

Environmentally friendly food consumption: What does this mean?

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Abstract Nutrition accounts for about 30% of environmental impacts caused due to the final consumption of Swiss households. It is thus the most important activity from an environmental point of view. We investigated possibilities for reducing the environmental impacts due to food consumption in dozens of LCA case studies during the past 15 years. This presentation summarizes the main findings and outlines the open research questions. It is shown that most important improvements can be expected on the level of diets. More research is considered to be necessary on the environmental impacts of different types of meals considering also ready-made and catering services. Knowledge gaps exist also concerning the impacts of open markets while considering the regional differences in agricultural production patterns. These findings also have to be taken into account while developing approaches for environmental information for products.

Keywords: environmental impact, food consumption, levels of decision-making, diets

1 Goal and scope

Nutrition accounts for about 30% of environmental impacts caused due to the final consumption of Swiss households. It is thus the most important activity from an environmental point of view. We investigated possibilities for reducing the environmental impacts due to food consumption in dozens of LCA case studies during the past 15 years.

The LCI database of ESU-services covers thousands of life cycle inventories of all types of products and services. The inventories of food consumption are partly based on a Ph.D. thesis, which investigated purchases of meat and vegetables [1, 2]. The data have been transformed into the EcoSpold Format and are now linked to ecoinvent data v2.2 as background data [3]. Further data have been investigated

in several projects (e.g. [4-19]). Our food database covers for instance the following types of products:

- Simplified agricultural production services: application of fertilizers
- Vegetables: spinach, salad, tomatoes, lettuce, potatoes, onions, asparagus, etc.
- Fruits: apples, strawberries, cherries, grapes, oranges, vine
- Meat products: pork, veal, beef, lamb, poultry, tofu
- Fish products
- Dairy products: butter, milk, milk powder, yoghurt, cheese
- Drinks: apple & orange juice, mineral water, tap water, beer, wine, milk, coffee, tea, cow and soy milk
- Sweets: chocolate, ice cream, quark cake
- Meals: roast, comparison of domestic vs. imported, ready-made lasagne, canteen meals, goulash soup
- Household appliances: cooking stoves and ovens, microwaves, refrigerators, carbonisation devices, coffee machine
- Food consumption: packages, transports, cooking, consumption patterns
- Pet food: cat food

Up to now more than 800 unit process raw data for food production, processing and consumption have been elaborated. Most data are valid for Switzerland and are investigated between 1996 and today. The data are mainly based on literature information. Detailed information about the products covered can be found in the full list on the internet.¹

This presentation summarizes the main findings and outlines the open research questions.

2 Consumer choices

Consumers can aim to reduce the environmental impacts on different levels of decision making [1]. These range from choice of packages for a product, preference for certain labels, choice on ingredients for a meal, vegetarian diets to general consideration concerning household budgets. For an evaluation of environmental impacts it is necessary to consider a range of environmental impacts and not focus on carbon footprint alone. It is shown that most important

¹ http://www.esu-services.ch/fileadmin/Images/projects/ESU_LCI_database.xls

improvements can be expected on the level of diets. Nevertheless there are also constraints that have to be considered while communicating such results to consumers.

3 Results of LCA case studies for different levels of decision-making

Nutrition causes about 12% of total energy demand and 18% of greenhouse gas emissions due to Swiss consumption patterns (Fig. 1). If all types of environmental impacts are included in the analysis this share rises to about 30% [20]. This is due to specific environmental impacts caused by agricultural practice such as pesticide use, heavy metal emissions from fertilizers, land and water use as well as problems caused by acidification and nitrification.

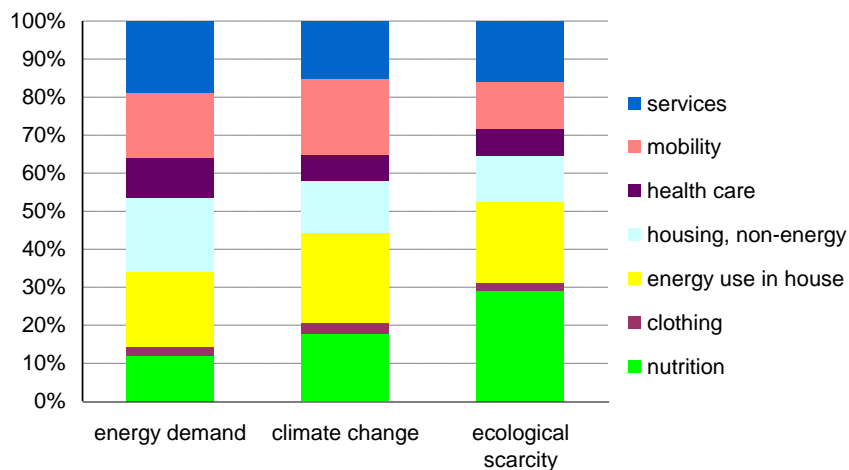


Fig. 1: Importance of nutrition in total consumption [20]

The main part of the environmental impact arises from the agricultural production of meat (Fig. 2).

