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Embracing a sustainable future: plant-based dairy alternatives

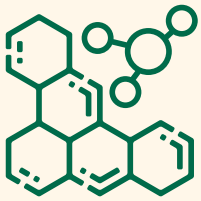
Key findings from two comprehensive 2023 scientific reviews investigating the nutrient profile and role of plant-based dairy alternatives within healthy and sustainable diets

Policy makers & health professionals

Fortified plant-based drinks and alternatives to yogurt have a role to play within healthy and sustainable national food-based dietary guidelines without compromising nutritional status

Recommendations for industry

Industry should be more aware of the nutritional needs of different population groups and adapt fortification accordingly



Advising consumers

Opt for **soya, oat** and **almond** over rice and coconut varieties

Plant-based alternatives to dairy, irrespective of protein content, will **not compromise protein status** in healthy individuals consuming a balanced and varied diet. If protein is a concern for an individual, opt for soya varieties

Unsweetened options available, but even sweetened options of plant-based drinks are in the main low in total sugars

Look at the label for **micronutrient content** – it will vary

- Calcium, vitamin D and vitamin B12 are often added to non-organic varieties
- Iodine and vitamin B2 are less frequently added

Organic varieties cannot be fortified with micronutrients due to the EU food regulation constraints. If opting for organic, ensure other food sources of critical nutrients are present in the diet. Depending on their chosen dietary pattern, supplements may or may not be required

Read the studies

Medici E, Winston CJ and Rowland I. A comprehensive analysis of the nutritional composition of plant-based drinks and yogurt alternatives in Europe. Nutrients 2023;15:3415. DOI: 10.3390/nu15153415

Craig WJ, Messina V, Rowland I, et al. Plant-based dairy alternatives contribute to a healthy and sustainable diet. Nutrients 2023;15:3393. DOI: 10.3390/nu15153393

The nutrition profile of plant-based dairy alternatives (PBDA) in Europe and their role in sustainable healthy diets

In 2023, Medici et al. conducted a comprehensive review of the nutrition profiles of the European PBDA market. Subsequently, a second study utilising the key findings from this publication, explored the role of PBDA in promoting sustainable and healthy diets.

Why the research was undertaken

There is a pressing need to transition towards plant-based diets as a means to address the existing environmental challenges and promote better human health. The increased adoption of PBDA in Europe, thanks to their reduced environmental impact, integration into dietary recommendations, and wider accessibility, has become a notable trend. With the surge in their popularity, there is a heightened emphasis on ensuring their nutritional adequacy, particularly when substituting for traditional dairy products.

This research aimed

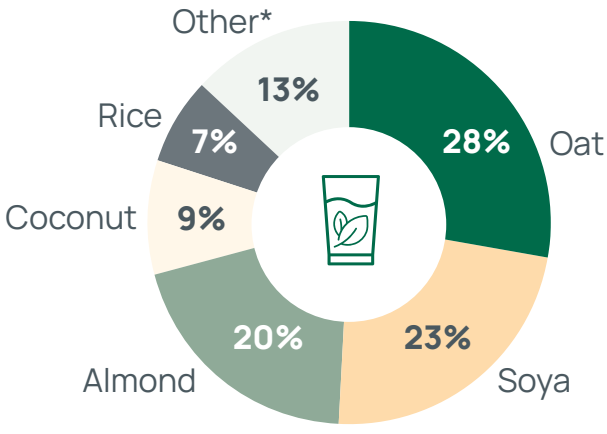
to investigate the nutritional profile of PBDA to support decision-making regarding their inclusion in sustainable food-based dietary guidelines (FBDG). As FBDG discourage the use of flavoured dairy and PBDA, the study's investigation focused on **plain, unflavoured plant-based drinks (PBD) and plant-based alternatives to yogurt (PBAY) and how they compared to their dairy counterparts.**

30 European countries

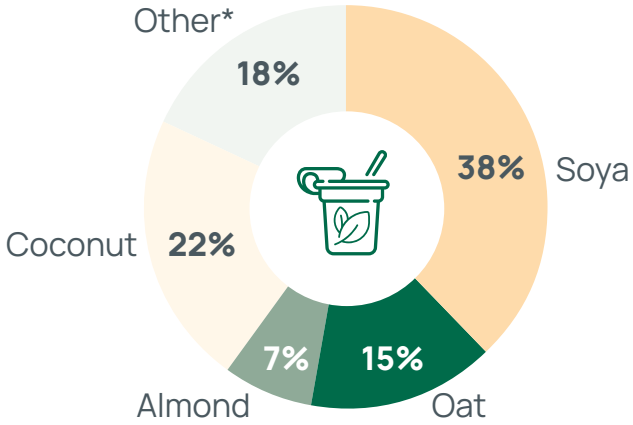
27 brands + **16** private (retailer)

