, while 117 thousand tonnes were imported into the EU. Another important trade partner is China. In 2022, around 11 thousand tonnes of butter and more than 206 thousand tonnes of whey powder were exported from the EU to China.
- Dairy product and farm milk prices in the EU and the world market (using New Zealand prices as a proxy) have converged since the abolition of the milk quota and past CAP reforms. The developments of dairy prices in the EU have been reflecting the general trends as well as the volatility that is observed by dairy prices at a global level.
- Even though the EU is a Single Market, dairy supply chains can show quite a degree of heterogeneity even within a single product category. Cooperatives have a high market share in the Scandinavian countries (Denmark, Finland, Sweden), Ireland, the Netherlands, France and Austria (all with a market share of more than 50%).

3.1. The EU dairy sector within the Global Dairy Market

3.1.1. Supply and demand developments

World milk production (roughly 81% cow milk) showed a trend **growth of about 2% per annum** during the last decade. In 2021, it increased by 1.1% to about 887 Mt in 2021 (OECD-FAO, 2023). This production growth is primarily driven by the growth in raw milk production in India and Pakistan. Milk production in the EU, the world's second largest dairy producer, slightly declined by 0.5% in 2022, although EU milk production (deliveries) registered an average annual increase of around 1.1% (1.4%) over the period 2012-22 (EU Commission, 2022). The production of the two other major dairy exporters, New Zealand and the United States, showed marginal and modest increases respectively in 2021 (OECD-FAO, 2023).

An important driver behind the **world demand** for dairy products is the **strong and buoyant demand in China**, which is the world's largest importer of dairy products. As incomes and population increase, more dairy products are expected to be consumed over the medium term. Overall, per capita consumption is expected to increase 0.4% p.a. to 21.9 kg (milk solids equivalent) by 2031 in high-income countries, compared to 2.0% p.a. (21.2 kg) and 1.5% p.a. (5.4 kg) in low-middle income and low-income countries, respectively (OECD-FAO, 2023).

Most dairy production is consumed in the form of fresh dairy products, which are unprocessed or only slightly processed (i.e. pasteurised or fermented). Their share in **world consumption** is expected to increase over the next decade (OECD-FAO, 2023). The key drivers for this are **strong demand growth in India, Pakistan and Africa**. In low and middle-income countries, fresh dairy products comprise over two-thirds of the average per capita dairy consumption (milk solids), while consumers in high income countries tend toward processed products (e.g. butter, cheese, skim milk powder and whole milk powder).

There is substantial regional variation in the consumption of processed dairy products. Cheese is the second most important dairy product (after fresh dairy products) consumed in terms of milk solids (OECD-FAO, 2023). Consumption of cheese primarily occurs in Europe and North America, exhibiting a growing trend in both regions. In Asia, butter is not only the most consumed processed dairy product, accounting for almost half of all processed dairy consumption in terms of milk solids, but it also has the strongest projected growth (OECD-FAO, 2023).

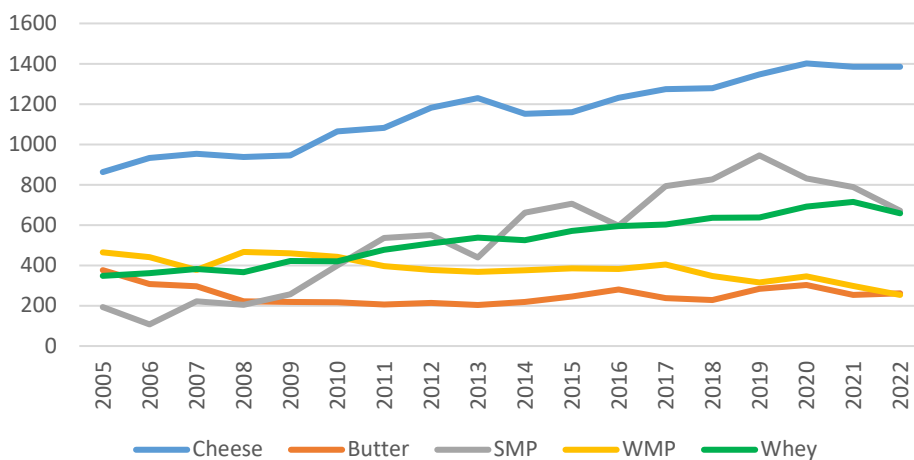
3.1.2. Trade flows of dairy products

The **total global dairy product import value** in 2022 amounted to approx. **38 billion US dollars**. **China** is the most **important importer** (having a 16% share), but EU MSs (Germany, Netherlands, Belgium, Italy, France, Poland) are also important importers (close to 25% of world dairy imports in 2022). Other important importing countries are Algeria, Mexico, Indonesia, Philippines and Malaysia. China is expected to remain the most important importer of milk products despite a projected slight increase in its domestic milk production relative to the past decade (OECD-FAO, 2023). The projected increase in import demand for dairy products in Asian countries will be driven by economic and population growth and a shift towards livestock products (OECD-FAO, 2023). However, in relative terms, the increase in the global demand for dairy products is slowing down. Mexico, the Near East and North Africa (NENA) will also continue to be important net importers of dairy products, whereas Russia's demand development is uncertain.

The EU and New Zealand are the main exporters of dairy products globally, both having a market share of about 24% (European Commission, 2023a). An **emerging third important dairy exporter is the US**, with a current market share of about 13%,

with expectations that it will gain further market share in the future as its domestic production will grow at a stronger rate than in the EU and New Zealand (European Commission, 2023a). These three key exporters are also projected to dominate future world dairy exports, anticipated to account for around 65% of cheese, 71% of WMP, 74% of butter, and 80% of SMP exports in world trade in 2031 (OECD-FAO, 2023). Argentina could become a competitor in the global WMP market due to its rising milk production and below-average domestic demand growth, even though it currently accounts for a relatively small share of trade (OECD-FAO, 2023). India and Pakistan so far are largely self-sufficient, with production growing in parallel with domestic consumption. However, a potential increase in the consumption of processed dairy products like cheese and milk powders may drive an expansion of processed dairy imports during the coming decade (OECD-FAO, 2023).

Figure 2: EU exports of dairy products and its evolution (thousand t)



Source: Based on European Commission (2023)

As shown in Figure 2, EU cheese, SMP and whey exports showed a steady increase over the period 2005-2022, with cheese being the most important product (both in terms of value, and milk use). EU WMP exports showed a downward trend, which is expected to continue, whereas butter exports have been increasing since 2013.

At a global level, **trade agreements** have the potential to **shape the trade of dairy products**, creating new opportunities to boost commercial flows. Free-trade zones outside the EU are created by agreements like the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), while the Comprehensive Economic and Trade Agreement (CETA) aims at boosting trade relationships between the EU and Canada (OECD-FAO, 2023).

Focusing on the dairy case, an important piece of legislation at EU level is the **EU-UK Trade and Cooperation Agreement** to regulate trade flows between the two regions

in the post-Brexit context. In the context of this agreement, Trade relations between Ireland and the UK are particularly relevant. Since April 2021, Irish dairy exports to the UK have not experienced any disruption. In parallel, increasing volumes of Irish products are reaching the continental EU by direct maritime routes from Ireland in order to avoid delays as happened in the case of road freight shipped via the UK. Another concern that needs to be mentioned is the 'mixed origin' milk issue affecting Northern Ireland producers and Irish processors.

Another important trade agreement is the EU-New Zealand Free Trade Agreement which is expected to lead to a 30% increase in bilateral trade in the coming 10 years (Euronews, 2023). However, the impact for the dairy sector is unclear since some impact assessments suggest a decline in total output for the EU dairy sector of around 0.1% (Farm Europe, 2023). Moreover, another element that could create new opportunities for processed dairy products at global level could be a potential expansion of consumption of dairy products in India and Pakistan (OECD-FAO, 2023).

Annex Part V provides further detail on developments in global dairy products trade since 2015 and also shows the importance of the EU and other key dairy exporters in global dairy trade. Additional figures to the contribution of EU dairy exports and imports to the global market are also included in this appendix.

3.1.3. Dairy product price developments

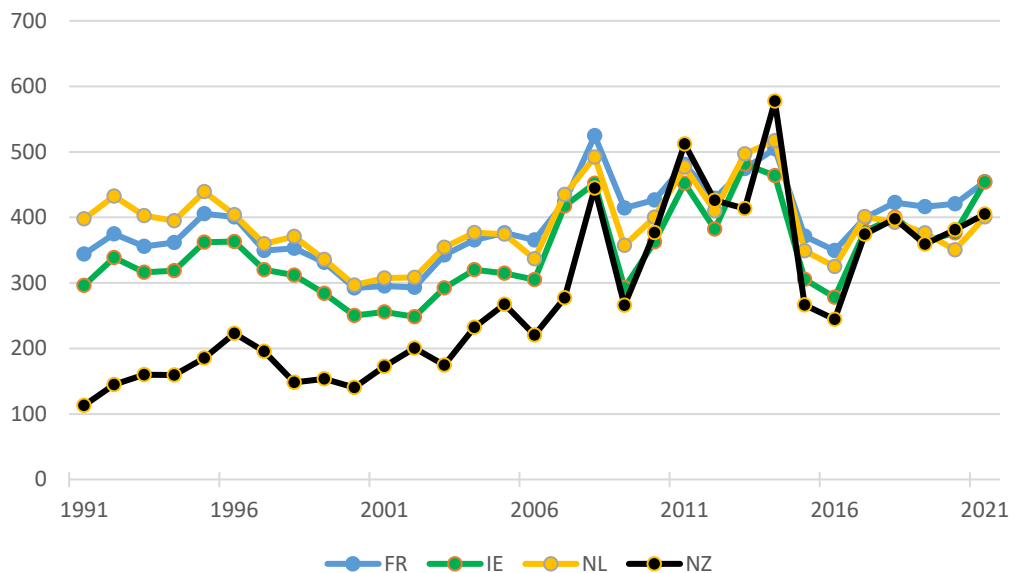
Most dairy products around the world are consumed in the country in which they are produced. World dairy prices are volatile because the volume of global milk production that is sold on the world market is very small relative to total global milk production. In volume terms about 8% (OECD-FAO, 2023) of global milk production enters the world dairy market.

Global milk production grows each year, but the growth rate from year to year can vary, influenced by economic factors and production conditions. Particularly **important** is the **production growth in major dairy regions which have exportable surpluses** (e.g. New Zealand, EU, US, South America), as this can cause the amount of product available for world market trade to increase or decrease significantly. This in turn influences world dairy prices, creating the world dairy price volatility we observe. On the consumption side, demand from major dairy importers can also vary from year to year and this too can influence world dairy prices.

Historically, **EU dairy commodity prices exceeded world dairy price levels**. The EU used market protection measures (**import tariffs**) to maintain this price differential, by limiting the entry of cheaper international dairy products onto the EU market. Given that EU dairy exports were generally not price competitive on the world market, a system of export refunds was required so that EU dairy products could be sold on the world market. Export refunds ensured that dairy exports to lower priced markets still

delivered a return equivalent to what could be achieved if those dairy products had been sold within the EU. However, this price differential began to change in the mid 2000s (see also chapter 6). **With the growth in international dairy demand, world dairy prices increased**, closing out the gap between EU and world prices for some dairy commodities. The volatility that was a characteristic of world dairy prices then began to transmit volatility to EU dairy prices. The convergence in EU and world dairy prices opened up more export opportunities for the EU dairy sector and created some of the impetus for the removal of the EU milk quota system.

Figure 3: Comparison between New Zealand and EU milk prices (USD per tonne)



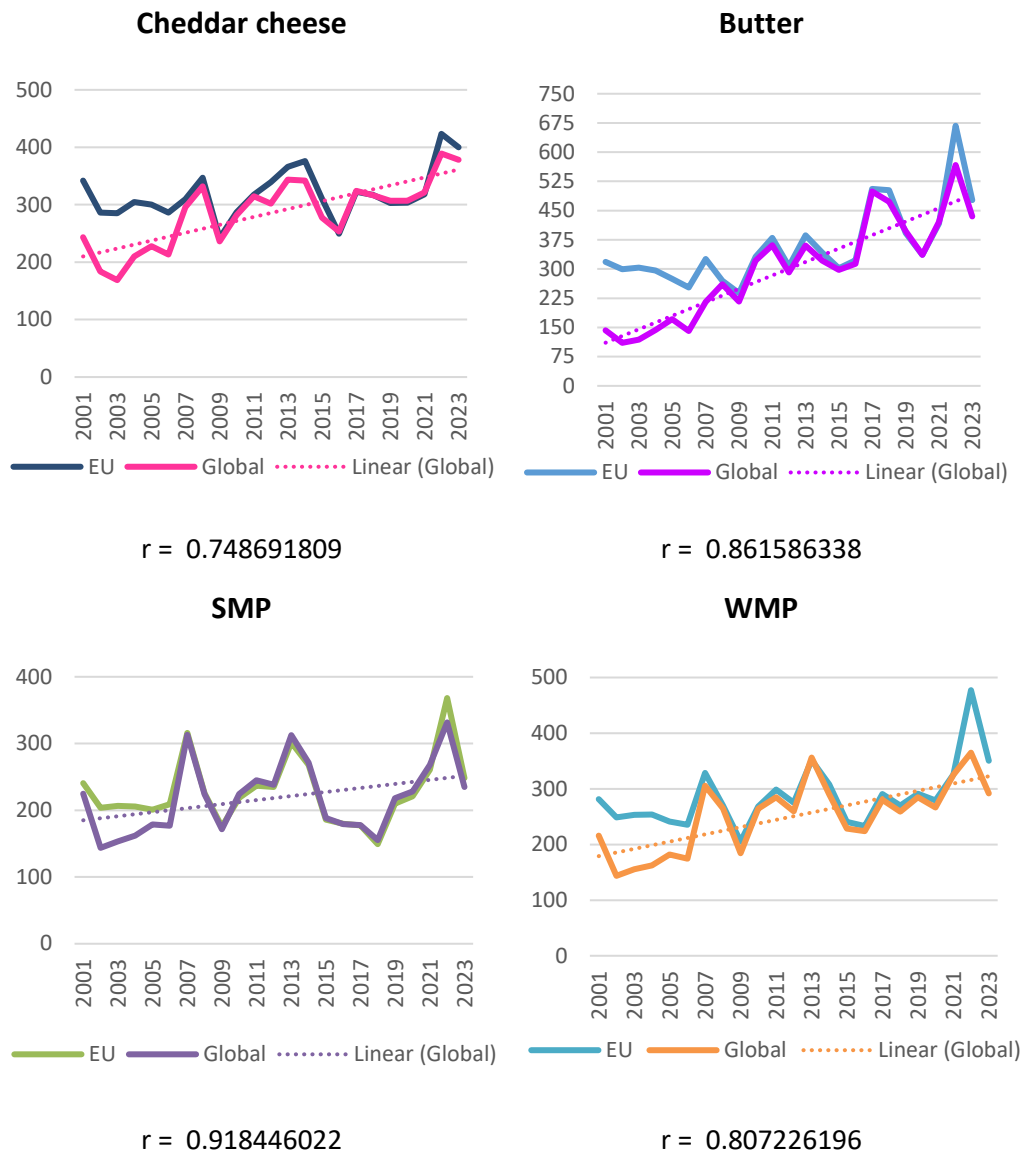
Source: Adapted from FAOStat data

Figure 3 compares the farm milk price in New Zealand with the farm milk price in selected EU MS over the period 1991 to 2021. The **New Zealand** dairy sector is known to be a low-cost producer. The New Zealand milk can be taken as a proxy for the world market price for milk. It can clearly be observed that a large price gap existed in the 1990's, but that this gap closed gradually and had all but disappeared by 2008. Note that this **price gap convergence was achieved by the gradual increase in world market prices** rather than by reductions in milk prices in the EU. Historically the EU would have been considered a high-cost producer than New Zealand, but Figure 3 illustrates that the EU has become more competitive.

Over the last two decades, the development of dairy prices in the EU has reflected the general trend observed in dairy prices at a global level (Figure 4). Nevertheless, EU and global dairy prices were at different levels prior to 2007-09, with EU dairy prices being generally higher than their global counterparts. **Over time EU and world market prices**

for dairy products are converging, which also explains why a similar pattern was found with respect to the EU/New Zealand milk prices (see Figure 3).

Figure 4: Trends in global dairy prices (EUR/100kg)



Source: Own elaboration based on FAO and EU Milk Market Observatory

Note: r stands for correlation coefficient. The observations for 2023 are preliminary ones.

More recently, in 2022, EU prices were above the average for the global market, reflecting higher input prices (animal feed and energy) and extremely high processing costs in the EU. Some **droughts** in areas such as the Northern region of Spain and France also **impacted positively on dairy prices** due to reduced milk output. In the

course of 2023, EU dairy prices are declining compared to their 2022 values. This reflects the **slowdown in feed prices** that global markets are registering (Rabobank, 2023). Another market driver that explains price increases for dairy products is **labour shortages**, which in countries like the UK have become a **chronic element** (Food Ingredients, 2022).

Looking across products, since 2015 **butter prices are notably higher than SMP prices**, reflecting a stronger demand for milk fat than for the latter (OECD-FAO, 2023). However, this gap is expected to be reduced in the coming decade due to an increasing demand for SMP in the case of middle- and low-income countries.

Looking ahead, the European Commission (2023a) suggests that in the coming decade, **cheese and whey powder prices** are expected to **increase** compared with their 2020-22 level (by 0.7 % and 2.4 % per year respectively). However, butter prices are expected to remain around the current level. Overall, the EU raw milk price could be of about EUR 4.5/100kg by 2032.

Further details on the price transmission mechanism within the EU are provided in the Annex (Part III).

3.2. Functioning of the EU dairy processing sector

3.2.1. The position of the EU dairy industry

The **EU dairy industry is very dominant in the world market**. In 2022, EU-27 exports amounted to €20.4 bn worth (equivalent with 16 million tons of milk equivalent or about 10% of EU total milk production) to other countries, while its imports of dairy products amounted to 2.5 billion. **The UK, Algeria, USA, Saudi Arabia, China, Egypt and Japan are important destinations for EU dairy exports**. EU dairy exports continue to increase and now represent 9% of the EU's total agricultural export value (European Commission, 2023e). At world level milk is traded mainly in the form of processed products (OECD-FAO, 2023).

About **45 thousand EU dairy industry jobs are export related** (EDA, 2017/18). The EU's €20 billion dairy exports exceed New Zealand's €12 billion in exports and the US's €8.8 billion in exports. Although its world exports are increasing in value, the EU's world market share is decreasing, since the world market is growing faster than the EU's export capability. **New Zealand benefits most from the increasing world dairy market demand**. Brazil is still a minor player in the world dairy market, but in a national context the importance of its dairy industry is increasing quickly. Due to increasing export competition, especially from New Zealand in the milk powder market, the EU specialises more in cheese exports.

In 2021 half of the global top10 dairies were European companies (Lactalis, Nestlé, Danone, Friesland Campina, and Arla), and also Europe's share in the global top20 dairies is 50% (Rabobank, 2022). The turnover of the 5 largest European dairies is €81 billion (55% share in the total top20 turnover value) (own calculations based on Rabobank, 2022). In addition to the companies mentioned above, other big EU dairies are Savencia, Sodiaal, Müller, DMK, Hochwald, Meggle, Ornu, Garnarolo, Edigio Galbani, Parmalat, Mlekpól, Polmlek amongst others. Especially in **north-western Europe the dairy industry is dominated by large firms**. In total the EU has about 12 thousand milk processing sites and employs more than 300 thousand people (additional to the EU's more than 1.6 million dairy farmers) (EDA, 2017/18 and European Parliament, 2018). Some 80 percent of European dairy companies are SMEs (EDA, 2017/2018). Cooperatives play an important role in EU milk processing and have about a 50% share in total EU milk collection.

The **EU dairy industry processes about 160 million tonnes of raw milk** into a rich portfolio of products of which drinking milk is the most important product by weight (31.4 million tons) and cheese is the most important product in value terms (10.4 million tonnes of product weight) (EDA, 2017/18). The processing industry can be characterised as an innovative sector (Wijnands et al., 2009). According to the Wijnands study, within the EU, dairy companies focus mostly on product innovation and relatively less so on marketing, administration and processing. Product innovations mostly relate to new product varieties, but new ingredients are also an important innovation (in functional foods). SMEs as well as large companies, including the packaging and ingredients industry, all contribute to innovation (Wijnands et al., 2009). For example, **more than 300 EU cheeses** are currently **officially registered and protected** as geographical indications or traditional specialities, products which are often widely traded (EDA, 2017/18). Although the EU dairy sector remains an important global player, it is losing market share as the world market is growing faster than EU exports. This signals a negative trend in market share which is already evident for more than two decades. According to Wijnand et al. (2009) the improvement in labour productivity and the growth in value added tend to compensate for the loss in market share. The EU's main competitor, New Zealand, in contrast has increased its relative world market share during this period.

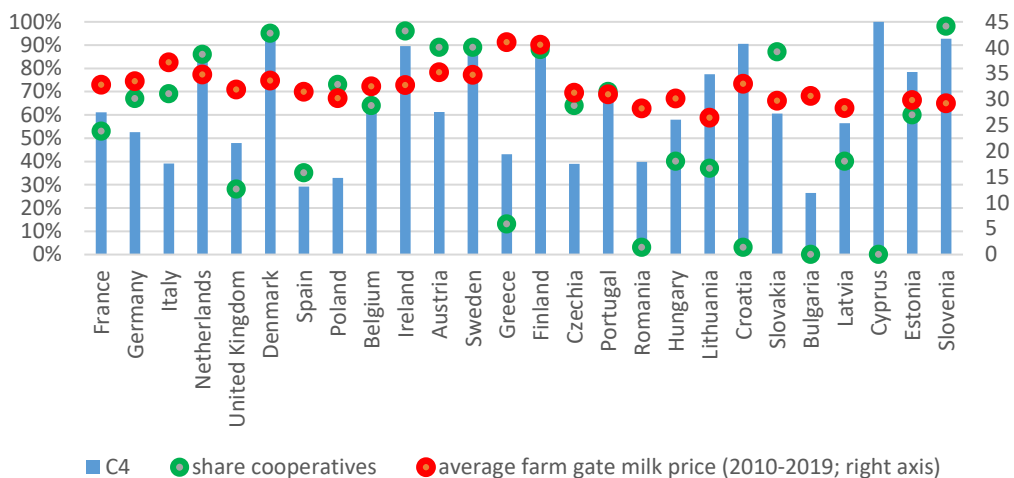
3.2.2. The structure of the EU dairy industry

Even though the EU is a Single Market, **dairy supply chains** can show quite a degree of **heterogeneity** even within a single product category. The total **number of dairy processors** in the EU (including ice cream) is about **13,000**.² When plotting the number of companies against the turnover in the industry, it turns out that that the average size

² The data are from Eurostat SBS. Luxembourg and Malta have no data reported. Missing data for Denmark and Italy was estimated from previous years and public information on the largest companies.

of the companies differs greatly between MSs (Jongeneel and Van Galen, 2019). The number of dairy firms increases with the size of the country. More specifically, Italy, Germany and Spain naturally have a large number of dairy firms. The total turnover of the industry also increases with the size of the country, but there are some exceptions. In particular, the Netherlands and Denmark have a larger dairy processing industry than would be expected in comparison to e.g. the number of inhabitants. For example, the Danish dairy processing sector, with Arla as the main processor, has just a small number of firms (71 in 2018) but a very large turnover resulting in a very high average turnover per firm. Using company accounting data, it is estimated that the four largest dairy firms in Denmark have a market share of 98%. **The Netherlands has 273 dairy processing firms**, but only about 20 have a turnover exceeding 10 million euro. The estimated **concentration ratios** for a range of countries are displayed in Figure 5, along with milk prices and the share of processors that are co-operatives in each country.

Figure 5: Concentration ratios (C₄) in the dairy processing industries, in EU countries and the UK, 2016-2018 estimates, share of cooperatives, and the annual farm gate milk price (euro/100kg, 2018)



Source: Eurostat SBS data, ORBIS Bureau van Dijk, calculations Wageningen Economic Research

Concentration ratios are a measure often used by economists and regulators **to assess the degree of competition in a business sector**. The concentration ratio expresses the share of activity in a sector represented by a specific number of firms e.g. a C₄ ratio indicates the percentage of the sector represented by the top 4 firms. A low C₄ value can be interpreted as an indicator of a higher degree of competition in a sector and vice versa.

Also shown in Figure 5 is the share of (farmer owned) dairy processing cooperatives in each country, which exhibits a lot of variation across the MSs (greater than the variation in C₄ ratios). **Cooperatives have a high market share in the Scandinavian countries** (Denmark, Finland, Sweden), Ireland, the Netherlands, France and Austria (all with a

market share of more than 50%). In Spain, Belgium and Germany, the market share of cooperatives is between 40% and 50% (Bijman and Iliopoulos, 2014). Moreover, **MSs with a high share of dairy cooperatives** (market share >80%) **are the Netherlands, Ireland, Austria, Sweden, Slovenia and Slovakia**. MSs with a low presence (market share < 25%) of dairy processing cooperatives are Greece, Romania, Portugal, Croatia, Bulgaria and Cyprus. Farmers, including dairy farmers, whether small or large, appear to place a significant value on a number of membership benefits provided by cooperatives (e.g. stable market channel, competitive producer price, services offered by the cooperative) (Alho, 2015). MSs with a **low presence of cooperatives** often show a **higher share of producer organisations**. Producer organisations can be seen as substitutes for cooperatives, as they are another institutional structure which promotes farmer interests through collective action and the creation of countervailing market power in the supply chains to counteract the power of other actors in the chain. In general, producer organisations are more highly developed in the fruit and vegetables sector than in dairy.

