

Reducing the biodiversity impacts of agriculture in Ethiopia

This policy briefing recommends policies that minimise agricultural expansion in areas of high biodiversity value and sustainable agricultural practices to maintain healthy and sustainable food systems.

The intimate relationship between biodiversity and agriculture

There is a close link between biodiversity and agriculture. Agriculture requires that surrounding ecosystems are healthy and resilient to support valuable ecosystem services.^{1,2} Some species act as natural pest controllers, reducing the pests and pathogens that threaten crops. For example, the fungal hyperparasite *Lecanicillium lecanii* provides a biocontrol service by reducing the severity of coffee leaf rust (*Hemileia vastatrix*) in Ethiopia.³ Other species act as pollinators for crops. For example, arabica coffee is pollinated by many bees and fly species in Ethiopia, which supports temporal coffee yield stability.⁴

Policymakers must promote the conservation of Ethiopia's areas of high biodiversity value (see Box 1) to maintain the ecosystem services that support agriculture. For example, if crops are grown in areas of high biodiversity value or in ways that do not support biodiversity-friendly farming, the health and resilience of ecosystems will be degraded, and farmers will lose valuable

ecosystem services that support agriculture. In Ethiopia, agricultural intensification has reduced natural pest control³ and pollination⁵ ecosystem services for coffee production.

Ethiopia's National Biodiversity Strategy and Action Plan (NBSAP) 2015–2020⁶ recognises this close link between biodiversity, ecosystem services and agriculture. Furthermore, the NBSAP regards the valuation of ecosystem services as a necessary means of promoting conservation, sustainable use, and access to benefits.¹

Methodology

Global-scale datasets – from EarthStat, the IUCN Red List, FAOSTAT, Birdlife International, WWF, Key Biodiversity Areas, and the Observatory of Economic Complexity – were used to map areas in Ethiopia where both biodiversity value and crop production are high.

The research team at University College London (UCL) used these maps to identify the spatial overlap between areas of high biodiversity value and areas of crop production. These are hotspots of trade-off risk – areas where environmental goals might be at risk of conflict with plans for agricultural development.

Key messages

Minimise agricultural expansion and intensification in high biodiversity value areas. Use maps highlighting the overlap between crops and areas of high biodiversity to identify regions where agriculture-biodiversity trade-off risks are highest.

Policymakers should use strategic spatial planning to minimize agricultural expansion in areas of high biodiversity value, such as forests, in alignment with Ethiopia's Green Economy Strategy. Consult maps that use crop-specific land use classifications instead of broad 'cropland' or 'agriculture' land use classes to develop agricultural spatial plans.

When agricultural production occurs in or near areas of high biodiversity value, such as protected forests, policymakers should promote the use of biodiversity-friendly agriculture.

Certain crops, particularly bananas, coffee, and maize, are grown close to high biodiversity value areas and pose the highest risk to Ethiopia's biodiversity. Therefore, policymakers should pay particular attention to promoting the sustainable production of these crops.

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Bananas, coffee and maize are among the most important crops in Ethiopia.⁷ They also occupy an extensive footprint within and surrounding areas of high biodiversity value (Figure 1). These crops currently pose the highest risk to biodiversity in Ethiopia because of the large amount of land used to cultivate them within or surrounding the areas of the highest biodiversity value.

Policymakers should minimise agricultural expansion and intensification in areas of high biodiversity value. Where this is unavoidable, policymakers must promote biodiversity-friendly farming practices to reduce negative ecological impacts from agriculture in these areas.

Ethiopia's Green Economy Strategy⁸ specifies that policymakers minimise agricultural expansion into forest ecosystems. The strategy therefore aligns with this policy brief's recommendations that policymakers reduce agricultural development in areas of high biodiversity value, including forest ecosystems.

A focus on self-sufficiency or international trade will not necessarily determine the impact of agriculture on biodiversity. It is more important where and how crops are grown, rather than whether they are consumed domestically or traded internationally.

Ethiopia already uses several biodiversity-friendly agricultural practices, including planting nitrogen-fixing trees, which has positively affected soil micro-organism diversity in planted forest systems, as well as improved fruit and vegetable varieties, the use of organic manure, and integrated pest management. These practices increase crop yields and improve nutrition.¹

Many biodiversity-friendly practices are relatively complex and require a good understanding of the local ecosystem. They can be knowledge-intensive, context-specific, and provide benefits in the

