

Redefining the Swiss agrifood system: the case of organic agriculture

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The future of the planet begins in our plates, as food consumption is responsible for tremendous impacts on the environment, human health and more. The current Swiss diet is responsible for 25% of Switzerland's environmental impacts [1] and the agricultural sector is responsible for more than 10% of the country's greenhouse gas emissions [2]. As half of the food consumed in Switzerland is imported, 70% of the consumption-related land use takes place abroad, thus leading to offshored major environment and social impacts [2]. Regarding impacts on human health, the current Swiss diet is unbalanced and unhealthy [3] - as well as land-intensive - which can lead to non-communicable diseases (NCD) [4]. Beyond the impacts of unbalanced diets on individuals, 80% of the Swiss health system costs are caused by NCD, accounting for CHF 51.7 billion [4] [5]. Furthermore, food consumption in Switzerland across the entire value chain leads to 2.8 million tons of losses and food waste per year, representing 37% of agricultural production [2].

To address the issues emerging from the agrifood system, implementing 'farm to fork' solutions that consider the entire food value chain is necessary, such as changing the food consumption towards sustainable diets - reducing the quantity of animal-based products, food waste and over-consumption - and shifting the production towards more sustainable practices.

Although there is a widespread belief that organic agriculture (OA) is more environmentally friendly than conventional farming, studies show that the environmental impacts are better when expressed per production area, but not necessarily per product unit [6] [7]. The literature review concluded that no quantitative modelling and comparison of OA at a country, 'farm to fork' and commodity level have been implemented. While the population is growing, discussions around alternatives deemed environmentally friendly but less productive emerge, debating the extent to which organic farming could contribute to tackle these challenges. The present paper aims at contributing to this debate by investigating how generalizing organic agriculture can satisfy Switzerland's needs while redefining the agrifood system to create positive environmental impacts and meet tomorrow's challenges?

This paper provides a commodity-based modelling of the production within the Swiss agrifood system in 2050, derived in four scenarios, to compare the environmental impacts of organic and business-as-usual production as well as the EAT-Lancet diet - commonly used for sustainable diet recommendations - and the Swiss Food Pyramid diet - recommended by the Swiss Federal Office of Public Health. This commodity-based methodology allows to tackle the whole primary food production with a high level of differentiation. Then, a Life Cycle Assessment based approach allows us to assess the environmental impacts on nine categories that cover climate, ecosystems, soil and resource depletion. This model considers food waste, self-sufficiency ratio, losses, and feed within the production but excludes other uses such as bioenergy and biomaterials.

Overall, all the 2050 scenarios showcased lower impacts than the reference year 2018 and are all feasible from a land use perspective. Changing the current diet of the Swiss population would therefore represent a huge step towards a more sustainable agrifood system. The EAT-Lancet diet is less impactful on 'climate change' and 'ecotoxicity, freshwater' than the Swiss Food Pyramid

diet, but creates more externalities on the other categories. Shifting towards organic agriculture would create less impacts for 'climate change', 'ecotoxicity, freshwater', 'water use', and 'resource use, fossils' but higher impacts for the other categories. The results show that organic agriculture of specific products create beneficial environmental impacts for some categories. The best scenario should be decided by weighting the categories and considering other factors such as land use. For instance, excess arable land could be dedicated to different purposes - biodiversity promoting areas, forests, energy or fiber crops - and therefore could potentially compensate for impacts.

Results support that changes in both production and diet are necessary to address the environmental issues of the agrifood system. However, organic agriculture might not be the best alternative. Further research and impact quantification is necessary regarding other opportunities such as regenerative agriculture, agroforestry and agroecology. Whilst a lot of emphasis is put on finding solutions that are less impactful, better alternatives should embody the possible positive impacts that can be created.

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