

This Digest is all about #food #sustainability

Yogurt as a sustainable food: an expert's opinion and supporting evidence

This Digest is a summary based on a presentation by [Dr. Adam Drewnowski](#) at the YINI Symposium, International Congress of Dietetics, Granada, Spain, 7 September 2016.

Dr. Adam Drewnowski is Professor of Epidemiology. He also directs the Center for Public Health Nutrition at the University of Washington, including the Center for Obesity Research, which addresses the environmental, social and economic aspects of the obesity epidemic. Dr. Drewnowski is the inventor of the Nutrient Rich Foods Index, which rates individual foods based on their overall nutritional value. According to Drewnowski, it is important to understand that nutritional value is an integral component of sustainability.

Sustainable food isn't just about the environment...

There are many different views as to what constitutes a sustainable food system, and what falls within the scope of the term sustainable food.

Adam Drewnowski defines the four major domains of sustainability as health, economics, society and the environment. The guidelines for sustainable food include the nutritional value of the food plus its environmental footprint, so the notion of sustainability encompasses foods that are nutrient-rich, affordable, environmentally friendly, and provide value to society. The key is to consider a food's nutritional value, affordability and accessibility within the landscape of its impact on factors such as land use, animal welfare, labour and market conditions and economics of food supply.



Figure 1: Sustainable diets comprise a complex combination of factors.

Sustainable diets are defined as “those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations”.

“Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources”.

Figure 2: Definition developed by the FAO Biodiversity and Sustainable Diets symposium, Nov. 2010, Rome, Italy.

According to Adam Drewnowski, nutrition and health are at the core of dietary sustainability alongside impact on the environment. Further, climate change will affect the choice of foods available – and what we eat also impacts the environment. Within this, Drewnowski refers to diets that help to create more “social value”, i.e., the value of a food in society. The notion of social value incorporates more well-being and benefit for society at large. Sustainable food systems need to balance how a food impacts the environment and the need to take care of the planet on the long term, as well as the health of people.

The dilemma

Nutrition and health are integral to maintaining social well-being.

- Nutrient-rich foods tend to be more expensive, whereas foods that provide “empty calories” are usually cheaper⁽¹⁾.
- Nutrient-rich foods typically have a higher environmental impact and are consequently costlier in terms of environmental footprint^(2, 3).

Meat and dairy foods that have a high nutrient density also have higher greenhouse gas emissions (GHGEs). Yet, sugar and some grains that have low GHGEs, have fewer nutrients. The key is to identify those foods which are high in nutrient density, whilst also being sustainable and affordable.

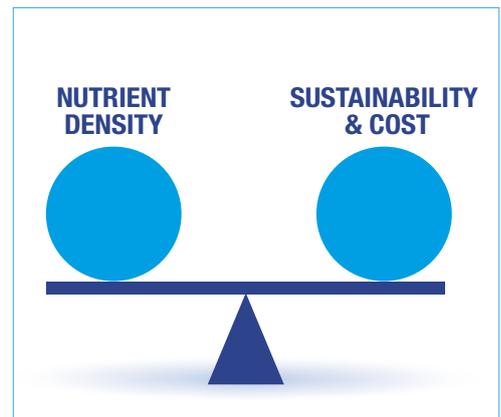


Figure 3: Sustainable well-being encompasses a delicate balance between nutritional value of a food and its impact on the environment.

Nutrient Profiling

Typically, nutrient density refers to nutrients per calorie, and they need to be differentiated from energy-dense foods that may have a high calorie content, but little or no nutrient value, often are referred to as “empty calories”. Drewnowski suggests that “energy-dense foods have more calories than nutrients, and nutrient-rich foods have more nutrients than calories.”

Most nutrient profiling methods rate foods based on their nutrient content relative to calories. One example of this is the Nutrient Rich Foods (NRF) index that calculates the amount of some key nutrients per 100 kcal of food.

As nutritional value of a food goes up, so does the carbon cost!