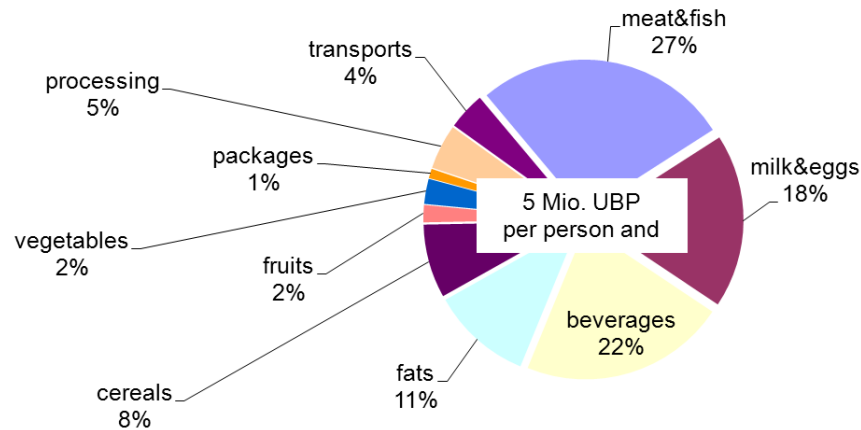


Fig. 2: Importance of product groups in total impacts of nutrition

A vegetarian diet is therefore seen as an instrument to reduce the environmental impact and greenhouse gas emissions from food consumption. The comparison of meat products with vegetarian alternatives however is complicated because vegetable or other products cannot always one-to-one substitute meat.

In order to overcome this obstacle, we assessed the environmental impact of 10 different choices of meat based and vegetarian canteen meals [18]. The meals represent both composed meals with main and side dishes as well as and one-pot dishes. Canteen kitchens of hospitals, retirement homes and other public institutions of the city of Zurich, Switzerland, provided the recipes for these meals.

The impact assessment has been carried out for greenhouse gas emissions [21] and for environmental impacts based on the ecological scarcity method 2006 [22]. Meat based meals cause an average global warming potential of 3 kg CO₂-equivalents per serving, whereas the supply of a vegetarian meals emits 0.9 kg CO₂-equivalents (see Fig. 3). The difference mainly arises from the high environmental impact due to meat production. Only a small amount of greenhouse gas emissions can be attributed to the side dishes. On the other hand, the evaluation of the global warming potential of the individual meat based meals reveals a high variance of greenhouse gas emissions from meat production. Meals based on beef or veal cause relatively high emissions in comparison to the use of pork or poultry. Consequently, beef or veal meals reach a global warming potential of more than 4 kg CO₂-equivalents. Meals containing poultry or pork range from 1.5 to 2 kg CO₂-equivalents.

Similarly, the vegetarian meals show some differences within their category. Risotto or lasagne cause less than 1 kg of greenhouse gas emissions. Spaetzle and

the vegetarian alternative of veal in cream, tofu in cream, range between 1 and 1.5 CO₂-equivalents.

