

The complementary role of dairy and plant foods in sustainable diets

- A prerequisite of **sustainable diets** is that they are healthy, i.e. deliver all essential nutrients and promote health.
- Through examining **nutritional properties, environmental impacts and market trends**, this document highlights how integrating both dairy and whole, plant-sourced foods can support a more inclusive and holistic approach to sustainable diets.
- **Dairy and plant-sourced foods complement each other** in creating balanced, nutritious, and sustainable diets.



Setting healthy and sustainable diets

According to WHO and FAO (1) healthy and sustainable diets should:

- Provide adequate **nutrition** and support all aspects of health and wellbeing.
- Minimize **environmental** impact.
- Be accessible and **affordable**.
- Respect **cultural** preferences and traditions.

Healthy and sustainable diets must ensure essential nutrient intake for all population groups. While predominantly plant-rich diets offer significant environmental advantages, moving too far towards them may pose challenges to reach optimal nutritional intakes of key nutrients at particular risk of deficiency. A diet cannot be considered sustainable if it fails to meet the nutritional needs of the entire population, particularly **vulnerable groups such as children, pregnant and lactating women, elderly or diseased.**



To support the public in achieving this balance, many countries provide **food-based dietary guidelines**. These serve as practical references of healthy, local diets that are nutritionally adequate, culturally acceptable, accessible and with lower climate impact, aligning with the principles of healthy and sustainable diets.

For example, the Dutch Health Centre notes that, currently, the average Dutch diet consists of approximately 60% animal-sourced foods and 40% plant-sourced foods. They suggest that a transition to a 50:50 ratio can be recommended without compromising nutrient adequacy or dietary acceptance. The current Dutch food-based dietary guidelines are already in line with this ratio. In addition, the Dutch Health Council states that it might be feasible to consume a 60% plant and 40% animal-based diet **including sufficient amounts of dairy** and fish in the diet to ensure nutritional adequacy (2).

Some other diets, such as the Planetary Health Diet by the Eat Lancet Commission¹, promote up to an **80:20 ratio** of plant vs animal protein. However, this model has been shown to be at **risk for potential deficiencies in vitamin B12, calcium, iron, and zinc** for some subpopulations, as summarized in Figure 1 (3).

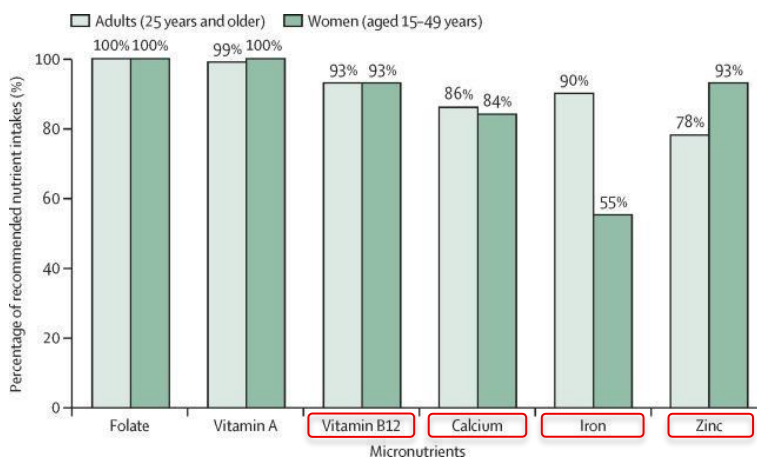


Figure 1. Percentage of recommended nutrient intakes for six micronutrients in the EAT-Lancet healthy reference diet, Beal, 2023 (11)

The nutritional value of dairy

The transition to plant-based diets is often wrongfully interpreted as the complete substitution of animal products being the solution for improving the environmental impact of diets. However, **fully substituting animal-sourced products for plant-sourced ones may seriously impact nutritional adequacy**. According to the DELTA model, a tool for investigating the nutrient availability supplied by the global food system, **dairy contributes significantly to global nutrition by providing 49% of calcium, 24% of vitamin B12, and 12% of protein** (4).



When considering **European data**, up to **60% of calcium, 38% of vitamin B12 and 24% of protein** are provided by daily consumption of dairy products (13). Milk is also an important source of other essential nutrients, including **vitamin B2, vitamin A, iodine, phosphorus, zinc and potassium**.

Unintended consequences of entirely replacing dairy

Even if certain plant-sourced products positioned as alternatives show similar technological properties (e.g. texture, taste) or consumption occasion, their nutritional composition often differs significantly and **replacing dairy entirely can lead to unintended nutrient deficiencies**.

