Environmental impacts of scenarios for food provision in Switzerland

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Introduction

- Commissioner:
  WWF Switzerland

- Commissioners goal:
  Provide guidance to consumers in terms of the environmental impact of different food consumption scenarios

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Goal & Scope

- Evaluation and comparison of the environmental impact of the food provision
  - for the average diet and for 6 different food provision scenarios
  - in Switzerland, per person and year
  - in a life cycle assessment (LCA)

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Goal & Scope: Analysis Components

Including

- Full life cycle of food products until purchase in supermarket
- Conventionally produced food products (as far as data available)

Excluding

- Transport to home and preparation
- Organically cultivated food

Further information

- For vegetable cultivation, the share of greenhouse cultivation is estimated
- Switzerland is set as origin of food products whenever possible

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Transport is estimated with average distances. Food losses in the life cycle are included in the data available for the food supply. Food losses in agriculture are roughly assessed (Schweizerischer Bauernverband 2013).

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Goal & Scope: Health Aspects

- Not a focus of this study
- Diets are taken as realistic examples
- Different scenarios for food supply are not necessarily comparable from a nutritional point of view
- Dietary recommendations only considered in FOODprints® scenario

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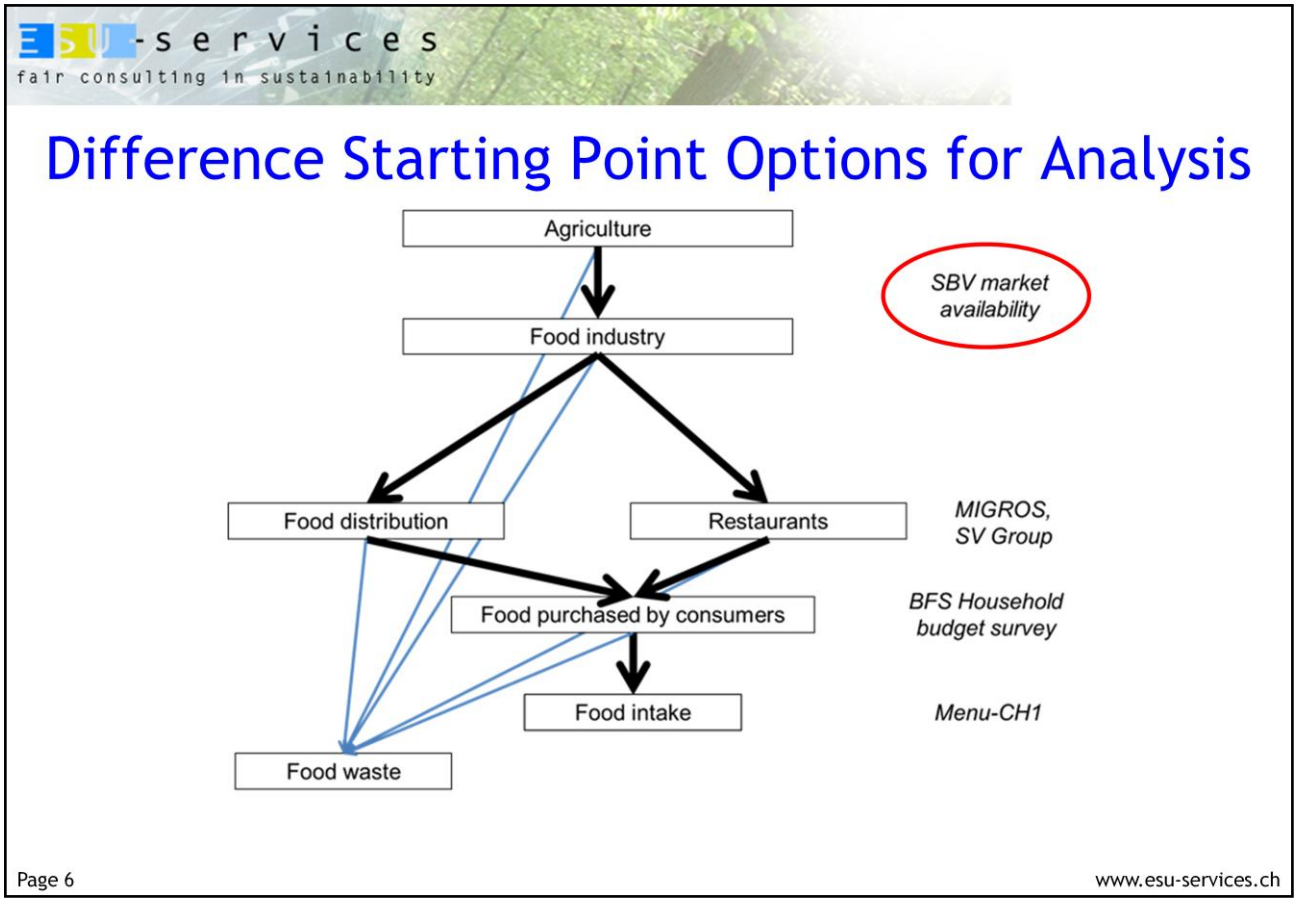
FOODprints® -> recommendations of SGE for a sustainable and healthy diet)