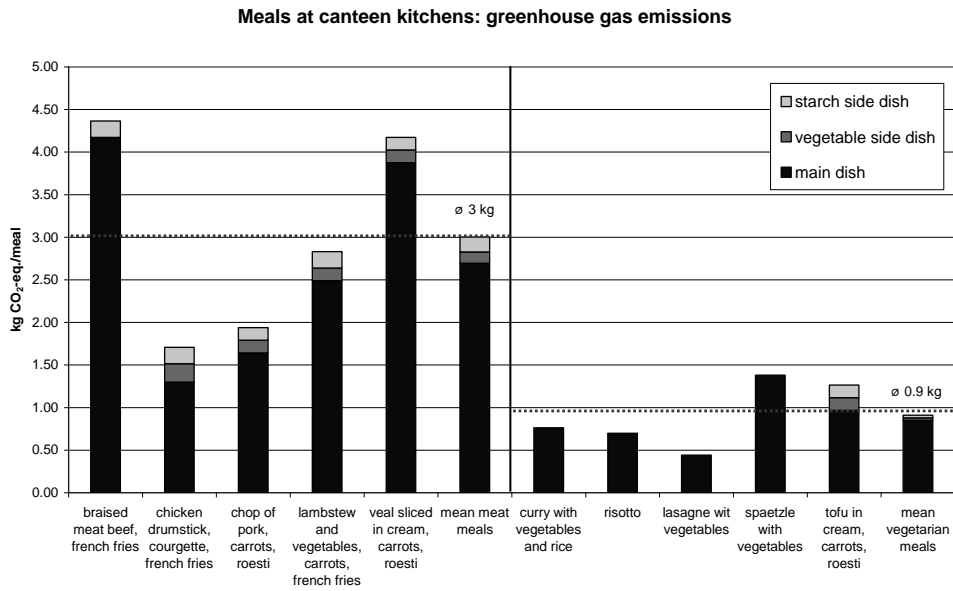


Fig. 3: Global warming potential of different meals

The impact assessment according to the ecological scarcity 2006 method [22] shows similar patterns (Fig. 4). The meat-based meals have an average environmental impact of 6622 Ecopoints per meal and the vegetarian meals account for 2085 Ecopoints. The environmental impact of the side dishes becomes more important, because of the higher weighting of vegetable production.

Meals at canteen kitchens: ecological scarcity 2006

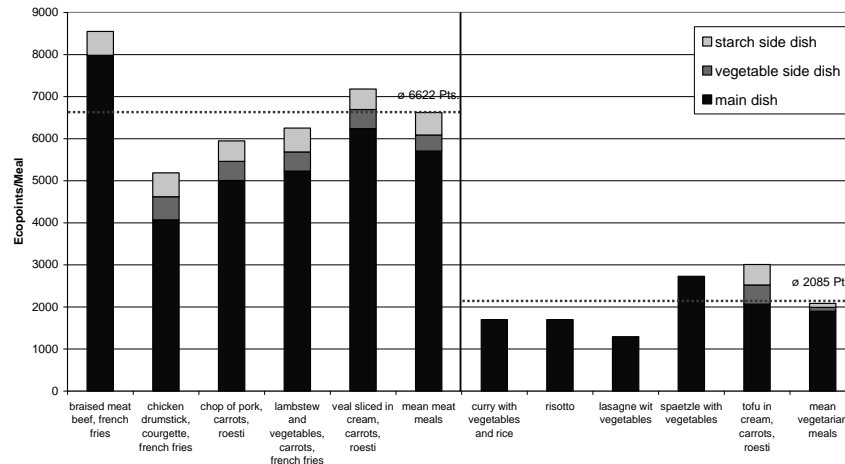


Fig. 4: Total environmental impacts of meals evaluated with the ecological scarcity method 2006

The average global warming potential and the environmental impact of meat based meals are considerable higher than for vegetarian meals. The meat-based meals cause 2 kg greenhouse gas emissions or 4000 Ecopoints more compared to an average vegetarian meal. Consequently, a vegetarian diet makes a significant contribution to the reduction of the global warming potential due to food consumption.

As is a high variance within the meat or vegetarian meals, the difference between two individual meals can be smaller or higher than the difference resulting from the average values.

4 Conclusions & outlook

The range of LCA studies shows that it is necessary to investigate and consider a range of different environmental impacts and themes. Simplified approaches such as carbon footprinting might even lead to wrong conclusions. The most important conclusions for consumers are as follows:

- Eat vegetarian. Consumption of fish, meat and animal products should be reduced to 2 portions a 180 g a week
- Air transported products should be avoided
- Buy seasonal. Less products from heated greenhouse should be bought

- Reduce luxury products like wine, coffee and chocolate
- Consider energy in private transportation and the household
- Reduce wastage and overconsumption

More research is considered to be necessary on the environmental impacts of different types of meals considering also ready-made and catering services. Knowledge gaps exist also concerning the impacts of open markets while considering the regional differences in agricultural production patterns. Therefore we need better models to address regional variation and specific types of emissions in agriculture. Even if many researchers agree on the importance of meat, we still need to define a level of sustainable meat consumption that should be aimed at on a global view. We would also welcome more LCA research on food ingredients like flavours and statistical data on food wastage in all stages of the production chain.

These findings also have to be taken into account while developing approaches for environmental information for products. It does not seem to be sufficient to highlight differences within narrow product categories. More important is the provision of information concerning e.g. differences between different types of diets.

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