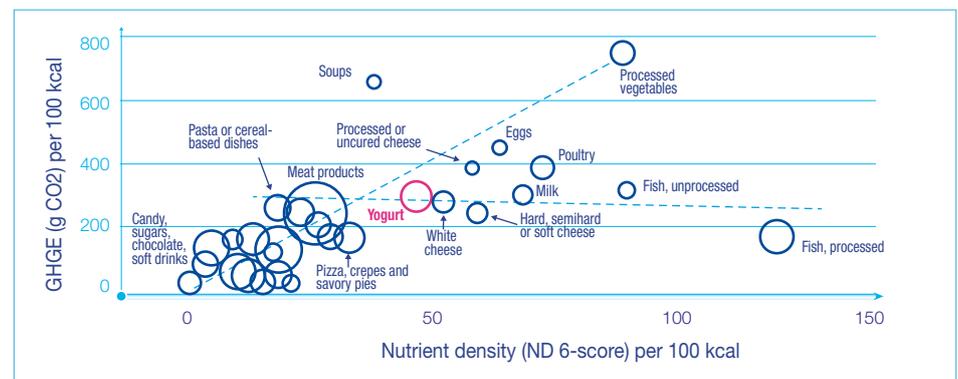


Figure 4: Nutrient density of various foods compared to their CO₂ emission, per 100 kcal (adapted from Drewnowski⁽³⁾).

ND 6-score is a marker of nutrient density that is based on the intake of six nutrients – protein, potassium, calcium, phosphorus, and vitamin D – custom created for the need of a specific study⁽³⁾. In Figure 4, the relationship between ND 6 and greenhouse gas emission is expressed per 100 kcal. A per 100 kcal basis seems to be more informative than using a 100 g basis, because physiological needs are based on calories in food and not grams of food. Comparing nutrient density of various foods to the carbon cost shows that the most nutritious foods also present the highest levels of CO₂ emission per 100 kcal.

From Turkey to Casino

An adapted nutrient profiling algorithm was created for Drewnowski's study on snacks eaten by Turkish children (NRF 6.3, see Figure 5), and a list of local foods based on their nutrient score was created^(4, 5) to separate snacks that are energy-dense from those that are nutrient-rich. Based on these calculations, foods such as **yogurt, fruit and nuts are recommended as a daily snack food for school children in Turkey.**

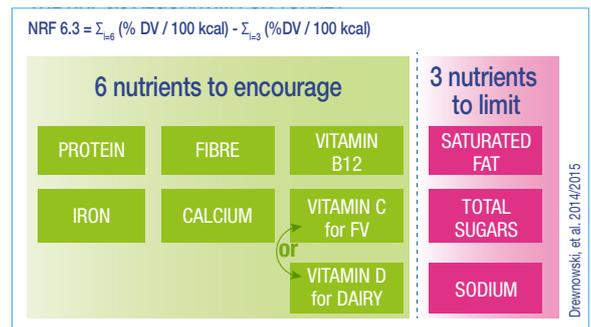


Figure 5: The NRF 6.3 Nutrient Profiling Model, focusing on six valuable nutrients to be encouraged, and three that should be limited⁽⁶⁾.

Greenhouse gas emissions can be assigned to foods. It is possible to look at a more complete picture of foods by examining their energy density, nutrient composition, and carbon cost. In 2008, the French retailer Casino, launched a food labelling initiative based on the carbon footprint of a range of its own-brand products. The Casino Project⁽³⁾ which involved a large number of French supermarkets, used GHGE and nutrient data to create carbon cost data. This allowed the researchers to assign the carbon cost in terms of GHGE per 100 kilocalories to a particular range of foods.

