Sentinel
Social and Environmental Trade-Offs in African Agriculture

Policy Brief
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# Reducing the biodiversity impacts of agriculture in Zambia

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. Other species act as pollinators for crops. For example, the western honey bee (*Apis mellifera*) provides a valuable pollination ecosystem service to agricultural production systems in Zambia. Biodiverse ecosystems are more diverse in the available nutrients to support crop production. Biodiversity is considered a natural way to protect against the effects of climate change through the implementation of ecosystem-based approaches to adaptation.[3]

Policymakers must promote the conservation of Zambia's areas of high biodiversity value (see Box 1) to maintain the ecosystem services that support agriculture. If crops are grown in areas of high biodiversity value, this will degrade the health and resilience of ecosystems, and farmers will lose valuable ecosystem services that support agriculture.

## 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 Zambia where both biodiversity value and crop production is 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 to identify regions where agriculture-biodiversity trade-off risks are highest.

Agricultural policies should consider the long-term resilience of ecosystems to support crop production. These policies should maximize ecosystem resilience by promoting biodiversity-friendly agricultural management practices.

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 maize and pulses, are grown close to high biodiversity areas and pose the highest risk to Zambia's biodiversity. Therefore, policymakers should prioritise promoting the sustainable production of these crops.

Different crops will require different types of biodiversity-friendly management. Therefore, biodiversity-friendly agriculture policies should make crop-specific recommendations on management practices.

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# Reducing the biodiversity impacts of agriculture in Zambia

Maize and pulses are among the most important crops in Zambia.[4] 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 Zambia because of the large amount of land used to cultivate them within and 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, biodiversity-friendly farming practices to reduce negative ecological impacts from agriculture must be promoted in these high biodiversity value areas.

Different crops have different impacts on biodiversity and require different management approaches to reduce their harmful effects on biodiversity. For example, establishing sugar cane plantations in wetlands rich in biodiversity must be carefully planned and, where possible, avoided. Examples of such biodiversity-rich wetlands are the Bangweulu Wetlands and Lukanga Swamp.