An attempt has been made to link farm gate milk prices (see also Figure 5, right axis) to the industry structure as comprised by the previously presented C₄ concentration ratios³, as well as the indicator expressing the share of cooperatives in dairy processing. However, this assessment did not lead to clear results. For example, the hypothesis that a relatively high concentration ratio (indicative of a higher degree of milk processor market power) leads to a relatively lower farm gate milk price was not confirmed. In contrast, **the C₄ ratio showed a positive rather than a negative correlation with the milk price**, although this was not statistically significant. There could be a rationale for this seemingly counterintuitive finding. An explanation would be that **a high C₄ could point to an advanced dairy supply chain consolidation**, including the utilisation of economies of scale in processing and marketing, (lower milk assembly, processing and product distribution costs) which may allow for higher farm gate milk returns, than in cases where the industry structure is still more dispersed and fragmented. Some evidence was found for a **positive relationship between the share of farmer owned-dairy cooperatives and the farm gate milk price**. On average the explanatory power of both variables (concentration rate and share of cooperatives) appeared to be low and not significant. However, the few impact studies that do exist on cooperatives in Europe do show a positive effect (increase) on farm milk prices. The cooperative yardstick theory, which argues that cooperatives together have a pro-competitive effect (Michalek et al., 2018) was confirmed for the EU dairy sector by Hanisch et al. (2013) who showed that cooperatives lead to higher farm milk prices and lower farm milk price volatility.

³ The C₄ ratio indicates the market share of the 4 largest companies in a sector.

3.3. Concluding remarks

- **EU milk production growth has lagged behind global milk production** and global demand growth. As a result, the EU's share of global dairy market trade is in decline, even though production and exports have been growing in absolute terms.
- **Together with New Zealand, the EU is a dominant player** in world dairy product markets, both having a **market share of about 25%**. The UK and China are important export destinations for EU dairy product exports. Other important EU dairy product export destinations include the MENA countries, Switzerland and Asia (Japan, Malaysia, Indonesia, Thailand).
- The **EU is an important producer and exporter of cheese**, and this has continued to be the case, even though the EU's milk production growth has slowed. Growth in cheese production and exports is at the expense of whole milk powder, whose EU exports have been declining.
- The competitiveness of the EU dairy sector on world markets has been altered by milk quota expansion and abolition, allied with the CAP Reform of 2003 which preceded it. Along with rapid growth in global dairy demand, this has led to **a convergence of EU and world market prices**. This has strengthened the outward orientation of the EU dairy processing industry and contributed to the development of a number of large international focused dairy business in the EU (half of the world's top dairy companies are EU-based).
- **Price transmission** along dairy supply chains **is only partial**. This could point to the presence of market power and its exploitation along the chain, but no clear evidence was found for this.
- **Industry concentration is strong** in the EU dairy processing sector (C₄-concentration ratios are higher than 50 percent in two thirds of the EU MSs) as is the role of cooperatives. Both (farmer owned) cooperatives and producer organisations are contributing to a better functioning of dairy markets and the fair pricing of raw milk.

4. THE DYNAMICS OF THE EU MILK SECTOR SINCE THE ABOLITION OF THE QUOTA REGIME

KEY FINDINGS

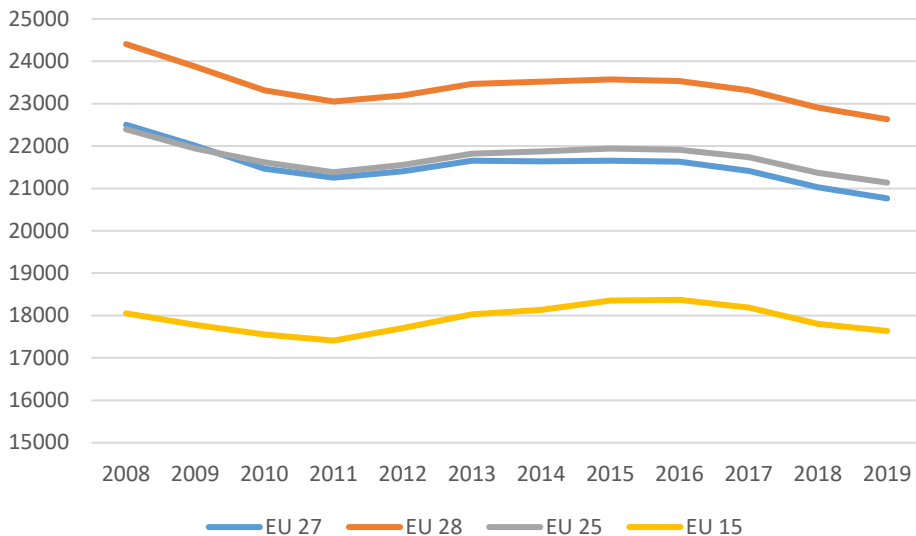
- EU dairy production increased considerably over the last 20 years, partly driven by EU expansion and more recently by the expansion of the EU milk quota and its eventual elimination.
- A general trend of declining cow numbers, rising milk yields per cow, a declining number of dairy farms and larger dairy farm size can be observed across the EU.
- The EU dairy sector is less insulated from world dairy market price developments than was previously the case. EU farm milk prices have become more volatile over the last 20 years. This volatility reflects the volatility that exists in EU dairy product prices, which in turn reflects the volatility in dairy product prices on the world market.
- Dairy input prices, such as feed, fertiliser and energy, are also volatile. Volatile dairy production costs and farm milk prices both contribute to the volatility observed in EU dairy farm incomes.
- Milk price volatility across the EU is not uniform across the MS. Typically MS with a greater export orientation have more volatile farm milk prices. CAP supports and market-based milk price management tools both contribute to reduce the impacts of milk price volatility on farm income.
- Market risk management tools are most important in MS where the milk price volatility is highest.
- Environmental policy, enacted at either EU or MS level, is exerting an increasing influence over the EU dairy sector, with greater pressures already emerging in a number of MS.
- Dairy farms in disadvantaged regions face additional challenges which need to be taken into consideration by policy makers.
- The EU Milk Crisis of 2014-16 presents some lessons for policy makers, although some aspects arising from the crisis could be considered as once off impacts arising from the removal of the EU milk quota.

4.1. EU Dairy Production

4.1.1. Developments in the dairy cow population

Figure 6 shows developments in the **dairy cow population** from **2008 to 2019** for the EU15, EU25, EU 27 and EU 28. The **decline in the dairy cow population** evident in the **period to 2010** is reflective of a **longer-term historical trend** due to the milk production limit under the milk quota system. In the milk quota era, the gradual increase in milk yields per cow led to a reduction in the number of dairy cows over time. This downward trend is interrupted in 2011 and **dairy cow numbers increase** year on year **until 2016**, reflecting the gradual unwinding of the milk quota regime and its eventual elimination. **Post 2016**, following the milk price crisis, the overall **downward trend in dairy cow numbers resumed** and has continues in subsequent years.

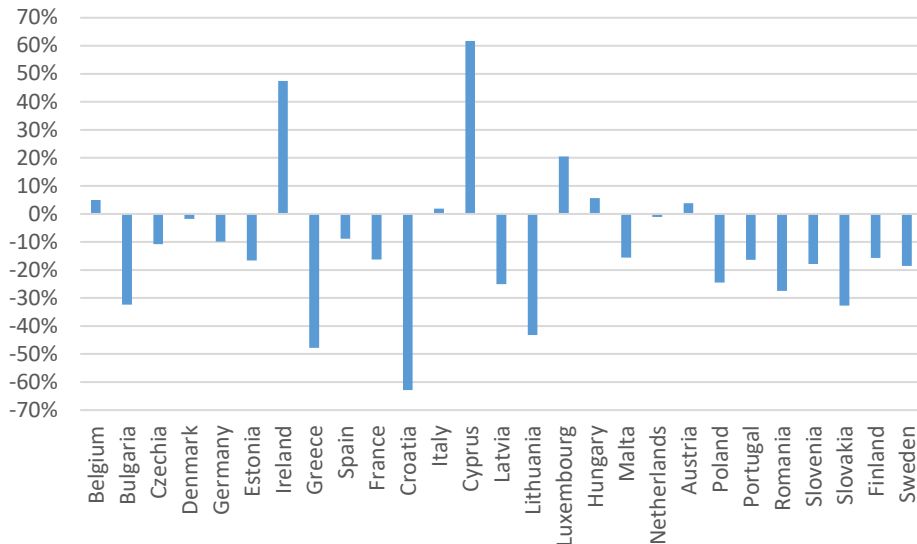
Figure 6: EU dairy cow numbers 2008 –2019 (thousand head)



Source: Eurostat

Figure 7 indicates the **diverse development in dairy cow numbers** across EU MS over the period 2008 to 2022. **Larger reductions** in cow numbers tend to be found in Nordic MS and in MS in **southern and eastern Europe**. Relatively few MS have experienced an increase in dairy cow numbers over the period, with the only **significant percentage increase** taking place in **Ireland, Cyprus and Luxembourg**. Smaller percentage increases were recorded in Belgium, Malta and Austria, while the dairy cow herd in the Netherlands and Italy show little change.

Figure 7: Percentage change in Dairy cow numbers by MS 2022 vs 2008

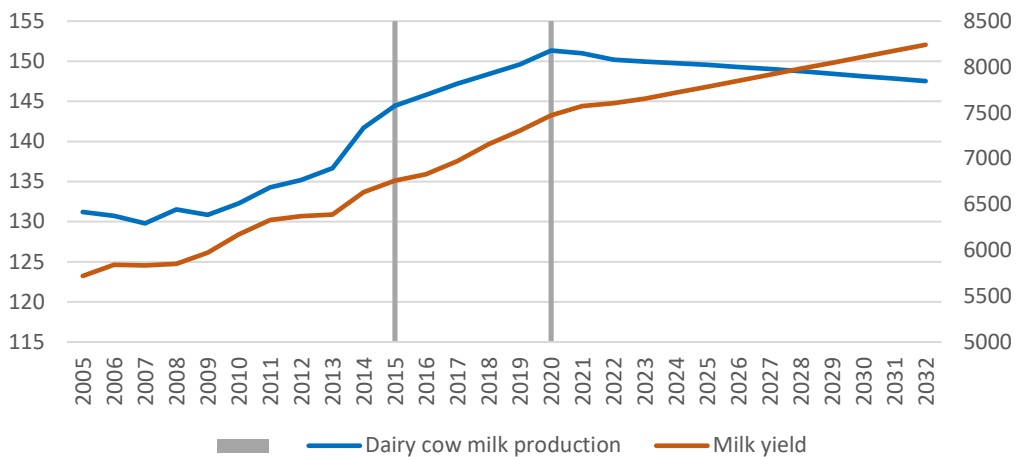


Source: Eurostat

4.1.2. EU level milk yield evolution and milk production developments

Figure 8 provides an overview of past trends with respect to **EU milk production** and milk yield per dairy cow. Also included is the expected future developments according to the European Commission’s Medium-Term Outlook. As can be seen in Figure 8, when the milk quota was abolished in 2015, EU milk production was already on the increase, as some producers had already prepared for expansion. In part the increase in milk production was caused by higher **milk yields**, typically achieved through increased (compound) feed input use, and in part by an increase in the EU dairy herd. Figure 8 also shows that since 2021 there seems to have been a slight **downturn** in EU milk production. For the period 2022-2032, EU milk production is projected to decline by 0.2 percent per annum (by contrast in the previous decade it increased by 1.2 percent per annum). As the yield projection path shows, the projected decline in future EU milk production is partly driven by a decline in the expected growth rate of the EU milk yield per cow. Over the past decade the EU milk yield per cow increased by 1.8 percent per annum, while for the coming decade this is projected to half to 0.9 percent per annum.

Figure 8: Milk production (in million tons, left axis) and dairy cow yield (in kg of milk per dairy cow; right axis) developments in the EU27



Source: Own elaboration based on European Commission (2023a)

The aggregate milk supply figure suggests a future decline in milk yield per dairy cow. **Milk yield growth** has been the key driver of the growth of milk production, more than compensating for the generally declining herd trend. This raises the question as to whether there is a **productivity slowdown already underway**. From assessing the milk yield evolution in EU MS, it is difficult to find a clear answer. For example, in Denmark, a MS which imposes environmental restrictions, since the milk quota abolition, milk yield growth per dairy cow has increased in the period 2011-2021 relative to the period 2000-2010 rather than decreased. It is also not always the case that milk yield growth is slowing down in those MS which already have high levels of milk yield per dairy cow (examples are Denmark, Germany, Belgium, The Netherlands, and Sweden). This suggest that there are no biological constraints currently limiting milk yield increases. A yield growth slowdown over the indicated period is observed for the **southern EU MSs** such as Italy, France and Spain. Strong yield increases are found for some MSs where initial milk yields were relatively low in 2000 (e.g. Bulgaria, Poland) as well as for MSs where (semi-)subsistence farms have been and are exiting the sector, while at the same time this production is taken over or compensated for by the expansion and modernisation of family and commercial dairy farms (e.g. Poland).

This raises the question what could explain or drive the slowdown in EU milk production growth? Would it be driven by the increasing switch to **organic dairy production** or other **special labels**, which often have lower milk yields than **conventional dairy** systems? Or is the projected slower growth in milk yields driven by tighter **environmental restrictions** with respect to ammonia emissions, nutrient surpluses or greenhouse gas emissions, following from the EU's increasing environmental

sustainability policy focus? Or alternatively, is this projected decline in EU milk production the net impact of **structural change** in farm size and farm numbers? In the past a decline in dairy cows due to dairy farms exiting the sector was usually compensated for by larger herd sizes (scale and intensity increases) on farms still in business and continuing to develop. Should farm exits continue, will the **rate of farm succession** in the EU decrease or will the opportunities for farm development decline due to lower future dairy farm profitability or increased policy uncertainty and **market volatility**? For example, could banks become more hesitant to provide the finance dairy farmers need to maintain or expand their businesses? Are these factors likely to produce a rate of decline in the EU dairy herd that is beyond historical precedent? (see Figure 12).

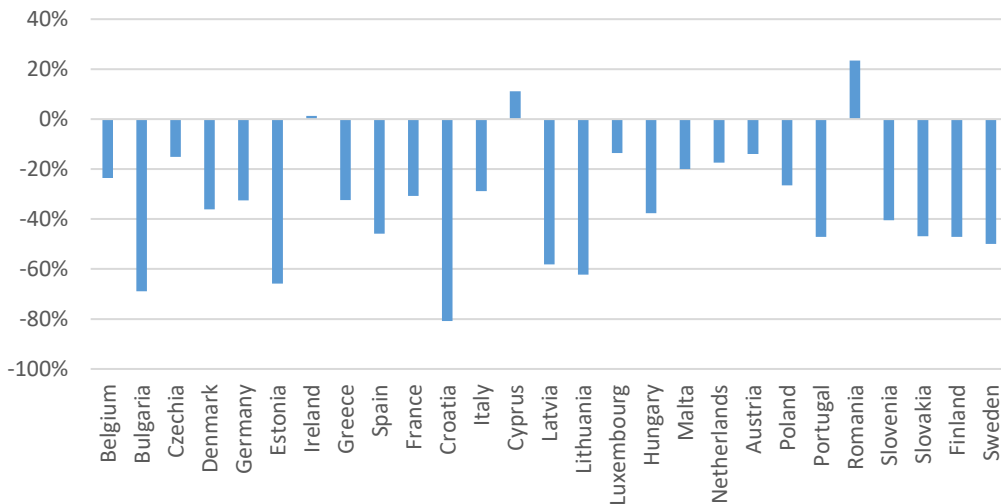
Overall, **since 2015** there has been a **marked difference in the development of milk production** at EU MS level. Several challenges and opportunities have arisen. There has been a considerable amount of **volatility** in dairy product and **farm milk prices** (see, Figure 12, Section 4.1.4.), **input costs** and **farm profitability**. Producers have also faced particular weather-related challenges over the period. In addition, the **age profile** of producers **continues to increase** and **dairy alternatives** continue to emerge and gain market share.⁴ The **environmental impact of dairy production** is also under greater scrutiny from policy makers, retailers and consumers. Against this background, there is a need to understand the **dynamics** and **prospects** of the EU dairy sector in this market setting.

4.1.3. MS level milk production developments

There has been substantial **consolidation** in the **EU dairy sector** at **farm level** over the last decade. Figure 9 shows that among the EU MS, the total number of specialist dairy farms increased only in Cyprus and Romania. The number of specialist dairy farms in Ireland remained relatively unchanged over the last decade. The **largest reductions** in the number of **specialist dairy farms** tended to occur in **eastern and Nordic MS**, with smaller reductions elsewhere. While the number of specialist dairy farms has generally decreased across the MS over the last decade, there has been a more mixed development across the MS in terms of the land area in dairy farming. The area accounted for by specialist dairy farms has decreased in many MSs over the last decade, but in a small number of MS the dairy area has actually increased.

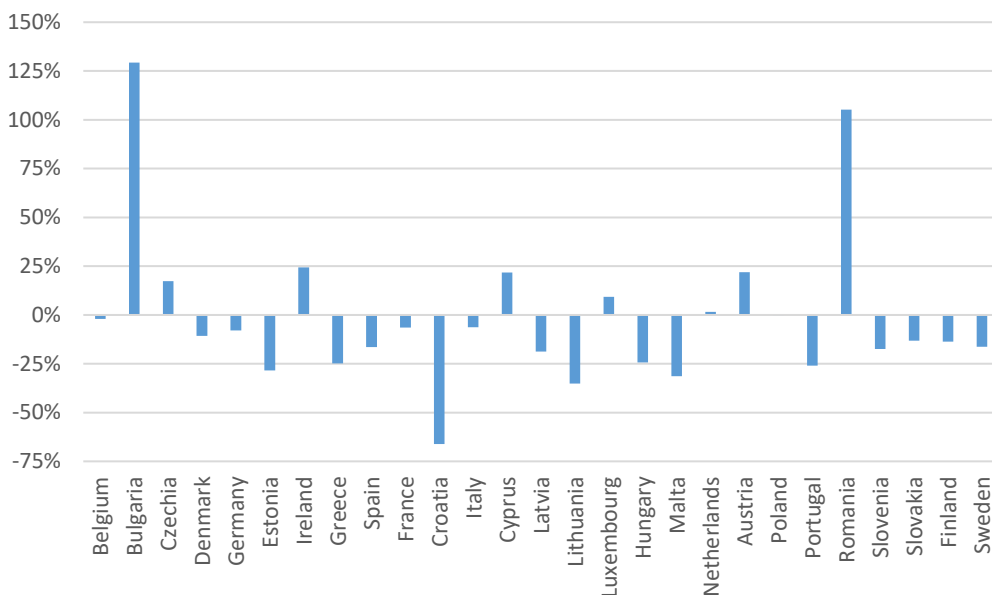
⁴ The consultation with key stakeholders suggested that dairy alternatives are not a major threat for the development of the sector.

Figure 9: Percentage change in Specialist Dairy Farms numbers in EU MS 2020 vs 2010



Source: Elaborated from Eurostat data

Figure 10: Percentage change in total Specialist Dairy Farm area in EU MS 2020 vs 2010



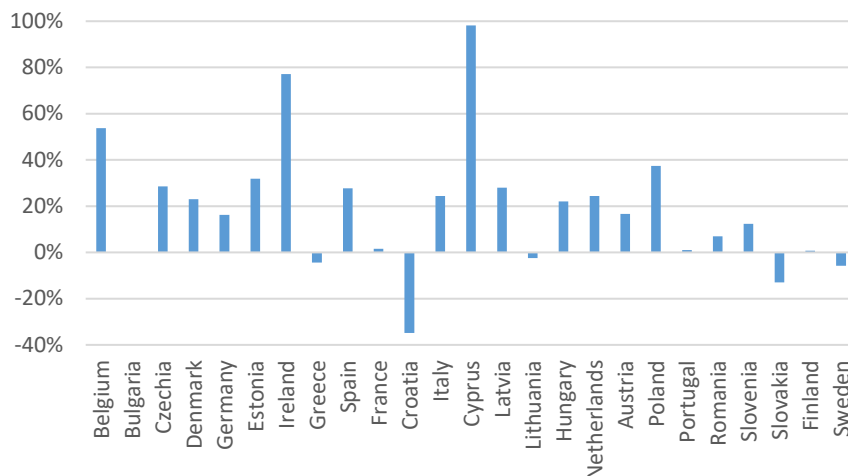
Source: Elaborated from Eurostat data

The **largest increases** in dairy area were recorded in **Bulgaria and Romania** (Figure 10). The other MSs showing an increase in dairy area were **Czechia, Ireland, Cyprus, Luxembourg and Austria**. The **largest decrease** in dairy area occurred in **Croatia** (which only became an EU member in 2013), with Estonia, Greece, Lithuania, Hungary,

Malta and Portugal also showing significant dairy area reductions. Minor reductions in dairy area were recorded in several other MS.

Looking at **milk deliveries at MS level**, there has been a very wide range of developments since the quota system began to be unwound with a series of gradual milk quota increases beginning in 2009, before its complete elimination in 2015. Figure 11 reports the percentage **increase in milk deliveries** over the period **2008 to 2021**. In percentage terms the largest increases in milk production occurred in Cyprus (98%) and Ireland (77%), with deliveries in Belgium (54%) and Poland (37%) also increasing substantially. Many MS recorded an increase in milk deliveries in the range of 15% to 25%, but others including the EU’s largest milk producer France, saw little change in milk deliveries over the period. The **largest reduction** in milk deliveries occurred in **Croatia**. Croatia’s dairy sector has undergone significant contraction following EU accession due to the sector’s poor competitive position (Kranjac et al. 2020).

Figure 11: % change in milk deliveries - selected EU-27 countries, 2021 v 2008



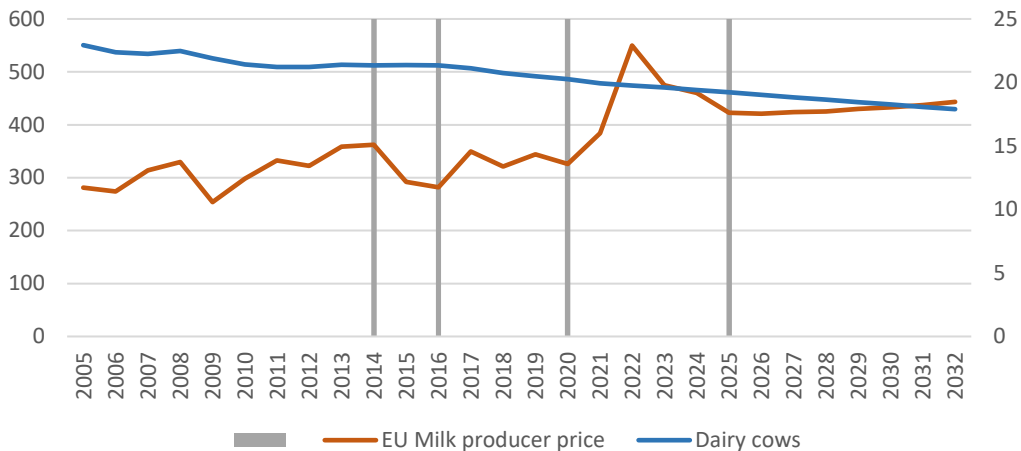
Source: Eurostat (data for Luxembourg and Malta unavailable)

4.1.4. EU level milk price evolution

Figure 12 shows the evolution of the average EU farm gate milk price. As can be seen, the farm gate **milk price** declined substantially immediately following the milk quota abolition in 2015. Theoretically this could have been partly caused by an increase in EU milk production induced by the removal of the quota constraint. However, the reality was more complex, with several factors coinciding to affect the EU (and global) dairy market causing the so-called '**milk crisis**'. As shown in Figure 12, when the **economic recovery** occurred in 2022 after the peak of the **COVID-19 crisis**, the demand for dairy

products increased, while the increase in global production was weak, driving the milk price up to a record level.

Figure 12: Milk price (euro/tonne, left axis) and dairy herd (million dairy cows, right axis) evolution in the EU



Source: Own elaboration based on EU MTO (2022)

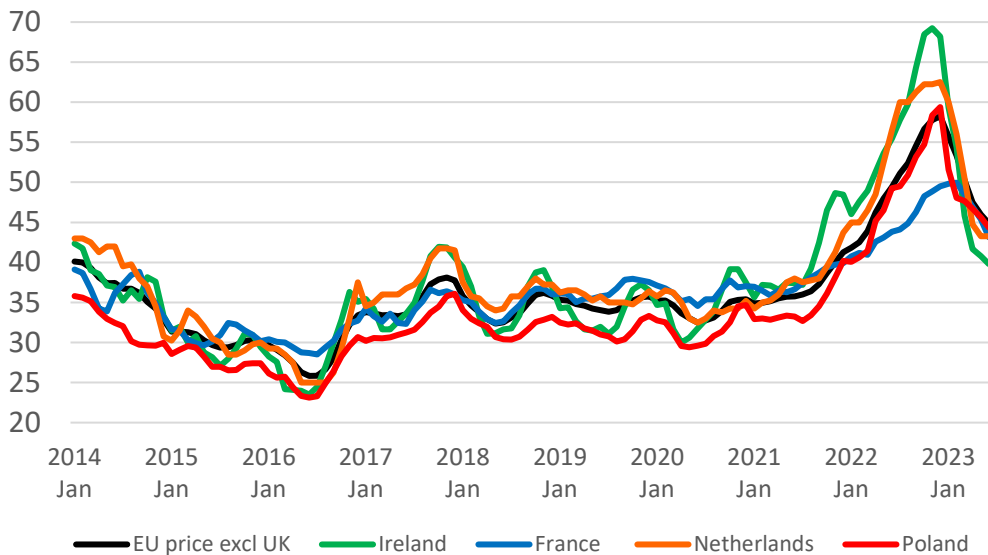
According to the **European Commission's Medium Term Outlook**, it is expected that, measured in annual terms, the **EU milk price will decline** from its recent peak until about 2025, after which it is expected to stay at a higher plateau than in the previous decade. Although the milk price fluctuates over time, in the past decade it showed an average annual (nominal) increase of about 2.8 percent per annum. However, for the coming decade an increase of only 0.5 percent per annum is projected, which is only a small fraction (less than 0.25) of the growth rate of the past. The question is which factors could explain this? Is the **margin** made on dairy products declining? But how does this slowdown in the milk price evolution relate to the projected increasing prevalence of more niche products such as organic dairy products and other special products, where the general expectation is they will sell at a premium rather than at a discount? And how does the milk price evolution relate to the development of the **costs of production** and its several components, e.g. feed, land prices, paid labour, veterinary services, etc.?