309 plain unflavoured PBDA

249 PBD



60 PBAY (incl. 8 Greek-style)



* other single ingredients or a combination

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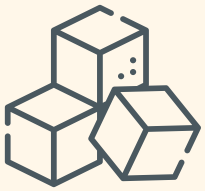
European organic food regulations prohibit the fortification of PBDA with micronutrients

35% organic

65% non-organic

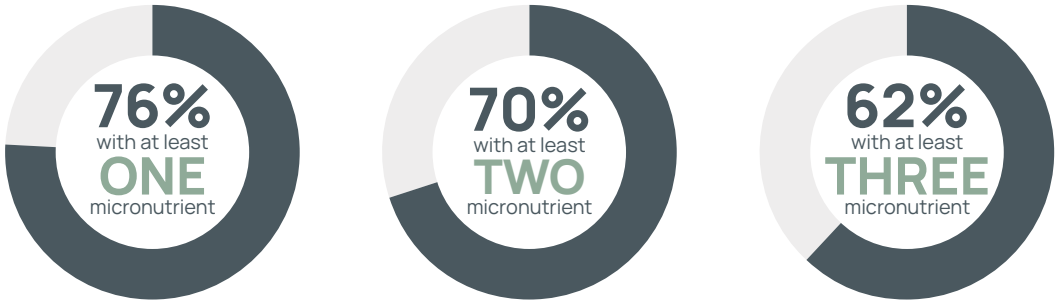
70% unsweetened

30% sweetened



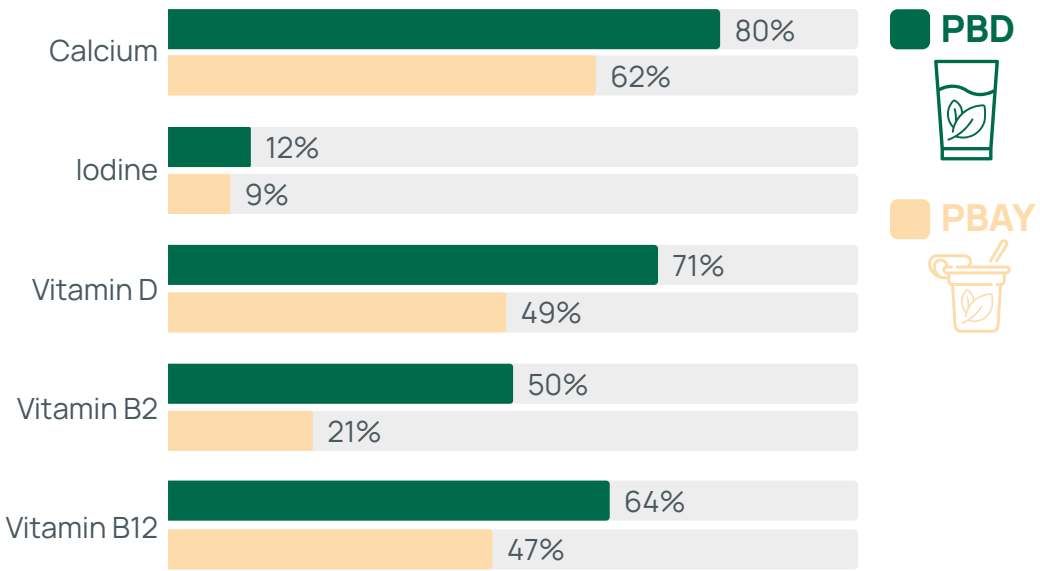
Micronutrients in non-organic varieties*

Percentage PBDA fortified



Micronutrients in non-organic PBDA

(number of products fortified in %)



* European organic food regulations do not permit fortification of organic plant-based dairy alternatives and therefore they have been excluded from our micronutrient analysis

Nutrition profile of plant-based dairy alternatives in Europe

Plant-based drinks

250ml **Median** (range) nutritional values per serving (n=249)

Saturated fat
0.5g (0-2.3g)

All varieties except coconut

Coconut at 2.8g (0.3-7.8g)

Protein
7.8g (5-9.8g) **Soya**

All other varieties 1.5g (0-5g)

Energy
98kcal (30-178kcal)

Almond drinks have the lowest cals

Total sugars
5.5g (0-17.5g)

All varieties except rice

Rice at 16g (0-22.8g)

Little difference between sweetened and unsweetened

Micronutrients in non-organic variants* (n=154)

- **Calcium 300mg** (0-463mg) — 80% fortified
- **Iodine 0µg** (0-90µg) — 12% fortified
- **Vitamin D 1.88µg** (0-3.75µg) — 71% fortified
- **Vitamin B2 0.25mg** (0-1.25mg) — 50% fortified
- **Vitamin B12 0.95µg** (0-1.73µg) — 64% fortified

Plant-based alternatives to yogurt#

150g **Median** (range) nutritional values per serving (n=60)

