Environmental impact of dairy substitution

Blonk Consultants, 2015

optimeal
defining sustainable nutrition

Little or no environmental benefit can be gained by replacing dairy products with non-dairy foods in the diet of adult men and women. This is the conclusion of an analysis using the Optimeal® optimisation program. The analysis shows that as a source of nutrients dairy products are just as environmentally efficient as the package of products needed to replace them. The outcome for meat is significantly different.

Introduction

Food production and consumption accounts for 20–30%[1] of global emissions of greenhouse gases. About 14.5%[2] of global emissions can be attributed to animal products.

Another important environmental factor in food production is land use, as fertile agricultural land is scarce. Of the 5,000 million hectares of land in agricultural use – about 38% of the global land surface – almost 70% is grassland or pasture for grazing livestock.[3]

Changing dietary patterns can make a considerable contribution to reducing greenhouse gas emissions and agricultural land use. Of course, the new diets must also provide sufficient energy and nutrients. This means that the key to devising healthy and more sustainable diets is getting the right balance between nutritional value and environmental impact. This can be determined quickly and accurately using Optimeal®,[4,5] an optimisation program developed by Blonk Consultants and the Netherlands Nutrition Centre.

In this fact sheet we show how dairy products perform in terms of their nutritional value and environmental impact. We then compare this with meat. We look at the full range of nutrients supplied by dairy and meat products, as far as these are covered by Dutch standards.

Method

An average Dutch diet was entered into Optimeal®. Then, step by step, dairy products were added to or removed from this diet to produce diets with a range of from 0% to 300% of the current intake of dairy products. As the amount of dairy products was reduced, other foods were added to provide the missing nutrients. Optimeal® chooses a package of substitutes that requires the least possible change in diet while meeting all the standards for energy and macro- and micronutrients, which are boundary conditions in the model. Conversely, as dairy products are added to the diet, they replace other products.

The same procedure was followed for meat in the diet.

The starting point was an average Dutch diet based on the Dutch Food Consumption Survey (VCP) 2007–2010 for men and women between 31 and 50 years old.

Optimeal® uses the quadratic programming optimisation technique to ensure that the altered diets remain as close to the current diet as possible. During the process the program keeps track of trends in two environmental indicators: greenhouse gas emissions and land use.

The model contains information on the nutritional value and environmental impact of 208 products from the Dutch Food Composition Database (NEVO) selected on the basis of their weight fraction in the Dutch diet, with the addition of some pulses, meat substitutes and soy drinks. The environmental impacts were determined by carrying out a life cycle analysis (LCA) to calculate the greenhouse gas emissions and area of agricultural land used during the whole life cycle (cradle to grave) of each product.

Results and Discussion

The current consumption of milk products and cheese formed the benchmark and these values were set at 100%. Figure 1 shows the changes in the amounts of other product groups in the diet as the amounts of milk products and cheese are varied from 0% to 300% of those in the current diet. In all cases the diets consist of an optimised package of foods that meet all nutritional standards and remain as close as possible to the composition of the current diet.