“There needs to be a trade-off between an environmental footprint and nutritional value”.
Drewnowski, 2016

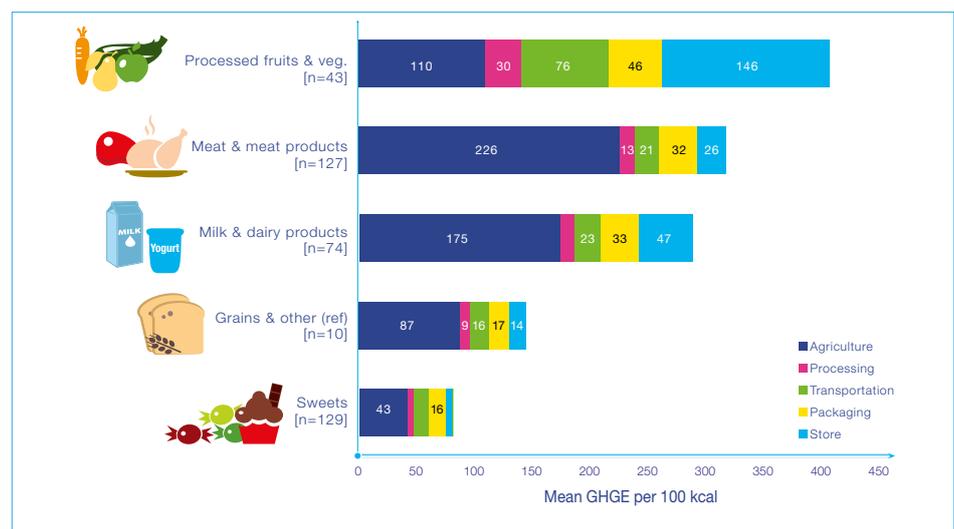


Figure 6: Carbon cost (GHGE) per 100 kcal by food category (Casino Project, adapted from⁽³⁾). “Processed” include both canned and frozen fruits & vegetables.

The carbon cost includes the greenhouse gas emissions from farming, agriculture, packaging, transport and storage in a supermarket (Figure 6). If a product needs to be refrigerated or frozen, this adds to the greenhouse gas emissions. Some products will have high agriculture and processing carbon costs, but lower in-store costs. Healthful frozen vegetables may have very high storage carbon costs, whereas sweets and sugars have a remarkably low carbon cost⁽³⁾.

The nutritional value of yogurt per calorie outweighs its carbon footprint.

Yogurt can be favorably compared with other healthy foods in terms of GHGE. As illustrated in Figure 4, its GHGE value is lower than what is predicted by its nutrient density. Paradoxically, it is sweets and sugars that have the lowest environmental impact – but they also offer the least nutritional value.

Can eating yogurt be good for our health and the health of our planet?

Dairy products, including yogurt, provide significantly more nutrients than calories relative to the body's needs and can be qualified as a **nutrient-rich** and a **low energy-dense food**. In nutrient profiling models, some of the highest nutrient density scores are awarded to unsweetened and low-saturated fat yogurts. Further, protein-rich yogurt offers **high quality proteins** and can make a good contribution to a lower meat diet.

Milk and yogurt are higher in nutrient density than sweetened beverages, sugar and sweets; but they are also higher in carbon cost. As discussed above, foods with high energy density typically have a low carbon cost, with some exceptions such as potatoes, and fortified breakfast cereals.

One of today's challenges is how we provide populations with enough sustainable protein. Fish, eggs and poultry are rich sources of protein, but they also have a higher carbon cost than vegetarian protein foods. Yogurt is high in protein and has a lower carbon cost than many other options.

Yogurt and dairy products are well positioned in terms of overall nutrient value, such as calcium and high quality proteins, and overall environmental impact.

We've established that sustainable foods need to be nutrient-rich and planet-friendly, but what about affordability? The review by Darmon and Drewnowski highlighted the importance of affordability in developing sustainable diets. Specifically, food patterns that are nutrient-rich, affordable, and culturally acceptable should be promoted to help alleviate socioeconomic disparities in diet quality⁽⁷⁾.