In a scenario where there is a 30% replacement, the intake of major nutrients such as **vitamin B12**, **vitamin A** or **calcium** already starts to decrease. This shows that even fortified products that are often suggested as alternatives, do not constitute full nutritional substitutes because of lower bioavailability of certain nutrients (7, 12).

In addition, although some plant-sourced drinks and foods marketed as alternative for dairy are enriched with calcium and some vitamins, a lot of similarly marketed products are not fortified. This makes it even more difficult for consumers to find and choose plant-based products with the least trade-off on nutrition.

Not all proteins are equal

Protein is crucial for growth and maintenance of bones and muscle mass, however not all proteins are equal. More specifically, plant-sourced proteins differ nutritionally from dairy proteins. **Dairy proteins are of a higher biological quality than many plant-based proteins**, providing all essential amino acids in the amounts the human body requires. (5)

Biological value/quality

Biological value/quality is a measure that indicates whether a protein supplies all the essential amino acids that the human body cannot produce on its own, and how efficiently the digested protein can be utilized for protein synthesis in the body's cells. **Dairy protein is recognized for its high biological value, which means it provides all essential amino acids in sufficient amounts, more effectively than most of plant-sourced proteins.** (6)

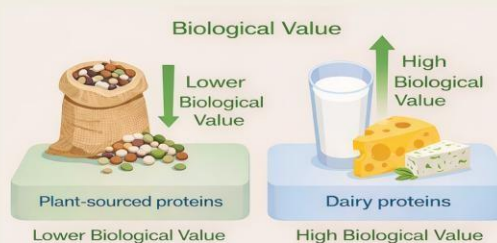


Figure 3 shows the effects on nutrient intake when dairy and meat are replaced by products that are positioned as alternatives in (Dutch) dietary guidelines.

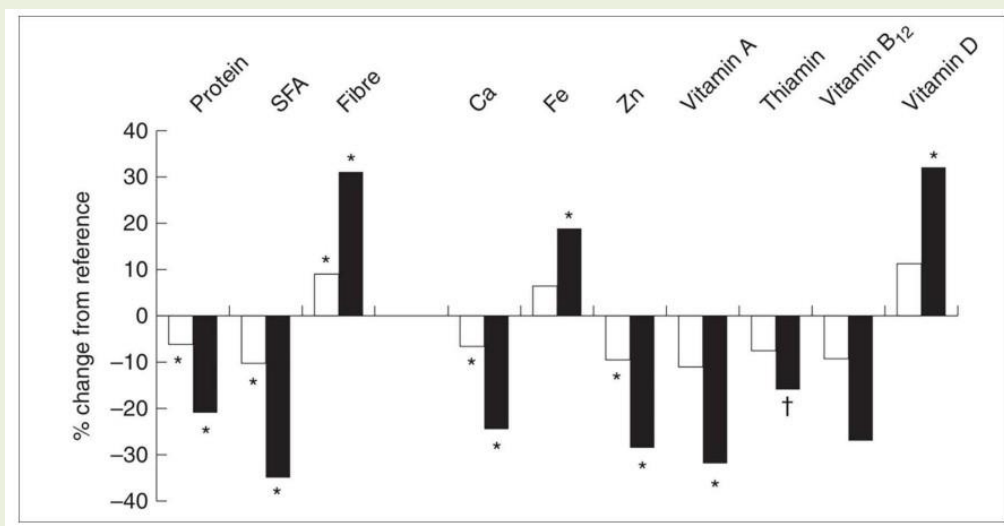


Figure 3. Percentage change in nutrient intake after replacing 30% (□) and 100% (■) dairy and meat with plant-based alternatives (7)

- **With a 30% replacement, calcium and zinc intake already decline significantly**, indicating that even moderate reductions in dairy affect nutrients for which dairy is a primary source. Other nutrients remain relatively stable, suggesting that limited replacement may be manageable but not nutritionally neutral.
- **With a 100% replacement, deficiencies become pronounced.**
 - › **Calcium** intake drops sharply and falls below recommended levels for most adults, confirming that plant-based replacements do not fully compensate for dairy.
 - › **Zinc** intake declines much further, leaving roughly one quarter of adults with inadequate intakes.
 - › **Vitamin A** intake decreases substantially, with more than half of men and women no longer meeting requirements.
 - › **Vitamin B12** intake shows a major reduction, increasing inadequacy from almost none to around one quarter of the population.
 - › **Thiamine (vitamin B2)** inadequacy also rises, particularly among women. (7)

