

A model-based analysis of the impact of selected agriculture related scenarios on the Gross Ecosystem Product indicator

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To date, the impacts of different economic policies have been usually measured by the evolution of Gross Domestic Product (GDP) or employment. Yet, GDP fails to capture fully the contributions of nature to economic activity and human well-being. Consequently, the benefits provided by ecosystem services, such as crop pollination or water purification, are not taken into account in such assessments. This is particularly important in the case of policies with potentially heavy environmental impacts. Hence, Ouyang et al. (2013) proposed and further developed (e.g. Ouyang et al. 2020) the concept of Gross Ecosystem Product (GEP), which summarizes the value that ecosystem services provide to the economy in monetary terms. The Gross Ecosystem Product (GEP) is a measure that quantifies the contribution of final ecosystem goods and services to the economy. GEP highlights the importance of ecosystem services and allows overcoming the current bias in decision-making in favor of GDP growth.

This paper applies the new GEP module in the macroeconomic model MAGNET to assess both, the economic and environmental impacts of a removal of the Common Agricultural Policy (CAP). This scenario is an unlikely policy option as it contradicts the EU Treaty. However, it provides useful insights into the economic, social, and environmental impacts without the policy framework provided by the CAP. MAGNET is a GTAP-based global CGE model used to assess the policy impacts on the economy. MAGNET's endogenous land supply and forestry representation make this model particularly suitable for this task, as does its international dimension. Built upon the INCA database on monetary value of ecosystem services, the new GEP module allows for comparison of the impact of different policies on both GDP and GEP in the European Union. In particular, we apply a forward-looking policy scenario that assumes a complete removal of the Common Agricultural Policy (CAP) in the European Union. The results of preliminary simulations show that a CAP removal would have an almost negligible impact on both GDP and GEP. Although, there exist significant differences between particular ecosystem services.

The Modular Applied GeNeral Equilibrium Tool (MAGNET) is a recursive dynamic, multiregional, multi-commodity CGE model, covering the entire global economy (Woltjer and Kuiper, 2012). As with other CGE models, MAGNET explicitly represents the economic linkages across the sectors of each regional economy. This is particularly important when analysing policy effects in sectors that are vertically linked with each other, such as bioeconomy sectors. It is built upon the GTAP (Global Trade Analysis Project) model (Hertel, 1997) and has been widely used for policy analysis (Nowicki et al., 2009; Woltjer, 2011; Philippidis et al., 2018; Doelman et al., 2019; Kuiper and Cui, 2021; Latka et al., 2021). The MAGNET model is modular in nature and extends the GTAP model through the addition of a number of policy-relevant modules. MAGNET currently uses version 11 of the GTAP database with a coverage of 141 regions, 65 sectors and 8 production factors including natural resources, oil and gas. In MAGNET, the original GTAP database is further disaggregated to include additional agricultural and bioeconomy sectors. As a result, a complete MAGNET database contains the total of 123 sectors and 144 commodities. For the present study, regions were aggregated to 40, sectors to 46 and commodities to 48. The database includes detailed information on production, gross bilateral trade flows, transport costs and trade protection data for a 2017 benchmark year.