Less expensive sources of calories typically include sugar, cereals, pasta, nuts, beans and milk; the latter provide good nutrition at a low cost. Using NHANES data⁽⁸⁾, yogurt has a medium energy cost, and fresh salads, fruits and seafood a higher cost. Eating a healthy balanced diet appears to be in conflict with affordability, since sweets and fatty foods tend to cost less and offer lower nutrition value, while some nutrient-dense foods can be associated with higher costs. New metrics of affordable nutrition⁽⁹⁾ have also confirmed that yogurts and some other dairy products such as milk are the lowest cost sources of dietary calcium and a very affordable source of high quality protein.

One of today's challenges is how we provide populations with enough sustainable protein.

Yogurt is a low-cost nutrient dense food.

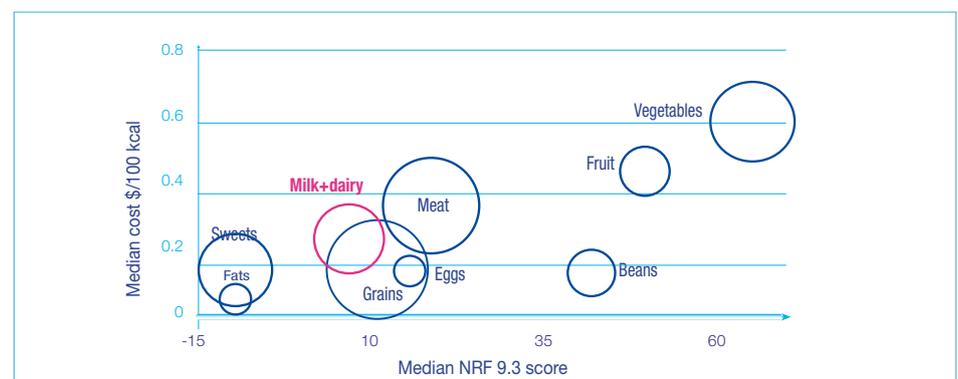


Figure 7: Relationship between nutrient density and cost per 100 kcal (adapted from⁽⁸⁾).

Similarly, analysis of nationally representative data from Mexico showed that energy-dense foods (e.g., fats and sweets) cost less per calorie than nutrient-rich foods such as dairy, vegetables, fruits and meat⁽¹⁰⁾. More, this study showed that higher dietary energy density was associated with lower diet cost.

Yogurt is a sustainable food, and it is also an integral part of a sustainable diet.

Yogurt is a sustainable food, and it is also an integral part of a sustainable diet. Macdiarmid et al⁽¹¹⁾ used diet modelling to determine whether reductions in GHGEs can be achieved while meeting dietary requirements for health. Proposed diets that incorporated dairy products (including yogurt) and meat were able to meet dietary needs whilst leading to a 36% reduction in GHGEs.

	Breakfast	Lunch	Evening meal	Snacks
Day 1	<ul style="list-style-type: none"> Whole-grain, high-fibre cereal and semi-skimmed milk White toast and jam 	<ul style="list-style-type: none"> Vegetable and lentil soup Prawn sandwich 	<ul style="list-style-type: none"> Chicken curry and rice Pita bread 	<ul style="list-style-type: none"> Fruit (berries, apple) Biscuit Milk for hot drinks 1 teaspoon
Day 2	<ul style="list-style-type: none"> Porridge Whole-meal toast and low-fat spread Fruit juice 	<ul style="list-style-type: none"> Egg salad sandwich Yogurt 	<ul style="list-style-type: none"> Chili beef and kidney bean tortillas Salad 	<ul style="list-style-type: none"> Fruit (banana, peach) Scone and jam Milk for hot drinks 1 teaspoon sugar
Day 3	<ul style="list-style-type: none"> Whole-grain, high-fibre cereal and semi-skimmed milk Whole-meal toast and low-fat spread Fruit juice 	<ul style="list-style-type: none"> Tomato and red pepper soup Whole-meal roll 	<ul style="list-style-type: none"> Salmon with cream cheese topping New potatoes, broccoli, and carrots Yogurt 	<ul style="list-style-type: none"> Fruit (pear, grapes) biscuit Small packet of crisps Milk for hot drinks 1 teaspoon sugar

Figure 8: Examples of healthy and sustainable menus (adapted from⁽¹¹⁾).