Saturated fat
0.6g (0.2-1.2g)

All varieties except coconut

Coconut at 7.7g (1.7-22.5g)

Protein
6.4g (5-9g) **Soya**

All other varieties 1.5g (0.6-6.8g)

Energy
117kcal

(59-260kcal)

Varied significantly

Total sugars
Unsweetened (68%):
0.8g (0-8.7g)

Sweetened: 6.8g (0.6-18.8g)

Micronutrients in non-organic variants* (n=47)

- **Calcium 180mg** (0-240mg) — 62% fortified
- **Iodine 0µg** (0-34µg) — 9% fortified
- **Vitamin D 0µg** (0-2.25µg) — 49% fortified
- **Vitamin B2 0mg** (0-0.4mg) — 21% fortified
- **Vitamin B12 0µg** (0-0.9µg) — 47% fortified

* European organic food regulations do not permit fortification of organic plant-based dairy alternatives and therefore they have been excluded from our micronutrient analysis. # including Greek-style varieties

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Nutritional adequacy of plant-based dairy alternatives (PBDA)

Energy

Energy values of plant-based drinks (PBD) were comparable to semi-skimmed milk and values for plant-based alternatives to yogurt (PBAY) (excluding coconut) were comparable to low fat yogurts.

Sugars

The majority (70%) of PBDA were unsweetened. For the majority of PBD, there was little difference in total sugars between sweetened and unsweetened varieties. PBDA's total sugars levels were comparable or lower than dairy, with the exception of rice PBD.

Saturated fat

FAT

PBDA were low in saturated fat with the exception of coconut varieties.

Protein

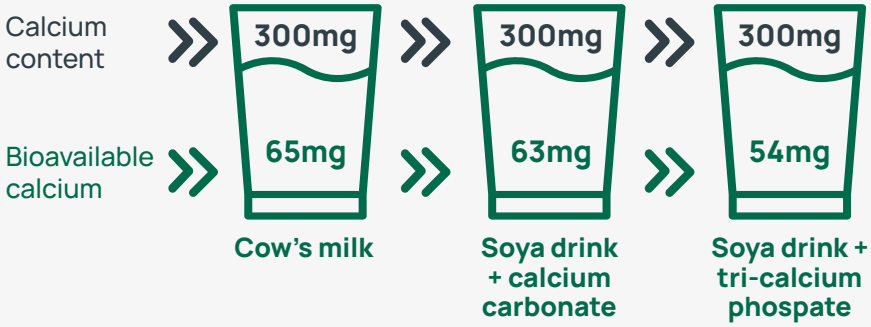
Soya and some pea protein PBDA have the same protein and amino acid profile as their dairy counterparts.

Other non-soya PBDA contain lower levels of protein and amino acids. However, it is highly improbable that this would compromise protein intakes in the context of a Western mixed diet which offers a cornucopia of protein-rich foods like beans, lentils, fish, and meat and results in general population groups consuming protein in excess.

Non-soya PBDA do not match the amino acid profile of dairy. However, **in developed countries with diverse food sources, this has little relevance to overall amino acid adequacy**, as nitrogen balance relies on amino acid intake from a variety foods eaten over the course of the day, rather than relying on a single food or meal.

Micronutrients in non-organic variants*

Calcium per 250ml serving



"Calcium from fortified plant-based drinks is typically absorbed at a rate similar to cow's milk."

Calcium is the most common fortification added to 76% of PBDA. Studies have demonstrated marginal differences in calcium bioavailability between dairy and fortified PBDA. One study found calcium bioavailability to be 21.7%, 21.1%, and 18.1% for cow's milk and soya drinks fortified with calcium carbonate or tricalcium phosphate, respectively. This translates to a minimal difference of 2–11 mg in bioavailable calcium for a 250 mL serving. Whether this difference is physiologically significant remains unclear.

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Iodine

Natural iodine-rich foods are few. Dairy is a significant iodine source in European countries where cattle fodder is fortified. For those countries, it would seem prudent for more PBDA to be fortified with iodine. Currently, few (11%) of non-organic PBDA are fortified.

Vitamin B12

A significant proportion (66%) of PBDA are fortified with vitamin B12. Unless an individual chooses to avoid all animal foods from the diet, which is not the usual PBDA consumer, vitamin B12 should not be an issue.

Vitamin D

The second most common fortification in European PBDA: 71% of PBD and half of PBAY. It's essential to note that dairy is not a natural source of vitamin D and is not commonly fortified in Europe, except for a handful of countries like Sweden, Norway, Finland, Belgium, and Spain.

Vitamin B2

Milk is a key source due to its prominence in the diet. 43% of PBDA are fortified with this vitamin. Vitamin B2 deficiency is not a concern in Europe, as a diverse and healthy diet typically provides sufficient quantities.

