

ENGLISH SUMMARY

Dairy product alternatives

Demand development and
potential implications for the
dairy market in Germany

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English summary

Dairy product alternatives.

Demand development and potential implications for the dairy market in Germany.

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Preface

Dear reader,

The dairy market is changing. Plant-based alternatives are now well established in many product categories in Germany and continue to evolve. In parallel technologies such as precision fermentation and biomass fermentation are opening up new possibilities. These developments create opportunities for the food industry – but also brings about changes for dairy farms and dairies in Germany.

With our study, we aim to contribute to a well-informed debate on this development. Together with the DLG – German Agricultural Society (Competence Center for Agriculture and Food) and the University of Hohenheim (Department of Agricultural Markets), we are investigating how the market for alternative dairy products might

have developed by 2035 and what impact a shift in demand might then have on the German dairy market and dairy farming at that time.

Our analysis shows: Alternative dairy products are expected to continue to grow in importance. At the same time, falling demand for cow's milk may present challenges for dairy farms. These developments must be identified and addressed early on, underpinned by a policy framework that could help harness opportunities, address challenges and take trade-offs into account. We hope this study will contribute to this effort. We look forward to further discussion with you.

Christine Chemnitz and Harald Grethe
Directors, Agora Agriculture

→ Key findings

- 1 **By 2035, technological innovations are expected to significantly improve the taste, functionality and economic viability of dairy product alternatives.** A stronger shift in consumption towards these products would make it easier to achieve societal sustainability goals. However, this development may also pose challenges for dairy farms in Germany. So far, there has been little debate on how a policy framework could help harness opportunities, address challenges and take trade-offs into account.
- 2 **Depending on the scenario, dairy product alternatives could account for between 12 percent (conservative scenario) and 25 percent (dynamic scenario) of total consumption in Germany by 2035,** driven primarily by growth in milk, cream and yoghurt alternatives. Plant-based alternatives are expected to continue shaping the market. From 2035 onwards, precision fermentation could provide further impetus to market development by enabling products with functional properties comparable to those of animal-based milk.
- 3 **If domestic demand for cow's milk declines without a corresponding increase in exports, structural change could accelerate, putting smaller and less competitive farms under greater pressure.** The extent to which changing demand affects individual farms in Germany will depend primarily on their competitiveness and on international demand. At the same time, dairies could diversify their portfolios through dairy alternatives and help preserve value creation in rural areas.
- 4 **Technological advances and changing consumption patterns are expected to bring lasting changes to the dairy market.** Policymakers in Germany should proactively guide this transition to provide planning certainty for dairy farms, dairies and producers of dairy product alternatives.

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Introduction

Dairy alternatives, such as plant-based versions of fresh milk, cream, yoghurt and cheese, have gained importance on the German market in recent years. They are now found in almost all product categories in food retail, both as direct substitutes and as ingredients in processed foods such as baked goods, confectionery and ready meals. Despite this trend, there has been little analysis to date of how the market share of dairy alternatives in Germany could develop and what this might mean for domestic milk production. To contribute to an evidence-based discussion, we develop scenarios for demand for dairy product alternatives in Germany in 2035. In particular, we examine the potential for substitution in processed foods and estimate how reduced demand for dairy products could affect dairy farms in Germany.

Approach

Agora Agriculture commissioned two background studies for the analysis:

The Food Department of the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft, DLG) assessed the development potential of different technologies for producing dairy product alternatives and individual milk components, based on expert interviews and a comprehensive literature review. On this basis, the DLG developed assumptions about changes in demand in 2035. The analysis covers alternatives for all relevant product groups, ranging from fresh products such as yoghurt and cream to cheese and butter, as well as milk protein and milk powder products. Building on this analysis, the project team developed two scenarios for how demand in Germany could evolve by 2035.

The Department of Agricultural Markets at the University of Hohenheim examined the potential effects of changing demand on milk production in Germany. Building on the demand scenarios, this second background study develops two scenarios for future milk production in Germany and examines their implications for farm structures.

The conclusions drawn from these analyses were developed jointly by all project partners.