4.1.5. MS level milk price evolution

The variability in the overall **EU average milk price is not mirrored exactly at the MS level**. While milk prices across the MS tend to be correlated (tending to move in the same direction at a point in time), it can be observed that there is greater variation in milk prices over time in some MS and less variation elsewhere. As an example, Figure 13 shows how milk prices in France move over a narrower price range than milk prices in the Netherlands or Poland, with milk prices in Ireland even subject to greater

variability. This variability in milk prices has implications for the extent of the volatility that is observed in dairy farm incomes across the MS (see, also, Annex Part IV).⁵

Figure 13: Monthly average raw milk price (€/100kg) across selected MSs 2014-2023



Source: Own elaboration based on EU Milk Market Observatory

Related to the price premium, some remarks regarding Country of Origin Labelling (COOL) are due. COOL for certain dairy products is mandatory in the EU, with some exceptions. From a consumer perspective this provides information on the origin of dairy products, allowing them to make informed choices and support local or specific regional products if desired. However, this can pose difficulties from a producer or processor perspective, particularly those operating in border regions where supply chains may be complex and may cross national borders. More generally, raw milk and dairy ingredients could be processed in the originating MS, further transformed into another dairy ingredient or even transported to another country. For small scale producers in particular, tracking the origin of ingredients may lead to excessive compliance costs. Similarly, seasonal variations in the composition of products may also pose challenges. On the other hand, the use of geographic indications (Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI)) to protect and promote traditional and regional products can be a valuable tool for highlighting its provenance and result in a price premium for producers. Salamon et al. (2016) provides an overview of the pros and cons of mandatory country of origin labelling for dairy products in Germany.

⁵ Some assessments of the milk price variability in the EU are presented in Ecorys and Wageningen Economic Research (2018, pp. 47 and 56).

4.2. Environmental and sustainability aspects of dairy farming

4.2.1. The role of EU policy

Traditionally the primary driver of EU policy associated with agriculture was the Common Agricultural Policy (CAP), which largely focused on the economic and social objectives associated with agriculture. The EU itself has launched a range of environmentally focused actions, including the **European Green Deal**, the **Farm to Fork Strategy**, the **EU Biodiversity Strategy**, the **Circular Economy Action Plan** and the European Climate Law, while the EU Nature Restoration Law is in process. These are in addition to other pre-existing environmentally focused policies, such as the **Water Framework Directive**, **Natura 2000**, the **EU GHG Emissions Trading Scheme** and **EU air quality standards**.

However, EU policy is increasingly being influenced by global agreements and policy objectives, such as the **Paris Agreement** (Cifuentes-Faura, 2022) and the **United Nations Sustainable Development Goals** (Matthews, 2020; Scown and Nicholas, 2020; Pe'er et al., 2019). The growing **prominence of environmental policy** at EU level has seen the debate concerning CAP reform increasing addressing environmental concerns. The CAP itself now has additional objectives which are environmentally focused. The definition of sustainable agriculture therefore now encompasses economic, social and environmental objectives. The current CAP now requires that farmers meet a minimum standard of environmental obligation in exchange for CAP Pillar 1 support, with additional Pillar 1 supports available for participation in targeted environmental schemes (eco schemes).

Box 1: National policy measures in The Netherlands and Ireland

More than **50% of the ammonia emissions of Dutch agriculture are related to cows**. Ammonia emissions create an over-fertilisation of sensitive Natura 2000 areas. The **Dutch** government has recently decided that the **ammonia emissions** from the dairy sector should be reduced by 2035 by another 50 percent relative to 2020. In order to achieve this ambitious objective three options will be used: (i) innovations in emission-reducing technologies (e.g. low emission stables); (ii) management measures (e.g. use of low protein content animal feeds, additional outdoor grazing); and (iii) livestock herd reductions. According to studies the livestock herd will have to be reduced by 20-30 percent. There are several buy-out programmes running, at national and provincial level, which aim to reduce peak-and other farm-emitters.

The greenhouse gas emissions of Dutch agriculture are 26,6 megaton CO₂ equivalents in 2020. Till 2030 a further reduction of 3.5 Mton (-13%) need to be achieved (implying an about 30% reduction relative to 1990). About one third of the total greenhouse gas emissions of Dutch agriculture is related to enteric fermentation and related to the ruminant livestock sector. Dairy farmers have access to a **farm nutrient management tool**, ANCA, which informs them about their greenhouse gas as well as ammonia emissions. As regards climate, a covenant has been made between the government and the dairy sector, which is followed up by an agreement Het Klimaat-akkoord 2019, in which the dairy sector commits itself to reduce CO₂ emissions by 1,2 – 2,7 Mton by taking various measures. The measures that will be taken to 'solve' the Nitrate-crisis (herd reduction) will also help to achieve the climate objective. However, for the longer run it has been estimated that satisfying future climate ambitions (climate neutrality) will be the most difficult challenge the Dutch dairy sector is going to face.

Interestingly, some dairy processors have started to pay farmers for reducing their CO₂ milk footprint. This payment can go up to 1.50 euro/100kg of milk, which for a farm delivering 900 thousand kg would then represent an amount of 13.5 thousand euro. This is a potentially significant amount and creates leverage to induce farmers to take emission-reducing measures.

In the case of **Ireland**, a small human population and strong orientation towards bovine agriculture means that the agriculture sector represents a large share (35%) of Ireland's GHG emissions. Ireland's favourable climate and its efficient dairy farmers allows the profitable expansion of milk production to take place. With the relaxation of the EU milk quota system, the amount of milk produced in Ireland has increased substantially in recent years, partly driven by an **increase in the dairy cow population** along with **higher milk yields per cow**.

As part of Ireland's **Climate Action Plan**, the Irish government has passed legislation requiring a 25% reduction in Irish agriculture's GHG emissions by 2030. Given the available GHG mitigation technologies and their current state of adoption by Irish dairy farmers, this 25% reduction in GHG emissions represents an onerous target. While the beef cow population in Ireland is in decline, concern exists that as the dairy cow herd continues to expand, technology adoption alone will not deliver the required reduction in GHG emissions. This has called into question the continuing growth of the dairy sector, with policy makers now actively considering whether policies that would slow down or halt the growth in the dairy sector are required.

A related environmental concern in Ireland relates to **water quality**. Ireland's derogation under the Nitrates Directive allows some dairy farmers in Ireland to operate at a higher stocking density. Recently the European Commission decided to reduce the **organic nitrogen** limit under the derogation. This reduction means that, starting from next year, dairy farmers in Ireland will have to reduce their stocking density, either by reducing their stock numbers or increasing their farm's land area. Potentially this could result in a slow down or even a contraction in Irish milk production.

Source: Own compilation

Further supports are available under Pillar 2 to encourage farmers to voluntarily undertake additional environmentally beneficial practices as part of the Agri Environmental Climate Measure (AECM). However, these additional supports are only available for actions beyond those required under Pillar 1 (to avoid double payment for the same effort).

The influence of EU and national level environmental policy on dairy farming is becoming increasingly evident across the EU. Box 1 provides further details on the policy developments in the case of the Netherlands and Ireland.

Collectively these **policies, regulations and strategies** provide a **challenging set of obligations for dairy farmers**. In Table 2 some of the key environmental pressures are summarised.

Table 2: Key environmental pressures facing EU dairy farmers

Environmental pressures	
<p>Greenhouse Gas Emissions: Dairy farming generates considerable GHG emissions in the form of methane and nitrous oxide. There is growing pressure to reduce GHG emissions across the EU, including emissions from dairy farming. This pressure is currently greater in some MSs than in others.</p>	<p>Antibiotic Use: excessive use of antibiotics in dairy farming, particularly in the context of disease prevention, is a concern. Major reductions in antibiotic use in agriculture generally are seen as imperative to address the growing problem of antibiotic resistance.</p>
<p>Habitat Preservation: Land use change to facilitate dairy production (feed or forage) can have a detrimental impact on habitats. The protection of habitats has risen in importance at EU level and this provides both challenges and opportunities for dairy farming.</p>	<p>Animal Welfare: EU citizens are increasingly concerned about animal welfare in agriculture. Higher welfare standards for dairy cows and calves are required to maintain the reputation of the EU dairy sector. Further concerns arise in the context of climate change which, unless addressed, may increase the prevalence of heat stress events in the dairy herd.</p>
<p>Water Pollution and Waste Management: Intensive use of synthetic fertilisers and high livestock densities is a feature of some EU dairy farm systems. This has been linked to water pollution. Farmers face limits on the amount of nitrates associated with their farm, which may limit cow populations and milk output. Dairy expansion following milk quota elimination has made this issue more acute in some regions and in some cases is a major issue of political tension between farmers and national governments.</p>	<p>Energy Use and Production: Milking and refrigeration on dairy farms requires electricity. Dairy farmers are encouraged to contribute to renewable energy production through the use of solar panels or the production of biomethane. While these renewable technologies are proven, they also carry very high up-front costs with uncertain payback times.</p>
<p>Water Use: Dairy farming can be an intensive user of water, to meet animal needs and also for cleaning and hygiene purposes at farm level and in milk processing also. Efficiencies in water use are increasingly being emphasised. The</p>	

situation is more acute in regions where water availability is more limited, with particular concern for the future in the context of climate change and the impact this might have on water availability.	
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Source: Authors' own elaboration

Box 2: Animal welfare

As part of the **Farm to Fork Strategy** the EU is currently reviewing its animal welfare legislation, and the Commission will shortly present new proposals to the Parliament and Council. **Animal welfare is also being considered within the sustainable food labelling** framework. A recent evaluation found that EU animal welfare legislation has generally proven to be effective however; the welfare of some animals remains sub-optimal, particularly in the case of those for which targeted legislation is currently lacking, such as dairy cows (European Commission, 2022). A particular aspect of relevance to the dairy sector relates to the tethering of dairy cows in tie-stalls and the expectation of new requirements around this. To date, apart from the general conditions under Council Directive 98/58/EC there are no specific legal EU regulations on tethering, except in individual countries. In a recent scientific opinion, the European Food Safety Authority has recommended that the **permanent tethering of dairy cows should be discontinued** citing welfare concerns around the duration of tethering, the adequacy of tethering design, the dimensions of the stall and the characteristics of the lying surface (EFSA, 2023). In tie-stall systems, animals are tethered while housed; however, a distinction can be made between (a) permanent tethering (all year round) and (b) tethering during the winter period combined with a varying degree of access to pasture during the summer (Beaver, 2021). Although in decline, the practice remains in place across some EU regions e.g. parts of Germany, Austria and Sweden (Molitorisová and Burke, 2022). Therefore, regulatory change in this area would have implications, particularly on smaller, more traditionally run operations with e.g. generational challenges, resistance to change and viability issues.

Source: Own compilation

4.2.2. Dairy organic farming

Increasing the area in organic farming is a priority under the EU's F2F Strategy. The organic milk sector accounts for just about **4 per cent of raw milk production** in the EU and the sector is mainly dependent on production from a small number of MSs (European Commission, 2023c). Significant growth is observed in the size of the organic milk sector in Austria, Denmark and Sweden, where the share of organic milk now

exceeds 10 per cent of total milk production (European Commission, 2023d). Greece is noteworthy for having the highest share of organic dairy cows with 23 per cent (Eurostat, 2023).

In recent years, **organic milk production has increased significantly in France and Germany**. As in the case of conventional milk, declines are observed in the organic milk price in both countries during 2023 and particularly in the case of France (AHDB, 2023). In France, a decline in organic milk production is observed in 2023 (FranceAgrimer, 2023) and this may be a response to the decline in the milk price.

Some consumers are willing to pay a price premium for organic products over conventional products (Loke et al., 2015). Higher output prices, along with additional CAP supports, can mean that organic production presents an attractive alternative to conventional production for some farmers. In a study about the economics of organic dairy farming in Europe, Grovermann et al. (2021) use data from the Farm Accountancy Data Network (FADN) from 2011 to 2013 and find that organic certification has a positive effect on farm profitability and particularly for farms in warmer climatic conditions. Elsewhere, Buttinelli et al. (2021) use FADN data to study the **financial sustainability of organic dairy farming in Italy** and find that performance is significantly **lower than for conventional dairy farming**. This points to the importance of the place and the context. In a study of the spatial distribution of organic farming in Italy, Bonfiglio and Arzeni (2020) conclude that organic farming in Italy tends to locate far from areas where intensive agriculture is practiced.

In addition, the **extensive nature of organic output and limited usage of farm inputs is considered to be environmentally beneficial**. However, **milk yields are significantly lower** on organic farms relative to conventional farms, although this varies between MSs (European Commission, 2023d). The lower output from organic dairy farming may create pressure to produce additional output in conventional farm systems. There are also concerns that organic output may fail to attract an organic premium which is a risk if the farmer cannot sell their milk to an organic processor or if the organic processor is unable to market the end product at a premium over conventional products.

There can be **high volatility in the premium available to organic milk producers**. For instance, the average premium for organic milk in the EU declined from over 10 cent per litre in H1 2021 to less than 4 cent per litre in H2 2022 with a partial recovery in H1 2023 (European Commission, 2023c). In addition, the **costs** of production for organic milk **are not always lower than for conventional milk**. For instance, evidence from FADN data suggests that the costs of production for organic dairy are higher than for conventional dairy in the case of Sweden and Denmark (European Commission, 2023d).

Organic farming has a clear definition according to EU regulations (EC Regulation 834/2007). From an **environmental sustainability perspective**, however, the tendency to make a very binary distinction between dairy production systems that are either

conventional or organic is an over-simplification. Conventional dairy production ranges from high input intensive confinement systems to low input extensive pasture systems. The environmental impact of these conventional dairy systems relative to organic and low-input dairy systems needs careful assessment. The available research points to the **complexity around the definition of low-input dairy farming** and the need for further research on environmental impacts and profitability (Bijttebier et al., 2017).

4.3 Implications of quota removal

4.3.1 Competitiveness challenge for dairy farms

The **removal of the milk quota system** has exposed dairy producers across the EU to a **greater** degree of **competition**. As detailed in section 2.3, other things being equal an increase in EU milk production would be expected to have a negative impact on EU farm milk prices.

There are particular categories of farm, which can be considered to be more vulnerable to milk quota removal. Many farms have increased in size as a strategy to deal with declining margins per kg of milk. Farms which did not increase in size typically experience a decline in incomes, making it more likely that such farms will exit the dairy sector. **Small dairy farms** were **under pressure** even during the quota period (their low level of profitability meant that they were poorly positioned to adopt newer technologies or buy additional quota rights in order to expand). The removal of the milk quota system caused this pressure on smaller farms to intensify as the expansion of larger farms was no longer limited by their ability to buy quota rights.

Farms in remote or disadvantaged regions are more likely to be **small farms, with higher production costs**. In times of high milk prices these farms are capable of generating sustainable incomes, but when milk prices are low, the income vulnerability of these farms is evident.

Dairy expansion at farm level requires additional processing capacity. However, if processors are unwilling or unable to expand processing capacity in a disadvantaged region, dairy farmers may be unable to avail of the expansion opportunities created by milk quota removal.

More generally **regions with high production costs or lower milk prices are vulnerable to the impact of milk quota removal** since milk quota removal increases competition in the dairy sector. While high production cost dairy farms are located throughout the EU, they are more prevalent in countries where production costs in general tend to be higher. Recent increases in input prices, have intensified the pressure of dairy farms with high production costs. While milk prices were elevated in 2022 and compensated many farmers for higher production costs, dairy commodity and milk

prices have fallen sharply in 2023, while farm input prices have remained high, bringing the issue of high production costs into even greater focus.

The **expansion opportunities** created by **milk quota removal** are **less attractive to small farms in disadvantaged areas**. Farms with traditional extensive grazing systems on lower quality land and in disadvantaged regions with a short growing season are vulnerable to the impact of quota removal. Such farms may be unable to intensify production per hectare and may only be able to expand production by increasing their land area. This may not be possible due to the unavailability or unaffordability of land in close proximity to the farm.

Farms in regions which are more reliant on the processing of milk into dairy commodities may also be vulnerable to the effects of dairy quota elimination. The **price of dairy commodities** is **more volatile than the price of branded and higher value added dairy products**, leading to larger fluctuation in the milk price paid to producers whose milk is used to produce dairy commodities.

4.2.3. The EU Milk Price Crisis 2014-2016

The milk crisis of 2014-2016 marked a period of **severe volatility in farm profitability**. It was caused by a **larger than normal increase in milk production** globally, due in part to the removal of the EU milk quota. Global dairy demand growth at the time was not rapid enough to maintain dairy commodity prices. EU dairy commodity prices fell below the intervention price level and a **sharp dip in farm milk prices** occurred. The sharp drop in farm milk prices caused a **sharp contraction in EU dairy farm margins**, leading to a **sharp drop in dairy farm incomes** generally and an acute income problem on higher cost farms.

The **EU's response** involved a **range of measures** to try to restore the dairy market supply/demand balance. This response comprised a mix of **mechanisms** that were established **features of the dairy Common Market Organisation (CMO)**, along with some **specific crisis actions**. The EU's response included intervention buying, aid for private storage, support for EU dairy third country exports and support for the marketing of dairy products in the EU. As an additional special measure, a **voluntary milk production reduction scheme** was introduced, which paid EU dairy farmers to reduce their milk production on a temporary basis.

A number of **lessons** can be drawn from the milk price crisis. The long period over which the milk quota existed, made it difficult to confidently predict the extent of the EU milk production would increase when quotas were removed. The **potential for expansion** in EU milk production due to milk quota removal was **underestimated**. While a **soft landing** series of EU milk quota increases took place from 2009 to 2013, this **adjustment mechanism** was probably still **too conservative** and proved insufficient for

a smooth transition from the quota system to a market determined level of EU milk output. But these impacts can be considered **once off consequences** of milk quota removal.

The crisis also illustrated **more persistent issues** that policy makers need to consider, including the growing influence of **volatile global dairy commodity markets** on EU dairy commodity prices. Through much of the milk quota period, the EU was at least partly insulated from supply and demand fluctuations on the global dairy market. This is now no longer the case.

The crisis also demonstrated the **volatility** of dairy commodity prices and farm milk prices was **not uniform across the EU**. This price volatility is **more extreme in some MS** than others. Greater milk price volatility is observed in MS where the dairy sector has a **greater export focus** (especially to third country markets) and a greater concentration on the **production of dairy commodities** (e.g. Netherlands, Ireland).

The crisis also emphasised that the **transmission of price signals** along the dairy supply chain **occurs slowly** and that this hinders the **ability of dairy farmers to respond** in a timely manner to a changing dairy market supply/demand balance. Looking at monthly price developments, it was possible to observe positive trends in farm milk prices at a time when dairy commodity prices were already falling and vice versa.

The crisis also drew attention to the **limited use of milk price risk management tools** (such as fixed milk price contracts) in the EU dairy sector. As a result, **many dairy farmers** were **fully exposed** to the **volatility** in spot farm milk prices. The crisis also illustrated the **lack of timely price and quantity data** to capture real time developments in the **EU dairy sector**, which contrasted unfavourably with the quality and timeliness of data for the US dairy market. This prompted the creation of the **EU Milk Market Observatory** as a one stop public repository for data describing the monthly performance of the EU dairy sector.

Overall, the crisis showed the **high level of price volatility** in the EU dairy sector, a requirement for **better and more timely dairy market data** (an early warning system), the need for **greater utilisation of price risk management tools**, the need for a **more immediate response** on the part of **policy makers** when extreme market difficulties emerge, with a particular need for policy to **focus on farms that are most vulnerable** in times of crisis.⁶

⁶ See, also, Ecorys and Wageningen Economic Research (2018) for further discussion on how climate change can affect milk price volatility and the use of risk management tools.

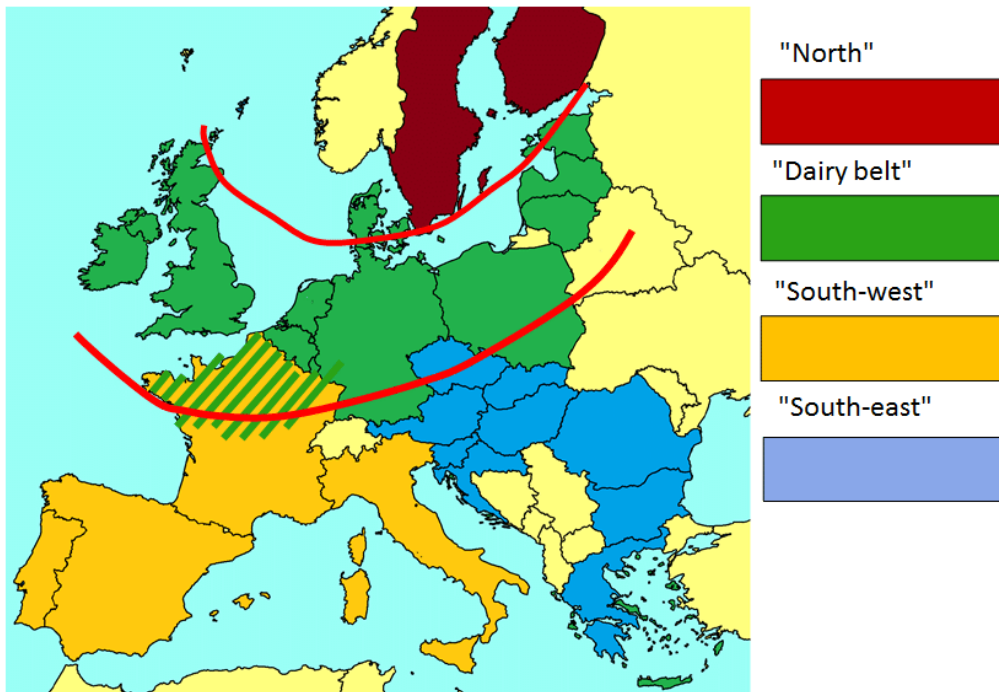
4.4 Regional Dairy Issues

The EU covers a wide geographic area, giving rise to significant difference in terms of climate which affect the natural potential for milk production, impact on milk production costs and therefore influences where milk production takes place. Other factors such as farm size, land characteristics, labour costs and the use of technology are also important determinants of milk production costs. On the flip side, another factor which influences the location of milk production in the EU is the value that is added to the milk once processed, since this can affect the farm milk price that is paid to farmers.

Collectively production costs and milk price determine the profitability of milk production. However, a final important factor which influences the income of EU dairy farmers is the CAP support payments they receive. As a share of dairy farmers' income CAP supports can vary considerably and depends on a range of factors such as farm size, location, scheme participation, size of the budgetary resources in the MS in which they are located. The end result is that we have **considerable variability in milk prices and milk production costs across the EU and considerable variability in the income that is generated in milk production**. This is discussed in more detail in Chapter 5.

The so-called **EU dairy belt** is a region, largely (but not exclusively) in **northwestern Europe**, where dairy **production conditions** are **favourable**, with **mild temperatures** and **ample rainfall**, giving rise to **good grass growth conditions** over a long grass growing season (also the production condition are **less suited to grain or oilseed production**, due to among other things climate, soil characteristics, unsuitable topography or small field size). Dairy **production costs** in such regions **tend to be lower** than in other parts of the EU (FADN, 2021). Figure 14 decomposes Europe into a number of regions with the countries of the dairy belt shown in green and specifically the region lying between the two curved red lines.

Figure 14: Visual representation of dairy regions in Europe



Source: Salamon et al. (2018)

Production costs for milk tend to be higher outside of the EU dairy belt (FADN, 2021). However, it does not necessarily follow that profitability is lower in higher production cost regions as some of these regions may also exhibit higher farm milk prices (Latruffe, 2010). Production in the Nordic, central, eastern and southern EU tends to be less profitable than dairy production within the EU dairy belt (FADN, 2021). Often such regions are naturally more suited to other forms of agriculture, such as arable or horticultural production.

Looking across the EU, there are **disadvantaged regions** where dairy takes place but where production is **not particularly profitable** or where **production conditions are not ideal**. It is not possible to produce an exhaustive list of the location of such regions, but they can be crudely categorised as dairy farms located in: mountain regions, regions in Nordic countries, island regions, arid regions and peripheral regions.

The decision by farmers to produce milk in these disadvantaged regions is often one of **historical tradition** and/or **economic necessity**. Historically, there may have been local demand for milk that could not be satisfied by production from outside the region (a historical necessity), but nowadays with improvements in supply chains this may no longer be the case. Sometimes aside from dairy farming, few other forms of agricultural production or economic activity is possible in these regions (economic necessity). It is

difficult to generalise the characteristics of these regions, but they tend to be in more remote locations with either unsuitable land, topography (hilly) or climate, for other types of agriculture. Farms in these regions tends to be smaller than average, **production** may be **extensive** and output tends to be low in volume terms. The **cost of production** per kg of milk produced on these farms therefore tends to be **higher** than on farms that are larger and in more favourable locations.

The **profitability** of farms in disadvantaged regions **depends** to some extent on the **products made** from the milk from these farms. In some situations, milk is used to produce **specialist cheeses**, or **other valuable dairy products** which can attract a **price premium** for the milk required, but in other cases the milk is used for **more generic dairy products** and does not attract a price premium, with adverse implications for farm profitability.

