

Snapshot: Analysis of climate change mitigation scenarios until 2050

Climate mitigation is a challenge: to stabilize global warming at 1.5°C degree temperature increase with no or low overshoot, global CO₂ emissions need to be reduced by 45% in 2030 compared to 2010 and EU greenhouse gas (GHG) emissions by 40% until 2030 (compared to 1990 and -30% compared to 2005). To evaluate the effects and potential contributions of carbon mitigation of agriculture the long-term scenario assesses the effects of an (i) EU wide unilateral as well as an (ii) Rest of the World (RoW) global effort to reduce agricultural greenhouse gas emissions (ag-GHG). The efforts are implemented as a proxy by a carbon tax on non-CO₂ greenhouse gas emissions. The RoW participation is realised as a percentage of the EU carbon price imposed on the RoW non-CO₂ emissions from agriculture. A100 % Buy-in means that the same carbon price in RoW as in the EU is applied, in the case of 0 % Buy-in no carbon price implemented, for a further descriptions of assumptions see snapshot 'Model_assumptions_baseline' and 'Model_assumptions_longterm', details are to be found in Deliverable D3.3. To assess the effects, two scenarios have been implemented:

- "1p5deg" for the 1.5 °C target either with a unilateral or global approach
- "2deg" for the 2 °C target either with a unilateral or global approach

Scenario results

In case of a EU unilateral mitigation effort implemented by the carbon tax on non-CO₂ emissions high reduction potentials are projected by the models. However, a 45 % leakage effect by increased non-CO₂ agGHG emissions outside the EU will occur reducing the mitigation effect on a global scale (left panel Figure 1), when a 0 % participation of the RoW is assumed.

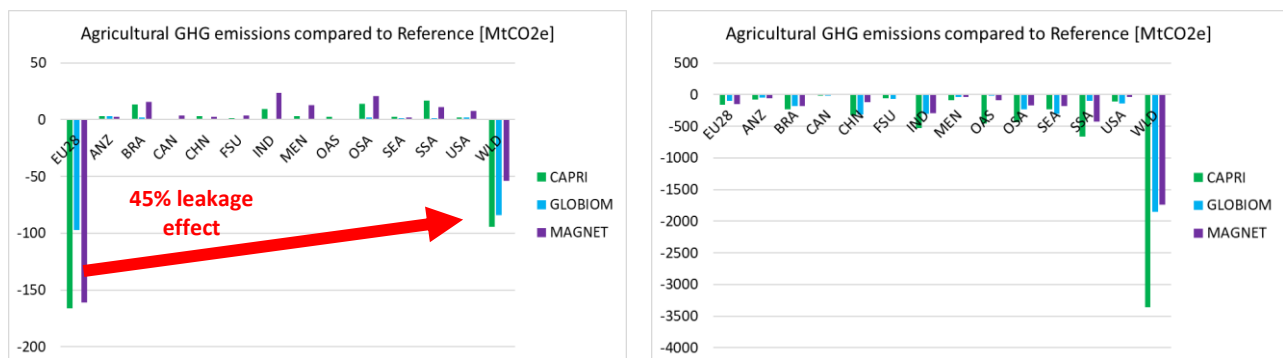


Figure 1 | EU unilateral effort alone (0% RoW Buy-in, left) vs. 25 % RoW global Buy-in (right)

If the the RoW "Buy-in" is increased to 25 % of the EU's carbon tax would already raise the global mitigation effect to 70 % of a 100 % RoW Buy-in, which can be seen in the right panel of Figure 1. The 25 % Buy-in level, thus, is seen as more realistic than a 100 % effort of the RoW.

The animal sector highly impacts the climate change. A unilateral mitigation effort of the EU, therefore, will mainly reduce ruminant production in the EU compared to the baseline, whereas, in turn, RoW farmers will increase their production as depicted under the 0 % Buy-in case (left panel Figure 2). A 25 % Buy-in in the RoW will lead to a reduction in ruminant production shared

by almost all countries in the RoW, except for the more developed countries USA and Canada as can be seen from the right panel of Figure 2.