Potential of technological approaches to producing dairy product alternatives

Our analyses show that the market for dairy product alternatives in Germany is likely to be shaped by three main technologies over the next ten years:

1. **Plant-based alternatives** are expected to retain the largest market share in the short to medium term. Extraction processes for plant-based proteins and fats have already reached industrial scale and are market-ready. Moreover, plant-based proteins are generally not subject to authorisation under the EU Novel Food Regulation or regulations governing genetically modified organisms (GMOs) and can therefore be used without the associated restrictions. They are already available, and experts expect their functionality and quality to improve further in the coming years.
2. **Biomass fermentation** offers the potential to partially replace milk proteins in certain applications in the medium term. The technology harnesses the ability of microorganisms to multiply rapidly and produce protein-rich biomass. This biomass is either processed directly into products or used as a functional ingredient. Some products are already commercially available. However, challenges remain regarding scalability and costs.
3. **Precision fermentation** is expected to gain importance in the medium to long term. It is considered a particularly promising but also technologically demanding option for producing functionally important milk proteins and fats. The technology uses genetically modified microorganisms to produce specific functional ingredients. At the end of the fermentation process, the resulting target molecules – such as casein – are isolated through purification and separated from the microorganisms that produced them. However, the lack of authorisation for the EU market under the EU Novel Food Regulation creates regulatory uncertainty. The development of production costs also remains difficult to predict. The technology

is expected to have considerable potential in the medium term – around ten years from now – and in the longer term.

Other technologies, such as cell cultivation, are not expected to develop significant market potential in Germany over the next ten years.

Development of different market segments

Based on our analysis, growth in the market share of dairy product alternatives by 2035 is expected to be driven primarily by alternatives to drinking milk, cream and yoghurt and, to some extent, cheese. By contrast, little or no substitution potential is expected for milk protein and whey products or milk powder products. One important reason cited is the high production costs of these alternatives compared with the corresponding animal-based products.

Due to limited data, we have so far only been able to make a rough estimate of the potential for substituting milk components in processed foods such as confectionery or ready meals. Initial estimates indicate that at least 8 percent of the milk processed by German dairies is used to produce baked goods, ready meals, ice cream and confectionery. Although this share is relatively small, the segment is nevertheless relevant because products with modified recipes can still align with established consumer preferences.

The same applies to hybrid dairy products such as milk, cheese or desserts that combine ingredients from different sources – plant-based, animal-based or produced using biotechnology. Such hybrid products could help reduce the consumption of animal-based products within familiar consumption patterns.

Scenarios for future demand

Based on expert interviews and a comprehensive literature review, we developed two scenarios describing possible consumption levels of dairy product alternatives in Germany in 2035.

We assume that per-capita consumption of dairy products remains constant, while the shares of animal-based dairy products and dairy product alternatives shift. We distinguish between a conservative and a dynamic scenario.

The **conservative scenario** is based primarily on a continuation of existing trends and assumes limited market growth. Production processes for plant-based dairy products are optimised, improving product quality. More efficient production and higher sales volumes reduce the costs of plant-based alternatives. Products made using precision fermentation initially remain largely unavailable on the market due to delays in EU authorisation. At the same time, we assume that biomass fermentation – unlike precision fermentation – is not subject to regulatory restrictions and helps reduce the functional limitations of plant-based products. In this scenario, production capacity expands only to a limited extent, particularly because of the substantial investment needed for fermentation facilities and bioreactors.