From a societal point of view, it is considered important that milk production is maintained in disadvantaged regions, since it provides households with income and maintains a population in these regions (Kuhl et al., 2020; Faccioni et al., 2019). **Milk production in disadvantaged regions** may also **have a societal importance** because it has a low environmental impact and can contribute in terms of ecosystem services (Tasser et al., 2007; Bernués et al., 2011). The continued sustainability of milk production in disadvantaged regions is also important from the perspective of generational renewal, ensuring that there is a population of younger farmers willing to live in these regions and take over the operation of such farms. Generational renewal is a particular challenge in regions where the profitability of milk production is very low. In periods of market weakness, the dairy farm household's only agricultural income source may be the support payments received through the CAP.

Box 3: Special focus – mountainous regions

Dairy farms located in mountain regions are generally economically disadvantaged due to their small size, limited capacity for expansion, and elevated production costs as a result of steep slopes and altitudes (Van den Pol-van Dasselaar et al., 2021; Kuhl et al.; Peratoner et al., 2017). The potential for low cost grass production and the use of farm machinery is limited in these regions. Therefore, there has been a general decline in mountain farms over recent decades, with a subsequent reduction in the area dedicated to grassland and dairy cow production (Berton et al., 2020; Peyraud and Peeters, 2016 and Battaglini et al. 2014). The Italian province of South Tyrol is an example of one such disadvantaged region. Stauder et al. (2023) documents the fundamental agro-structural changes that the area has been confronted with over many years. This has resulted in an intensification of the livestock sector there with fewer, but larger, dairy farms. Given productivity and profitability challenges, the majority of dairy farms in the region are operated on a part-time basis. Furthermore, in response to environmental and topographical constraints, dairy cows are mainly kept in conventional tie-stalls (Poulopoulou et al., 2023; Zanon et al., 2021). Extensive mountain farms such as those in the Alps can contribute to overall sustainability improvements through for example the maintenance of traditional landscapes and biodiversity, and their impact on ecosystem services and tourism. These issues are discussed in more detail by Katzenberger et al., (2020) Kuhl et al. (2020) and Battaglini et al. (2014).

Dairy production in mountainous disadvantaged regions can be distinguished between those producing high value-added specialities (e.g. PDO/PGI) and those supplying milk as a commodity. In order to improve the economic situation of small and low-input mountain dairy farms, Kuhl et al. (2020) propose a number of strategies including the payment of premiums for value-added milk products for those not already in receipt of same. Given the lack of alternative options for land-use and limited employment opportunities, the maintenance of a vibrant farm population in these mountainous and disadvantaged areas are seen by many as being important.

There is **no common definition of areas designated as disadvantaged** in relation to milk production at the EU level. Disadvantage generally relates to constraints which result in lower yields or higher costs. Biophysical handicaps (e.g. altitude or slope) are considered to be a key disadvantage. In addition, a recent report commissioned by the EU Committee of the Regions outlines that milk production

The study, Soldi (2016) considers four categories of criteria:

- (1) Biophysical handicaps considered in the definition of ANCs (e.g. low temperature, dryness, limited soil drainage);
- (2) Geographical constraints determined by mountainous conditions, insularity and remoteness;
- (3) Unfavourable population-related characteristics (low density, depopulation, and ageing workforce) and inefficient production scale, and:
- (4) Infrastructure handicaps and the incidence of fragility, intended as a high reliance of the area on the dairy activity in economic and employment terms.

Within the identified typology, 332 NUTS3 regions across 24 EU Member States were classified and mapped as 'disadvantaged'. A gross approximation indicates that a share of 9.3% of the total Utilised Agricultural Area (UAA) is classified as disadvantaged. This, in turn, corresponds to 17.9% of the total cow milk production at the EU level. The report concludes that it would be appropriate to build on the scope of the typology and outline differentiated support strategies for regions across categories.

Source: Own compilation

Some of the issues for disadvantaged dairy regions in the EU are common to agriculture in general in disadvantaged regions across the EU, while other issues encountered in disadvantaged dairy regions within the EU are also common to the wider EU dairy sector.

Table 3: Summary of challenges faced by EU dairy farming in disadvantaged regions

Challenges	
Economic viability: Farm size can be small, production costs can be high.	Depopulation/generation renewal: Where dairy farming produces low incomes, it can be unattractive as a career choice for the younger generation. If alternative job opportunities are unavailable, young people may leave the region in search of employment and the possibility of farm succession is reduced.
Access to processing infrastructure: Remoteness of these farms can limit milk processing opportunities. Milk collection and milk processing can become less efficient if milk production	Limited diversification opportunities: Low dairy farm incomes can be supplemented through non-farm income sources. However, in some regions these

<p>in the region is contracting, with adverse consequences for the milk price processors can pay. This can create a vicious cycle of declining milk production and milk prices.</p>	<p>off farm income opportunities can be very limited.</p>
<p>Land and climatic constraints: Land quality and climate related factors can be a particular challenge for dairy production in some regions. These are fundamental farm characteristics which cannot be altered by the farmer.</p>	<p>Knowledge transfer deficit: The remoteness of these regions can make successful knowledge transfer activity more challenging. As a result, farmers may have limited or no knowledge transfer interactions. This limits the learning opportunities of farmers and the adoption of new technology.</p>
<p>Access to markets: The remoteness of these regions can mean that it is only feasible to market dairy products locally, which can also limit the range of products manufactured from the milk produced, creating an over reliance on individual product categories and limiting the potential for production of additional milk for other products.</p>	<p>Representation: Some of the issues faced by dairy farmers in remote regions are specific to dairy farming in those regions. Farmers in these regions may struggle to bring political attention to such issues to achieve solutions.</p>
<p>Lack of investment (technology adoption): Low farm incomes can limit the capacity to invest to replace outdated farm infrastructure and adopt new technologies to generate farm efficiencies to remain competitive.</p>	<p>Preservation of social and cultural aspects: An important aspect of dairy farming in disadvantaged regions is the need to carefully consider the implications of farm modernisation, farm consolidation and regulatory changes since these may compromise the desire to preserve some traditional farming practices which are valued by society.</p>

Source: Authors' own elaboration

A further overview of the challenges and opportunities facing the EU dairy sector is provided in the next chapter.

4.5 Concluding remarks

- **EU milk production** has increased over the last 15 years due to the relaxation and eventual removal of the EU milk quota system. Lying behind this increase at the overall EU level, is a **very large amount of structural change** in the sector, which can be summarised by a **very large reduction** in the **number of dairy farms**, a general **increase** in the average dairy **farm size**, but a relatively **small change** in the total **dairy land area**. The long-term decline in dairy cow numbers and offsetting increase in dairy cow yields (which dates back to the 1980s) was briefly interrupted by the elimination of the EU milk quota system, but this reduction in EU dairy cow numbers has now resumed.
- **Milk quota removal** has had a **varied impact** across the **EU MS**. At MS level **growth in milk production** has been **widespread**, particularly so in a few MS, but on the other hand **milk production remained static or declined** in **several MS**. These developments largely reflect the competitiveness of the dairy sector in the respective MS.
- **Farms in disadvantaged areas** face a **particular set of challenges** which are additional to the challenges faced by dairy farmers generally. In devising policy, the **consequences** for farmers in disadvantaged areas **needs to be considered**. This can best be done by ensure that the **voice of farmers in disadvantaged areas** is heard, so that their particular needs and circumstances are understood.
- **Environmental policy**, particularly relating to GHG emissions and water quality, is playing an **increasing influence on the EU dairy sector** and in some MS is already as important, if not **more important than the CAP**. The diverse range of environmental obligations have the potential to **confuse, alienate and discourage EU dairy farmers**. There is an urgent need to consider how farmers can be given the **right advice** to allow them to take the **right actions** which deliver the **right environmental outcomes**, while maintaining the economic and social sustainability of dairy farming.
- The **milk crisis** of 2014-2016 was partly caused by the once off impact of EU milk quota removal and an associated increase in EU milk production, which surpassed the expectations of policy makers. Other drivers of the milk price crisis continue to present a **future risk**. Better data provision can help to provide an **early warning system** to anticipate such shocks. There is a need to **identify the dairy farms which are at greater risk in the context of a future milk margin crisis**. **Prompt action** to support the most **vulnerable dairy farms** could limit the adverse impact of a future crisis and would represent a **more effective use of budgetary resources** than less targeted forms of crisis support.
- **Milk price volatility** is a feature of the dairy sector in the EU. Milk price volatility is **greater in some MS** than others and along with **input price volatility**, it is responsible for the volatility in dairy farm margins. As well as supporting the level of dairy farm incomes, **CAP income supports** also act as an **important buffer** against **milk margin volatility**, reducing the overall level of dairy income volatility.

5. PROSPECTS AND CHALLENGES OF THE EU MILK SECTOR

KEY FINDINGS

- While the EU is a single market, at MS level the EU dairy sector is heterogeneous. This is due to the array of dairy products, climatic conditions, production systems and farm scales found across the EU. This means that there is wide variation in milk prices, production costs and farm profitability in the dairy sector across the EU. Specialised milk farms had higher incomes per annual work unit than the average EU farm, though they were not among the top three best performing farm types in recent years.
- The most competitive MS are Belgium, Denmark, Luxembourg, Ireland the Netherlands and the United Kingdom. Farm structures impact on competitive performance. More specialised farms tended to have lower production costs, (also expressed as a share of output) compared to less specialised dairy farms. The opportunity cost of owned resources is an important consideration in longer term competitiveness for the sector.
- As price takers, dairy farmers occupy a vulnerable position in the dairy supply chain. Dairy farmers must grapple with high levels of milk price and input price volatility. The challenges faced by dairy farmers are compounded by the lag in transmission of prices along the dairy chain.
- EU farmers' milk supply responses seem to be more price inelastic in the post-quota period.
- Economic, environmental and social challenges exist for dairy farmers in the EU, but there are also opportunities for dairy farmers which should not be ignored.
- The age demographics of the farmer population highlights the relevance of farm succession and the need to encourage generational renewal.

5.1. Zooming into the dairy sector: The dynamics at farm level

5.1.1. Production costs and margins at an aggregate EU level

A review of the **costs of production** of specialist milk farms, using FADN data post milk quota removal indicates that in the EU-28, the operating costs of milk production mainly consist of: **feed costs** which are around **50%** of operating costs, (70% of which are for purchased feed and 30% for home-grown feed); and **energy, machinery and buildings** upkeep, and **contract work**, each representing about 10% of operating costs.

The **trend in EU milk production costs** over the past 15 years at an aggregate level has shown that, after a **steady increase in input costs** between **2009 and 2014**, a **downward trend** was observed in **2015-2016**. In 2015, the total operating costs for milk production decreased by 8% year-on-year, and in 2016 they went down by another 2%. In 2017, input costs started rising again reaching the 2015 level. **Operating costs increased** in 2018 by another 6%. Whilst there was some reprieve from the inflation in costs of production inflation in 2019 and 2020, there has been an **estimated steady increase** in costs of production in **2021 and 2022**. This assessment of 2021 and 2022 is anecdotal based on reports from individual MSs, given that this data is not yet available from FADN post 2020. These changes are driven mostly by **fluctuations in feed costs**, along with other costs such as **fertiliser and energy**.

There have been what is referred to as **significant dairy margin 'crises'** since quota abolition. During the 2014-16 'crisis', the farm milk prices declined and **net margins dropped significantly**. Milk net margins were **minus €1 per tonne in 2016**, on average across all MSs, which was lower than the net margin figure of **€2 per tonne in 2009**, widely considered a terrible year for the EU dairy sector.

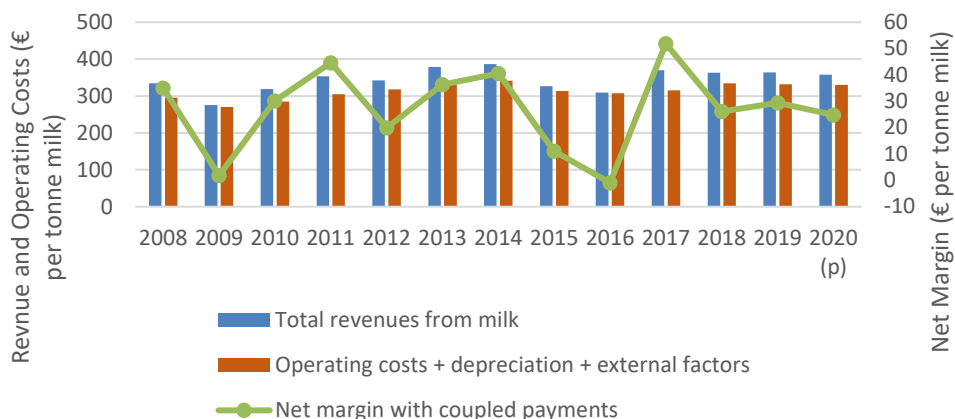
After the increase in milk prices in 2014, dairy cow herds and milk production rose in 2015 and 2016. This coincided with a **decline in global import demand** (in particular from Russia and China) and had an **adverse impact on EU dairy margins**. The proportion of specialised milk farms in EU-28 with a positive milk margin fell between **2014 and 2016**.

The global market situation changed again in **2017**, due to a slowdown in milk production growth and a change in product demand. Consequently, milk producers experienced an **increase in milk prices** (to € 363/t). This led to a significant improvement in net margins, €52/t, which was the **highest recorded net margin** in the decade.

The demand for global dairy products was more stable in **2018**, compared to the large growth in 2017. Production of milk in 2018 was about 1% higher than in 2017. A shortage of feed stuffs led to a 6% increase in overall costs (€ 334/t). This cost increase coupled with a milk price decrease, saw net margins decline to €26/t.

The situation in 2019 was only a slight increase in milk prices and a slight decrease in costs, leaving net margins up only slightly in 2019.

Figure 15: Revenue, Operating costs and Net Margins per tonne milk, Average EU-28, 2008 – 2021(e)



Source: Authors' own analysis of FADN data

At an aggregate EU level, specialised milk farms provided higher incomes per annual work unit (FNVA/AWU) than the average EU farm, though they were not among the top three best performing types of farm in recent years, based on the latest available FADN data. For example, in 2018, the FNVA/AWU in the average farm was € 23 332/AWU, whereas in specialised milk farms it was € 28 842/AWU, only below farms specialising in granivores (€ 36 637/AWU), wine (€ 36 004/AWU) and horticulture (€ 31 496/AWU).

5.1.2. Production costs and margins at MS level

The averages presented in Figure 15 conceal a large amount of variation at the MS and region level. This section examines the performance in individual MS based on costs of production and margins, for the latest available data from FADN, 2020.

Highest margins: The highest margin in the EU in 2020 was in **Italy** (€127/t). This was due to its **high value-added products** generating high prices, coupled with relatively low costs. **Bulgaria and Poland** followed, with margins of €91/t and €89/t respectively. **Malta** was just behind Bulgaria and Poland at €85/t. Revenues were very high in Malta, which were boosted by Voluntary Coupled Support (VCS), which were the highest in the EU.

Ireland followed next in net margin terms, with a net margin of 75/t and compared well to the other MSs, with the **second lowest operating costs** per tonne, with only **Poland** exhibiting **lower units operating costs**.

Above average margins: Following Ireland, countries such as **Spain, Belgium, Romania, Austria and Croatia** also performed well compared to the average EU net margin, with margins ranging from €56/t in **Spain** to €31/t in **Croatia**. Amongst these set of countries, it is interesting to note that Romania performed relatively well, despite exhibiting the third lowest revenue per tonne, owing to also exhibiting the third lowest operating costs per tonne across the MSs.

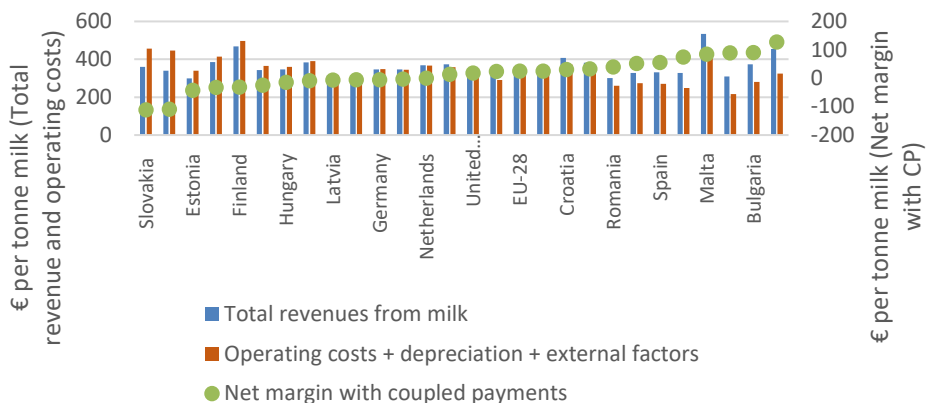
The average net margin per tonne of milk produced in 2020 was €25/t.

Below average positive margins: **Portugal, United Kingdom, France and the Netherlands**, despite having a positive net margin per tonne, were below the EU average in 2020, with a net margin of between €24/t and €1/t.

Negative margins: All remaining countries had a negative net margin per tonne received. The net margin per tonne in **Slovenia, Germany, Lithuania, Latvia, Denmark and Hungary** exhibited margins of up to -€20 per tonne. The remaining countries exhibited net margins below -€20 per tonne: **Luxembourg, Finland, Sweden, Estonia, Czechia, and Slovakia**. Slovakia had the lowest net margin at -€111 per tonne of milk produced.

There were some **notable features** in the negative net margin countries relating to specialisation and operating costs. For example, for Slovakian dairy farms, like in Finland, **overheads** were a substantial part of operating costs (Figure 16). Interestingly, some of the MSs in the lowest recorded net margin group have relatively **low levels of specialisation** (64% in Czechia and 80% in Hungary vs an EU-28 average of 93%) having **high operating costs** relative to milk revenues. Their revenues are not low compared to other MSs, but their costs were high.

Figure 16: Revenue, Operating costs and Net Margins (Euro per tonne) for specialist milk producers, by MS, 2020



Source: Authors' own analysis of FADN data

5.1.3. Farm Structure

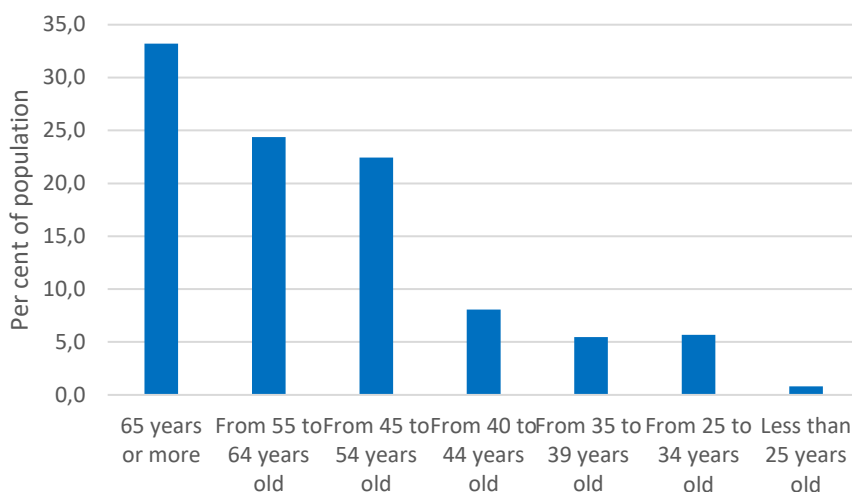
The data outlined in the previous sections refer to farm level data collected by FADN in individual MSs, based on farms that are specialist milk producers. The **structural data** on these farms is outlined here in this section, with reference to the year **2020**, the sample was made up of **13,482 farms**, which were representative of **438,968 farms** in EU-28.

There are significant structural differences across the MSs and regions captured in the survey (see, Table 18 (Annex Part VI) for the relevant indicators and some discussion on the statistical figures).

In addition to the farm structural data provided by FADN, Eurostat also provides important other official demographic data on farms in the EU. In particular, the latest census of agriculture conducted in 2020 in the EU provides some interesting **data on age of the farm manager** which provides insights for future competitiveness of the sector. Figure 17 shows the **majority (57.6 %)** of farm managers were **at least 55 years of age**. Only 11.9 % of farm managers were young farmers (see Figure 17) - defined here as those under the age of 40 years.

The number of young farmers was particularly low in Cyprus (5.1 % of all farm managers), Portugal (6.4 %), Greece (7.2 %) and Spain (7.7 %). Young farmers were more prevalent in Austria (23.4 %) and Poland (21.0 %). In comparison there was a higher number of farmers of 65 years of age or more in many MSs; in Portugal one half (50.3 %) of all farmers and two-fifths or more of farmers in Cyprus, Spain and Romania were 65 years or older. This age structure explains the **policy relevance of farm succession** and the **need to encourage generational renewal**.

Figure 17: Age classes of farm managers at EU level, 2020



Source: Authors own analysis of Eurostat data (2020)

5.2. Some reflections on the competitiveness of the sector

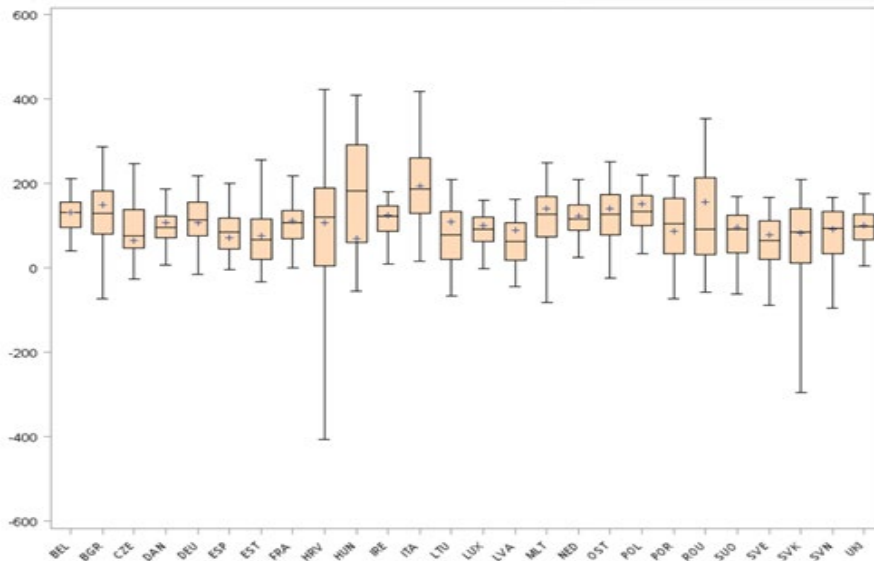
When **defining competitiveness** of the primary sector it is important to understand that there is **no universally agreed definition**. Rather, each study which examines the concept tends to define it differently.

In this analysis the **definition** and measurement of competitiveness is that **of the EC FADN unit**, which uses two variables in the definition of competitiveness: (i) the **MS gross margin including coupled payments** per tonne of milk plus (ii) the **inter-quartile range** of the margin across the population.

Whilst the previous sections have examined net margin per tonne as the primary indicator of economic viability, the EC FADN have chosen **gross margin plus distribution around the mean value** for a given MS to define competitiveness. A rationale behind choosing gross margin rather than net margin could be related to the **time horizon under consideration**, with the farm operator having control in the shorter-term horizon over variable costs rather than over total costs, where the later includes fixed cost items which the operator has limited control over in the short term.

This definition of competitiveness brings an additional dimension of distribution around the mean value into consideration, which is possibly related to the **ability of dairy farming in the MS to respond to market opportunities** in the short to medium term. For example, a MS with a large variation around the mean margin may find it harder to scale up dairy production and respond to growing market opportunities.

The latest available data from the EC FADN unit which demonstrates competitiveness is based on **2018**. These data indicate that EU-15 MSs are the **most competitive** in the dairy sector in the EU: for example, **Belgium, Denmark, Luxembourg, Ireland, the Netherlands** (and the United Kingdom). These MSs have a **gross margin with coupled payments** per tonne of milk close to or **exceeding the EU average** and also have the **smallest inter-quartile ranges**, close to or less than € 60/tonne of milk.

Figure 18: Weighted boxplot of gross margin with coupled payments per MS (2018)

Source: EU FADN - DG AGRI. Extreme values are not displayed. The whiskers represent the 5th and 95th percentiles. The mean is a global ratio. Data for Cyprus and Greece are not displayed for confidentiality reasons (minimum number of farms should be 15).

Source: Reproduced from FADN (2021)

Finally, it must be acknowledged that the definition of competitiveness examined here is just one definition of competitiveness available in the literature. The relevance of this specific metric adopted by the EC has merit particularly in the short to medium term, when the farmer has limited opportunity to alter fixed costs of production. In addition, over the **medium to longer term** the **opportunity cost of owned resources** becomes more relevant. In particular, the opportunity cost of **owned land, capital and labour**, which the FADN data details as having **high degrees of heterogeneity** across the dairy farm population in the EU. In the context of an ageing farm population, **appropriate remuneration of family labour** would be important to attract a **new generation of farmers** into dairy production.

5.3. The position of the farmer in the supply change

A feature of milk production is the **biological lag** that is inherent in farm production decisions. Farmers can make some **minor adjustments** to **milk supply** over the course of a production season **by altering feeding strategies**, but more **significant adjustments** in production require the **addition or removal of dairy cows** from the herd.

If a farmer decides to add a cow to the dairy herd then this requires that a suitable calf is produced from a suitable cow or heifer. That calf then has to be raised for at least two years before it can itself produce a calf and then begin to produce milk. In effect, it can

take **three years to add a cow** to the dairy herd. Once added the farmer will expect to obtain **several lactations** from the dairy cow during its productive life. Eventually, as the cow's performance declines, the farmer decides to cull the cow from the herd. In economics terms, the addition of a cow to the herd represents an **investment decision** with an **expected return** extending over **several years**.

