

# Ecosystem service benefits of agricultural knowledge, science and technology



## The Challenge

Global biodiversity and food production faces multiple threats, especially from climate change. Investment in agricultural knowledge, science and technology (AKST) can improve global crop and livestock productivity. This has the potential to alleviate some of the pressures on biodiversity and other ecosystem services through reducing land use change. The purpose of this study was to investigate global economic benefits of investment in AKST in terms of biodiversity and ecosystem services.

## Policy Implication

Investments in AKST can improve livelihoods and create resilience to environmental change. Our research shows that there may be substantial environmental benefits by reducing pressure for land use change in natural habitats. However, benefits are not evenly distributed. This reflects both the disparity in incomes which drive the value of ecosystem services, and a disparity in the levels of land use change. Part of this is the potential for greater trade in agricultural products, particularly from sub-Saharan Africa to developed countries which allows the latter to change some agricultural land back to uses such as forestry. Care may be needed to avoid the loss of important, but undervalued, ecosystem services in lower income regions.

## Research

The TEEB Ecosystem Services Valuation Database was used to identify relevant valuation studies across developing regions, which were then combined with spatial data to estimate value functions to explain ecosystem services. The value functions were then applied to a global land cover dataset to determine how the overall value of ecosystem services changed due to land cover change relative to business-as-usual.

## Results

By reducing the pressure for land use change from forest to agriculture and from grassland to arable, investment in AKST has estimated global ecosystem service benefits of US\$2,978bn between 2000 and 2050. However, there are some regional disparities. Due to reduced forest loss, Central and South America have estimated annual benefits of US\$65bn in 2050 compared to an annual loss of US\$5.5bn in Russia and Central Asia – this loss is due to technology allowing currently unutilised areas of Central Asia to come into crop production. High benefits are also estimated for OECD countries and China, with relatively small benefits for North Africa and the Middle East, sub-Saharan Africa and South Asia. These differences reflect both relative levels of habitat change and incomes.

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## Contact

Contact: Alistair McVittie

Email: [alistair.mcvittie@sruc.ac.uk](mailto:alistair.mcvittie@sruc.ac.uk)

Research group: Land Economy, Environment and Society

Address: SRUC, Peter Wilson Building, Edinburgh, EH9 3JG.

## About

The Land Economy, Environment and Society (LEES) Research Group is one of the largest groupings of economists and social scientists working in the rural, agricultural and land based sectors in the UK. Our vision is to be recognised as one of the leading centres for agricultural and wider rural economic and social research globally, benefiting the land use sector, the environment and rural communities.

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