

'Make sure consumer diets don't become more unhealthy due to sustainability concerns'

How do you make an optimal food product that is affordable, sustainable and high quality? This question is central to the work of Dr. Peter de Jong, Van Hall Larenstein University of Applied Sciences. With his expertise and experience in modeling, de Jong can calculate the ecological footprints of foods. This has led to some surprising insights.

TEXT STEPHAN PETERS (DUTCH DAIRY ASSOCIATION, THE HAGUE) PHOTO MICHEL CAMPFENS

Can you tell us more about your background and expertise?
“Calculating processes – or modeling – is the common thread in my career. I started right after finishing my degree in chemical engineering. Initially, modeling aimed to reduce costs in production processes without compromising food quality or safety. Thirty years ago, cost control and process safety in a factory were the most important factors in food production. Sustainability came later. With my team, I have brought my modeling expertise to factories and production sites around the world. Looking at factories for these calculations helps us stay close to the actual processes. These days, we not only look at factory processes, but also at the entire food chain, from farm to consumer.”

Health and sustainability have become increasingly important in your work as process technologist. How do you feel about this?

“For me, the extent to which a product benefits consumer health is an important part of product quality. Take the development of baby food. For years, companies focused on the formulation and microbiological safety of baby food. So what was in it. But the ingredients in a product say nothing about the bioavailability of those ingredients once consumed. More and more we are finding that the bioavailability of foods is also determined by how those

foods are processed. This is of course extremely important to our work. In our computer models, we can incorporate all of these health aspects, including sustainability. This allows us to design the optimal process for making a healthy and sustainable food at relatively low costs and minimal levels of energy intensity.”

Can you also compare foods on sustainability indicators, like carbon footprint?

“Of course. We're seeing, for example, that companies are trying to differentiate themselves on CO₂ emissions per kilogram of product. But the significance of this indicator is very limited, because the value of a food is largely determined by the nutrients it contains. This indicator takes no account of this. Mineral water, for example, can have a low CO₂ emissions level, but you can't live on it. There are no or hardly any nutrients in it. That's why there's no point to comparing the CO₂ emissions per kilogram of a soft drink to that of milk. Or of bananas to meat.”

In reality, though, foods are being compared to each other based on CO₂ emissions per kilogram of product. Why is that, and why is this wrong?

“We've only been looking at the ecological effects of our food for about 15 years. This forms the basis for LCA (life-cycle assessment) calculations of foods. The LCA methodology can calculate the sustainability indicators of >



‘There’s no point to comparing the CO₂ emissions per kilogram of a soft drink to that of milk’

Dr. Peter de Jong

1983-1987 Graduated in Chemical Engineering, The Hague University of Applied Sciences

1987 - present Principle Scientist Food Processing, NIZO Food Research, Ede

1996 PhD in interaction between protein denaturation and equipment contamination, TU Delft

2012 - present Program Director, Institute for Sustainable Process Technology

2014 - present Lecturer in dairy process technology, Hogeschool Van Hall Larenstein, Leeuwarden

food production, such as CO₂ emissions, land use or water use. Based on LCAs, a sum can be made of the so-called CO₂ footprint of a product in all phases of the production chain. This results in the ecological footprint, which is expressed in terms of CO₂ emissions per kilogram of product. From this – generally speaking, because there

are multiple exceptions – it appears that animal products have a higher CO₂ footprint than products made from plants. As a result, it is often assumed that a diet with fewer products from animals and more products from plants means a lower CO₂ footprint, which is good for the planet. This could be true for a specific type of diet. But you simply cannot compare products like this. I’ve mentioned the example of soft drinks and milk. If you want to compare products on their sustainability, then you also have to account for quality and health effects. This is not happening enough right now. And there’s another complication here: not all of the LCA calculations are of the same quality. There are many intrinsic assumptions that are difficult to trace back.”