Box 1. Definitions

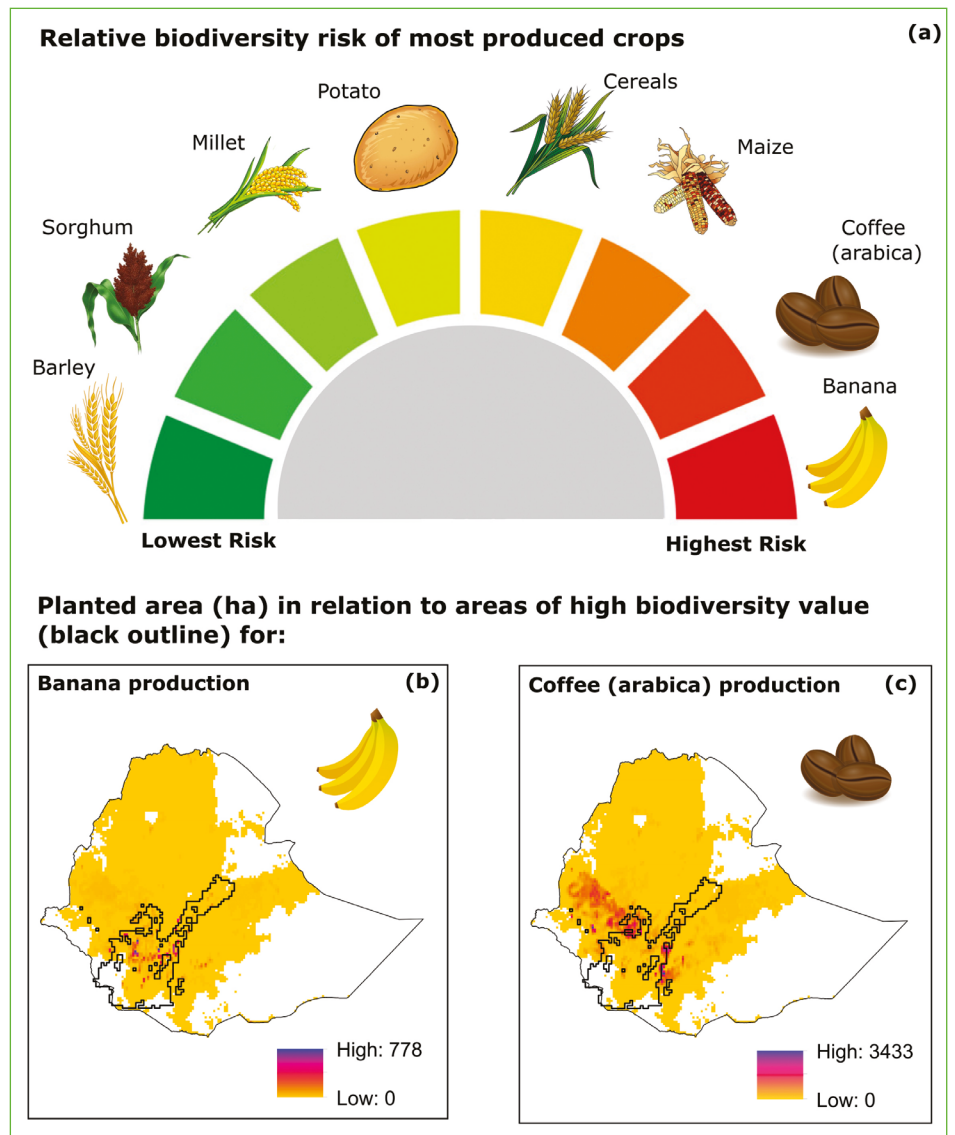
- **Agriculture-biodiversity trade-off risk:** meeting agricultural production needs puts biodiversity conservation at risk and vice versa. For example, a farmer expanding their cropland may encroach on pristine forests and put biodiversity at risk. A socioeconomic-focused goal is met by increasing production, but a conservation-focused goal is compromised. All agricultural production harms biodiversity to some extent, but farmers can reduce this impact by avoiding production in areas of high biodiversity value and using biodiversity-friendly farming practices.
- **High biodiversity value area:** a region with the top 10% of species in the country by area.
- **Ecosystem services:** the benefits that humans derive from ecosystems. Ecosystem processes, such as pollination, support ecosystem services, in particular the production of crops. In combination with human activities including cultivation, harvesting, transport and land preparation, ecosystem services produce goods, for example flour, that humans value.
- **Biodiversity:** the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.⁹
- **Vertebrate biodiversity:** this research focused on vertebrate biodiversity on land only, which is the variety of life in groups of birds, mammals, reptiles, and amphibians.

long term. Research should be promoted that investigates which biodiversity-friendly agricultural practices deliver environmental, social and economic benefits in areas of high biodiversity value in Ethiopia.



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Figure 1. The relative biodiversity-agriculture trade-off risk, identified as the spatial overlap between areas of high biodiversity value and areas of crop production in Ethiopia. (a) The highest production volume crops [tonnes in 2020] in terms of the relative risk to biodiversity. The planted areas of bananas and arabica coffee overlap with high biodiversity value areas to the greatest extent and pose the most significant threat to biodiversity in Ethiopia. The planted area (ha) per 10 km² of these two crops in relation to Ethiopia's high biodiversity value areas (black outline) are shown in (b) and (c), respectively.



The Microbial Biodiversity Directorate of the Ethiopian Biodiversity Institute promotes the conservation and sustainable use of the country's biodiversity. This institute should be engaged in research and policy development on biodiversity-friendly agricultural practices in Ethiopia.

High biodiversity value areas in Ethiopia

The areas of the highest biodiversity value are scattered across the central and southwestern regions of the country (Figure 1, b and c). These areas are of high value because they support the country's highest number of vertebrate species.

The country contains 10 ecosystems, and 18 major and 49 minor agro-ecological zones that support a great diversity of animal, plant, and microbial genetic resources, making the country one of the world's biodiversity hotspots.⁶

Ethiopia possesses an estimated 6,000 species of higher plants, of which 10% are endemic. In addition, the country reports 284 wild mammal, 861 bird, 201 reptile, 200 fish, 63 amphibian, and 1,225 arthropod species. Of these faunal resources, 29 wild mammal, 18 bird, 10 reptile, 40 fish, 25 amphibian, and 7 arthropod species are endemic to Ethiopia.⁶

Conclusion

Ethiopia's ecosystems support biodiversity and ecosystem services, such as pest control and pollination, which are essential for maintaining healthy and sustainable food systems. Agriculture threatens ecosystems that are crucial for biodiversity. Policymakers should prioritise agricultural expansion in areas outside of Ethiopia's high biodiversity value areas, so that food production can continue into perpetuity without degrading the biodiversity and ecosystem services on which it depends.

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About this briefing

This policy briefing describes the risk of agricultural production to biodiversity in Zambia. It is aimed at policymakers in agriculture, environment, and planning.

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