Starting Point of this study marked in red circle.

There are different options to determine the amount of food production of a specific nutrition type. The environmental impacts of food consumption in Switzerland were already investigated from different starting points (Figure 1), such as: top-down splitting the overall environmental impacts to different consumption areas in an input-output analysis (Jungbluth, Nathani et al. 2011), **food availability on the Swiss market (SBV market availability**, Jungbluth, Itten et al. 2012; Schweizerischer Bauernverband 2013), data for large distributors such as supermarkets (MIGROS, Jungbluth 2011) or canteens (SV Group, Jungbluth, Keller et al. 2015), data from the Swiss BFS household budget surveys on food purchases (BfS 2012; Saner, Beretta et al. 2015; Jungbluth, Eggenberger et al. 2016), meals consumed (Jungbluth, Keller et al. 2015), nutritional recommendations (Brunner and Casetti 2014; Eggenberger and Jungbluth 2015).

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Food provision scenarios

1. Average availability of food products on the Swiss market (Starting Point)
2. Vegan
3. Ovo-lacto-vegetarian
4. Ovo-lacto-pescetarian
5. Flexitarian
6. Protein-oriented
7. Meat-oriented
8. FOODprints® (intake recommendation, food losses not accounted for)

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From the starting point, the following six scenarios are estimated

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Life Cycle Inventory of food items produced

Food product group	Unit	Average 2012	Vegan	Ovo-lacto-Vegetarian	Ovo-lacto-Pescetarian	Flexi-tarian	Protein-oriented	Meat-oriented	FOODprints®
Vegetables	kg	107	200	133	133	120	53	53	131
Fruits	kg	61	76	76	76	68	30	30	75
Grain Products	kg	171	171	171	171	171	171	171	111
Eggs and Honey	kg	13	0	16	16	12	33	20	9
Milk, Milk Products	kg	144	0	144	144	144	203	144	155
Meat	kg	50	0	0	0	16	78	104	13
Fish	kg	8	0	0	14	4	8	8	3
Meat alternatives and soy milk	kg	0	159	16	14	8	0	0	11
Fats and Oils	kg	30	30	30	30	30	30	30	11
Pulses	kg	1	8	4	4	3	1	0	5
Nuts	kg	4	13	13	11	8	4	2	9
Non-alcoholic beverages, without tap water	kg	215	215	215	215	215	215	215	34
Alcoholic beverages	kg	94	94	94	94	94	94	94	31
Total (without beverages)	**kg**	**587**	**657**	**602**	**612**	**582**	**610**	**562**	**533**
Calories (without beverages)	kcal/d	3227	2980	3288	3285	3202	3538	3292	2571
Proteins	g/d	101	173	90	94	90	147	121	77

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AVERAGE 2012: This scenario corresponds to the Swiss average diet as it was estimated by the commissioner with a weekly consumption of 1kg of meat, 21 portions of milk products and 3 to 4 eggs.

Based on this average market availability, 6 different diet scenarios are estimated

- The deviation is based on different studies for dietary recommendations and pre-defined values by the commissioner.
- The scenarios only model a change in protein intake.
- Other factors, for example the provision of alcohol and mineral water, were not changed in comparison to the Swiss average scenario.
- The included amount of food provision is considerably higher than the finally eaten amount of food because food losses occurring at various points within the life cycle are included.