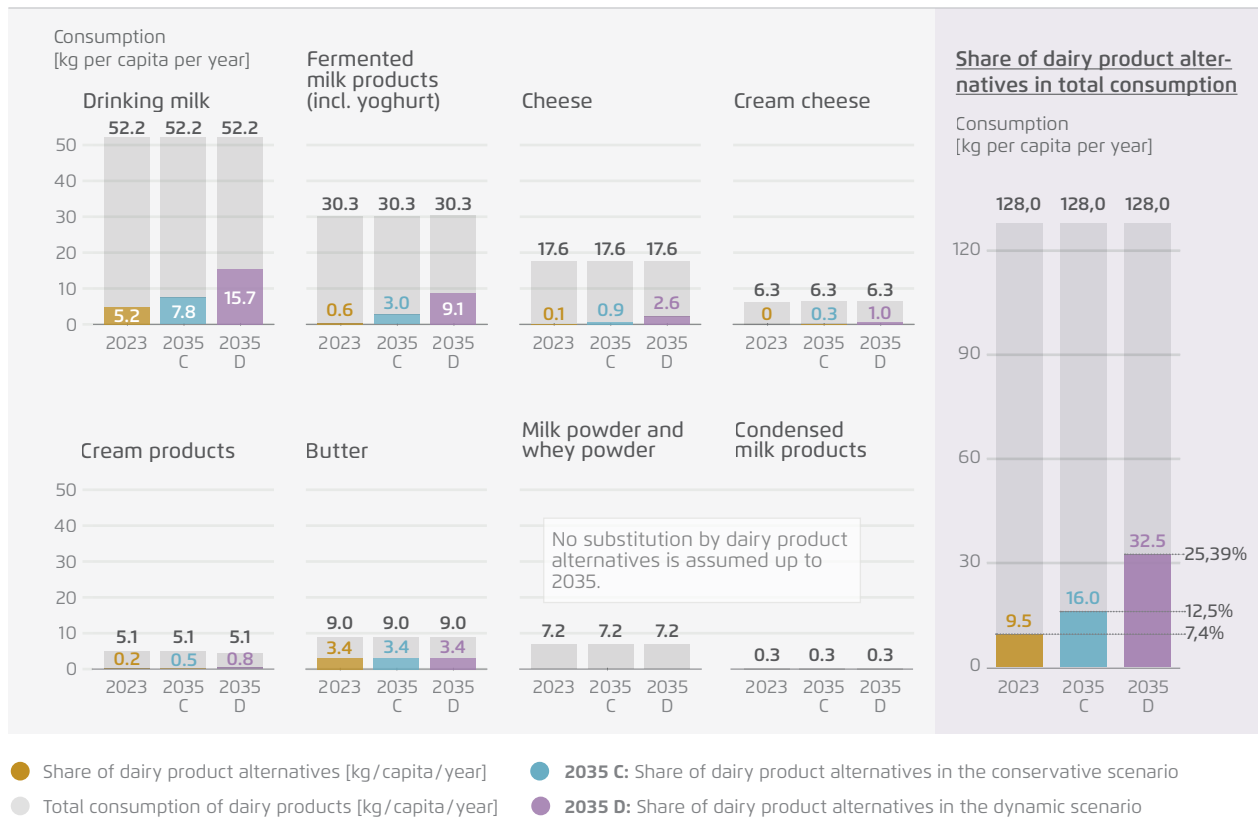
In the conservative scenario, the share of dairy product alternatives increases from 7.4 percent of total per-capita dairy consumption in 2023 to 12.5 percent in 2035. For the individual product segments, we assume the following consumption shares: 15 percent for drinking milk alternatives, 10 percent for yoghurt alternatives, 10 percent for cream alternatives and 5 percent for cheese alternatives (including cream cheese).¹

The **dynamic scenario** assumes greater technological advances, moderate market growth and EU authorisation of products made using precision fermentation without major delays. In this scenario, the market for dairy product alternatives continues to grow, driven primarily by plant-based alternatives. Advances in plant breeding, innovative technologies and the use of artificial intelligence significantly improve product quality. Production optimisation and economies

¹ For the cheese product group (including cream cheese), we assume that 20 percent of cheese alternatives are plant-based. The remaining 80 percent are hybrid products combining plant-based raw materials with biomass fermentation or microfermentation.

Consumption of dairy product alternatives in Germany – status quo and scenarios to 2035

→ Fig. A



Agora Agriculture, based on calculations by DLG and supply balance sheets for 2023 (BLE 2024c). Figures for dairy alternatives are based on GfK data from AMI 2022 and a trend extrapolation for 2023. Per-capita margarine consumption is based on Statista 2026.

of scale allow plant-based alternatives to reach price parity with animal-based products, with some even becoming cheaper than their animal-based counterparts.

In this scenario, biomass fermentation becomes more widely established and is used specifically to produce hybrid products in combination with plant-based raw materials. Precision fermentation also overcomes regulatory barriers by 2030, allowing several products to be authorised. Caseins and whey proteins produced through precision fermentation are neither classified nor labelled as genetically modified foods. At the same time, substantial investment flows into large-scale production facilities to achieve economies of scale in precision and biomass fermentation. Technological advances in fermentation and purification processes improve protein quality and yields, while more efficient fermentation and heat

recovery reduce energy demand and production costs. Particularly significant advances are expected in yoghurt and cheese alternatives. Comprehensive safety and quality studies, together with improved sensory properties, also increase consumer confidence and facilitate market penetration.

