Steering towards a stable and resilient 1.5°C food system

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Key message

The agricultural sector is an important contributor to climate change, but can be part of the solution, without jeopardizing food and nutrition security, if the right interventions are targeted.

Short summary

The food system will have to contribute substantially to the mitigation efforts to achieve the ambitious climate change stabilization target agreed in the Paris Conference. The contribution will require efforts at the level of the food production and processing, but also land use efficiency gains to decrease deforestation and free land for negative emission technologies deployment, in particular afforestation and bioenergy production coupled with carbon capture and sequestration.

Most of the mitigation technologies are potentially in competition with food production. Effects however differ depending on the type of instrument used, the sector targeted and the overall macroeconomic context. EU agriculture and food policies will need to be revisited in coordination with other climate policies to integrate the climate change dimensions without jeopardizing food security. International action is also required and the EU should support the progress of negotiations to see agriculture's role recognized as part of the problem but also of the solution. More resource efficient supply chains, better soil management practices and smarter nutrition orientations appear as efficient options to limit the adverse impact on food production, and should be promoted.

Full summary

Introduction

In December 2015 the majority of the world's governments agreed in the so-called 'Paris Agreement' on a renewed commitment to hold "*the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels*". While such an ambitious commitment is likely to reduce substantially the challenges to adaptation, it represents an unprecedented challenge in terms of greenhouse gas emissions reduction. Today, Agriculture, Forestry, and Other Land Use (AFOLU) account for about a quarter of all anthropogenic emissions, most of which is directly or indirectly related to agricultural production. Direct emissions from the agricultural sector, such as methane emissions from enteric fermentation or rice cultivation and nitrous oxide emissions from soil fertilization, represent about half of the AFOLU emissions and continued increasing over the past decade, while emissions from land use change were stagnating or even decreasing. In three of the FoodSecure scenarios, the current trends continue and the direct emissions increase by 24% to 34% by 2050, depending on the population growth and technologies used. However, in the “Ecotopia” scenario, where consumption of meat decreases and production is less dependent on fertilizer inputs, direct emissions from food production is found to increase by only 2% by 2050.

Integrated Assessment Models, such as IMAGE-MAGNET or MESSAGE-GLOBIOM are used to project future greenhouse gas (GHG) emissions and their necessary reductions to achieve particular climate stabilization targets. An economically balanced burden sharing across all sources of emissions in the economy would lead to a reduction of direct emissions from agriculture by 26% to 29% by 2050 compared to the reference level, whereas forest area and biomass production from dedicated energy crops would require 360 to 420 Mha of land depending on the scenario, i.e. 25-30% of the current global cropland. The competition for land and the additional costs related to direct emissions reduction, for a price around 100 euros per ton of CO_2 equivalent in real terms by 2050, would lead to an increase of agricultural producer real prices by 20% to 40%. If not mitigated through farm support and/or food aid programs, this price increase would lead to a decrease in average calorie availability per capita by 6% to 9%, which would impact the most vulnerable households, in particular in urban areas. These results are conditional on large scale availability of negative emissions technologies, in particular carbon sequestration through afforestation and through bioenergy systems connected to carbon capture and storage (BECCS). Climate stabilization will require to reach zero net emissions by the mid-century, therefore, negative emissions technologies will have an important role to play to limit the pressure of mitigation on the food production system.

Direct emissions from agricultural production can be reduced in four different ways:

1. Reduction of emissions intensity of agricultural production through economic instruments such as tax or subsidies (Havlik et al., 2014, Smith et al., 2013)
2. Soil organic carbon (SOC) sequestration through tillage and residue management (Paustian et al., 2016).
3. Technology transfer and international trade to decrease the inefficiencies related to suboptimal production allocation (Valin et al., 2013).
4. Decrease in the amount and type of food consumed, through dietary changes but also better waste management (Stehfest et al., 2009).

Robust policies for a sustainable 1.5 degree food system

Given the need for agricultural emissions reduction to start immediately (Wollenberg et al. 2016), ambitious policies need to be urgently implemented. The European Union (EU) is responsible for 8% of global agricultural emissions while it produces 10% of global cereals supply, 15% of meat supply, and 21% of milk supply. The EU land use, land-use change and forestry (LULUCF) sector acts already as a net sink of CO_2 emissions, while globally the sector represents about 12% of total anthropogenic GHG emissions. From this perspective, the EU agricultural sector in general is very GHG efficient.

Concrete EU-policy implications thus include:

- Mitigation policies on the producer side should support adoption of technical solutions further improving the GHG efficiency of the sector without compromising its competitiveness in international markets.
- EU policies guiding consumer behavior towards reduction in wastes, overconsumption and overall less GHG emissions intensive diets (diets with f.i. less meat, milk, palm oil, rice) ould have the triple dividend of reducing emissions, creating health benefits, and supplying international markets or freeing land for afforestation or energy biomass production.
- Most mitigation potential is outside the EU, and here the EU should contribute through research and technology transfer to increase production while reducing deforestation (REDD+), and providing land for forest and energy plantations expansion.
- As bioenergy is essential to cost-efficient and ambitious climate stabilization, the EU should take the lead in development of advanced biofuels technologies and feedstocks, which are not in direct competition with food production, and have the potential to ultimately provide negative emissions at the needed scale.
- There are important synergies between the mitigation policies listed above and other environmental issues, leading to benefits for nutrient balances, biodiversity and reduced land degradation.

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