- TABLE SOURCE: 269 LCI Table
  Y:\ESU Mitarbeiterinnen\198 Vorträge\2016-10 LCA food

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Life Cycle Impact Assessment

- Methods applied:
  - Swiss ecological scarcity method 2013
  - Global warming potential (IPCC GWP 100a, incl. RFI = extra damages from aircraft emissions)

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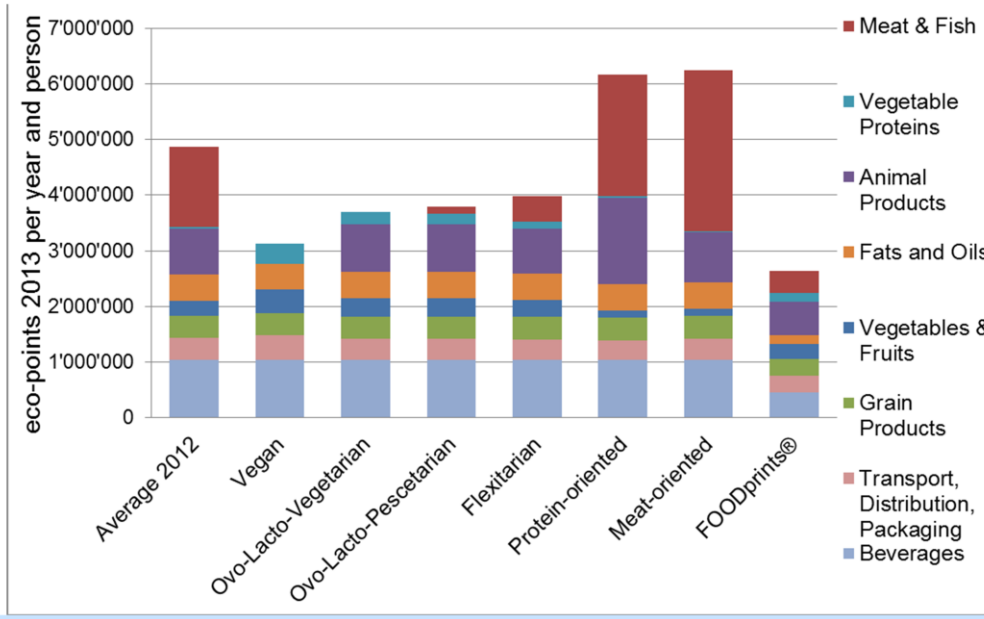
Ecological Scarcity method 2013, split per food product group



- Changes in animal products are very relevant

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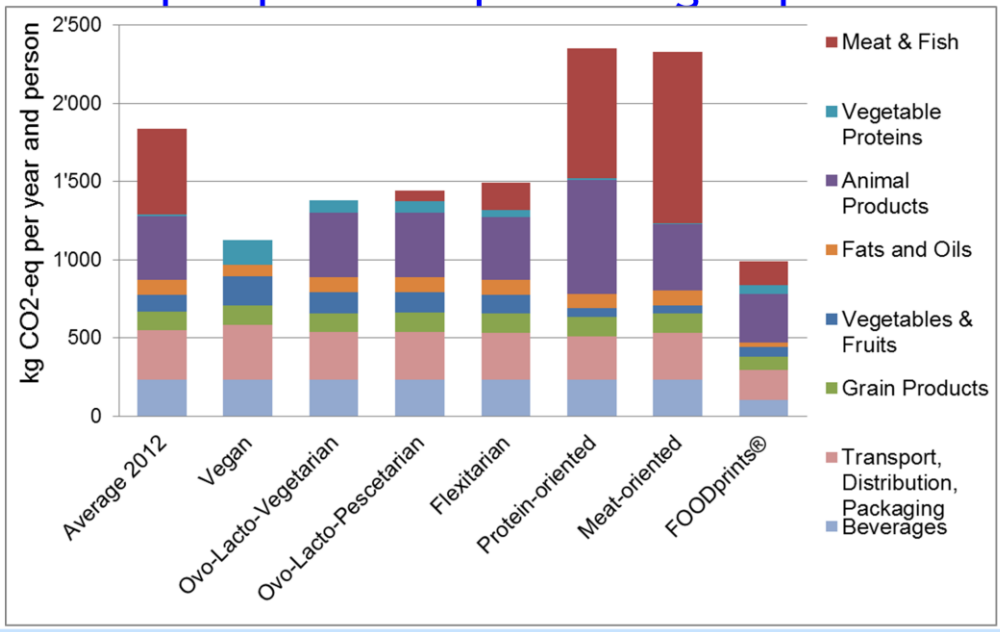
Global warming potential (IPCC GWP 100a, incl. RFI), split per food product group