Assuming the projected regulatory and technological developments materialise, we estimate that dairy product alternatives will account for 25 percent of the market in 2035.

For the individual product segments, we estimate the following shares of total per-capita consumption of animal-based dairy products and dairy product alternatives: 30 percent for drinking milk alternatives, 30 percent for yoghurt alternatives, 15 percent for cream alternatives and 15 percent for cheese alternatives (including cream cheese). In our

scenario, most dairy product alternatives remain plant-based. Only in the yoghurt and cheese segments are products made using biomass and precision fermentation included to a limited extent.

We have incorporated trends in production costs only to a limited extent in both scenarios, as little reliable data is currently available. This also makes it difficult to break down current costs by category, for example raw materials, energy and other inputs, investment, research, infrastructure or labour. Without a clear understanding of this cost structure, the potential for scaling is difficult to assess. The development of production costs for animal-based dairy products also plays an important role, as achieving price parity or narrowing the cost gap is crucial for market penetration.

Potential impacts on German milk production

Based on the two scenarios for the market penetration of dairy product alternatives and additional expert interviews, we examined the potential impacts on agricultural milk production in Germany in 2035.

We considered two hypothetical extreme scenarios. The export compensation scenario assumes that a decline in domestic consumption of animal-based dairy products is fully offset by additional exports. While production volumes do not differ between the conservative and dynamic consumption scenarios, export volumes vary depending on the respective level of domestic consumption.

By contrast, the production reduction scenario assumes that the decline in consumption is fully reflected in domestic production. Milk production would accordingly fall by 5.5 percent in the conservative scenario and 19.4 percent in the dynamic scenario. This would have structural implications for the dairy sector. Assuming unchanged milk yields, the number of dairy cows would decline by around 200,000 to 670,000, equivalent to 5.4 to 18.0 percent of the approximately 3.71 million dairy cows in Germany in 2023.

This would correspond to a reduction of around 2,000 to 8,000 average-sized dairy farms. Less competitive farms would be particularly affected, as they would be less able to offset potential price declines resulting from lower demand. Geographically, a higher proportion of smaller and less competitive farms is located in southern Germany, meaning that the impacts would be particularly noticeable there. However, larger farms across Germany could also be affected if they are located within the catchment areas of less competitive dairies whose processing operations are scaled back or discontinued.

Overall, our findings suggest that under the dynamic scenario, structural change is likely to accelerate – even if raw milk prices remain stable due to exports. By contrast, the conservative scenario would result in only minor structural changes.

At the same time, our calculations indicate that potential developments in the market for dairy product alternatives could change the production potential and marketing channels of the German dairy sector.

If dairy processing companies – such as dairy cooperatives – diversify their business activities while making use of existing production facilities, product lines and expertise, changing demand could create new opportunities for action. For example, dairies could partially offset declining demand for animal-based dairy products by expanding their domestic business in dairy product alternatives. Maintaining dairy processing structures with a diversified portfolio of animal-based and alternative products could, in turn, help dairy farms remain in operation.

Conclusion

The scenarios and developments described in this study depend strongly on further technological developments, the authorisation of new technologies and products at EU level, policy frameworks, cost trends, consumer acceptance and societal debates on nutrition, sustainability and animal welfare.

These developments have significant implications for livestock farms, dairies and the food industry. Policymakers should shape the policy framework early on to help achieve agreed societal sustainability goals while providing planning certainty for dairy farms. This requires an early and fact-based

discussion of the factors shaping the future development of the dairy market, their potential impacts and the relevant policy framework.

With this report and the accompanying stakeholder discussions, we aim to contribute to this debate.

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Agora Agriculture develops science-based and politically feasible approaches for a sustainable food, agriculture and forestry sector. As part of the Agora Think Tanks, the organisation works independently of economic and partisan interests and aims to contribute to achieving democratically negotiated sustainability goals such as climate neutrality and biodiversity protection.

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