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

The biodiversity risk of agriculture is not significantly different

**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.[5]
- **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.

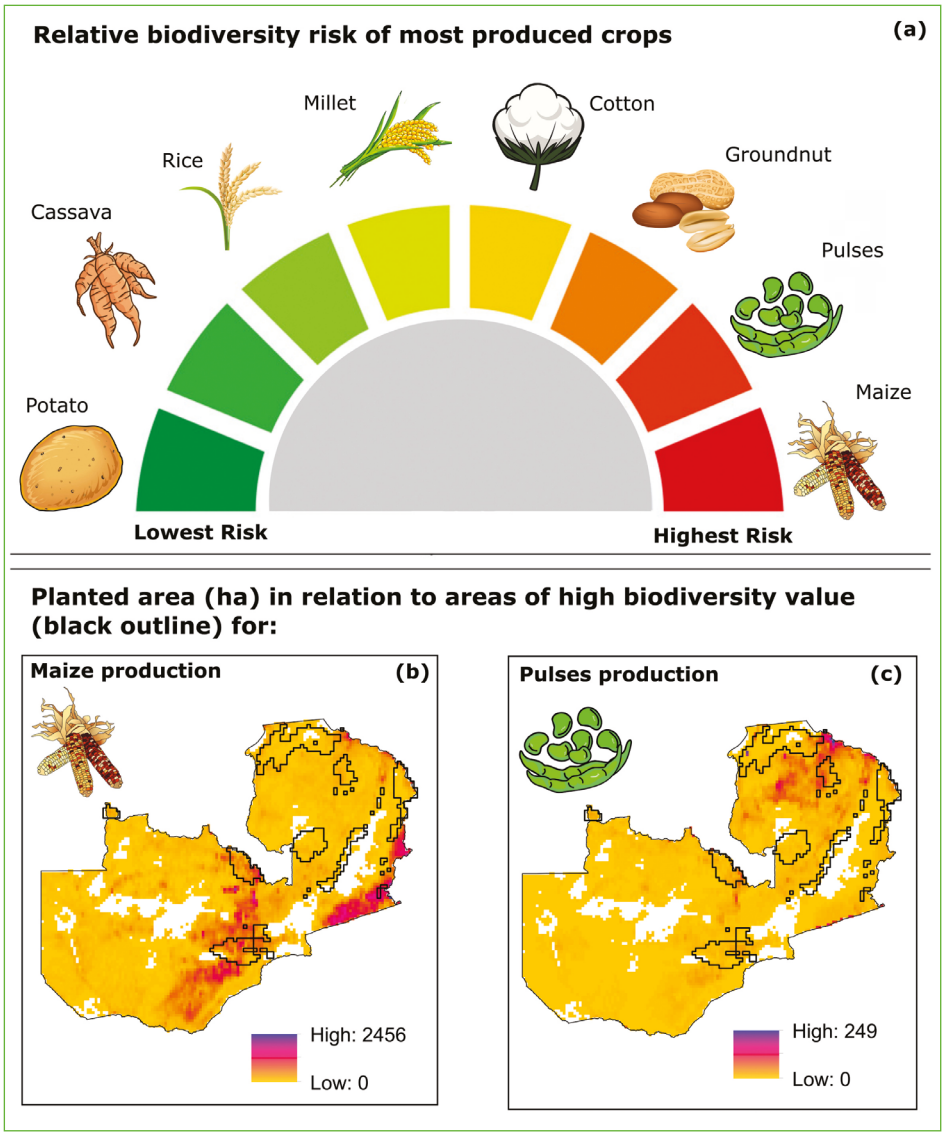


**Figure 1. The relative biodiversity–agriculture trade-off risk, identified as the spatial overlap between areas of high biodiversity value and areas of crop production in Zambia. (a) The highest production volume crops (tonnes in 2020)[4] in terms of the relative risk to biodiversity. The planted areas of maize and pulses overlap with high biodiversity value areas to the greatest extent and pose the most significant threat to biodiversity in Zambia. The planted area (ha) per 10 km² of these two crops in relation to Zambia's high biodiversity value areas (black outline) are shown in (b) and (c), respectively.**

between domestic and traded crops, so a focus on self-sufficiency or international trade will not necessarily determine the impact of agriculture on biodiversity. It is more important where crops are grown and what management practices are used in their production, rather than whether they are consumed domestically or traded internationally.

The Biodiversity Community Network – a nongovernmental organisation (NGO) working within the International Federation of Organic Agriculture Movements (IFOAM) framework – should be engaged in research and policy development on biodiversity-friendly agricultural practices in Zambia.

## High biodiversity value areas in Zambia

Zambia supports a high diversity of species, including invertebrates (6,135 species), wild flowering plants (3,543 species), fish (490 species), mammals (224 species), crustaceans (200 species), and reptiles (156 species).[6,7]

The areas with the highest biodiversity value are scattered across the country's eastern region (Figure 1). These areas are of high value because they support the highest number of species in the country.

Zambia's wetlands support important biodiversity, including some endemic and endangered species. Wetland ecosystems include the Kafue Flats (Lochnivar and Blue Lagoon National Parks), Bangweulu Swamps (Chikuni), Lukanga Swamp, Busanga,

Lake Tanganyika, Luangwa Floodplains, and Barotse floodplain, which are listed under the Ramsar Convention. In addition, Lake Tanganyika, Mweru Wa Ntipa and the Barotse Plains are centres of molluscan endemism.

IUCN's 2014 Red List of Threatened Species indicated that over 28 of Zambia's animal species and subspecies are threatened, endangered, or vulnerable. More than half of the 200 crustacean species in various ecosystems are endemic to Zambia. In addition, Zambia has 45 rare reptile species, including lizards, snakes and tortoises, that are found only in a single location.

## Conclusion

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

## References


1 FAO (2019) The State of the World's Biodiversity for Food and Agriculture. Rome, Italy: FAO Commission on Genetic Resources for Food and Agriculture Assessments.

2 Ortiz, AMD, Outhwaite, CL, Dalin, C and Newbold, T (2021) A Review of the Interactions between Biodiversity, Agriculture, Climate Change, and International Trade: Research and Policy Priorities. *One Earth* 4 (1): 88–101. DOI: 10.1016/j.oneear.2020.12.008

3 Jones, HP, Hole, DG and Zavaleta, ES (2012) Harnessing Nature to Help People Adapt to Climate Change. *Nature Climate Change* 2 (7): 504–9.

4 FAO (2022) FAOSTAT. www.fao.org/faostat.

5 CBD (2006) Convention on Biological Diversity. Article 2. Use of Terms. Secretariat of the Convention on Biological Diversity. 2 November 2006. www.cbd.int/convention/articles/?a=cbd-02.

6 GRZ (2015a) Fifth National Report. UN Convention on Biological Diversity. Lusaka, Zambia: Ministry of Lands, Natural Resources and Environmental Protection. www.cbd.int/doc/world/zm/zm-nr-05-en.pdf.

7 GRZ (2015b) National Biodiversity Strategy and Action Plan II (NBSAP 2). Lusaka, Zambia: Ministry of Lands, Natural Resources and Environmental Protection. www.fao.org/faolex/results/details/en/c/LEX-FAOC163433/.


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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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