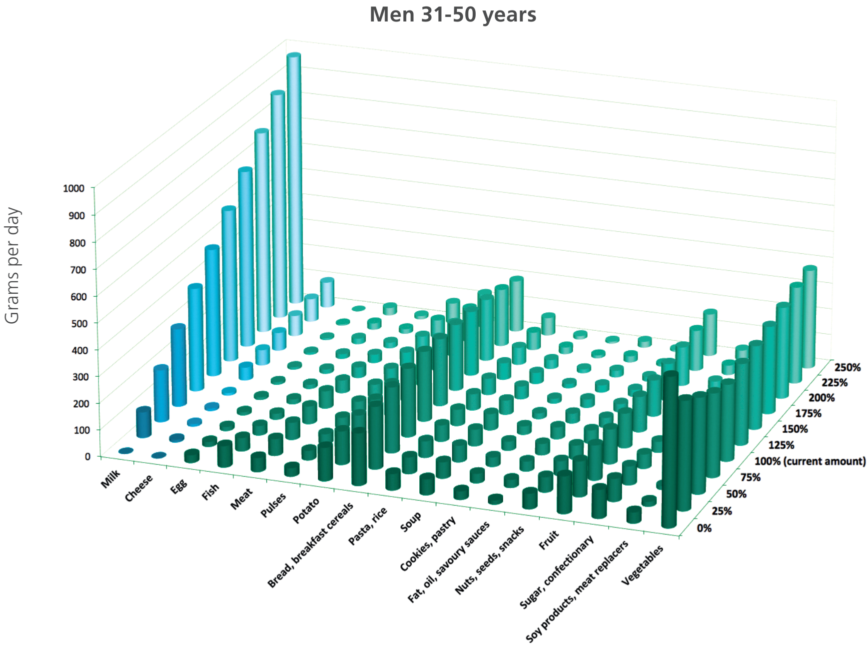

Figure 1 *Changes in composition of the diet as the amounts of cheese and milk products are varied. Drinks are not included*

As the amounts of cheese and milk products are reduced, both are replaced by other products, including vegetables, nuts, soy drinks, eggs and fish. These alternative products provide nutrients such as calcium, zinc, phosphorus, potassium, B2 and B12 as well as the energy that would otherwise be supplied by the dairy products.

As the amounts of dairy products are increased, the amounts of meat, eggs and nuts are reduced and the amounts of pulses, vegetables and fruit are increased. An important reason for reducing meat in the diet is the saturated fat content, for which an upper limit of 10 energy per cent was set.

Combining the amounts of products in Figure 1 with their environmental impact makes it possible to track the environmental impact of the menu and derive the relationship between the source of nutrients and environmental impact.

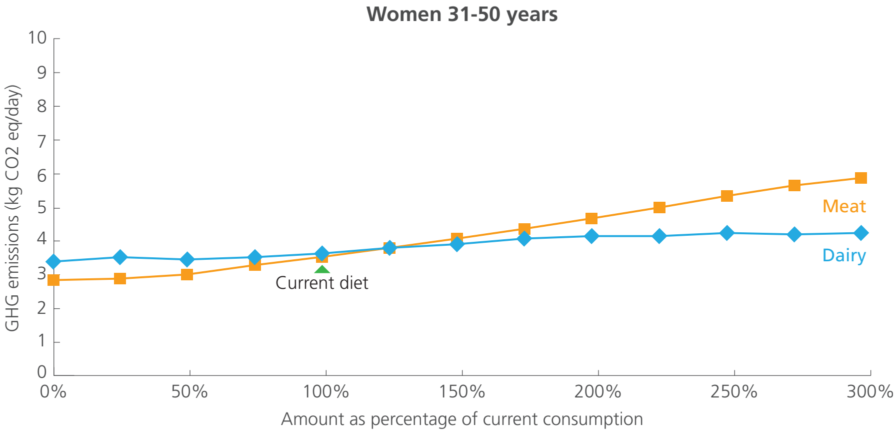

Figure 2 *Trends in greenhouse gas (GHG) emissions from the whole diet for increasing amounts of dairy products and meat. The reference is the current diet (green triangle).*

Figures 2 and 3 show the trends in this relationship measured by the environmental indicator greenhouse gas emissions. As the amounts of dairy products increase, the line remains more or less horizontal, for both men and women. This indicates that replacing dairy products with alternative products is almost neutral in terms of the greenhouse gas effect.

For meat, the line rises as the meat content of the diet increases, more steeply for men than for women. This clearly shows that the relationship between the nutritional input and environmental impact of meat is unfavourable.

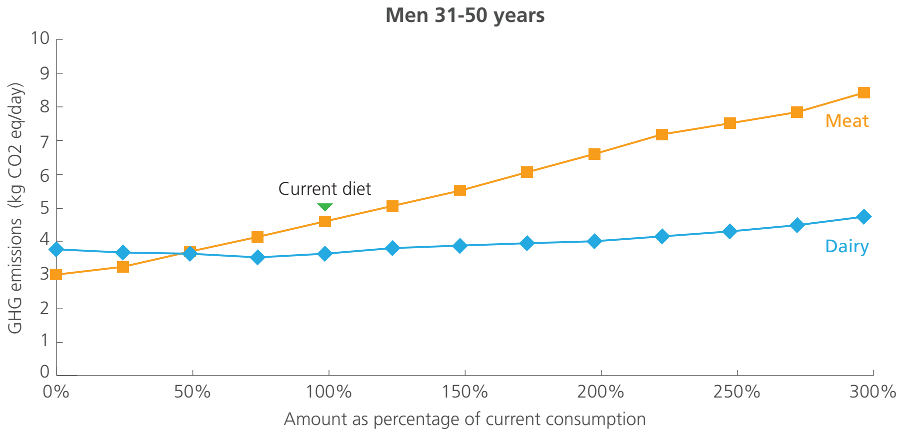

Figure 3 *Trends in greenhouse gas (GHG) emissions from the whole diet for increasing amounts of dairy products and meat. The reference is the current diet (green triangle)*