Nutrient-rich foods like vegetables, fruit, poultry, fish, seafood and fresh meat are more expensive, while milk and yogurt are cheaper, and foods like rice and sugar are cheaper still. It seems that at some point as you go towards a lower cost, you start to lose nutritional value. It's all about compromises!

The Double Pyramid

The key to sustainable eating is to identify which foods are nutrient-dense, affordable and planet-friendly (have a low environmental impact).

The Double Pyramid model by the Barilla Center for Food and Nutrition Foundation helps to depict how eating a nutritious diet can also be environmentally friendly (Figure 9).

The Food Pyramid dovetails with the Mediterranean diet: large amounts of fruit and vegetables, followed by cereals such as pasta, and pulses. Next come unsaturated oils, then dairy such as yogurt. The top of the pyramid comprises foods such as cheese, lean meats, fish, eggs, with the very top depicting sugar-rich foods that we are recommended to eat less, like cakes and biscuits.

The Environmental Pyramid depicts foods ranked by their ecological footprint; foods with a low environmental impact should be chosen more often than those with a greater environmental footprint. This Pyramid suggests that a vegetarian menu has a lower environmental impact compared to that of a menu rich in meat. **Milk and yogurt are in the lower part of both Food Pyramids.**

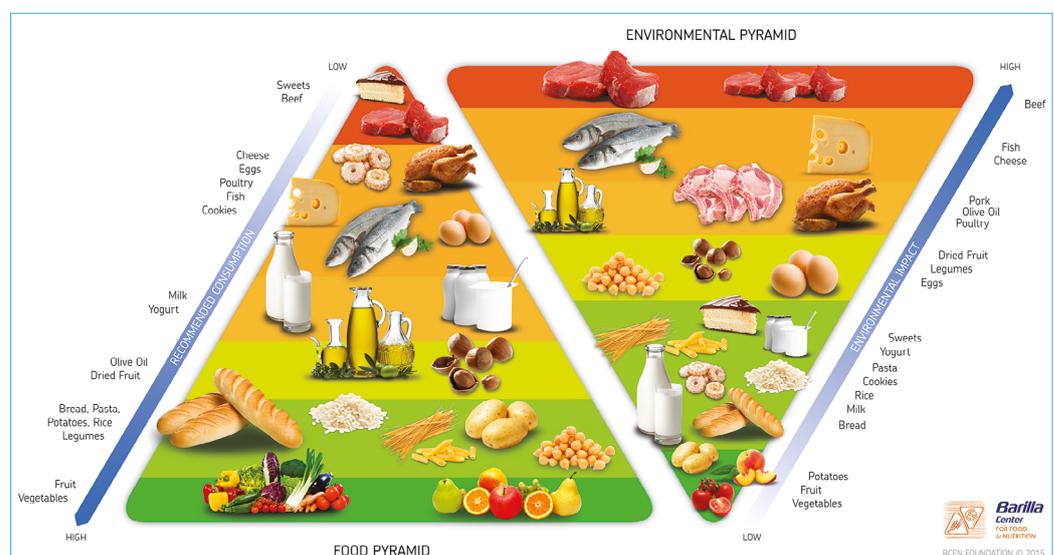


Figure 9: The Double Pyramid model (Source: BCFN Foundation, 2015).

IN CONCLUSION...

The protein and calcium content of yogurt, considered together with its low carbon footprint, mean that yogurt is indeed a sustainable food.

Yogurt is an integral part of a varied diet. Yogurt consumers appear to have more adequate nutrient intakes, and they tend to make other healthier food choices. Yogurt consumption is also linked to other healthy lifestyle habits. It also has a low carbon footprint, whilst supplying quality proteins and minerals such as calcium. It can thus be an affordable, environmentally friendly part of nutrient-rich sustainable diets.

- Digest 1: [What added value does yogurt bring to dairy protein?](http://www.yogurtinnutrition.com/added-value-yogurt-bring-dairy-protein/)
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