Scenario modelling of future greenhouse gas emissions in the EUâ€‘27 agricultural industry using a multi-regional input-output approach

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Agriculture remains one of the main sources of greenhouse gas emissions in Europe, which makes the analysis of its longâ€‘term drivers essential for effective climate mitigation. This study applies a multiâ€‘regional inputâ€‘output framework to project agricultural emissions in the twentyâ€‘seven European member states up to the year 2050 under a set of demographic and policy scenarios. The contribution of this work lies in integrating future demand trends with several policy pathways, including trade measures, efficiency improvements and strategic initiatives planned for the sector, thus providing one of the few forwardâ€‘looking assessments of longâ€‘term emission trajectories in agriculture. The first scenario isolates the influence of population growth by examining how projected changes in total population affect future demand for agricultural products. Preliminary results indicate that demand originating within Europe contributes to a moderate reduction in emissions, whereas the strongest increases arise from population growth in third regions. The second group of scenarios evaluates policy interventions relevant for the agricultural sector. The potential increase in tariffs by the United States is found to reduce European agricultural exports and limit market opportunities. Improvements in production efficiency consistently lower emissions even under rising output. In addition, forthcoming European policy instruments, including carbonâ€‘related measures, generate further emission reductions. The magnitude of these effects ultimately depends on the evolution of global food demand, which remains the dominant determinant of longâ€‘term emission patterns. Overall, the study provides a systematic assessment of the structural and regulatory factors shaping future agricultural emissions in Europe, offering evidenceâ€‘based insights to support the development of climateâ€‘aligned policies and longâ€‘term strategic planning in the sector.

Keywords: Multi-Regional Input-Output, Greenhouse gas emissions, European Union, Agriculture industry, Climate policy assessment.