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Centre de Biologie pour
la Gestion des Populations

Mardi 28 juin 2022, 11:00
Salle de réunion + visio

Europe's soybean self-sufficiency under climate-change: insights from data-driven yield projections using machine-learning

par
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🗨 The satisfaction of European soybean demand is highly dependent on imports. Currently, Europe imports about 58 Mt yr-1 of soybean which accounts for nearly 90% of the domestic consumption. These imports mainly come from South America, where soybean cultivation has been shown to be an important driver of deforestation. Reducing soybean imports through domestic production could therefore help reducing "imported deforestation", while contributing to the diversification of cereal-based European cropping systems. However, despite the rapid expansion of soybean-growing areas across Europe in recent years, a Europe-wide assessment on the agroclimatic suitability of soybean production areas under current and future climate is lacking.

🗨 Using data-driven relationships between climate and soybean yield derived from machine-learning, we made yield projections under current and future climate with moderate (RCP 4.5) to intense (RCP 8.5) warming, up to the 2050s and 2090s time horizons. The selected model showed high R2 (>0.9) and low root-mean-squared error (0.35 t ha-1) between observed and predicted yields based on cross-validation. Our results suggest that a self-sufficiency level of 50% (100%) would be achievable in Europe under historical and future climate if 4-5% (9-11%) of the current European cropland were dedicated to soybean production.

🗨 The findings could help farmers, extension services, policymakers and agribusiness to reorganize the production area distribution. The environmental benefits and side effects, and the impacts of soybean expansion on land-use change, would need further research.

🗨 Exposé en français.

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