Interview Dr. Peter de Jong

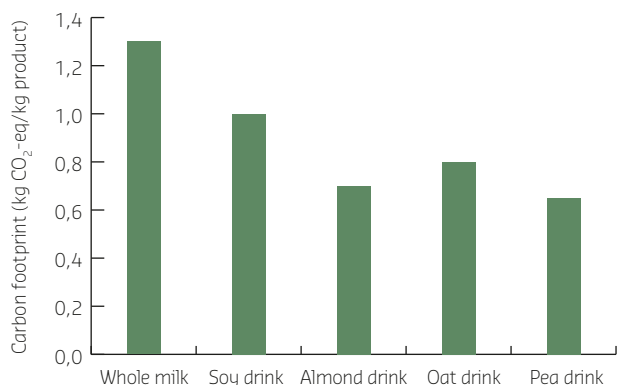


Figure 1. CO₂ footprint per kg product of various foods

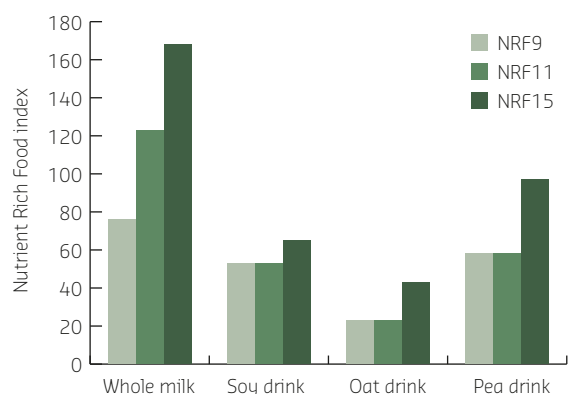


Figure 2. Nutrient density (Nutrient Rich Food index score) of various foods

NRF9: protein, fiber, vitamin A, C and E, calcium, iron, magnesium, potassium
 NRF11: protein, fiber, vitamin A, B12, C and E, calcium, iron, magnesium, potassium, zinc
 NRF15: protein, fiber, vitamin A, B1, B2, B12, C, D and E, calcium, iron, magnesium, potassium, zinc, unsaturated fats, folic acid.

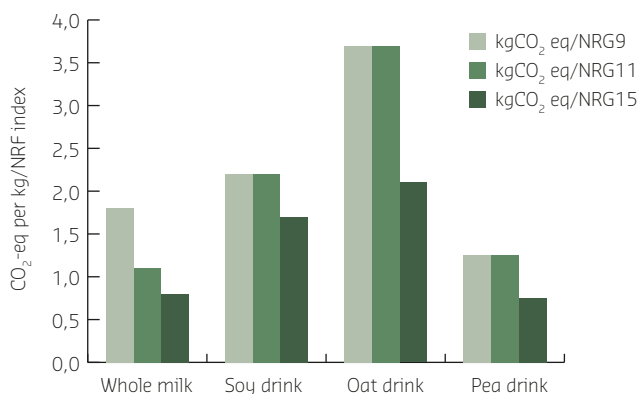


Figure 3. CO₂ emissions of foods in relation to Nutrient Rich Food scores

Why are there such differences in the quality of LCAs?

“The discussions around the sustainability aspects of food started with CO₂ emissions. Later, other aspects were added, such as land use and the emission of phosphate and nitrogen. Notably, the issue has been oversimplified by the media. We see ‘plant proteins are great’ and ‘animal proteins: time to get rid of them’. When I hear these things, I think: let’s do the math. What data was used and what assumptions were made? When you dig into the LCA data, several things stand out. If you look at dairy products, you see that the dairy chain has closely mapped out the impact of dairy production from beginning to end. Accurate LCA calculations can be made with this data. But such detailed LCA reports don’t exist for dairy substitutes, or are not as readily available. Secondly, we often only see the positive aspects of plant-based alternatives in the media and popular science articles. And because we lack good LCA reports on these plant-based alternatives, we are left with Google. For the CO₂ footprints of say oat drink, Google will take you to the websites of environmental organizations and vegetarian or vegan food producers. In their messaging, they are always going to use favorable data on plant products and negative data on animal products. On the internet, you’ll find LCA data on plant products compared to absurdly high CO₂ values for milk products. Such high numbers may come out of regions like Africa, but not from Europe or the United States which have the most efficient dairy production sectors. That could make a two or three-factor difference! Not to mention that the situation in Africa is entirely different. The LCA values are higher there than in Europe, but the dairy chain in Africa is set up in such a different way, and there are other interests that come into play. There, a cow supplies milk, but also functions as a tractor and it can be a financial buffer if needed.”

You say that LCAs are used in the wrong way. Why aren’t LCAs enough for comparing products?