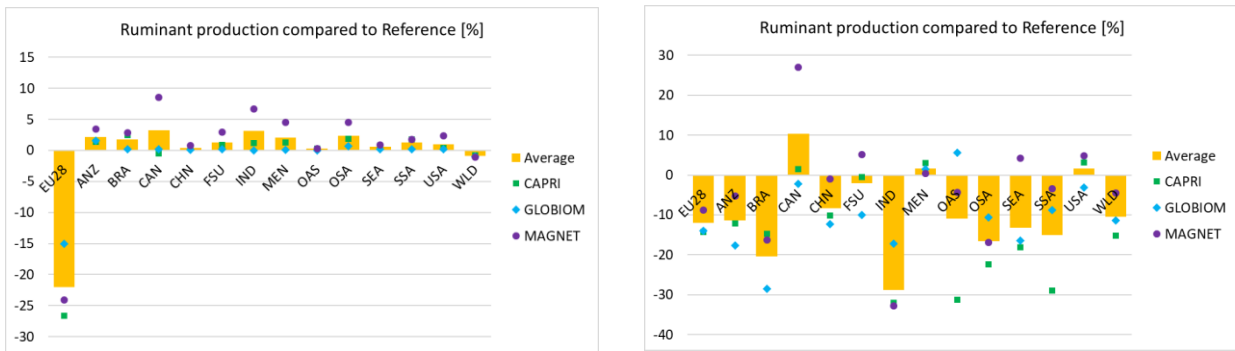


Figure 2 | Effects of a EU unilateral beef production reduction (left panel, 0 % RoW Buy-in) vs. 25 % RoW global Buy-in (right panel)

Only limited changes are projected for the EU-28 consumers' prices in case of a unilateral agGHG action of the EU-28 compared to a global 100 % Buy-in (Figure 3 top). In the latter case only the ruminant prices would significantly differ (Figure 3 bottom), with the least developed countries suffering the most.

Indeed mitigation policies can have negative effects on food availability globally depending on the share of participation with respect to the RoW. Here, again 25 % Buy-in of the RoW is simulated to be an adequate compromise as can be seen in Figure 4.

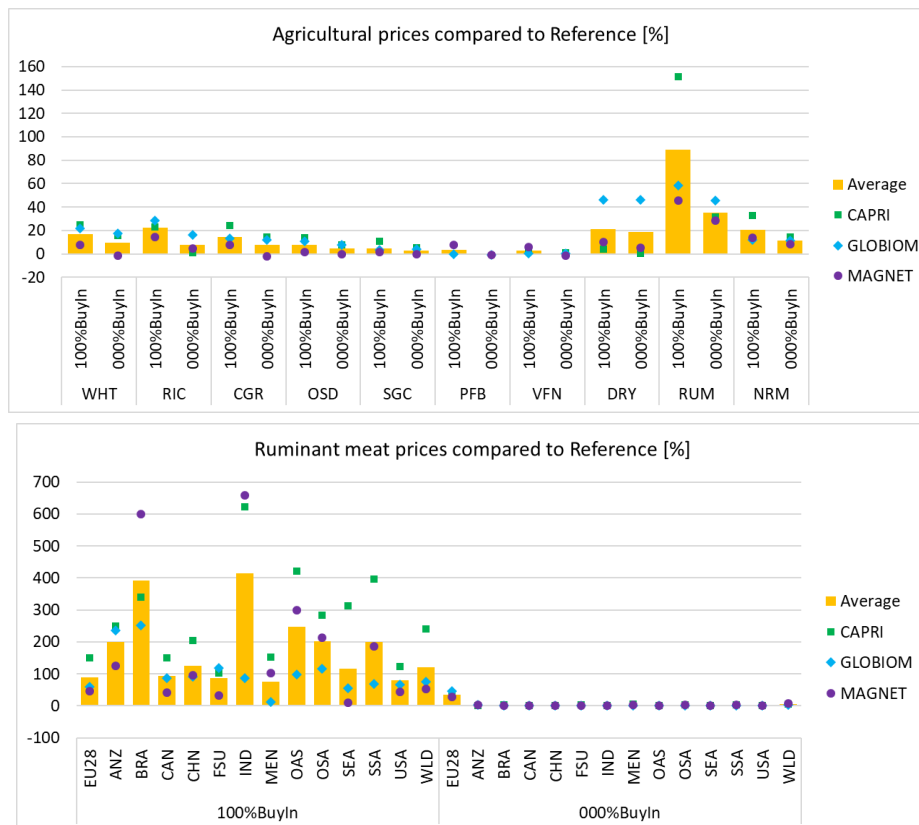


Figure 3 | Effects of a EU-28 unilateral carbon mitigation effort on EU agricultural consumer prices (top) with focus on ruminant meat prices (bottom) compared to a 100 % global BuyIn