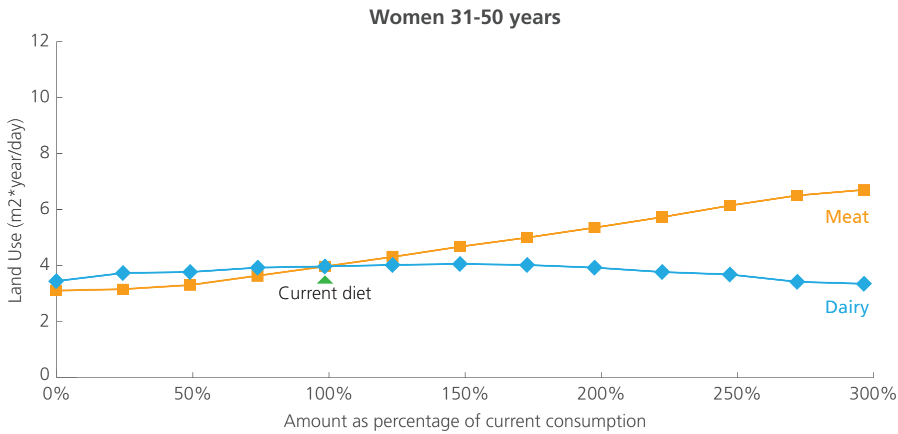

Figure 4 *Trends in land use for the whole diet. Women, 31–50 years old.*

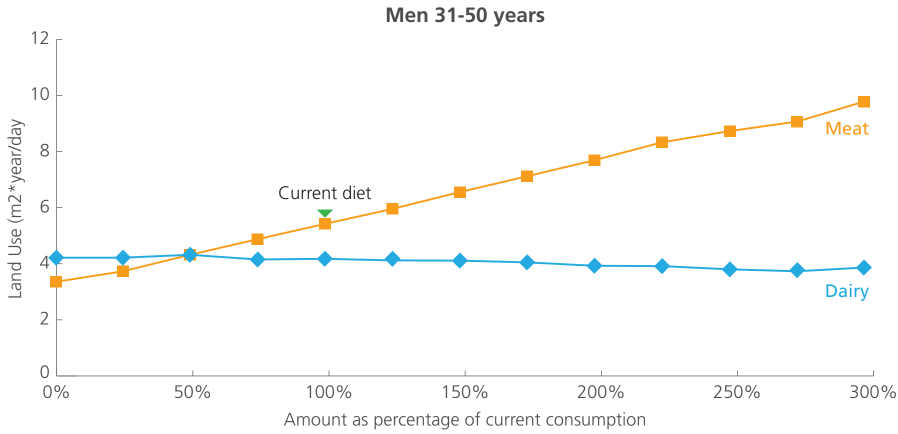

Figure 5 *Trends in land use for the whole diet. Men, 31–50 years old.*

The results for land use show a similar picture (Figures 4 and 5).

As the amount of dairy products in the diet increases, land use shifts from arable land to more grassland. Given the scarcity of fertile arable land, this is a favourable trend.

Conclusions

When all the relevant nutrients are taken into account and the dietary pattern is kept as close as possible to the current dietary pattern in the Netherlands, replacing dairy products with alternative foods delivers little or no environmental benefit.

The relationship between nutritional value and the environmental indicators greenhouse gas effect and land use for dairy products is virtually neutral: in other words, as a source of useful nutrients dairy products are just as environmentally efficient as the products used to replace them.

Future guidelines for a more sustainable dietary pattern should take the different profiles of dairy products and meat into account.

References

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More information

Blonk Consultants
Meike van de Wouw
Telephone: +31 182 579 970
Email: meike@blonkconsultants.nl
www.blonkconsultants.nl

Dutch Dairy Association (Nederlandse Zuivel Organisatie, NZO)
Stephan Peters
Telephone: +31 6 4609 6196
Email: peters@nzo.nl
www.nzo.nl