

Identifying suitable areas for maize and soybean rotation in Northeast China: Toward a sustainable and resilient food system

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Abstract

Crop rotation can help to alleviate land use pressure, prevent soil degradation, and promote sustainable agricultural development. Land in Northeast China (NC) has long been overused to ensure national food security. Maize–soybean rotation (MSR) is an effective land conservation strategy but its suitability has not yet been determined in NC. In this study, we applied an optimized MaxEnt model by integrating multiple environmental variables to systematically predict the suitability of land for maize and soybean cultivation, establish an MSR suitability function, and define its specific range and priority in NC. The results are summarized as follows. (1) The optimized MaxEnt model obtained significantly improved performance, where the suitable areas for maize and soybean covered 60.25 % and 56.88 %, respectively, of the total area of NC. (2) Suitability for MSR was influenced by multiple factors, including the climate, topography, soil, and hydrology, but the soil conditions, particularly the gravel content and soil depth, were identified as the main factors. (3) Extensive areas of land in NC are suitable for supporting MSR, but highly suitable areas only account for 6.96% of the total area and they are primarily located in the Songnen Plain, most of which has been developed into cropland. In this study, we scientifically determined the areas suitable for implementing MSR in NC, thereby providing crucial support for adjusting the agricultural planting structure and optimizing land use planning in NC.

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