In a dairy market with **volatile milk and farm input prices**, farmers will experience period of **high and low profitability**. In a period of **low profitability** farmers may be forced to **cut costs**, which in extreme cases can involve the **unplanned culling of dairy cows**. However, when milk prices improve the dairy farmer cannot immediately restore additional cows to the herd. **Rapidly changing milk prices** are therefore a problem for dairy farmers, not just in terms of their immediate impact on farm profitability, but the **protracted impact** they can have of the farm's level of **milk production** and the capacity to **fund the maintenance or expansion** of the farm business.

Beyond the dairy farm, further down the dairy chain, processors buy milk from farmers and process it in dairy products. Some dairy products such as fresh products are for immediate sale and consumption, but others such as cheese, butter and powders may be stored or shipped for a period before they are consumed. The price obtained by the processor for the end product reflects supply and demand at the time of sale and therefore may not always relate well to the price paid for the milk used to produce the product at an earlier point.

This **lag in the transmission of prices** along the dairy chain is a problem for dairy farmers as it can **exacerbate the variability in dairy farm margins** and give farmers **inappropriate prices signals** on which to base their future **production and investment** decisions.

Farm milk price uncertainty is also reflective of the **inequality** that exists in the **dairy supply chain**. The various actors further down the chain (retailers, wholesalers, processors), will do all that is necessary to ensure that they **maintain a positive margin**, having enough market power to raise the price they charge where required. By contrast, as **price takers** at the end of the chain, **dairy farmers** have little control over the price they receive for their milk. Similarly, dairy farmers have no control over the price they pay for **farm inputs**. This leaves **dairy farmers exposed** to a lot of market risk on both the output and input side.

While some variability in milk prices is desirable in economic terms as a price signal to inform farmers' production decisions, actions that would **reduce the level of extreme volatility** in farm milk prices would **benefit dairy farmers**. This could include the use of **price risk management tools** to lock in a milk price for the farmer by means of a fixed milk price contract.

However, fixed milk price contracts are not without their flaws. They **guarantee a milk price**, but they do not address potential volatility in input costs and therefore these milk

price contracts **cannot guarantee** the farmer a **specific dairy margin**. As an example, the experience of some farmers in fixed milk prices contracts in 2022 was not a good one. Given the inflation in milk production costs following Russia's illegal invasion of Ukraine, spot milk prices increased to well above the prices available in fixed milk price contracts, leaving dairy farmers in fixed milk price contracts with lower margins than dairy farmers who sold their milk at the available spot price. For more on fixed milk price contracts see Box 4.

5.4. Further considerations on milk supply

In view of the increasing attention that evidence-based policy making is currently gaining, it is important to look at the implications of the milk quota abolition from a modelling perspective. In general terms, commercial dairy farming has **considerable sunk costs** and **lock-in effects** which lead to milk supply not being very responsive to short-run and temporary price fluctuations. This fact is translated into **low** econometrically-estimated **elasticities**, as discussed by Jongeneel and Gonzalez-Martinez (2022a).

Focusing on the quota period, Jongeneel and Tonini (2009) analyse the quota rents and milk supply elasticity estimates which are included in several modelling tools. They identify supply elasticities being in the range of 0.16–0.67 for the European Dairy Industry Model (EDIM), while varying between 0.50 and 0.83 in the case of AGMEMOD (AGricultural MEmber States MODelling). They conclude that milk supply is more sensitive to quota rent estimates than to supply elasticities.

Moreover, Bouamra-Mechemache et al. (2008) explore the potential impacts of alternative dairy policies in the context of a WTO agreement, by means of a spatial model with international trade flows. The **price elasticities** included in this modelling tool, are similar to the ones used by previous research. More specifically, Colman et al. (2005) concentrate on the UK case and identify a milk supply elasticity in the range of 0.2–0.3 for selected specialised farms. These outcomes are in the same range of other milk supply elasticities estimated for EU in the pre-quota period. For example, Boots et al. (1997) indicates a **supply price elasticity of 0.26 in a no-quota regime**.

More recently, Jongeneel and Gonzalez-Martinez (2022a) investigate the potential changes in the **responsiveness of the EU milk supply** that could have been caused by the abolition of the milk quota. **Milk supply** at MS level seems to be **inelastic**, with the (short-run) yield and herd milk price elasticities being 0.2 and 0.1 respectively. Their analysis suggests that two thirds of the supply impact of a milk price change result from dairy cow yield changes, while a third is explained by variations in the number of dairy cows (see, Annex, Part II for an overview of the results). The lower price responsiveness of milk supply indicated by Jongeneel and Gonzalez-Martinez (2022a) is now 'closer' to the price reactions previously identified by other modelling tools. In short, this study concludes that **milk supply responses** seem to be **more price inelastic** in the **post-**

quota period. This lack of responsiveness points to the presence of some price asymmetry which could have prevented supply from falling rapidly when prices were declining.

5.5. Examination of the relationship between EU Dairy policy and developments in the milk sector

There has been a lot of change in the EU dairy sector over the last 10 years, but it would be wrong to assume that all of this change can be attributed to dairy quota removal. Other factors that are important drivers of change in the EU dairy sector are detailed below.

Table 4: Factors shaping change in the EU dairy sector

Outside the EU	Within the EU
<p>Shifts in global dairy demand: The EU dairy market is mature with low demand growth, with little change in population or consumption per capita. However, in some emerging and developing economies, increases in population, rising affluence and a westernisation of diets has created strong growth in global dairy demand. This has created additional export opportunities for regions with a dairy surplus. The level of dairy market demand from emerging and developing economies is exerting an increasing influence on farm milk prices in the EU.</p>	<p>Milk Quota Removal: This has allowed MSs and individual farmers to increase their milk production where feasible. However, in some cases, at a national or at a farm level, production has remained unchanged or has contracted. Other things being equal, higher total EU milk production leads to lower EU milk prices compared to a situation where the milk quota would have remained in place.</p>
<p>Trade Agreements: Increased market access due to trade agreements for both EU exports to third countries and vice versa. However, to this point this has had little implication for the EU dairy sector.</p>	<p>Other CAP Reforms: The current CAP places additional requirements on farmers in terms of their environmental performance, with support payments increasingly linked to the provision of positive environmental outcomes. This may have implications for production techniques, production costs, the level of production and farm profitability.</p>
<p>Price convergence and price volatility: International dairy prices have risen over the course of this century, closing out</p>	<p>EU and National Level Environmental Policies: Outside to the CAP itself a range of EU environmental policies and</p>

much of the gap between EU dairy commodity prices and world prices. This in turn has led to increased transmission of world dairy commodity prices (and world price volatility) to the EU dairy commodity price.	policies adopted by national governments are increasing the obligations faced by farmers and altering farm production practices to achieve environmental compliance.
Technology adoption: A range of technologies at the farm and processing level are available to increase the efficiency of dairy production at the global level. Adoption of these technologies can influence the development of production costs and influence the international competitiveness of dairy farmers outside of the EU.	Changing Consumer Preferences: EU consumers are increasingly confronted with a wider choice of food options, including a range of dairy alternatives, which claim to be more environmentally sustainable and healthier. It remains unclear how dairy alternatives may influence the future level of demand for dairy products.
	Farm and processor level restructuring: Smaller farms and smaller dairy processors continue to face the pressures of consolidation. Further reductions in the total number of dairy farmers and dairy processors are likely.

Source: Authors' own elaboration

5.6. Identification of future challenges for the milk sector including input from stakeholders

The EU dairy sector faces a range of challenges, but also has some opportunities. Using the general objectives of the CAP as a framework for analysis, it is possible to categorise these challenges and opportunities into three categories, economic, environmental and social. Economic challenges and opportunities are summarised in Table 5. The economic challenges and opportunities relate to production, trade and consumption.

Table 5: Economic challenges and opportunities for the EU dairy sector

Economic Challenges	Economic Opportunities
Global Competition in the dairy sector: Dealing with competition from efficient dairy producers outside the EU, especially those with significant export capacity.	New value added products: New dairy products are opening up new opportunities to market higher value added dairy products to consumers, including consumers who might be less

	likely to consume traditional low margin dairy products.
Dairy Price volatility: A feature of the dairy sector today is that large variations in dairy commodity prices can imply large variations in farm milk prices. Use needs to be made of emerging price risk management tools to dampen milk price volatility.	New Markets: Increasing affluence and changing consumer preferences in middle income countries create potential new markets for EU dairy products, especially in regions where dairy production is limited.
Trade agreements: Further EU bilateral trade agreement may increase market access to the EU dairy market for competitors.	Technology adoption in production and processing: Greater automation has the potential to reduce manual labour requirements. The adoption of smart farming technology has the potential to reduce input requirements. Better animal genetics can improve dairy cow performance.
Changing Consumer demand: Consumer preferences in more established affluent markets may shift away from dairy products to some extent, due to the prevalence of dairy alternatives.	Sustainability Credentials: With consumers now showing greater interest in the provenance and production processes used to produce dairy products, there are opportunities to market products on the basis of their sustainability and potentially secure a price premium for desirable sustainability attributes.
Input price volatility: Volatile commodity markets and high rates of general inflation have created a volatile input price environment, making it more challenging for farmers in particular to plan production and ensure profitability. This can compound the income difficulties farmers already experience due to volatile milk prices.	Supply Chain Optimisation (reduced waste): Better management of waste streams, can reduce the overall amount of waste in the dairy supply chain. New uses can be found for waste, which adds value to milk.
	Stronger brands (producer groups): Better branding based around product attributes can secure higher prices for products and a better return for dairy

	farmers, making it feasible to profitably producer milk with higher production standards which may have higher production costs.
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Source: Authors' own elaboration

The issues identified (in Table 5) reflect the expert knowledge of the authors, supplemented by the expert knowledge of dairy industry experts interviewed as part of this study. The list of topics explored should not be considered as exhaustive, as this would require a more specific study.

Environmental challenges and opportunities are summarised in Table 6. The environmental challenges relate to **gaseous emissions, water usage, water pollution and biodiversity**, while the environmental opportunities relate to renewable energy production, valorisation of waste streams, the production of sustainable feeds and environmental labelling.

Table 6: Environmental challenges and opportunities for the EU dairy sector

Environmental Challenges	Environmental Opportunities
Greenhouse Gas Emissions: Increasingly EU and MS level environmental policies are focusing on GHG emission reductions in bovine agriculture, placing a heavy emphasis on the adoption of GHG mitigations actions by farmers.	Renewable Energy (e.g. solar panels, biomethane): Dairy farms can produce renewable energy and in so doing they reduce to footprint of their operation. Moreover, surplus energy produced may be sold and can become a revenue-generating source.
Water usage: Water consumption in dairy production is considerable. Water is used for feed production, animal maintenance, cleaning/hygiene and milk processing. Potential exists for more efficient water use and reuse.	Circularity (valorising waste streams): Potential exists to divert waste streams into alternative uses, lower production and processing costs or adding value to output.
Biodiversity impact: The impact of intensive dairy production on habitats and meadow birds can be significant. Moreover, ammonia emissions from dairy cows can threaten the quality of biodiversity in adjacent sensitive Natura 2000 areas.	Sustainable animal feeds and pastures: The production and use of more sustainable animal feeds and dairy pastures (e.g. multi species grass swards) can reduce the environmental impact of dairy farming by lowering import requirements and reducing input requirements.

<p>Nutrient use and water quality: Intensive nutrient use has adverse implications for water quality and therefore lower levels of nutrient use is now an objective.</p>	<p>Certification and labelling of sustainable products: Greater use of certification can give farmers credit for their sustainability actions and provide consumers with information to make more sustainable consumption choices.</p>
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Source: Authors' own elaboration

Social challenges and opportunities are summarised in Table 7. These are a diverse range of topics, encompassing issues that are important from the perspective of farmer and societal well-being. The social challenges relate to evolving societal expectations with regard to the **ethics of food production** including such issues as animal welfare and the need to foster trust between farmers and urban dwellers in particular. From the farmer perspective **work/life balance** is a social challenge. Opportunities exist in terms of developing local markets, educating consumers about food production, securing a better share of the valued added in the food chain for farmers and making progress on **gender equality** in farming.

Table 7: Social challenges and opportunities for the EU dairy sector

Social Challenges	Social Opportunities
<p>Adapting to changing societal expectations: There is increased societal emphasis on animal welfare and ethical/sustainable production practices.</p>	<p>Local markets (Shorter supply chains): Opportunities exist for dairy farmers to capture more of the margin in the supply chain by marketing their products more directly to consumers. Consumers in turn derive benefits through a better understanding of where the products originate.</p>
<p>Worklife balance and labour availability: The labour input in dairy farming, in particular for milking, can make it unattractive due to long working days. This can make it unattractive, particularly in the context of generational renewal and the life expectations of younger people in today's society.</p>	<p>Engaging in social sustainability initiatives: Dairy farmers have the opportunity to actively participate in social sustainability initiatives with the aim of delivering benefits to the local communities.</p>
<p>Supporting the viability of rural communities: Dairy farming is important, not just in terms of the income it directly delivers to dairy</p>	<p>Consumer education: Today's consumers are bombarded with conflicting message about how to make good purchasing decisions. Through</p>

<p>farmers, but also for the economic contribution it makes to the wider rural community, especially in regions where dairy farming is the dominant agricultural activity. The persistent low incomes in dairy farming has the potential for wider negative social impacts, as it may impede generational renewal.</p>	<p>better engagement with consumers there is the possibility for farmers to more effectively convey the positive societal contribution of dairy farming and dairy products.</p>
<p>Evolving societal attitudes to animal welfare: This may have implications for some production practices in dairy farming which if prohibited could have adverse implications for particular dairy production systems.</p>	<p>Fairer distribution of added value in the supply chain: A longstanding complaint amongst dairy farmers is that they receive too little for their milk when compared with the retail price of the dairy products produced from it. A fairer distribution of the value added in the dairy chain would see dairy farmers benefit through higher farm milk prices.</p>
<p>Nurturing trust with urban population: There is evidence of a growing divide between urban and rural populations and a disconnection of urban communities from the ways in which dairy products are produced. This has caused some in society to develop an increasingly negative perception of the role of dairy farming in food production</p>	<p>Gender equality: In spite of their significant labour contribution on many farms, women continue to have a limited influence in dairy farming. A more significant role for women in dairy production would benefit both women and men in the dairy sector.</p>

Source: Authors' own elaboration

5.7. Concluding remarks

- **Heterogeneity of production systems** across the EU is evident from indicators of economic performance, Costs and returns matter in achieving a competitive position.
- **Specialised milk farms were shown to have higher incomes per annual work unit than the average EU farm**, though they were **not among the top three best performing types** of farm in recent years.
- **EU-15 MSs** were shown to be the **most competitive** in the dairy sector in the EU: for example, Belgium, Denmark, Luxembourg, Ireland the Netherlands and the United Kingdom.
- **Farm structures** appear to have an **impact on competitive performance** for example **more specialised farms** tended to have **lower production costs** (also expressed as a share of output) compared to less specialised dairy farm.
- The **opportunity cost of owned resources** is an **important consideration** in the **longer term competitiveness** for the sector, especially given the ageing demographic of the farming population.
- Dairy farmers occupy a **vulnerable position** in the dairy **supply chain**. The nature of milk production means that farmers can only slowly adapt to changes in milk prices or farm profitability. As price takers, the high levels of milk price volatility (and input price volatility) faced by dairy farmers leads to strong dairy income fluctuations which compromise the ability of dairy farmers to plan production decisions. The challenges faced by dairy farmers are compounded by the lag in transmission of prices along the dairy chain.
- **EU farmers' milk supply responses** seem to be **more price inelastic** in the post-quota period. This lack of responsiveness points to the presence of some price asymmetry which could prevent supply from falling rapidly when prices were declining.
- Economic, environmental and social **challenges exist for dairy farmers** in the EU, but there are **also opportunities** for dairy farmers which should not be ignored. The market setting and policy landscape faced by EU dairy farmers is complex and there is a need for better recognition of this in the policy making process.

6. EU/NATIONAL POLICY INTERVENTIONS AFTER THE QUOTA ABOLITION

KEY FINDINGS

- While the EU's supply management system (milk quota) dominated the EU dairy regime for more than 30 years, EU dairy policy now contains a rich framework of policy instruments, including market measures, farm income support and safety net provisions, that benefit EU dairy farmers.
- With the 2023 CAP reform, EU MSs, via National Strategic Plans, tailored their policies to their needs, and made further steps to strengthen the sustainability of EU agriculture, including the dairy sector.

6.1. EU Dairy Policy Framework from the quota period till 2022

The EU's dairy policy dates from the 1960s and shared the classical properties of the CAP of that time, i.e. a **combination of import protection, price support and export subsidies**. As the border measures (levies, and restitutions) were variable, they could buffer fluctuations in world dairy product prices. Dairy farmers benefitted from a guaranteed and, relative to the world market, stable price for their milk that was higher than on world markets, regardless of market demand. This encouraged increased EU milk production and the success of the policy contributed to significant overproduction, with surpluses of milk and milk products in the late 1970s and early 1980s. In 1983, EU-10 milk production peaked at 111.8 million tonnes. **On 2 April 1984**, as an EU policy response, MS level milk **quotas were introduced** under the CAP to limit the maximum amount of milk delivered to dairies and the amount of direct sales on the farm.

6.1.1. The EU dairy policy framework

The Dairy CMO: The milk sector is covered by CMO Regulation (EU) No 1308/2013 of the European Parliament and includes several market tools providing a safety net in the event of serious market imbalance. More specifically it includes:

- **Public intervention:** Public intervention allows the European Commission to buy in 60 000 tonnes of **butter** at a set price of €2 463/tonne and 109 000 tonnes of **skimmed milk powder** at a set price of €1 698/tonne between 1 March and 30 September each year. The aim is to provide a **minimum price floor** during periods when prices are low. Once the volume limit has been reached, the products can only be offered into public intervention by tender. When market conditions allow, the products can be sold back on the market through a tendering process. Article 16 of the CMO Regulation also provides that

products bought in under public intervention may be disposed of by making them available for the EU scheme for food distribution to the most deprived.

- **Private storage:** Private storage is a market tool through which the European Commission grants private operators support for the storage of butter, skimmed milk powder and cheeses with a protected designation of origin or protected geographical indication (PDO/PGI). This helps private operators, who can temporarily take products off the market for a contractual storage period. They keep ownership of the products and are responsible for selling them when the storage period has expired.
- **Exceptional measures:** Exceptional measures can be mobilised in cases of severe market disturbance, as set out in Articles 219 to 222 of the CMO Regulation.
- **The EU school fruit, vegetables and milk scheme:** This scheme is funded by the CAP and supports the distribution of fruit, vegetables and milk to school children across the EU. The total budget is €250 million per school year, of which **€100 million is for milk**. The aim is to promote healthy eating among children and to reconnect them with farming.
- **Promotion programmes:** these programmes are aimed at promoting EU agri-food products in the EU and in third countries. They help producers to communicate about the quality of their production, as part of a vast publicity campaign, in order to strengthen their market share or gain new markets. As indicated by European Parliament (2018, page 5), 'In 2018, a total of **€179 million** was available for promotion programmes selected for EU co-financing. Among the 52 new programmes approved at the end of 2017 as a result of the latest call for proposals, some schemes promote dairy products or cheese exclusively, while others promote these as part of a basket of agricultural products.'
- **Direct payments to farmers and rural development measures:** Dairy farmers receive direct payments under the first pillar of the CAP, which can also include support for those working in areas with natural constraints. Coupled support for milk producers facing difficulties can be granted under certain limited conditions. Currently, 18 MSs operate coupled payments in the dairy sector.
- **Rural development measures:** Under the CAP's second pillar, dairy farmers can also benefit from various rural development measures. These include the income stabilisation tool, designed to support farmers facing a severe fall in income. However, few MSs have allocated resources to this instrument in their rural development plans.

- **EU quality requirements:** The dairy sector is covered by the EU quality policy and has to comply with a number of constraints and rules, notably relating to public and animal health.

6.1.2. The history of the EU milk quota system

Under the **milk quota system**, farmers (or dairies) were **constrained in the amount of milk** they could produce. For production in excess of the (individual or national) quota, farmers had to pay a levy (**the super levy**), which was so high that excess production was not profitable. For about 30 years (the period 1984 – 2015) the quota regime was the main policy instrument in the European milk sector. The system succeeded in capping milk production in the EU, while at the same time allowing the EU to continue supporting the milk price, while avoiding an 'open bill/blank cheque' with respect to export restitution expenditures. Due to the EU's lowering of intervention prices for butter and SMP with the 2003 CAP reform, and the increasing world market prices, the dairy product price gap relative to the world market declined. Moreover, the volume of unsubsidised exports of cheese increased (this held in particular for quality and PDO/PDI cheeses). As a consequence, the **market orientation and competitiveness of the EU dairy sector gradually improved over time** (Jongeneel et al, 2011).

The **milk quota system** had two **important side effects**. On the one hand it had **implications for the process of structural change in the dairy sector**. As a consequence of the increase in milk yields per cow (owing to improvements in genetics, feed efficiency and farm management) a given amount of milk could be produced with a steadily declining dairy herd. Moreover, due to the economies of scale in dairy, an attractive strategy for dairy farmers was to specialise and increase their farm scale. From 1983 to 2013, the number of farms with dairy cows decreased by 81% (-1.2 million dairy farms) in the ten (initial) EU MSs, a reduction that was sharper than that registered for all types of farms (-55%) (EU Commission, 2018). On the other hand, the milk quota system **contributed to an implicit 'sustainability benefit'**. The reduction in the EU dairy herd which it led to, contributed to a steady decline in the dairy sector's nitrate (ammonia) and greenhouse gas (methane) emissions (Jongeneel, 2009).

An important **drawback** of the quota system was that it **did not allow the EU to benefit from the emerging third country export market** for dairy products. As a result of the policy regime, EU dairy products at that time were not competitive at world market price levels, although this started to gradually improve following the 2003 (Fishler) CAP reform. In 2003 the long-term plan of eliminating the milk quota was first announced. The EU decided **to phase out the milk quota by 2015** in order to allow EU farmers and dairy processors to be able to respond to an increasing demand for dairy products, that was expected to keep on growing. To ease this policy regime change, steps were taken to prepare for a **'soft landing'** for farmers: **from April 2009, quotas were increased by 1% a year over five years** (Bouamra-Mechemache et al., 2008).

6.1.3. The important role of farm income support in the dairy sector

In relation to the economic objectives of the CAP, it is worth noting that the EU’s livestock sector has subsectors that are facing difficulties because they are characterised by **low profitability**. This especially holds for the **grazing livestock sectors** (in particular beef, sheep and goats and to a lesser extent dairy), although this is a broad generalisation and there is much variation across the MSs. As such, farm **income support** is important for these sectors to ensure a fair living (see also previous section).

Farm income support has been and remains a corner stone of the CAP. In this regard, the direct or per hectare payments play an important role, since this instrument is directly aimed at supporting farm incomes. Table 9 provides an overview of specialised dairy farms in the EU, showing their dependency on farm income support. Since farm incomes vary year by year (more than turnover) averages over the period 2017-2021 have been used. As the table shows, at EU-27 level, **direct payments (SE606) represent about 40% of dairy farm net income** on average. There are only 7 Member States where direct payments are less than one third of income (PL, NL, AT, ES, BE, IE and IT), and 4 Member States where this share is higher than 100 percent (SK, CZ, EE, FI). As Table 8 shows, the dependency of farm net income on direct income support, comprising the various (decoupled and voluntary coupled) direct payments, is substantial, emphasizing the importance of direct income support even though the EU dairy sector has become more competitive. It also emphasises the **need for indirect support** (e.g. investment support) **to modernise farms and to achieve a scale** which allows them to exploit economies of scale. Although some MSs with larger average farm sizes (measured in terms of sales per farm) show a high dependency on direct payments (e.g. Slovakia, Czech and Estonia) the general pattern seems to be that lower “margins” (see also Figure 19 below) are associated with an increase in scale to generate a sufficient farm income.

Table 8: The dependency of specialised dairy farms on EU direct income support

Member State	Total output (€/farm) *) (SE131)	Farm Net Income (€) (SE420)	Total direct payments (€)(SE606)	Direct payments as a % of output	Direct payments as a % of farm net income
Slovakia	859415	30423	172456	20.1	566.9
Czechia	845133	97282	173920	20.6	178.8
Estonia	607478	39335	62401	10.3	158.6
Finland	256792	43687	55620	21.7	127.3
Hungary	266340	47451	47276	17.8	99.6

Sweden	521757	66746	58235	11.2	87.2
Latvia	60565	14301	10985	18.1	76.8
Lithuania	39896	14142	8413	21.1	59.5
Bulgaria	48615	21738	12699	26.1	58.4
France	263494	50809	28306	10.7	55.7
Denmark	1218244	141988	71282	5.9	50.2
Croatia	52199	21456	10572	20.3	49.3
Portugal	124698	29982	14400	11.5	48.0
Malta	293366	52622	23790	8.1	45.2
Germany	331690	61100	26881	8.1	44.0
Romania	18982	8198	3604	19.0	44.0
Slovenia	74515	17405	7066	9.5	40.6
Luxembourg	354966	87175	34258	9.7	39.3
EU27_2020	161950	40367	15249	9.4	37.8
Poland	55292	23829	7679	13.9	32.2
Netherlands	445347	77957	23012	5.2	29.5
Austria	97911	31691	8627	8.8	27.2
Spain	268958	76404	20697	7.7	27.1
Belgium	300962	84268	19752	6.6	23.4
Ireland	247299	84326	18610	7.5	22.1
Italy	272764	113161	16122	5.9	14.2

Source: Compilation by the authors, based on FADN data, averages over period 2017-2021.

