
Changing dietary habits and potential regionalization: Implications for agro-diversity and future GHG emissions

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Abstract

Changing food consumption patterns and their environmental impacts have been a matter of the scientific debate over decades. Agriculture is a major greenhouse gas (GHG) emitter and thus, holds a large potential for climate change mitigation. Population growth and diet changes are two main drivers of global food demand. We investigate diet changes globally on a country basis, estimate diet embodied emissions, and project future agricultural emissions. Additionally, we estimate future livestock feed demand due to changing dietary habits towards meat rich diets. Lastly, we explore the potential of regions shifting to local food considering both the present state and the future scenarios including climate change and diet shifts.

Globally, we identified sixteen dietary patterns between 1961 and 2007 with food intake ranging from 1870 to 3400 kcal/cap/day. Dietary patterns are changing towards more meat rich diets worldwide. Due to a large share of animal products, very high calorie diets exhibit large per capita emissions of 3.7-6.1 kg CO₂eq./day. Globally, 1.9 billion people can be fed by local food produced within their 5' grid while about 1 billion Asian and African require intercontinental trade.

By closing crop yield gaps, Asia and Africa can be food self-sufficient. This also reduces international trade and increases a self-sufficient population in a 5' grid up to 2.9 billion. However, such a degree of food self-sufficiency can only be achieved by when farmers grow diverse crops increasing agro-diversity and consumers rely more on local products. By 2050, agricultural emissions will approach 7 Gt CO₂ eq./yr and global feed demand will remain similar to 2000 due to population growth. This will change tremendously when diet changes are also accounted e.g. emissions of 20 Gt CO₂eq./yr and 1.3 times increase in feed demand. Furthermore, the number of people depending on international trade will vary between 1.5 and 6 billion. The effects of diet shifts and closing yield gaps will be stronger on international trade. Moreover, agricultural trade will increase by 4% to 16% due to climate change.

Closing yield gaps is a viable option to meet the future food demand in addition to enhancing agro-diversity, shifting diets towards lower share of animal products, and relying more on local food.

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