AGRICULTURE AND LAND USE

Rainfall drives cropland expansion

Proc. Natl Acad. Sci. USA https://doi.org/ds9r (2020)

Climate change has already altered rainfall patterns in regions of the world and is expected to pose risks to food production through further disturbances of temperature and precipitation. This may lead farmers to relocate to new favourable agricultural regions, expand cropping area to compensate for lower yields, or adopt crops and management practices with different land requirements. Empirical analysis can shed light on the aggregate impact of such strategies on land-use change.

Esha Zaveri and colleagues from The World Bank's Water Global Practice have examined how rainfall anomalies impact cropland globally, looking particularly at the differential scale of such impact across world regions. They generated disaggregated panel data at the 0.5° grid-cell level, for 171 countries, from 1992 to 2015. Defining an anomaly as a variation in precipitation that is at least one standard deviation from long-run averages, they mapped the temporal and spatial distribution of such extreme events and checked for correlations with cropped area and agricultural productivity. To isolate the impact of anomalies from other factors, focus was placed on exogenous and unexpected rainfall variations, combined with year fixed effects and other controls at the grid-cell level to capture changes in cropland and net primary productivity. The same analysis was repeated with forest instead of cropland area.

Results indicate farmers' greater sensitivity to cumulative and persistent declines in yields than cumulative increases obtained through cropland expansion. Repeated dry anomalies were associated with cropland expansion, but no significant effect was found with wet anomalies. The fact that dry anomalies drove cropland expansion only in developing countries, in tandem with forest suppression, and were less pronounced in regions with access to irrigation suggests that most cropland expansion is conducted by smallholders to counter reductions in crop yields. In fact, dry anomalies were estimated to account for approximately 9% of the rate of cropland expansion over the past two decades, and for 15% of total forest reduction on average.

Further research should explore intraseasonal rainfall variability, different types of calorie, the distinction between food and feed, as well as more adaptive responses by farmers. Yet, the study's global and empirical approach is crucial for understanding the climate-induced spatial rearrangements of food production and the identification of vulnerable regions. Estimating the specific contribution of rainfall variability to cropland expansion can also guide investment and policy efforts, hopefully breaking the negative feedback loop between land conversion for agriculture and climate change.

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Published online: 19 May 2020
https://doi.org/10.1038/s43016-020-0088-8