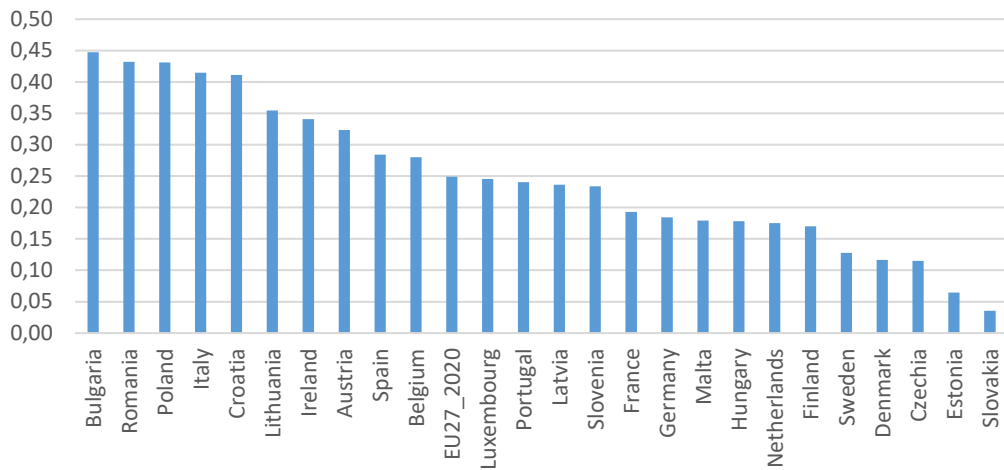
*) Includes returns from product sales as well as policy payments.

Note: SE131, SE420 and SE606 are the relevant FADN variable codes.⁷

The outcomes presented in Table 8 can partly be explained by differences in the level of income that is achieved per unit of dairy sales. As Figure 19 shows, this varies considerably, with the contribution to net farm income per euro of dairy output ("margin") ranging from about 0.45 (Bulgaria) to 0.045 (Slovakia) euro farm net income/euro of sales.

⁷ Further details are available at: <https://circabc.europa.eu/ui/group/befb6055-ab0c-4305-84fe-0c80c1c0553d/library/8c2982e7-c295-4316-be23-c208997179ba/details>.

Figure 19: Dairy margin per euro of dairy output (euro of farm net income/euro of sales), ratio



Source: Compiled by the authors. Information based on FADN data; ratio calculated using the first two columns of Table 8

6.2. Suitability of the current EU dairy policy given the future challenges facing the milk sector

CAP Reform 2023: The 2023 CAP reform did not lead to major changes in the EU dairy policy framework: The set of **instruments** that was available during the previous period **has largely remained in place**. The most recent CAP reform provides the Commission with extended exceptional measures to address severe market disruption (by means of, for instance, market-support measures in the event of animal disease outbreaks or a loss of consumer confidence owing to public, animal or plant health risks). In terms of EU policy, the reorientation towards sustainability goals has become more and more important. This is driven mainly by the EU’s environmental (e.g. Nitrate and Water Framework Directives) and biodiversity (e.g. Birds and Habitat Directives) policy, which increasingly is influencing the CAP.

Relevance of income support payments: As the EU’s **direct payments** are predominantly area-based, Basic Income Support for Sustainability (**BISS**) covers all the agricultural sectors and consequently a part of the total BISS payments will also support the grazing livestock sector, even though there is no specific targeting of BISS by sector. Livestock farmers, including dairy farmers, also benefit from other direct payments such as Coupled Redistributive Income Support for Sustainability (**CRISS**) and Complementary Income Support for Young Farmers (**CIS-YF**), where applicable.

Moreover a significant part of the financial allocations to Coupled Income Support (CIS) (about 70%) is directly supporting the ruminant livestock sectors, including dairy.⁸

Table 9: EU MSs that target Coupled income support (CIS) to milk producing livestock sectors

Milk and milk products	# of MSs	MSs (abbreviated)
Cows	20	FR, BG, RO, IT, CZ, SK, MT, BE.Wallonia, ES, PL, PT, HU, HR, FI, SE, DK, SI, LT, EE, LV
Other milk producing animals	11	FR, BG, IT, SK, CY, BE.Wallonia, ES, FI, LT, RO, SE

Source: Based on an assessment of the MS CSP's by the authors. See, also Ecorys (forthcoming)

Table 9 provides an estimate of the extent to which MSs use CIS to support their milk producing livestock sectors. As Table 9 shows, about three quarters of the EU27 MSs use CIS targeted to the **dairy cow milk sector**. In addition to the frequencies of application of CIS in the milk sector indicated in Table 9, using the planned output indicators some estimates have been made to quantify the share of the EU dairy cow herd benefitting from CIS. This is estimated to be close to 50 percent (based on 2019 herd numbers), indicating a significant increase relative to the previous programming period⁹. It also signals that MSs increasingly recognise that the dairy sector is **facing difficulties**, as this is one of the key criteria motivating coupled income support. Moreover, it should be noted that part of the CIS support allocated to crops (notably the part related to supporting protein and legume fodder crops, supported by 20 MSs) can be considered as indirectly supporting the livestock sectors through the support provided for animal feed production.

Relevance of investment support: In addition to the income support interventions, an increase in the number of farmers benefitting from **Investment Support** for restructuring and modernisation could be expected in most MSs, which will benefit the livestock sector. Overall, the proposed targets for the number of farms obtaining investment support for the purpose of modernising are 30% higher for this period compared to the achievements noted, at EU level, in 2021 (Ecorys, forthcoming).

Price and production risk: The livestock sector is characterised by various **vulnerabilities**. One is that animals are subject to diseases, while, in particular grazing

⁸ See, also, Münch et al. (2023).

⁹ Member States (14) applying CIS to more than 60 percent of their dairy herd (based on 2019 herd numbers) are BG, CZ, DK, ES, FR, IT, CY, LV, LT, HU, MT, PL, PT, and SK.

animals, are also impacted by (extreme) weather conditions (e.g. heat stress) as well as by **weather conditions** that affect pasture and roughage production. In addition, there are **market risks** related to **price volatility** and market disruptions in case of **crisis situations** for both inputs and sales. Dairy futures markets have emerged in Europe (EEX 2023) but account for a very small share of the sector. Schulte and Musshoff (2018) conclude that most dairy farms in Europe are too small to participate directly in futures markets but that processors could play an important role in hedging and subsequently offering futures contracts in smaller increments to individual farmers. This may help deal with transaction costs and costs associated with monitoring market developments. Schulte and Musshoff explain that basis risk would continue to pose challenges but could be reduced with a more active futures market. Several MSs plan interventions to help livestock farmers to manage their risks. Some form of livestock **insurance** covering disease risk is available in most MSs, either supported by the CAP or from national policies, although livestock insurance protection against revenue, price or margin risk plays a minor role. A minority of six MSs¹⁰ make provision for one or more **mutual funds**, which are to compensate either for production risks and/or to stabilise income (see, also, Box 4).

CAP environmental goals: In relation to the **environment and climate objectives**, overall, there is a strong need to reduce agriculture's environmental impact and emissions and support biodiversity. The climate needs relating to the ruminant sectors, including dairy, is pressing, as **methane** (CH₄) emissions from enteric fermentation and **nitrous oxide** (N₂O) emissions from soils are responsible for more than **80%** of total agricultural GHG emissions. Methane (CH₄) from manure management is the third most important source of emissions, accounting for about 10%.¹¹ The **improvement of nutrient balances**, reducing the intensity of farming practices, promoting the use of digestate from renewable energy (biogas) and boosting and improving climate adapted livestock and shelter are further areas of attention for the EU policy agenda related to the livestock sector.

Recent **CAP interventions** have been designed to reduce the environmental and climate impact from livestock production, with conditionality playing an important role in mainstreaming key farm practices. Eco-schemes and agri-environmental and climate measures play a key role, both in terms of budget allocation (more than 77 billion euro) and in the environment-preserving, climate mitigation and animal welfare improving activities they target (Ecorys, forthcoming). Also, the assistance offered to farmers to switch to **organic agriculture** is notable, as this will lead to a reduction in fertiliser and pesticides uses. As already mentioned, **CIS** contributes to the maintenance of ruminant livestock production in the majority of MSs, with a strong focus on **extensive livestock**

¹⁰ Ecorys and Wageningen Economic Research (2018).

¹¹ See, also, Peyraud and MacLeod (2020).

production, with potential positive impacts on genetic diversity, biodiversity, the maintenance of traditional forms of agriculture and cultural landscapes, and the maintenance of agricultural income in regions dependent on livestock production.

Moreover, in order to preserve landscapes and biodiversity, MSs express a strong requirement to support **key farmland species populations**, especially those in grassland habitats, as well as promoting agricultural genetic resources ensuring animal genetic diversity. A potential 'conflict' between agriculture and nature can emerge when working towards the protection of EU biodiversity because improving **Natura 2000 area management** may interact with (or constrain) the development of livestock sectors in zones around N2000 areas (ammonia emission and deposition).

CAP social sustainability goals: When considering the sustainability of livestock production, including dairy, **social and consumer concerns** also require consideration. In many remote areas across the EU, in particular mountain areas, livestock production is important for the maintenance of the human population, and often provides opportunities where few other economic activities are possible. Although the direct impact on **employment** may be low, the indirect impact through **cultural and landscape preservation**, as well as attracting **tourism**, is often highly important. The disappearance of livestock from these areas would constitute a major issue in terms of rural development. As such the **ANC** and **CIS** interventions, when targeted towards ruminant production, are helpful to support dairy production in 'disadvantaged' regions.

The viability of the dairy sector relies on successful **generational renewal** which is therefore – albeit often indirectly – closely linked to the creation of jobs and growth in rural areas. To ensure this process, improving **access to financial resources and land**, strengthening farms' **competitiveness and profitability** (including through investments and **modernisations**), as well as improving the attractiveness of rural areas and farming (including quality of life and working conditions) are some of the areas to which policy support is directed. In terms of the financial allocations and design of interventions, the funds allocated to complementary income support for young farmers (**CIS-YF**), funds allocated to interventions such as setting up of young farmers and new farmers and rural business start-ups (**INSTALL**), investment support (**INVEST**), cooperation (**COOP**), and knowledge exchange and dissemination of information (**KNOW**), and the corresponding design of these interventions, are important to achieve the objectives of the CAP which have a more social nature.

Importance of productivity growth: A key factor contributing to economic viability as well as sustainability is **productivity growth**. Several policy interventions, designed by MSs are focusing on this, in particular support for investments and European Innovation Partnership for Agriculture Productivity and Sustainability (**EIP-AGRI**) and a key challenge for the EU is to preserve productivity growth, and make it more **inclusive**, while simultaneously considering the broader set of sustainability, biodiversity and

animal welfare objectives. This requires the use of safeguards and targeting of the policy interventions used to support the livestock sector.

In conclusion, many MSs needs and policy interventions directly or indirectly affect the economic, environmental and social dimensions of the dairy sector. This is understandable given its economic and social significance, its key role with respect to interactions with the environment and climate, and consumer (animal welfare) and health (antimicrobial use, animal diseases, including zoonoses) concerns. While **CIS has maintained bovine production in some areas**, the payment of CIS does not necessarily lead to an increase in GHG emissions. However, it is recognised that the livestock sector is at the heart of often competing and conflicting EU and MS policy objectives.

6.3. Consideration of future developments in the dairy sector and their implications

Environmental policy: With respect to future developments, the **EU Green Deal** Roadmap, aiming for climate neutrality in 2050, and related strategies such as the **F2F Strategy** and the **BD Strategy** are important considerations. Although much remains unclear about the precise policy implications arising from these policy documents, some studies (Barreiro-Hurle et al., 2021; Jongeneel et al., 2021; Henning and Witzke, 2021) suggest that achieving the EU's Green Deal objectives may lead to a reduction in EU livestock production, including dairy, of the order of **10 to 15 percent**. This potential outcome follows from the objective of **reducing Gross Nitrogen Balance surpluses**. This environmental objective has to be realised in part by **reducing manure production** and herd sizes. Agricultural **product market conditions** are of key-importance in determining the impacts of future environmentally focussed policies on revenues and farm income. Dairy production **costs** (notably those related to feed, sustainable management practices, investments in abatement technologies and low emission animal housing) are likely to increase, although it is beyond the scope of this report to quantify this (partly due to uncertainties with regard to world market responses and partly due to the incomplete coverage of F2F and BD measures in the impact assessments; e.g. the impact of reductions in food waste and shifts in diets are not considered).

The (short-term) impacts on **farm net income** are likely to be diverse and influenced by various factors such as milk prices, the **region-specific impact of environmental constraints**, changes in CAP direct payments, developments in production costs (e.g. purchased feed, fertiliser), and subsidies. The projected reduction in future EU milk production volume may **induce an EU milk price increase** that compensates partly the revenue loss (with milk prices increasing, as a consequence of the projected reduction in EU milk production).

Without **compensating incentive payments**, it can be foreseen that there would be serious additional negative impacts on net farm income due to the increase in costs associated with various measures farmers would need to take to address environmental concerns. A **voluntary policy regime** would probably lead to a low adoption rate for these measures. Under a policy regime that makes the **adoption of measures obligatory**, the exercise shows the need for additional income support and/or innovation to counteract the negative income effects.

Spatial considerations in environmental policy: As the **environmental** and biodiversity challenges are **spatially differentiated**, the impacts of environmental policy on dairy farm profitability will also be spatially differentiated. This will affect local policy needs and pleas for **regionalised tailored policy approaches**. A targeted policy approach, both by and within MSs, will be important to deal with the local circumstances. The **new delivery model** of the CAP will be helpful in this regard, as it facilitates such a tailored policy implementation. But in addition to this, more budget may also be needed when the goal is to simultaneously achieve several ambitious objectives, while compensating farmers for the efforts required. To the extent that a tailored policy approach fails to be implemented, one may expect a **regional divergence of production** and associated net farm income impacts. Particularly in regions where there is high pressure on the environment (as for example measured by the gross nitrate surplus per hectare) a **competitive disadvantage** and decline in the volume of production is likely.

Social sustainability objectives: The F2F objective to **reduce antimicrobials** (-50 percent) will require specific farm management measures, but there are empirical cases (Sweden, the Netherlands) which suggest that it will be feasible to achieve this objective without lasting negative impacts on production. However, this is nevertheless challenging for the dairy sector, as such a reduction is not likely to be achieved without a substantial, coherent and integrated policy effort.

The increasing concerns and tightening objectives with respect to **animal welfare** are likely to also affect the dairy sector (e.g. potential welfare regulation impacts on animal transport, including calves/veal), and could lead to new requirements both from **the public and the private side** (e.g. milk price mark-up paid to farmers that secure a minimum number of hours of outdoor grazing, coupled support for the raising of male dairy calves).

Organic dairy: The announced policy priority aimed to increase the extent of **organic production** (25 percent of land area) cannot easily be translated into the impacts it is likely to have on dairy production activities per se. The uptake of organic production will be codetermined by a **sufficient market demand for organic** dairy products. It is necessary to secure a premium price for organic milk (needed to cover the extra costs associated with organic dairy). As the milk yields of organic dairy cows are lower than

those of conventional cows, an increase in organic dairy production will be reflected in a lower average milk yield at MS and EU aggregate level.

The impact of achieving the biodiversity objectives may be serious.¹² There is a high share of **habitats at an unfavourable status** (more than 70 percent), which has to be reduced to about 50 percent by 2030. Achieving this goal is likely to require higher **ammonia emission reductions** from the livestock sector than has been considered in current assessments.

Impact of competitiveness: More generally the **competitive position** of EU farmers relative to those outside the EU is likely to worsen. Here the degree to which border measures (e.g. existing TRQ and import tariff structures) will protect EU farmers (thereby sustaining EU level price increases as a response to a decline in EU domestic production) will be important. As regards the **climate objective**, adjustments in trade may also negatively affect the effective realisation of the objective (leakage).

Given the above considerations, how will the EU dairy **market develop in the coming years**? There is a degree of **uncertainty** relating to future EU milk production growth. The EU dairy sector now faces a range of environmental pressures, which imply that the sector will need to meet a range of environmental targets. Achievement of these targets could involve an increase in EU milk production costs. Milk producers whose production costs are already high may find that these additional costs are unbearable and may exit production. If this results in a slowdown or even a contraction in EU milk production in the coming years, then what might be the implications for the EU’s role in international dairy trade? An important consideration is what may happen to prices (the extent of the pass through of increasing producer costs into consumer prices) and how demand for dairy products is going to evolve. In Table 10 we explore two possible pathways. The **two pathways** make the same assumption regarding developments in EU milk production, but differ in terms of their assumptions regarding EU dairy consumption, which in turn has differing implications for the future of EU dairy trade.

Table 10: Alternative future pathways

Pathway A	Pathway B
<p>Production</p> <ul style="list-style-type: none"> • Due to the pressures of environmental policy EU milk production growth slows down, stabilises or even contracts 	<p>Production</p> <ul style="list-style-type: none"> • Due to the pressures of environmental policy EU milk production growth slows down, stabilises or even contracts

¹² The reader is referred to the EU Nature Restoration Law. Available at: https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en.

<p>Consumption</p> <ul style="list-style-type: none"> • EU dairy consumption growth similarly slows down, stabilises or contracts • These changes in EU milk production and EU dairy consumption tend to offset each other • EU dairy product prices are likely to show limited changes, as EU supply and demand move in parallel 	<p>Consumption</p> <ul style="list-style-type: none"> • EU dairy consumption growth continues and outpaces developments in EU milk production • This keeps being so even though there may be some negative impact on consumption because of price increases for dairy products at EU markets
<p>Trade</p> <ul style="list-style-type: none"> • The EU continues to have an exportable dairy surplus • The level of EU dairy exports is maintained • Imports of dairy products into the EU continue at a low level • There is no material change in the EU's net exports of dairy products. 	<p>Trade</p> <ul style="list-style-type: none"> • The EU's exportable dairy surplus contracts • Dairy processors need to consider whether the returns from milk used for dairy exports exceed the returns from milk used for consumption on the domestic EU market. • Exports of high value added dairy products continues • Exports of lower value added dairy products fall due to reduced production • Imports of lower value added products into the EU increase to satisfy a deficit in lower value added products on the EU dairy market • EU net exports of dairy products contract

Source: Authors

6.4. Review of the suitability of potential new policy tools given the potential future challenges facing the milk sector

The CAP is a wide-ranging policy framework, allowing MSs a rich set of intervention opportunities. This is even more so under the latest reform, where MSs, via their national strategic plans, can tailor their policy choices to their local needs and conditions. As such, the challenges in making dairy more sustainable can be addressed by several policy measures, as was stated in the previous section. However, reflecting on the previous assessment, a number of focal points emerge:

- **EU dairy product prices, and, by extension, farm gate milk prices in EU MSs have become more volatile**, even though this volatility is not uniform across the MSs (see Chapters 3 and 4). The CAP's **risk management toolkit** can assist farmers to stabilise their income and could benefit from further extension (van Asseldonk et al., 2019). Also, **direct payments per hectare** have a role here, as they represent a **fixed (risk free) farm income stream** (Ecorys and Wageningen Economic Research, 2018). Nevertheless, it has been observed in several studies that the potential risk management measures that can be used by farmers are not fully exploited (Ecorys and Wageningen Economic Research, 2018). As has been shown, alongside public policy approaches, **market-based solutions are of value** (e.g. fixed price contracts), although they are most likely not sufficient to do the whole job.
- As regards the environment, there is the issue of **manure-related nutrient surpluses** and the pressure this causes on soils, surface and ground water, as well as emissions into the air (ammonia emissions). This is especially relevant in so-called **environmental hotspot areas** (de Vries and Schulte-Uebbing, 2020). A regionally tailored policy approach to such areas would be most appropriate, and better than the generic application of general EU standards, such as manure application standards (Ros et al., 2023).
- As was previously observed (see Chapter 4), making agriculture more sustainable starts by informing farmers and preferably incentivising rather than regulating their activities so that they make desirable investment, innovation and management decisions on their farm. A priority need is to **provide farmers with nutrient management tools**, which inform them about the environmental implications of their actions¹³. Furthermore, with appropriate guidance, farmers can see how changes in behaviour could improve their environmental performance and the trade-offs required to do this. As such the development and propagation of such tools should be an important priority. This is not only because at present these various environmental objectives are abstract to farmers. Farmers need to first be made aware. Second, the **approach should not be to drop top-down** generic

regulations on farmers, as prescriptive requirements which they need to obey (a “stick-approach”). But rather the approach should be to steer farmers towards the goals, allowing freedom and choice to farmers as to how they can best achieve these objectives (a “carrot-approach”). Such an approach respects farmers and recognises their knowledge and entrepreneurship and leaves space for farmers to find least-cost solutions (Ros et al., 2023). This is not only a better approach from a human behavioural perspective, it is ultimately more efficient and provides farmers with a level of independence consistent with their entrepreneurial freedom. Preferably, this approach should be combined with **financial incentives**, which might be linked to key performance indicator scores derived from the already - mentioned farm nutrient management tools. It can be conceded that the new CAP has already made progress here, but it could still be much more ambitious. Moreover, there are mechanisms that still need to be determined to make real performance-based approaches compatible with the CAP.

- As regards climate change, all farmers that benefit from **area- and animal-based support** through the CAP need to respect the **enhanced conditionality** in order to receive full CAP support. With the latest reform, enhanced conditionality integrates previous greening requirements, raising the environmental and climate baseline that farmers need to respect to benefit from CAP support. This, along with the ring-fencing of funding under **Eco-schemes** (the voluntary green tool under Direct Payments) and under Rural Development interventions, contribute to an increased focus on environmental and climate objectives. However, the targeting and coherence of policy could be improved. As an example, about **70% of the coupled support is going to livestock sectors**, which are known to have a relatively high footprint compared to crop sectors. It may be worth considering further conditionalities to such production-enhancing support, so that both economic and climate objectives are simultaneously realised.
- As a means to further incentivise climate friendly behaviour, some countries (including New Zealand, but also Denmark) are considering the introduction of a CO₂ price (tax) in the dairy sector, and/or to tax on meat and dairy products at consumer level (e.g. Spain, Germany, Netherlands and also Switzerland). **Innovative ways to combine the ‘polluter pays principle’ (a levy) with the ‘provider gets principle’** (remunerating proper management actions, e.g. via the eco-scheme) can create more leverage to reduce greenhouse gas emissions from the (primary) livestock sector.
- **Generational renewal** is a serious issue in the dairy sector, given that a significant share of farm managers are 65 years or older. Under the current CAP MSs plan to help approximately 368,000 young farmers establish agricultural production over the 2023-2027 period (Ecorys, forthcoming). Many MSs also offer **higher support for investments made by young farmers**. This additional effort under the new CAP relative to the previous policy is welcome. However, dairy farm exits appear to be

positively correlated with the age of the farmer, and negatively correlated with the size of the farm (with smaller farm having a relatively high probability of exit). Farm scale and farm development (modernisation) are important variables determining the long-term economic perspective and income generating capacity of dairy farms. This is even more the case given that sustainability improvements increasingly require non-productive investments necessary to achieve the sustainability objectives. In this regard, **EU support for land consolidation** projects could help farmers to overcome structural barriers and to pursue a targeted policy approach in regions with a poor farm structure (many smallholder farms) or in areas which are environmental hotspot.

6.5. Concluding remarks

- The **EU has a rich policy framework** which includes **various (hectare) payments** that support and contribute **to stabilising dairy farm income**, market measures that limit extreme downside price risk through automatic stabilisers (intervention mechanism), a risk management toolkit helping farmers to cope with different kinds of risks. Moreover, there are interventions providing support for productive (farm modernisation) as well as non-productive investments, and which **support generational renewal**. As regards the sustainability dimension of the CAP, the role of the eco-scheme and environmental and climate measures are important. There are **also support measures, facilitating the transition of farmers from conventional to organic farming**.
- The **abolition of the milk quotas** in April 2015, **together with** the various **CAP reforms** since 2003, have **made the EU dairy sector**, both at farm and industry level, **more competitive**, and have contributed to the growth of EU dairy product exports to the world market.
- The policy changes also allowed a **more direct price transmission** between EU and world dairy product markets, with the volatility that has been characterising world dairy markets now also affecting price movements and dairy farm incomes in the EU.
- In spite of the increase in competitiveness, the **reliance of net dairy farm income on EU income support payments is still substantial (close to 40%)**, signalling the importance of such income support policies.
- Under the new 2023 CAP, MSs increased the targeted income support to the dairy sector (20 out of 27 MS support the dairy sector with CIS for Sustainability). Moreover, a ringfencing approach to climate measures has been pursued: 25% of the direct payments will be allocated to eco-schemes, providing stronger incentives for climate and environment-friendly farming practices. Also at least 35% of the RDP funds will be allocated to agri-

- environment measures, Natura2000 and Water Framework Directive payments, environmental and climate investments, and animal welfare.
- The various **challenges facing the dairy sector** (price volatility, environmental and climate goals, generational renewal) require an adequate policy framework. As regards **the CAP, some extension and additions** could be helpful:
 - There exist various policy measures, which could help farmers **to cope with price volatility and risk**. However, it seems that the sector could benefit from more widespread adoption of such measures. Private measures can complement public provisions, but will not make the latter superfluous.
 - With respect to the reduction of environmental pressure, **introducing user-friendly and informative Farm Nutrient and Emission Management (FNEM) tools** would be crucial for an effective policy approach.
 - With respect to **GHG emission reduction measures**, the incentives farmers have to reduce such emissions are still limited and indirectly target farmer behaviour. Several countries are considering more developed incentive policies, such as a CO₂ tax in the dairy sector, to reduce GHG emissions. In dairy farming, this would create a mechanism similar to the ETS system and activate the polluter pays-principle alongside a subsidy or payment-approach. Such a system could go together with the introduction of emission-rights.
 - While the **EU has strengthened its generational renewal policy**, no ideas for innovative additional policy measures have emerged so far according to our assessment.

