

Farmers' Heterogeneous Perceptions of Marginal Land for Biofuel Crops in U.S. Midwestern States Considering Biophysical and Socio-Economic Factors

Objective

Use of marginal land for dedicated energy crop production plays a critical role in biofuel development. To estimate marginal land availability, it is necessary to understand not only the biophysical and economic characteristics of land, but also how these factors influence farmer decision-making and perceptions of land marginality. This research employs survey data and neural network modeling to help shed light on farmers' marginal land perceptions and extrapolates the results to the Midwestern region of the United States.

Approach

- ❖ Surveyed 242 farmers on land-use and perceptions of marginal land availability on their farms.
- ❖ Trained a predictive neural network model on the survey results and remote sensing data.
- ❖ Applied the model to Midwestern states to identify patterns of marginal land availability and dominant factors influencing land characterization.

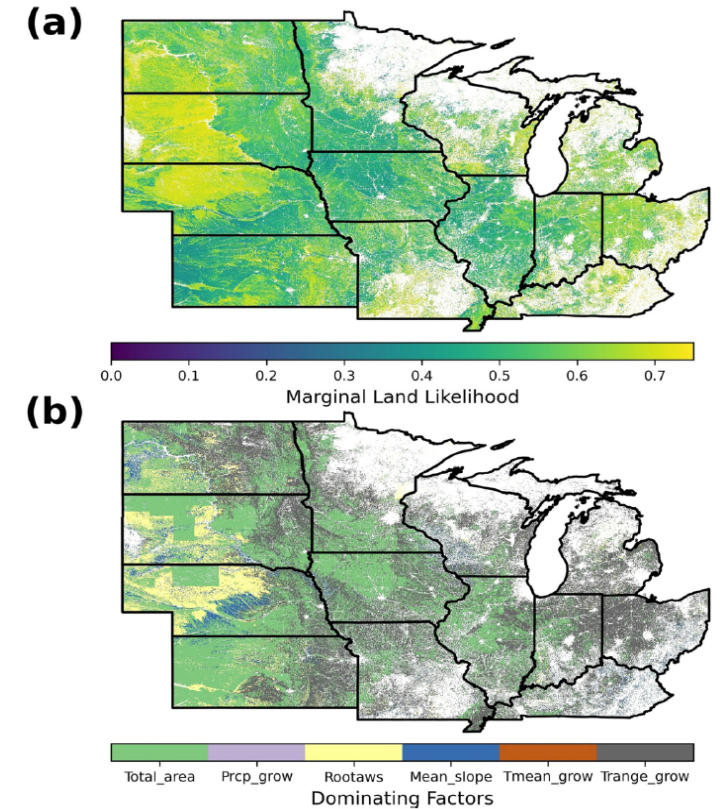
Results

- ❖ Farmers' perceptions of land marginality are affected by a combination of biophysical (e.g., soil water capacity, temperature variability, and slope) and socio-economic factors, of which farm size appears to be significant.
- ❖ Farmer identification of their land as marginal was influenced mainly by unfavorable biophysical factors, while identification of no marginal land was mainly explained by small farm size.
- ❖ The majority of land identified as marginal was located in North and South Dakota and Nebraska and was primarily under pasture and grassland. Some marginal land in the Corn Belt was under crop production.

Significance

This work allows more nuanced understanding of how land marginality is heterogeneously perceived by farmers and may be used to inform more targeted policy design to encourage bioenergy crop adoption.

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Maps show (a) marginal land likelihood and (b) the factor that dominated in the determination of (a). (Total_area: farm size, Prcp_grow: growing season; Rootaws: root zone soil water capacity; Mean_slope: average slope; Tmean_grow: growing season mean temperature; Trange_grow: growing season temperature range.)