Finally, a recent simulation study based on the French dietary survey (INCA 3) evaluated the effects of substituting animal-sourced products with plant-sourced alternatives. The results indicated that **replacing dairy products was associated with a higher risk of iodine deficiency**, highlighting the potential need for iodine fortification in these alternatives. (8)

Science indicates many beneficial health effects of dairy



Substantial evidence in the literature supports the beneficial health effects of milk and fermented milk product consumption across a wide range of outcomes. For example, a recent systematic review found that dairy consumption is not associated with an increased risk of non-communicable diseases or all-cause mortality. On the contrary, it may be associated with a moderate **risk reduction of cardiovascular disease and certain cancers**, such as bladder, breast, colorectal, liver, oral, and ovarian cancers. Additional studies have linked dairy consumption to improved body composition, **a lower risk of type 2 diabetes, and enhanced bone health**. (9)

Health effects of dairy cannot be simply extrapolated to plant-based drinks

The health impacts of plant-based beverages remain insufficiently characterized, particularly with respect to long-term outcomes. This is likely due to the substantial heterogeneity of these products, and their relatively recent emergence as widely consumed dietary items.

Even if the nutritional composition is similar due to fortification, we cannot extrapolate the scientifically proven health benefits of dairy to fortified soy-based drinks (nor vice versa) as other factors and components also play a role. This is why national authorities (e.g. in Belgium) do not systematically include fortified dairy alternatives in its guidelines.

Dairy has an optimal ratio between nutritional value and environmental impact



A predominantly animal-based diet has a higher impact on the environment when compared to a plant-based diet. However, not all types of animal foods have the same impact, and **dairy is part of the animal foods with the most optimal ratio between nutritional value and environmental impact**.

The Optimeal® model (10) helps us understand the environmental implications of dietary changes while ensuring no trade-offs in nutritional value – i.e. nutritionally adequacy is obtained. This model shows that while eliminating meat intake reduces CO2 emissions by 21%, **eliminating dairy products only leads to a maximal 7% reduction**. Furthermore, decreasing meat consumption can be compensated by dairy in a plant-based diet, whereas eliminating both meat and dairy significantly increases fruit and vegetable consumption without providing a complete range of essential nutrients, such as high-quality protein and certain vitamins and minerals. This shift is not sustainable from a health perspective, even with supplementation.

Affordability of dairy

The model also reveals that **eliminating dairy increases grocery costs by 35%**, making it less affordable and a less attractive option. Eliminating dairy does not significantly reduce CO2 emissions while having a significant impact on the **economic sustainability of the diet**.



Dairy products, with their high biological value and comprehensive nutrient profile, provide essential nutrients both in terms of quantity and quality for an accessible cost. Conversely, whole

food plant-sourced products contribute to dietary diversity, provide essential nutrients absent from animal-sourced products and vice-versa and support environmental goals. **Plant foods are (dependent on habitual dietary pattern) relevant providers of e.g. dietary fibre, vitamin C, vitamin E, vitamin B1, vitamin B6, folate and selenium, whereas dairy foods are providing e.g. high-quality protein, calcium, vitamin B2, vitamin B12, vitamin K, iodine, phosphorous and magnesium in consumers diets.**

Both plant-sourced foods and dairy food intakes are associated with lower risk of non-communicable diseases.

A balanced dietary approach like a flexitarian or lacto-vegetarian diet, combining both dairy and healthy plant-sourced whole foods, can address nutritional needs while promoting environmental and economic sustainability.



Conclusion

- By recognizing the **complementary roles of dairy and plant-sourced products**, we can create more **balanced dietary patterns** that meet nutritional needs and support environmental sustainability. Embracing the strengths of both can pave the way for a more inclusive approach to nutrition, catering to diverse consumer preferences while ensuring adequate nutrient intake.
- Sustainable diets are plant-based diet optimised with animal-sourced foods to guarantee nutrient adequacies for all populations.
- Thanks to its nutrient richness, documented health benefits, affordability, and high consumer acceptance, **dairy foods can play an important role in healthy, nutritious, sustainable plant-based diets.** Both dairy and whole, plant foods contribute to nutritional adequacy of sustainable diets, which is well reflected in national Food Based Dietary Guidelines.



Sources:

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- (13) EDA survey on contribution of dairy foods to nutrient intake in various Member States (DK, UK, DE, BE, FR, NL) - data provided by national dairy associations (2025)