Other

Total fat levels were generally comparable to lower-fat dairy. Fibre levels in PBDA were relatively low, with most products containing a maximum of 2g per serving. Despite some criticism for added salt, 98% of PBDA products contained less than 0.3g per 100g/ml, similar to levels found in dairy products.

SUMMARY

Fortified PBDA can play a valuable role in the transition towards more sustainable plant-based diets and align well with current national Food Based Dietary Guidelines.

They offer a low saturated fat option (with the exception of coconut) and, in the main, have energy and total sugar levels comparable to dairy. Although non-soya PBDA have lower protein levels compared with dairy, this is unlikely to compromise status in Western population groups consuming a varied diet and currently exceeding recommended intakes.

The majority of non-organic PBDA provide bioavailable calcium comparable to dairy and many are fortified with vitamin D and vitamin B12. Enhancements can be made to address the iodine fortification gap, particularly in countries where dairy is a primary source, and to ensure more consistent fortification practices.

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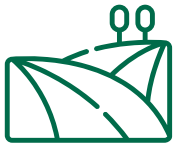
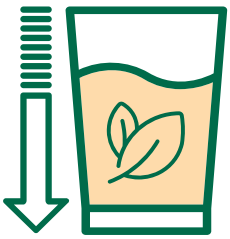
Environmental impact of plant-based drinks in Europe*

GHG emissions (kg CO_2 equiv.) per 250ml

59% to **71%** **fewer** GHG emissions

Land use (m^2) per 250ml



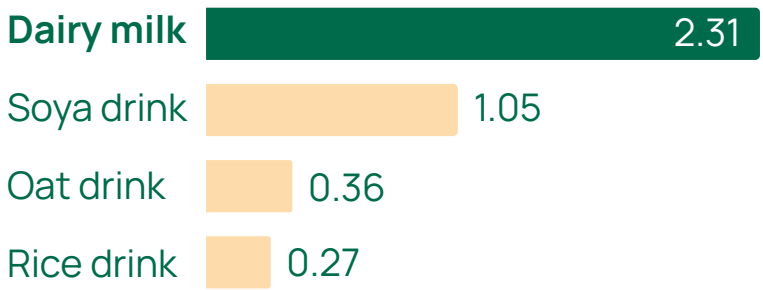


77% to **84%** **less** land needed

Water use (L) per 250ml

use **99%** **less** water

Eutrophication potential (g PO_4^{3-} equiv.) per 250ml



55% to **88%** **lower** eutrophication potential

*Source: Poore J and Nemecek T. Reducing food's environmental impacts through producers and consumers. Science 2018;360:987–992.

**Sourcing rice from producers who are adopting non-traditional paddy field practices will significantly reduce the water foot-print of rice drinks

Fortified plant-based drinks lower the environmental footprint without compromising the nutritional quality of sustainable diets

EAT Planetary Health Diet (EAT-PHD) is the reference diet for optimum health and environmental sustainability. We investigated the impact of switching the EAT-PHD dairy milk allowance with a plant-based drink (PBD) for a European population.

The comparison

1. **EAT-PHD Europe:** re-analysis of the original EAT-PHD with the 250ml daily dairy milk allowance - using European food composition datasets and comparisons to European dietary reference values (DRV)

2. **EAT-PHD with PBD:** exactly the same analysis as 1, but 250ml dairy milk is replaced with 250ml fortified soya OR oat drink (calcium, iodine and vitamins D, B2 and B12)

Neither diet met all European DRV for adults, and emphasises the EAT Commissions advice that the EAT-PHD should function as a foundational dietary framework that can be tailored to meet the nutritional and health goals of individual nations.

Replacing the EAT-PHD 250ml dairy milk allowance with 250ml fortified PBD resulted in a similar to improved nutrition profile of the diet and further reduced the environmental footprint.

Overall difference between the EAT Planetary Health Diet with 250ml dairy milk or 250ml plant-based drink

Protein: **similar** and both exceeded DRV by 150%

Saturated fat: **8-9% lower** with EAT-PHD with PBD

Salt: **similar** both providing no more than 0.7g in total

Calcium: **no difference** – both providing 729mg daily. Both EAT-PHD with dairy and with PBD need adaptation to improve levels

Total fat: **no difference**

Fibre: **similar** and both exceeding DRV

Total sugars: **little difference**

Iodine: **31% increase** with PBD (this is if an iodine PBD is used)

Riboflavin: **similar**

Vitamin D: **85% higher** with PBD. However, both diets contain insufficient amounts to prevent deficiency, highlighting lack of dietary sources in general and need for supplementation

Vitamin B12: **marginally lower** with PBD. The EAT-PHD requires European adaption to improve quantity for either diet – currently only achieve 69-73% DRV

Environmental footprint further reduced

9% switching dairy milk to soya drink

12% switching dairy milk to oat drink