LCA results are usually expressed in terms of CO₂ emissions per kilogram of product. This is fine if you want to make production chains more efficient, for example. It will show you if the measures you have taken have had an effect on CO₂ emissions. But for years, CO₂ emissions per kilogram of product have become a kind of basis for comparing foods to each other. That soft drinks or broccoli have a lower CO₂ footprint than respectively semi-skimmed milk or eggs does not mean that you should replace milk with soft drinks or eggs with broccoli. Policy is being made right now based on the LCA per kilogram comparison. But the discussion around fewer animal products and more plant-based diets requires nuance. You can’t look at just food footprint. If you want to make diets more ecologically friendly, then you should do this in a healthy way. There’s no scarcity of kilograms of calories in the world, but we don’t have enough nutrients like proteins. This is also true in the



Dutch context. In the west, we tend to eat too much protein, but vulnerable populations like the elderly don't get enough. The protein problem is even more pronounced in the global context. UN data indicates that every year, we need to produce 3 million more tons of protein in order to meet the global need. In making our diets more sustainable, it should be about the quality of our food, not the quantity. This is why we should find another indicator besides CO₂ emissions per kilogram of product to express the ecological footprint of foods. This indicator should account for a food's nutrients and health benefits. This is the only way to gain better insight into which foods or combinations can be substituted for a more sustainable diet."

Which indicators should we use to determine our footprint?

"Lots of indicators can be used. I am currently working on a scientific paper on it. Comparisons based on a single nutrient like protein are too limited. You can't base a healthy diet on protein alone. We need a combination of many different nutrients to stay healthy. By quantifying the most important nutrients in a product, you can attain a new ecological footprint. The so-called Nutrient Rich Food (NRF) scores are one example. A product's contribution to the daily requirements of the consumer can be calculated based on a summation of the nutritional benefits of that product. Products with a high NRF score have a lot of added value for our health. This also means that for products with low NRF scores, we have to eat more of them, which often means more unwanted calories and a higher footprint. By using the NRF scores in the ecological footprint of foods, you can connect ecological footprint to a product's health benefits. This sometimes provides a different picture than you would expect from the ecological footprint per kilogram."

"The rationale here is maybe best illustrated in figures 1, 2 and 3. Figure 1 is the 'old' way of comparing products based on CO₂ per kilogram of product. You see that compared to plant-based drinks, milk has a higher CO₂ footprint. This perspective changes when you account for a food's nutritional value and thus its health benefits. Figures 2 and 3 show the NRF scores for milk and plant-based substitutes. When you combine the ecological footprint with the NRF scores, these plant-based substitutes show a less positive picture. Of course there are many nuances here, but this makes clear that nutritional value and (micro)nutrients have to be included when comparing products in terms of sustainability."

The world of food is under considerable pressure right now, and concrete plans are being made to combat climate change. What's your view on this?

"There are more and more publications in scientific literature that do look at the number of nutrients in a food and their

'When it comes to sustainability, nutritional value and the nutrients themselves must be included in product comparisons!'

digestibility. This is a positive development, because a nutrient's digestibility is an important factor. Plant proteins are often less digestible than milk proteins. So you have to consume more to reach the same levels in your body. This of course has consequences for the footprint. Another concern in the research continues to be the LCA data. Ideally, a research team would conduct LCAs of all relevant products using the same method and at the same level of detail. This way we would have LCAs of the same quality. Thankfully someone has made a start here. Blonk Consultants in the Netherlands is doing good work in this area. But it is a labor-intensive task. I hope that politicians and policymakers will be aware of these complexities before affectuating policies towards plant-based alternatives on false grounds. Because when it comes to sustainability policies for our food, the health of the consumer must be guaranteed. This means that we have to stop using the indicator 'per kilogram of product' for the ecological footprint, and replace it with an indicator that accounts for a food's nutritional value and health benefits. This way, you make sure that consumer diets don't become more unhealthy due to sustainability concerns, even though the intentions are good."

Some grocery stores are thinking about working with eco scores, which would mean including the CO₂ emissions per kilogram on food packaging. What do you think of this?

"This would be unwanted at this moment. Product labels should provide good information to consumers. Not confuse or mislead them. Food labels already include a lot of information. You may wonder to what extent even more information would help the consumer. And if you want to provide an eco score, then you should always do this in relation to the nutrients in the product. In fact, that's the main reason why a consumer buys a food: in terms of how much it benefits their health. Only the second question would be: has it been sustainably produced? In that order."