- Similar patterns as total environmental impacts

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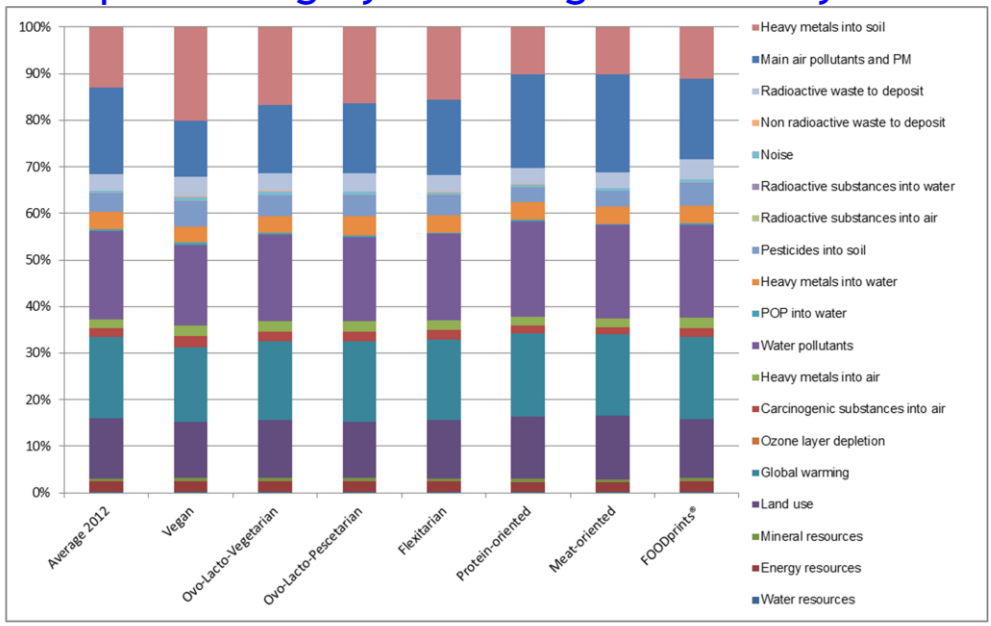
Environmental Impacts

split per impact category of ecological Scarcity method 2013



- Most important: land use, climate change, water and air pollutants and heavy metals

Interpretation

1. Confirmation of important role of meat and fish provision concerning the environmental impact of diets in Switzerland. The less meat, fish and animal products the lower are the impacts
2. Same amount of beverages for all scenarios (except FOODprints®) assumed. Nevertheless, they are important when assessing environmental impact reduction potentials (quarter of total impact)
3. The results depend on the starting point of the analysis.
   - Calculations based on recommended diets (FOODprint), the amounts of food are much lower than delivered to the market.

1. The highest environmental impacts are those obtained with the top-down approach (input-output-analysis).

1. Vegetable proteins in the meat-reduced diets cause a lower environmental impact. This is even true for the vegan diet scenario, which is characterized by an increased amount of consumed vegetable proteins in order to substitute meat, fish and other animal products such as milk and eggs. The impact of other animal products is to be highlighted as well when addressing reduction potentials of environmental impacts. After meat and fish, this food product group is the second most important source of the environmental impact of diets.
2. Therefore, this food product (beverages) group does not influence the differences between the diet scenarios.
   On average, almost a quarter of the total impact is caused by beverages (particularly wine and coffee).
3. This can be explained by food waste in different stages of production and by a possible overconsumption.
   Estimates based on nutritional recommendations also tend to underestimate the impacts because they seem to omit parts of frequently consumed food (e.g. alcohol or sweets).
   Hence, there are huge differences between the impact results when considering different starting points in terms of the amount of food included

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Thank you very much for your attention!

Further information on our website:

www.esu-services.ch/projects/lcafood/food-stiles/

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