



# RESEARCH BRIEF

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## Diversified Farms Promote Biodiversity and Buffer Climate Change Effects

*Agricultural practices often cause the greatest harm to nature, but incorporating nature into farming by diversifying crops or providing micro-habitats, may offer the best opportunity to improve biodiversity.*

### Background

Half the habitable land on earth is currently in use for agriculture which has significant implications for biodiversity and ecosystem services. Recent studies have documented that agricultural landscapes can support high levels of biodiversity over the short term, but little was known about those same effects when examined over time. A better understanding of the long-term changes in biodiversity is crucial to improve forecasting of ecosystem dynamics and the effectiveness of conservation interventions which are dependent not just on protected areas, but also on the habitats found in croplands, grazing lands and tree plantations.

This brief is based on Stanford research that examined extensive long-term data on the health of bird communities in Costa Rica (as an indicator) to answer two questions: what are the long-term effects of agricultural practices on bird diversity, and do agricultural practices intensify the effects of climate change on wildlife.

### POINTS FOR POLICY MAKERS

Understanding the long-term changes in biodiversity is crucial to improve forecasting of ecosystem dynamics and the effectiveness of conservation interventions. In multi-cropped agriculture systems species diversity remained high over the long term, indicating that this form of land management could play a powerful role in biodiversity conservation.

► **Diversified agriculture can help alleviate the long-term loss of biodiversity outside natural protected areas.** Birds serve as a bellwether for evaluating the overall health of natural ecosystems. Shifting away from intensive farming practices will help ease biodiversity deterioration in nearby ecosystems by providing critical habitat outside protected areas.

► **Agricultural diversification shields ecosystems against the impacts of climate change.** Farms employing diversified cropping are better able to mitigate climate change effects on biodiversity over the long-term as their support of habitat is comparable to natural forests.

► **Developing integrated, diversified agricultural systems can help farmers to adapt to climate change effects.** Shifting the focus towards global adoption of agricultural methods that promote crop productivity and economic security as well as biodiversity could help both human as well as wildlife communities adapt to a changing climate.



A major difference in bird diversity occurs between diversified and intensive agriculture. Diversified-agricultural communities have high species richness, on par with that of natural-forest communities, while the species richness in intensive agriculture was on average 52% lower than that found in the natural forest. Biodiversity within intensive agriculture declined over the course of the study, particularly for species that were of conservation concern. In diversified farming systems, biodiversity remained relatively unchanged, indicating that this practice can play an important role in conservation.

The effects of climate change, such as higher temperatures and drought, also have the greatest negative impacts on wildlife in intensive agriculture. Diversified farms offer refuge from climate change by buffering the harmful effects in ways similar to a natural forest ecosystem.

On some diversified Costa Rican farms, bananas and coffee are planted together allowing the taller banana plant to shade the temperature-sensitive coffee bean. This cropping practice offers more opportunity to increase habitat than intensive, mono-cropping alone, while also providing multiple income streams for the farmer.

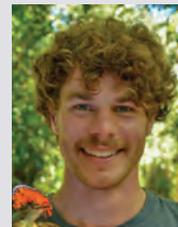
Halting species loss will require a major shift from wide-spread intensive farming practices to sustainable and resilient agricultural systems that promote not only farm productivity and livelihood security, but also biodiversity. Sustaining biodiversity, in turn, will also ensure that nature's full array of vital benefits is available for wildlife as well as people long-term.

## ABOUT THE AUTHORS



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This brief is based on the paper “**Intensive farming drives long-term shifts in avian community composition**” published in *Nature* (2020).

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## FOR MORE INFORMATION

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