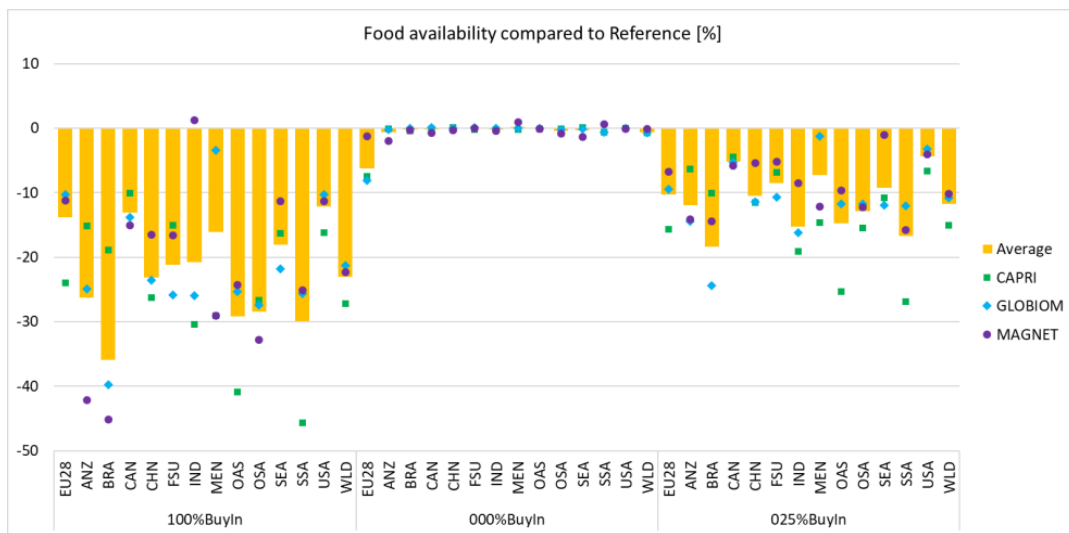


Figure 5 | Effects of a unilateral or global mitigation policy effort on the food availability in different regions of the world

Besides these trade-offs, a carbon tax is also projected to yield in co-benefits for the environment like for example increased natural vegetation areas inside the EU-28 (Figure 5).

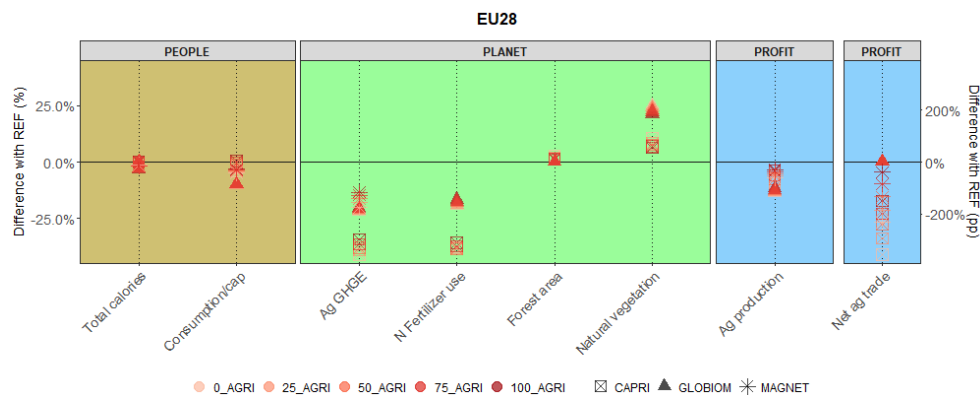


Figure 4 | Not only trade-offs but also co-benefits arise from a carbon tax

References:

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