

Abstract for Planet under Pressure conference

Environmental impacts of integrating biomass production into European agriculture

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As energy crop production on European croplands expands, driven by accelerating consumption of bioenergy, there is a pressing need to evaluate the environmental impacts associated with this production. This study (de Wit et al., under review, *Energy & Environmental Science*) considers on-going yield increases as a means of boosting agricultural output without need to convert nature areas and grasslands to additional cropland. Our approach simulates four key developments in the EU-27 and Ukraine: (i) intensification of agricultural production, (ii) expansion of dedicated energy crop production, (iii) implementation of mitigation measures, and (iv) the replacement of fossil fuels for transport with biofuels. For nine land-use variants, the study evaluates cumulative greenhouse gas emissions (GHG) of nitrous oxide (N₂O), net organic carbon fluxes from soil and abated emissions by replacing fossil fuels. Land use and yield projections are derived from the REFUEL study and GHG emissions from agriculture are assessed by the MITERRA-Europe model.

The main finding is that, in European agriculture, it is possible to combine large-scale biomass production with food production sustained at current levels, without direct or indirect land-use changes and while accomplishing significant net environmental benefits. Maintaining the current agriculture results in 4.9 Gton CO₂-eq. of cumulative N₂O emissions by 2030. Intensified food production and energy crop production on freed cropland in combination with mitigation measures can significantly reduce cumulative emissions for the annual crop groups of oil, starch and sugar to 1.9, 1.5 and 2.1 Gton CO₂-eq., respectively. By 2030, perennial energy crop production can mitigate cumulative emissions for grass and wood crops to 3.3 and 4.5 Gton CO₂-eq., respectively. The results indicate that research and policy efforts aimed at further increasing productivity can raise the output from existing European croplands while being able to reduce or mitigate emissions.

Reference:

Wit, de M.P., Lesschen, J.P., Londo, M.H.M., Faaij, A.P.C. Under review. Environmental impacts of integrating biomass production into European agriculture. *Global Change Biology Bioenergy*.