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## Impacts of climate change on land suitability for cereal crops in Ethiopia

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Climate is a key factor influencing cropland suitability, hence, climate change poses a significant threat to future cropland quality and availability across the globe. The magnitude and direction of these impacts, however, vary across regions and crop types, with rainfed agriculture systems in vulnerable regions such as sub-Saharan Africa facing the greatest challenges. Here, we assessed current and future cropland suitability (CLS) for four major cereal crops (maize, teff, sorghum, and wheat) in Ethiopia (Wakjira et al., 2024). We established functional relationships between recorded crop yield and climatic factors (growing season rainfall, temperature, and solar radiation), as well as soil factors (texture, pH, and organic carbon) extracted from global datasets, to determine current suitability and to quantify changes in CLS under future climate scenarios based on multiple climate model projections.

We show that more than half of the rainfed agricultural region of Ethiopia is moderately to highly suitable for the top three cereals crops: teff (54%), maize (51%), and sorghum (63%) while only 29% of the region is currently suitable for wheat. Under the future climate, which is projected to be wetter and warmer across most of the rainfed agricultural region, major altitudinal shifts (from lowlands to highlands) in the currently suitable croplands are expected. The differences in suitability losses across lowlands and gains in highland agroecologies are relatively smaller (with losses being slightly higher) for maize and sorghum, compared to that of teff and wheat. As a result, suitable cropland areas are projected to decrease, for example by up to 25% for teff and 16% for wheat under the SSP2-4.5 emission scenario by the end of the century. Through climate sensitivity analysis, we found that changes in CLS in the lowland and highland agroecologies are primarily driven by temperature increases, while in semi-arid and hyper-humid areas, the changes in CLS are mostly driven by rainfall. These findings underscore the urgent need for adaptation actions considering the agroclimatic conditions and locations of the croplands.

## Reference


Wakjira, M. T., Peleg, N., Six, J., and Molnar, P.: Current and future cropland suitability for cereal production across the rainfed agricultural landscapes of Ethiopia, *Agric. For. Meteorol.*, 358, 110262, <https://doi.org/10.1016/j.agrformet.2024.110262>, 2024.

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## Supplementary materials

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