

Addressing trade-offs and synergies between SDGs: compare EU with Non-EU.

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The Sustainable Development Goals, agreed by 193 countries of the United Nations in September 2015, galvanize policy action from all global players through responsible production and consumption. In this study, we explore the extent to which the evolution of the EU food system to 2030 is likely to contribute to the Sustainable Development Goals. We consider three possible paths of development for the EU food system based on Shared Socio-Economic Pathways, with a focus on the implications for synergies and trade-offs between *SDG2 Zero hunger*, *SDG9 Industry, Innovation and Infrastructure*, *SDG13 Climate action*, *SDG15 Life on land* and *SDG17 Partnerships*.

The three pathways for the EU food system to 2030 are based on SSP1 – a low challenge pathway with a focus on sustainability, SSP2 – a middle of the road pathway with intermediate challenges and SSP3 – a high challenge pathway. We consider which pathways are most consistent with progress towards the Goals, how the EU fares relative to other regions and whether particular pathways call for policy action in Europe to assist with global progress.

We conduct the analysis using three models: the Modular Applied GeNeral Equilibrium Tool (MAGNET), GLOBIOM and CAPRI. MAGNET is a global economic simulation model that has been extended with the newly developed MAGNET SDGs Insights Module which includes a suite of official and supporting indicators, covering 12 of the 17 SDGs. GLOBIOM is a global model to assess competition for land use between agriculture, bioenergy, and forestry and supplies key SDG indicators. CAPRI is a partial-equilibrium model of agriculture in the EU that provides a wide range of economic and environmental indicators. Together, these models form a toolbox for the assessment of the evolution of the EU food system using a suite of European indicators developed within the Sustainable Food and Security (SUSFANS) project, complemented with SDG indicators for the rest of the world.

The approach allows synergies and trade-offs among economic, social and environmental objectives to be assessed in scenarios where several market instruments are operating simultaneously. The results of the scenarios highlight synergies and trade-offs both across SDGs and across scales: showing where the impact for the EU differs from the rest of the world, particularly developing regions, with a view to maximising gains for all.

The synergies across SDGs are embodied by certain SDG goals being reinforced by related SDGs. SDG17, which aims to revitalize the global partnership by promoting an open global trading system, will help enhance global food availabilities and achieve food security, which are the goals of SDG2. SDG13, which calls for urgent action to combat climate change, is consistent with SDG9 that encourages building resilient infrastructure to increase the ability to adapt to climate change and greater adoption of clean technologies and industrial processes to reduce greenhouse gas emissions. SDG15 will also help realize SDG2 and SDG13 by promoting sustainable use of terrestrial ecosystems and restoring degraded land as this will increase land productivity and strengthen ecosystem's capacity for adaptation to climate change.

The trade-offs across SDGs are reflected in certain SDG goals being counteracted by other SDGs. SDG2, with a goal for ending hunger and achieving food security, may require increases in food production and this implies that more land needs to be used for producing food and thus less land will be available for maintaining resilient ecosystems to combat climate change. Also, increases in food production require increases in energy consumption and this would lead to more greenhouse gas emissions. In a sense, realization of SDG2 may create difficulties in pursuing SDG13 and SDG15.