7. CONCLUDING REMARKS

The final chapter details the various conclusions reached in the report and makes a list of recommendations.

7.1. Conclusions

7.1.1. Some reflections on price volatility

Dairy commodity **price volatility is a feature of the global dairy market** and there is no basis to believe that this will change. The EU dairy market is not protected from this dairy commodity price volatility and this implies that milk prices in the EU are also volatile. Milk price volatility varies considerably across the EU MSs, with implications for the level of income price volatility experienced by dairy farmers in the various MSs.

Dairy production costs are also volatile due to movements in input prices (e.g. animal feed, fertiliser, energy). Volatility in milk prices and dairy production costs can be correlated and move in the same direction, in which case the implications for income volatility are less significant. The experience of dairy farmers in 2022, when milk price increases offset higher production costs. However, it is also possible that milk prices and dairy production costs may move in different directions. For example, in 2023 we have observed a sharp fall in milk prices while production costs have remained stubbornly high, resulting in a sharp fall in dairy farm incomes.

In contrast to their volatile profit margins, the **CAP support payments EU dairy farmers receive are relatively fixed in value**. These fixed payments tend to dampen the volatility in income that EU dairy farmers would otherwise experience if their incomes were derived solely from their profit margin. This is an interesting **distinction between the dairy sector in the EU and** in competitor regions such as **New Zealand**. In New Zealand and Australia, farmers can participate in tax and savings schemes, which enables farmers in both countries to improve their liquidity and smooth after-tax income (Glauber et al., 2021).

A further mechanism which could provide some stability to dairy farmer incomes in the EU would be the use of **fixed milk price contracts**, which give dairy farmers advanced knowledge of the milk price they will receive. However, as a risk management tool fixed milk price contracts are not without their flaws. In particular, these contracts do not guarantee the dairy farmer's profit margin, as the dairy farmer remains exposed to input cost volatility and production risk. The experience of the use of fixed milk price contracts in Ireland has been highlighted as an example in this report.

7.1.2. Reducing nutrient emissions

The EU livestock sector, including dairy, is contributing to emissions affecting soil, water and air quality. **Manure-related nutrient surpluses**, especially those in

environmental hotspot areas, create pressure on the environment and have negative impact on biodiversity quality in Natura 2000 areas. A regionally tailored policy approach to such areas would be most appropriate, and better than the generic application of general EU standards, such as manure application standards. In order to achieve improvement in environmental sustainability a priority need is **to provide farmers with nutrient management tools**, which inform them about the environmental implications of their actions. Furthermore, farmers need appropriate guidance on how changes in behaviour could improve their environmental performance. Ideally MSs should have options to further incentivise farmer behaviour, e.g. by attaching levies and/or payments to key performance indicators associated with the nutrient management tools. This is not only a better approach from a human behavioural perspective (using the incentive of the carrot rather than the stick of regulation), it is also ultimately more efficient and provides farmers with a level of independence consistent with their entrepreneurial freedom.

7.1.3. Reducing GHG emissions

At present there are no consequences for individual dairy farmers arising from the GHG emissions generated by their farm. Therefore, it can be argued that there is little or **no individual incentive** for dairy farmers **to reduce** their **GHG emissions**, especially if reducing those emissions would place a cost on farmers, due to either having to reduce their production or incur the cost of the adoption of a GHG mitigation technology. A free rider problem exists in that the reduction in emissions on a farm is shared across the whole sector, rather than benefitting the farm which has made the effort.

One potential policy tool to deliver a reduction in dairy sector GHG emissions would be to initially grant farmers a quantity of **emissions rights** which would then be gradually reduced year by year. A market would be created to access emissions rights, which effectively would place a **carbon price** on these emissions. In theory placing a price on the GHG emissions produced by the farm would **incentivise the dairy farmer to adopt emission reduction technologies**, if doing so is cheaper than the cost of buying emissions rights.

While on the face of it, this approach is not very different from a milk quota constraint, there are important differences. Measuring the milk output of a farm was not difficult as it could be recorded by the dairy processor. **Measuring the production of GHGs** on individual dairy farms would be much more **complex**. To do so would **require the accurate** and ongoing **estimation** of the GHG emissions produced by the dairy farm. This is a relatively **complex data intensive calculation**, which could be costly to implement at scale. While it might appear attractive to use a **simpler proxy measure** of GHG emissions (e.g. based on the farm's number of cows and level of fertiliser use), such an approach could be **both flawed and unfair**, as it would **fail to take account of**

the mitigation technologies the farmer has adopted and lead to an overestimation of the farm's GHG emissions.

While **reducing the GHG emissions** from agriculture is an **EU policy priority**, some **dairy processors** may be more interested in demonstrating the **improved carbon footprint** of their products (e.g. through Life Cycle Assessment (LCA) assessments). This carbon footprint focus is perceived as important since it can present a point of difference which could present **marketing advantages** to dairy processors. In certain circumstances, **improving the carbon footprint** of dairy products may be **compatible with reducing GHG emissions** from the dairy sector. However, if milk production is increasing, then the **increase in milk output** itself represents an emission source, which may **negate the benefit of a reduced carbon footprint**. This does not imply that reducing the carbon footprint of dairy products is irrelevant, in fact it is a vital part of the solution.

Much is made of the contribution that dairy farmers can make in providing **renewable energy**, through for example, **solar panels, wind energy or biomethane** production as a means to **displace** some of the **fossil energy** used in society. However, it must be understood that while these initiatives would support the EU's Green Deal objectives, due to the **rigidities of the GHG accounting process**, these initiatives **would not contribute to a reduction in the GHG emissions of dairy farmers**. Instead, credit for the **energy GHG emission reductions produced by farmers** would accrue to the ultimate **users of the energy** rather than the farmers that generated the renewable energy. While the afore mentioned logic of the emission accounting approach is to ensure that emission reductions are not double counted, the approach also lacks imagination, as **it limits the incentive for dairy farmers** to adopt such technologies on their farm.

The overall EU effort relating to **energy and climate legislation** in the period to 2030 has been framed by the EU's commitments under the Paris Agreement. The ensuing **Nationally Determined Contributions (NDCs)** at MS level prescribe how the Paris agreement aims to tackle global emissions at the level of member state. In practise at individual MS level the NDCs and associated climate action legislation prescribe targets for individual major emission sectors, such as energy, transport, industrial, commercial, and agriculture. The **competing targets for the individual emission sectors** mean that whilst agriculture may contribute to the production of renewable energy, the **benefit will accrue to the energy sector** with its own GHG emission targets, rather than the agriculture sector that produced the energy.

7.1.4. Availability of labour and generational renewal

Availability of labour remains an important input on dairy farms. Two concerns exist in this regard, generational renewal and availability of hired labour.

Generational renewal is particularly important in dairy farming, as the labour intensive nature of dairy farming, makes it unattractive as farmers get older. However, the average age of dairy farmers continues to increase, indicative of delayed succession or the absence of successors. The income expectations and lifestyle preferences of younger generations mean that dairy farming may be unattractive for potential farm successors. This emphasises the need to ensure that dairy farming is sustainable in economic, environmental and social terms to facilitate generational renewal.

Hired labour is required on some dairy farms, in particular larger farms. However, the availability of hired labour can be limited due to the absence of suitable workers or because wages rates have risen making it harder for farmers to pay wages in line with workers' expectations. **Technological solutions to delayed succession**, the absence of a successor or a shortage of hired labour do exist. Some farmers are turning to robotic milking systems as a solution. Other solutions involve farmers **transitioning out of dairy production into extensive beef production**, where the required labour input is much lower.

7.1.5. Organic farming

Increasing the area in organic farming is a priority under the EU's Farm to Fork Strategy. Some consumers are willing to pay a price premium for organic products over conventional products. Higher output prices, along with additional CAP supports, can mean that organic dairy production presents an attractive alternative to conventional dairy production for some farmers. In addition, the **extensive nature** of organic dairy output and **limited usage of farm inputs** is considered to be environmentally beneficial. However, organic dairy farming is also associated with lower levels of milk output per hectare, which may create pressure to produce additional milk output in conventional dairy farm systems. There are also **concerns that organic dairy output may fail to attract an organic premium**. This is a risk if the farmer cannot sell their milk to an organic processor or if the organic processor is unable to market the end product at a premium over conventional products. From an environmental sustainability perspective, the tendency to make a very binary distinction between dairy production systems that are either conventional or organic is an over-simplification.

7.1.6. Dairy farming in disadvantaged regions

While the dairy sector in general faces a range of challenges, milk production in **disadvantaged regions can encounter particular obstacles**. These challenges can **relate to** a range of **farm characteristics**, such as farm size, unfavourable weather conditions, farmer age profile, generational renewal and a lack of technology adoption. Many of these farm characteristics are associated with **low farm profitability**, making the future of such farms more uncertain. A particular concern is that there may be few economic alternatives for farmers operating dairy farms in disadvantaged regions, due

to the unsuitability of the farm for other forms or agricultural production or a lack of alternative income opportunities in the region where the farm is located.

7.2. Recommendations

In this study a number of policy challenges (price volatility, the environment, climate, labour availability, generational renewal) have been addressed (see previous section). Based on this assessment, the report makes the following policy recommendations:

- **Addressing milk price volatility:** Various policy measures exist which could assist farmers in coping with price volatility and risk (e.g. insurance schemes from the risk management toolkit, cooperatives or producer organisations, direct payments, including coupled support for sustainability and income averaging for taxation purposes) but dairy farmers could benefit from a more widespread adoption. Further consideration of mechanisms/instruments that could assist farmers in dealing with income volatility is required. Dairy processors could play some role in improving the effectiveness of futures markets for dairy farmers. Tax and savings measures including farm management deposit schemes could be considered further.
- **Reducing dairy's environmental impact:** Reducing nutrient emissions requires changes in farmer behaviour (e.g. management actions). A prerequisite for that is that farmers have access to the proper information regarding their emissions, where they come from and how emissions can be reduced. User-friendly and informative Farm Nutrient and Emission Management (FNEM) tools should be provided and their adoption and use should be encouraged by supporting policy interventions.
- **Environmental policy:** reducing GHG emissions and improving water quality, is having an increasing influence on the EU dairy sector and in some MS is already as important, if not more important than the CAP. The diverse range of environmental obligations have the potential to confuse, alienate and discourage EU dairy farmers. There is an urgent need to consider how farmers can be given the right advice to allow them to take the right actions which deliver the right environmental outcomes, while maintaining the economic and social sustainability of dairy farming.
- **Reducing GHG emissions and making dairy climate neutral:** Consideration could be given to the advantages and disadvantages of introducing some form of CO₂ levy in dairy, creating a better financial incentive to adopt emission reducing technologies and management actions. Support could be provided for the adoption of such measures to reduce the cost incurred by the farmer in their adoption. More generally, consideration should be given to mechanisms that

incentivise or reward individual farmers for individual efforts made to reduce their farm's GHG emissions.

- **GHG emissions vs emissions intensity:** Dairy processors must be made fully aware of the importance of monitoring the total amount of emissions generated by their milk suppliers rather than focusing solely on the carbon footprint of the milk produced.
- **Dairy farming and bioenergy:** For carbon accounting reasons, the contribution dairy farmers can make to fossil fuel displacement does not reduce their farm's agricultural emissions. This accounting approach is unhelpful in incentivising dairy farmer action on renewable energy production.
- **Labour and generational renewal:** More support should be given for technological solutions which could reduce the labour requirement on dairy farms thereby delaying dairy farm exits (allowing older dairy farmers to remain in dairy farming where a successor is absent) and also increasing the attractiveness of dairy farming for the younger generation, making generational renewal more likely.
- **Organic dairy farming:** The promotion of organic dairy farming over conventional dairy production, needs careful consideration. Some conventional dairy systems may deliver environmental benefits that are near equivalent to organic farming, with fewer of the challenges associated with organic farming (such as the sourcing of organic feed, the cost of organic certification). Uncertainty about the future size of the organic dairy market is a risk that needs consideration, and further investigation, in the context of the promotion of organic dairy farming over conventional dairy farming. The availability of farm-level statistics about organic farming requires significant improvement so that farmers and other stakeholders can compare the economic, environmental and social sustainability of organic production relative to conventional production.
- **Tailored regional policy approaches:** The concerns of dairy farmers in disadvantaged regions need to be considered as part of the policy formation and policy evaluation process. It could be wrong to assume that the impact of policy changes on dairy farms in disadvantaged regions will be similar to the impact of policy changes on dairy farms in general. This means that the appropriateness of policy needs to be tested in the context of dairy farms in disadvantaged regions. It is, therefore, important to ensure that dairy farmers in disadvantaged regions are stakeholders in policy development. This requires that their perspectives are conveyed through farmer representative organisations and factored in by policy makers as part of the policy making process.

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ANNEX

PART I: Data sources

Table 11 provides a list of the statistical sources that have been consulted in order to gather the relevant quantitative data on which this study has relied. The table also provides a general overview of the indicators that are available at each of them.

Table 11: List of key data sources

Database	Example variables that are included in this source
Eurostat	Production, dairy herds, milk prices, dairy products, feed, farm structure
Farm accountancy data network (FADN)	Farm accountancy data, such as farm income, costs
EU Milk Market Observatory (European Commission)	Market data, dairy product prices (EU and world market), policy data (e.g. intervention)
AGMEMOD	Production, consumption, market balances, trade
National data sources (published by national statistical office, relevant ministry, etc.)	Environmental data, production data
Non-EU data sources (USDA, FAPRI, OECD outlook, etc.)	Milk production in non-EU countries, dairy herds in regions such as New Zealand or the US, milk prices in the global market
Other data sources (e.g. data published by producer associations, market analysis firms, industry associations, etc.)	Production, market data, consumption, trade, etc.

Source: Authors

PART II: Literature review

An overview of the different elasticities reported by Jongeneel and Gonzalez-Martinez (2022) is provided below.

Table 12: Elasticity comparison

	AGMEMOD (quota period, previous estimates)	CAPSIM	EDIM	Bouamra- Mechemach e et al. (2008)	This study (non-quota period, updated estimates)
Austria	0.750	0.229	0.292	0.172	0.0150
Belgium	0.760	0.352	0.280	0.216	0.2792
Bulgaria	0.500	0.264	0.170	NA	0.0230
Croatia	NA	NA	NA	NA	0.3507
Czech Republic	0.160	0.253	0.561	0.273	0.0062
Denmark	0.550	0.308	0.420	0.181	0.1470
Estonia	0.500	0.347	0.576	0.284	0.1710
Finland	0.520	0.331	0.428	0.237	0.1416
France	0.590	0.288	0.341	0.215	0.2918
Germany	0.630	0.218	0.373	0.210	0.0770
Greece	0.570	0.284	0.313	0.226	0.3599
Hungary	0.560	0.235	0.664	0.284	0.0618
Ireland	0.770	0.349	0.402	0.206	0.2820
Italy	0.830	0.294	0.337	0.179	0.2267
Latvia	0.540	0.234	0.576	0.292	-0.006
Lithuania	0.50	0.277	0.576	0.284	0.1221
Netherlands	0.780	0.272	0.442	0.216	0.0920
Poland	0.540	0.235	0.650	0.292	0.2556
Portugal	0.550	0.310	0.421	0.249	0.2531
Romania	0.500	0.295	0.159	NA	0.1705
Slovenia	0.500	0.307	0.576	0.283	0.1122
Slovakia	0.500	0.150	0.576	0.283	0.1417

Spain	0.710	0.329	0.284	0.183	0.1697
Sweden	0.590	0.238	0.459	0.243	0.1135
United Kingdom	0.600	0.278	0.387	0.189	0.0492
Production-weighted average	0.634	0.278	0.399	0.217	0.1610
Coefficient of variation	0.230	0.170	0.330	0.180	0.670

Source: Reproduced from Jongeneel and Gonzalez-Martinez (2022)

PART III: Price transmission

This section further elaborates on the content of Section 3.1. As the focus of this section is on the functioning of **supply chains vertical price transmission**, the extent to which cost and/or price changes at one stage result in price changes at other stages is elaborated on. Asymmetries in price transmission – generally meaning that cost increases are transmitted faster than cost decreases – are studied and found in numerous agricultural supply chains (e.g. Peltzman 2000; Meyer and von Cramon-Taubadel, 2004). The European Commission (2009) suggests that for **most commodities price transmission is asymmetric** in the sense that upward shock are transmitted faster than downward shocks, while in the long run most price transmission is symmetric. Furthermore, margins were observed to increase to the benefit of processors in the Danish dairy chain. In contrast, another study on the Belgian dairy chain and a study on the French dairy chain found no evidence of pricing irregularities.

Bonnet et al. (2015) focus on the Dutch dairy chain with specific attention to fluid milk and dairy desserts. Their analysis does not look at asymmetric price transmission, but rather focuses on the impact of a farm gate milk price increase on market equilibria for various dairy products. They find that a **10% decrease in the milk price** (farm price) causes a **1.9% decrease** in marginal costs of yoghurts, a **2.0% decrease** in the costs of cottage cheeses, a **0.6% decrease** in the marginal costs of other dairy desserts, and a **4.1% decrease** in the marginal costs of fluid milk. Consumer prices would decrease by 1.1%, 1.3%, 0.3%, for yoghurts, cottage cheeses and other dairy desserts respectively. Similar results were found for dairy supply chains in Austria and Spain (Jongeneel and Gonzalez-Martinez, 2022a). The percentage changes at industry dairy product level or retail level are only a fraction of the change at farm level. It should be realised however that part of this 'reduced percentage price transmission' can be directly explained by the **price wedge** between these different supply chain stages and would occur even in case of complete price transmission to industry and retail levels (O Connor and Keane, 2009).

Moreover, Bonnet et al. (2015) further shows that pass-through is larger for national brands in fluid milk and lower for private labels, whereas the situation is reversed for dairy desserts where pass-through is lower for national brands than for private labels. These differences may well be explained by the contracting arrangements. National brands may be able to increase their prices faster after an increase in the farm price than private label suppliers. National brands manufacturers may be able to decide on the final resale price through the contracts that they have with retailers (Resale Price Maintenance). It seems that retailers are mostly competing on **private labels** while national brands attempt to avoid competition on prices. Retailers can use their private labels as a strategic tool in negotiations with brand manufacturers, mainly in the fluid milk market where private labels have a high market share. In the desserts market, brand manufacturers have a stronger position.

Summarising, some of the changes in farm milk prices are not transmitted to consumers, while the dairy industry and/or the retailers adjust their **mark-ups**. The results show that contrary to the case of perfect competition, in the case of imperfect competition and strategic behaviour, both undershifting and overshifting of cost changes can occur.

PART IV: Looking into price volatility and self-sufficiency rates

As in the case of many previous related studies, we use the coefficient of variation (CV) as a measure of price volatility. In a previous report for the European Commission, Chartier et al. (2017) describe the CV as a standardised measure of dispersion (often expressed as a percentage), defined as the ratio of the standard deviation to the mean (or its absolute value). Chartier et al explain that the CV enables a meaningful comparison between two or more magnitudes of variation, even if they have different means (e.g., revenue versus gross margin) or different scales of measurement (e.g. yields in kg versus prices in euro).

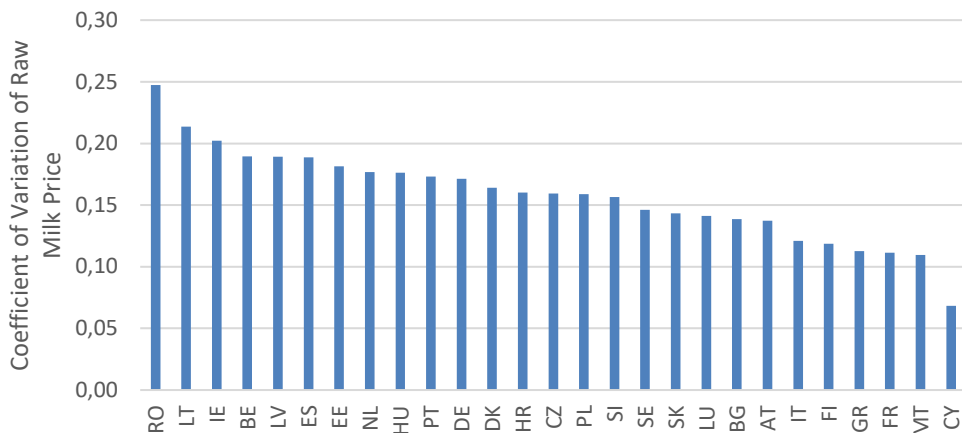
Figure 20 shows the CV for raw milk prices by EU MS during the period from January 2007 to August 2023. For most cases, the milk price data is detrended based on the compound growth rate of milk prices from their average in 2007 to 2009 relative to the average reported from September 2020 until August 2023. Figure 20 shows that price volatility is relatively high in Romania, Lithuania and Ireland where the CV is above 0.2 and relatively low in Greece, France, Malta and Cyprus where the CV is less than 0.12.

Price volatility is a directionless measure about the extent of variability in a price or quantity (Gilbert and Morgan 2010) and measures of price volatility can contain information about both positive and negative price changes. In the case of Romania, the high CV is largely due to the rapid increase in milk prices from the summer of 2021 until the end of 2022. Apart from the influence of global markets, this increase may reflect some improvement in the performance of the milk sector in Romania, which has faced many challenges in recent times including relatively low milk yields and high

transportation costs (Zaalmink et al., 2020). The high milk price volatility in Ireland is considered to be due to a variety of factors including the seasonality of production and the exposure to global markets and volatility in foreign exchange rates. Dairy farmers in Lithuania experienced sharp declines in milk price in 2009 and from 2014 to 2016. The price decline in 2014 was connected to the Russian ban on imports and the European Commission intervened with exceptional aid for milk producers in Lithuania, Estonia, Latvia and Finland (Boulanger et al 2016).

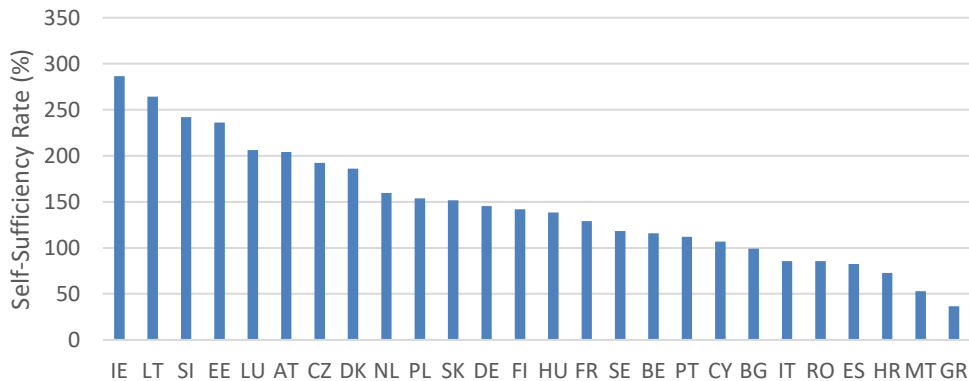
In some EU MSs, the relatively low milk price volatility could be partly attributed to institutional factors including those relating to co-operatives, producer organisations, the status of Protected Designated Origin (PDO) or the status of Protected Geographical Indicators (PGI). Müller et al. (2018) concluded that a negative relationship exists between the co-operative share in the dairy sector and the extent of milk price volatility. However, the low milk price volatility in Greece and Cyprus is unlikely to be due to co-operatives given the relatively low co-operative share in these two MSs. Milk prices in these two MSs were much less affected by the global downturn in 2009 and during the milk price crisis of 2014-2016. Milk prices in Cyprus have some positive correlation with milk prices in Italy, which is a key trading partner in the dairy sector (Stanuch and Firllej, 2021) and Italy is another MS with relatively low milk price volatility.

Figure 20: Coefficient of Variation in Milk Prices by EU MS (2007-2023)



Source: Authors calculations based on Milk Market Observatory data from the European Commission (2023a)

Figure 21: Self-Sufficiency Rate for Milk by EU MS (2002-2022), %



Source: European Commission (2023b)

Both Ireland and Lithuania are noteworthy for having a particularly high self-sufficiency rate for milk products (over 250 per cent). Figure 21 has shown that milk price volatility is relatively high in both MSs and there is a possible connection between price volatility and self-sufficiency. Countries with a very high self-sufficiency rate will tend to be more dependent on exports and dairy farmers in these countries are more exposed to price volatility emanating from global markets. In contrast, dairy farmers in countries with relatively low self-sufficiency could have some advantages in terms of a lower exposure to price volatility. For instance, Greece, Italy and Malta are EU MSs with relatively low milk price volatility and relatively low self-sufficiency rates.

Box 4: The Experience of Milk Price Risk Management Tools in Ireland

Fixed milk price contracts are one of the few available **risk management tools for dairy farmers in Ireland**. After the historically large drop in milk prices in 2009, the dairy sector in Ireland became more alert to the challenges posed by milk price volatility. This motivated the introduction of fixed milk price contracts, which enabled **dairy farmers to sell a pre-specified quantity of milk to their milk processor at a fixed price for a specific period of time**. At this time, dairy farmers in Ireland began preparing for the removal of milk quotas. Apart from the direct impact in stabilising farm-gate prices, these contracts also supported investment and expansion decisions at farm-level. Tirlán (formerly known as Glanbia) was the first of the Irish milk processors to announce a fixed price forward contract for Irish dairy farmers in late 2010, made available for milk delivered in 2011 (Irish Examiner, 2010).

The **Tirlán initiative** was soon followed by the introduction of fixed milk price guarantees by other Irish milk processors. By 2017, the vast majority of milk processors in Ireland offered fixed milk price contracts to their farmer suppliers. Pardeshi et al. (2023) used Teagasc NFS data to explore the adoption rates for fixed milk price contracts in Ireland. Their results indicate that the adoption rates peaked in 2017 and 2018 with approximately 42 per cent of dairy farmers adopting these contracts. The adoption rate however, declined to approximately 29 per cent by 2021.

