

Science for Environment Policy

Climate change to shift global spread and quality of agricultural land

New areas of land suitable for agriculture will open up under climate change's effects, new research predicts, particularly in far northern regions of the world. However, the overall quality of land for farming will decline and many regions, including Europe, could lose large areas of suitable land.

Demand for agricultural products is expected to rise by 70–110% by 2050. This is driven by population growth, increased meat consumption and greater use of biofuels and bio-based materials, such as bioplastics.

At the same time, [climate change](#) is affecting the quantity and quality of farmland. For instance, changing temperatures and rainfall patterns contribute to soil erosion and desertification. However, warmer and wetter conditions may also make some previously uncultivable areas better suited to growing crops.

This study assessed the impact of climate change on agricultural land for 16 crops. It compared the global spread of farmland between the 'current' period (1981–2010) and a future period (2071–2100) using a computer model which simulated climate change's probable impact.

These 16 crops are those that are most important to food security, the global economy and biofuels, and include wheat, potato and soy. The study assumed that climate change would progress as per the [IPCC's A1B scenario](#), which predicts rapid economic and population growth up until the mid-21st century, and then decline.

The simulations accounted for three influences on land: local climate, [soil](#) and terrain. To isolate climate change's effects on land and farming, the study assumed that there will be no changes in irrigated areas, soil properties, terrain or adaptations, such as breeding new crop varieties.

The results indicate that, in the future, there will be a global net increase in land suitable for crops of 4.7 million km², from 54.2 million km² to 58.9 million km². These figures include land that is both rain-fed and irrigated, and exclude protected areas and dense forest. Large areas of forest were also considered suitable for cropland, but the researchers excluded these from this estimate because of the importance of conserving these to protect ecosystem services, such as carbon storage. Most new land will become available in Canada, China and Russia.

However, there will be a downward shift in land quality: 3.9 million km² is projected to be 'highly suitable' for crops, compared with 4.6 million km² for the current period. In turn, more land will be classified as 'marginally suitable' or 'moderately suitable', with increases of 3.8 million km² and 1.6 million km², respectively, under these categories.

Total cropland is predicted to shrink across all regions of the EU (including protected areas and dense forest), with the exception of Scandinavian Member States where 0.21 million km² of land could become available. Across the EU as a whole (excluding Croatia), there may be a total loss of 1.7 million km². The Mediterranean region of the EU shows a steep decline, with an expected loss of 0.7 million km².

Globally, Sub-Saharan Africa is the region predicted to lose the most land suited to growing crops, at 2.3 million km². This is followed by the Middle East and North Africa region, which could lose 1.8 million km².

The study's authors note that agricultural expansion always has an ecological cost, even where protected areas are not affected. Future research should explore the environmental and social impacts of using newly suitable land for farming, they suggest.



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