In the first phase of the Tirlán scheme, farmers committed a minimum of 15 per cent of their milk production to a fixed milk price contract for a three year duration (Irish Examiner, 2010). New contracts emerged in subsequent years with different terms and conditions including so-called Index linked fixed milk price contracts with some adjustments for changes in input prices (Buckley, 2011). Farrell (2017) highlighted the strong demand for fixed milk price contracts during this time and reported that '60% of Tirlán suppliers are involved in Fixed Milk Price schemes with, on average, 30% of their milk locked in, equating to 18% of Tirlán's milk pool'.

The availability of fixed milk price schemes supported many dairy farmers in Ireland during the milk price slump in 2015/2016. However, some problems emerged over time. Many of the schemes were oversubscribed and some farmers were therefore unable to avail of the opportunity to fix their milk price. Initially, the inclusion of adjustments for input prices appeared quite popular with farmers and their representatives (Irish Examiner, 2011). However, demands emerged for the removal of these adjustment rules. In some contracts, farmers were obliged to purchase inputs from particular suppliers. This provoked an argument that such conditions could be anti-competitive.

Since their introduction, there has been variation in the maximum volume of milk permitted under different fixed milk price contracts. In the case of the Tirlán and Carbery processors, most of the contracts have permitted farmers to enter a maximum of 20 per cent of their milk production into one fixed milk price contract. In the case of other milk processors such as Aurivo and Lakeland, the maximum permitted volume in one contract has tended to be either 10 per cent or 15 per cent of production. Farmers can adopt multiple contracts from their milk supplier and the total proportion of their milk production can therefore exceed 20 per cent.

In **2018**, the impact of the **summer drought impacted strongly on the volume of inputs used** on dairy farms in Ireland. The drought impacted negatively on economic margins with the average net margin per litre declining from 15.21 cent in 2017 to 9.6 cent in 2018 (Teagasc, 2019). Fixed milk price contracts did not protect economic margins under this scenario. This may have impacted negatively on adoption rates in subsequent years.

The average dairy farm income in Ireland increased strongly in 2022 after a relatively good year in 2021 (Dillon et al., 2023). On most farms, the increase in output prices was sufficient to more than offset the impact of large increases in input prices and this led to significant increases in income. However, this was not the case for farmers with a large proportion of production entered into fixed milk price contracts. In 2022, the farmers with fixed milk price contracts achieved a much lower milk price relative to those farmers who did not adopt such contracts. A small cohort of dairy farmers entered the majority of their 2022 milk production into fixed milk price contracts and this caused significant hardship and financial stress. In 2022, average milk prices reached 53.1 cent per litre on a standardised basis. However, the fixed standardised milk prices offered in 2020 and 2021 were in the region of 35 cent per litre.

In a bid to address the resulting hardship, the Ornuá organisation intervened to support the co-operatives in dealing with the financial problems of farmers with a large reliance on fixed milk price contracts (Ornuá, 2022). Ornuá is essentially a co-operative which markets and sells dairy products on behalf of its co-operative members which consist of many of the largest milk processors in Ireland. Individual milk processors also intervened to support farmers with a high share of production in fixed milk price contracts. However, the general appetite and demand for these contracts diminished greatly in 2022 as more farmers considered the limitations of such contracts in protecting economic margins.

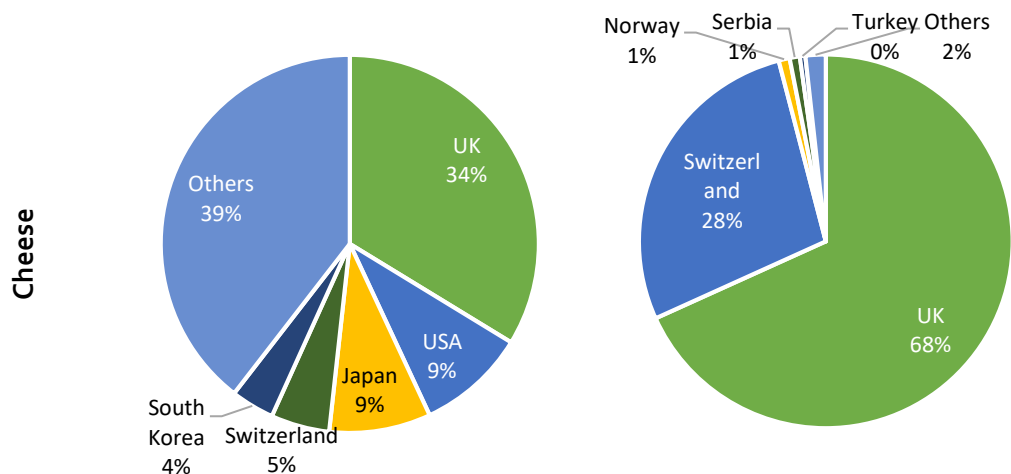
Source: Own compilation

PART V: Additional figures

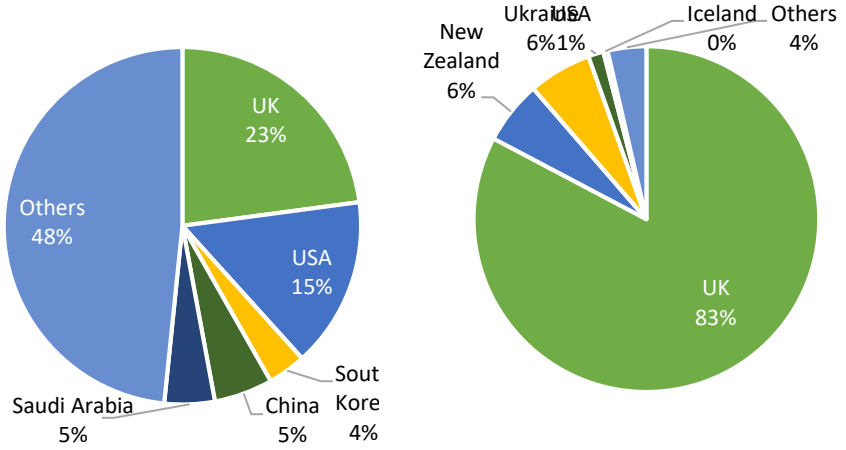
This section provides further statistical data on trade and consumption at the global level.

Looking at traded volumes by product category (Figure 22), the EU is a net exporter for cheese, butter, SMP, WMP and whey powder. According to the **EU Medium-Term Outlook** (European Commission, 2023a), **the EU is expected to remain the largest global dairy supplier**, with the EU representing around 24% of the global dairy trade in 2032). Nevertheless, European Commission (2023a) suggests that dairy exports will decline due to an improvement in the production capacity of some traditional importers. Focusing on the current situation, in 2022, net export volumes range from almost 1.2 million tonnes in the case of cheese to 175 thousand tonnes of butter traded in net terms. **Significant trade flows between the EU and UK** are identified, with the UK being the country of origin of most EU dairy imports (more than 68% of total imports). In 2022, more than 422 thousand tonnes of cheese were exported to the UK, while 117 thousand tonnes were imported into the EU. Another important dairy trade partner is China, with around 11 thousand tonnes of butter and more than 206 thousand tonnes of whey powder exported to this country from the EU in 2022.

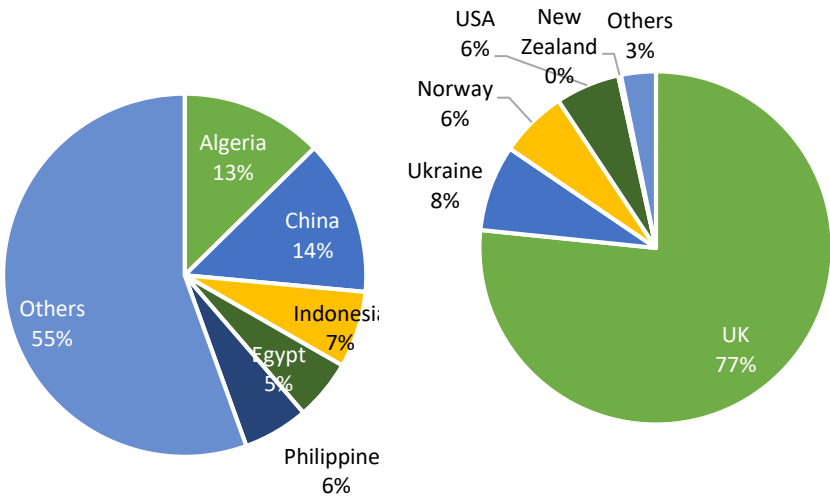
Figure 22: Contribution of EU dairy exports and imports to the global market



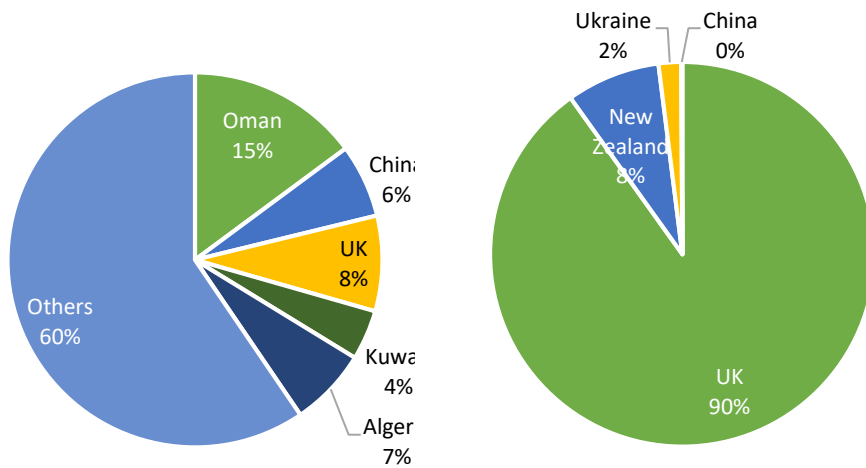
Butter

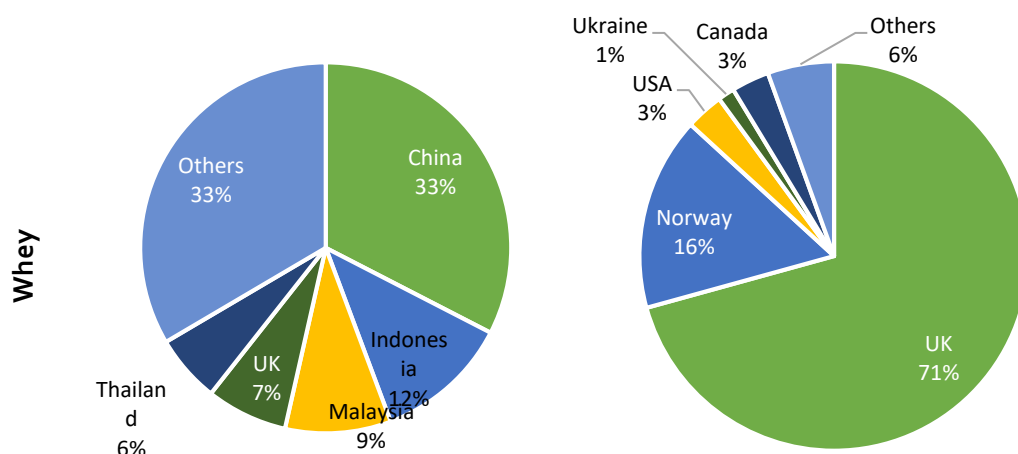


SMP



WMP





Source: Own elaboration based on Eurostat Comext data

Note: Exports are presented in the left panel, while imports are shown in the right panel. The relevant shares are calculated over the period 2019-22, based on traded quantities (thousand t)

Table 13 shows the value of EU dairy exports across key dairy products. A general increase in the value of dairy exports is observed, with the value of dairy products in 2022 being particularly high.

Table 13: Value of EU Dairy exports 2015 to 2022 (million EUR)

	2015	2016	2017	2018	2019	2020	2021	2022
Butter (02300)	1,003	1,148	1,337	1,380	1,499	1,417	1,346	1,812
Cheese (02499)	3,163	3,180	3,465	3,555	3,890	3,960	4,163	4,710
SMP (02221)	1,509	1,157	1,611	1,426	1,936	2,000	2,048	2,638
WMP (02222)	1,174	1,101	1,358	1,140	1,113	1,180	1,062	1,148
Fresh cheese (02491)	940	946	1,129	1,085	1,140	1,215	1,396	1,801
Milk and cream (02213)	293	378	496	565	545	575	707	870
Malt extract; food preparations (09894)	1,725	1,679	1,957	1,918	2,262	2,465	2,482	3,065
Food preparations for infant use (09893)	3,890	4,225	4,605	4,747	4,788	4,834	4,050	5,262
Casein (59221)	285	256	268	273	342	429	505	677

Source: Authors based on Eurostat Comext data

Note: SITC codes are reported in brackets

Table 14 show the value of exports which proxies an average price for each product category. The very strong increase in the unit value of butter is observable. Large price

increases can be observed for other dairy commodities. The smallest increases are observed in the case of milk and cream and fresh cheese and food preparations for infant use.

Table 14: Unit value of EU dairy exports 2015 to 2022

	2015	2016	2017	2018	2019	2020	2021	2022
Butter	3.86	3.89	5.29	5.67	5.05	4.54	5.13	7.12
Cheese	4.81	4.59	4.90	4.91	4.97	4.89	5.40	6.54
SMP	2.14	1.94	2.03	1.73	2.05	2.41	2.60	3.71
WMP	3.04	2.89	3.36	3.29	3.53	3.42	3.56	4.86
Fresh cheese	2.97	2.84	3.16	3.13	3.18	3.15	3.47	4.44
Milk and cream	2.07	1.90	2.36	2.68	2.61	2.53	2.66	3.33
Malt extract; food preparations	1.98	1.81	1.92	1.86	1.94	2.08	2.09	2.68
Food preparations for infant use	7.99	8.02	7.74	7.51	7.77	8.04	7.98	9.13
Casein	6.59	5.46	5.91	4.97	5.49	6.86	7.39	10.94

Source: Authors based on Eurostat Comext data

Table 15 (next page) shows the volume of EU dairy exports. The volume of exports increased in the years immediately after milk quota removal but has stabilised in the last couple of years, reflecting the more recent slowdown in EU milk production growth.

Table 15: Volume of EU Dairy exports 2015 to 2022 (thousand kg)

	2015	2016	2017	2018	2019	2020	2021	2022
Butter	259,640	295,353	252,572	243,447	296,772	312,152	262,431	254,429
Cheese	657,533	693,471	707,171	723,416	782,618	808,975	771,712	719,992
SMP	706,558	597,004	793,718	826,055	945,491	831,026	788,054	710,645
WMP	385,990	381,316	403,940	346,441	315,327	344,829	298,421	235,961
Fresh cheese	316,508	333,368	356,740	346,661	358,584	386,455	401,754	406,025
Milk and cream	141,589	199,049	210,307	210,377	208,689	227,164	265,432	261,221
Malt extract; food preparations	870,453	925,532	1,016,715	1,032,240	1,165,625	1,183,917	1,188,588	1,144,581
Food preparations for infant use	486,728	527,161	594,685	632,275	616,246	601,227	507,637	576,365
Casein	43,244	46,933	45,446	55,008	62,300	62,445	68,403	61,858

Source: Authors based on Eurostat Comext data

Table 16 shows a breakdown of EU dairy exports by the leading EU MS for the year 2021. The final column shows the proportion of those exports that go to countries outside of the EU. The share of Butter and Cheese exports going to non-EU countries tends to be lower than the share of powder exports going to non-EU countries. Also notable is the variation in the share of exports going to non-EU countries by EU MS. France Germany and Ireland have significant non-EU markets for Butter. Ireland has by far the largest non-EU export share for cheese, with much of this destined for the UK. Denmark, Germany and Belgium are the largest exporter of SMP to non-EU countries, while the Netherlands, Denmark and France are the largest non-EU WMP exporters.

Table 16: Total volume of dairy exports in 2021

	Total (thousand kg)	Intra (thousand kg)	Extra (thousand kg)	Share extra EU trade (%)
Butter				
NL	341,259	301,795	39,464	12
IE	284,929	200,669	84,260	30
BE	161,573	144,627	16,946	10
DE	156,461	140,915	15,546	10
FR	100,056	47,817	52,239	52
DK	53,618	24,146	29,472	55
PL	49,384	41,421	7,963	16
FI	33,845	29,250	4,596	14
Cheese				
NL	680,683	522,697	157,986	23
DE	626,976	534,366	92,610	15
FR	359,398	270,880	88,518	25
IE	227,483	81,697	145,786	64
IT	196,034	114,476	81,558	42
DK	156,751	125,577	31,175	20
PL	124,460	92,675	31,785	26
GR	108,741	83,835	24,905	23
SMP				
DE	326,642	209,823	116,820	36
FR	272,645	107,603	165,043	61
BE	195,875	57,379	138,496	71
IE	152,556	55,282	97,274	64
NL	147,856	68,223	79,633	54
PL	108,966	37,195	71,771	66
SE	54,302	21,957	32,345	60
FI	45,495	8,521	36,974	81
WMP				

NL	174,725	75,234	99,491	57
FR	84,341	41,656	42,686	51
DE	65,185	51,339	13,846	21
IE	56,586	25,439	31,147	55
BE	51,871	27,242	24,629	47
DK	51,229	2,658	48,571	95
SE	23,085	2,641	20,444	89
PL	19,744	14,530	5,214	26
Whey				
DE	583,976	48,8709	95,267	16
IT	250,607	187,852	62,755	25
FR	206,498	158,527	47,971	23
DK	196,774	114,099	82,675	42
BE	119,479	86,567	32,912	28
PL	110,206	88,579	21,626	20
NL	98,461	75,158	23,304	24
ES	42,577	37,889	4,688	11
Milk				
DE	238,817	206,824	31,993	13
FR	188,631	100,428	88,202	47
BE	167,171	142,171	25,001	15
NL	133,173	115,164	18,009	14
ES	98,987	72,643	26,343	27
PL	94,977	90,414	4,564	5
DK	81,318	61,506	19,812	24
LT	65,945	65,324	622	1
Casein				
IE	57,033	15,450	41,583	73
FR	28,015	10,889	17,126	61
NL	6,124	3,779	2,345	38
DE	5,796	3,396	2,399	41
LV	5,325	4,827	498	9
AT	2,719	2,646	73	3
PL	2,642	1,261	1,382	52
ES	2,203	124	2,079	94

Source: Authors based on Eurostat Comext data

Note: Extra EU exports are calculated as a share of total Exports for each MS

Table 17 illustrates the importance of the EU in global dairy trade. In 2021 the EU was by some distance the largest butter, cheese and whey exporter. The EU is the largest SMP exporter, but North America

and New Zealand also have a large share of global SMP exports. New Zealand is by far the largest WMP exporter.

Table 17: Global volume of dairy exports and imports by major regions around the world

Year	2015		2021	
Region	Import Quantity	Export Quantity	Import Quantity	Export Quantity
Butter				
World	1,444,509	1,660,054	1,684,286	2,051,765
Africa	80,645	8,626	68,558	6,401
Northern America	31,994	20,591	63,147	45,215
Central America	38,748	10,563	19,782	2,763
Caribbean	7,128	802	7,325	74
South America	7,875	31,398	12,082	31,094
Asia	343,631	24,515	387,834	36,196
Europe	910,580	1,010,236	1,090,230	1,230,506
European Union (27)	720,319	869,712	894,926	1,083,984
Rest of Europe	190,261	140,523	195,303	146,521
Oceania	23,905	553,320	35,327	699,511
Cheese from whole cow milk				
World	5,549,873	5,787,261	6,964,705	7,125,597
Africa	109,250	31,140	127,627	59,529
Northern America	157,846	309,358	166,548	381,142
Central America	158,597	40,489	197,972	44,996
Caribbean	33,997	1,145	53,836	396
South America	60,934	74,155	106,730	78,826
Asia	912,442	227,722	1,144,002	161,700
Europe	4,021,351	4,628,145	5,077,833	5,722,510
European Union (27)	3,307,462	4,208,839	4,208,225	5,175,439
Rest of Europe	713,889	419,306	869,607	547,071
Oceania	95,455	475,106	90,158	676,498
Skim milk and whey powder				
World	2,754,871	2,888,912	3,072,181	3,507,120
Africa	331,124	14,476	386,415	25,809
Northern America	5,344	571,707	2,963	912,188
Central America	270,717	1,181	189,088	670
Caribbean	2,4121	131	3,5207	51
South America	80,242	51,507	95,966	34,574
Asia	1,281,428	136,822	1,533,686	183,627

Europe	745,941	1,490,876	802,094	1,631,078
European Union (27)	593,305	1,270,793	716,430	1,429,467
Rest of Europe	152,636	220,083	85,663	201,611
Oceania	15,949	622,208	26,759	719,118
WMP				
World	2,742,017	2,954,718	3,374,746	4,090,381
Africa	568,015	18,833	617,958	19,022
Northern America	9,904	37,389	13,834	40,598
Central America	35,514	2,5875	172,267	23,740
Caribbean	88,924	513	45,531	123
South America	289,353	294,838	158,618	298,488
Asia	1,389,803	367,906	1,979,696	381,804
Europe	334,153	738,380	338,896	623,948
European Union (27)	276,130	599,979	287,159	554,029
Rest of Europe	58,022	138,401	51,736	69,919
Oceania	26,348	1,470,982	47,942	2,702,655
Whey (dry)				
World	2,130,125	2,317,758	2,463,811	2,696,946
Africa	48,867	3,791	8,5913	1,194
Northern America	22,039	445,037	14,272	593,841
Central America	63,849	707	45,921	411
Caribbean	2,144	28	2,914	11
South America	42,453	89,218	47,807	68,276
Asia	964,805	50,517	1,238,016	103,202
Europe	955,260	1,688,849	1,011,452	1,872,589
European Union (27)	819,414	1,379,563	912,040	1,620,552
Rest of Europe	135,845	309,286	99,411	252,036
Oceania	30,703	39,608	17,514	57,419

Source: Authors based on Eurostat Comext data

PART VI: Farm level indicators

Yield: The average yield per cow in the EU-28 in 2020 was **7,586 kg/cow**. In 2020, the average yield exceeded 9,000 kg per dairy cow in two MSs, Denmark and Finland. At the opposite end of the spectrum, five MSs had a yield per cow less than 6,000kg/cow, namely: Bulgaria, Spain, Croatia, Romania and Slovenia. These data reflect the differences in dairy farm structures in the EU-28, which can be associated with differences in pedio-climatic conditions, as well as the social, economic and policy context.

Farm Size: In 2020 the average number of dairy cows in the EU-28 was **46 per farm** and the average number of forage hectares was **41 ha**. In term of forage area, farms in Slovakia, Czechia, Denmark and the UK had the highest number of dairy cows, well above the EU average of 45 LU per farm.

Table 18: Farm Structural Characteristics, Specialist Milk Producers, EU-28: FADN 2020(p)

	Farms represented	Share of milk production from specialised farms (%)	Forage area (ha)	Dairy cows (LU)	Rented UAA (%)	Total labour (AWU)	Share of family labour (%)	Milk per ha fodder area (t/ha)	Milk yield (kg/cow)	Milk production (t)
EU-27	438968	93	39	43	62	1.96	78	8.57	7580	324
EU-28	450818	93	41	46	61	1.98	77	8.66	7586	345
Belgium	6132	90	54	75	73	1.93	95	11.19	8118	605
Bulgaria	7126	85	15	28	90	2.42	66	7.05	3646	102
Czechia	1101	64	332	195	81	19.03	6	5.10	8692	1692
Denmark	2919	99	122	194	34	3.57	35	15.22	9967	1936
Germany	53167	94	65	74	65	2.33	64	9.34	8273	609
Ireland	889	95	175	103	61	5.12	18	5.72	10125	1039
Estonia	17169	98	63	79	26	1.64	87	7.38	5938	467
Spain	13940	93	32	69	49	2.10	70	18.67	8746	607
France	51426	97	84	66	90	2.01	84	5.72	7223	478
Croatia	5642	80	12	14	47	2.00	87	6.21	5274	72
Italy	27383	93	28	54	68	1.98	80	13.85	7191	391
Latvia	7105	94	44	20	43	1.99	60	3.26	7067	143
Lithuania	17531	92	27	14	48	1.68	77	3.16	6290	85
Luxembourg	658	97	89	78	53	1.62	84	7.18	8228	639
Hungary	3122	76	43	58	84	4.21	20	12.44	8316	480
Malta	100	100	3	70	84	2.39	78	142.56	6861	481
Netherlands	16049	97	59	104	39	1.90	88	15.54	8863	920
Austria	23887	95	25	22	36	1.63	99	6.36	7270	161
Poland	88637	88	15	20	33	1.86	93	8.36	6440	127
Portugal	4343	92	21	40	49	1.87	76	15.34	8119	322
Romania	74197	74	5	7	48	1.36	86	5.61	4406	29
Slovenia	5052	92	16	19	41	1.66	100	6.81	5753	110
Slovakia	311	67	645	240	92	25.52	2	3.03	8157	1957
Finland	7179	99	57	41	39	2.08	81	6.88	9605	395
Sweden	3676	98	122	89	66	2.65	65	6.19	8476	754
UK	11850	98	119	148	41	2.97	57	9.54	7653	1134

Source: Authors' own analysis of FADN data (2020)

This report evaluates the challenges and opportunities for the EU dairy sector in light of milk quota abolition and the sector's medium-term prospects. It focuses on structural change in the sector, the dynamics of the dairy market, the need for environmental resilience and rural sustainability. The specific concerns of disadvantaged dairy regions are also addressed. The report offers policy recommendations for the European Parliament's consideration to bolster dairy farming and sustain rural communities effectively, while addressing the sector's sustainability requirements.

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