Bioenergy crops better for biodiversity than food-based agriculture

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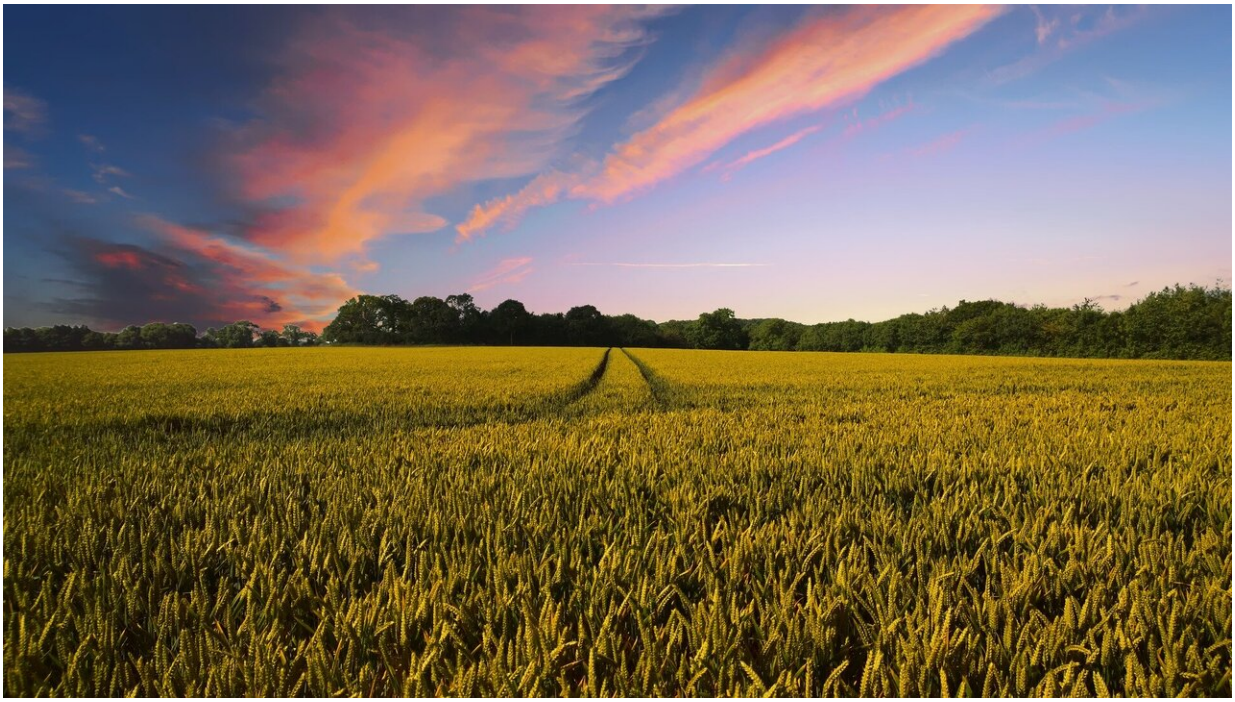

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A study led by the University of Southampton suggests a greater diversity of plants and animals can be found where bioenergy crops are grown, compared with areas supporting traditional agricultural crops.

A team of scientists, from the universities of Southampton, Surrey and California, analyzed data from a variety of field-based studies to

establish overall trends of biodiversity for different crop types. Originally starting with some 4,000 studies, they used a strict selection criteria to identify 21 to examine in more detail for this research.

Findings, published in the journal *Environmental Research Letters*, showed that biodiversity increases 75 percent after land-use change from food-based agriculture to non-food bioenergy crops, with bird abundance increasing 81 percent and bird species richness rising 100 percent. Benefits were also found for insects, plants and soil biodiversity.

The study looked at non-food or dedicated bioenergy crops, including energy grasses of Miscanthus and switchgrass and short-rotation energy trees of willow and poplar. These bioenergy crops improved farm-scale biodiversity, compared to food-based agricultural land-use (managed grasslands or arable crops), for three main reasons: reduced management intensity, provision of features more similar to natural ecosystems, and increasing complexity or heterogeneity in the landscape.

The results of this systematic review and meta-analysis are timely, occurring during the COP26 climate change summit in Glasgow, with most decarbonisation scenarios requiring high levels of land conversion to non-food bioenergy crops, substituting fossil fuels, and delivering negative emissions via Bioenergy with Carbon Capture and Storage (BECCS). At the same time, biodiversity is in a critical condition globally, with one million species of plant and animal at risk of extinction.

Study author and Postgraduate Research Student at the University of Southampton, Caspar Donnison says that "whilst concerns have been raised about the biodiversity impacts of bioenergy, previous studies have either considered first generation bioenergy food crops only, or the conversion of natural lands. Our study is the first meta-analysis to

evaluate the biodiversity impact of growing non-food bioenergy crops on agricultural land."

On reviewing the visual esthetic and recreation impact of non-food bioenergy crops the team found an important knowledge gap, with few conclusions to report from some 2,000 papers screened and just 12 studies providing relevant information. Whilst they found evidence that the visual impact of bioenergy crops is not currently a primary concern of the public, and that these crops can fit in and even enhance the visual attractiveness of a landscape, the evidence base is limited, and further work is needed.

Principle Investigator for the research, Professor Gail Taylor comments that "this study shows clearly that land-use change from agricultural crop production to bioenergy cropping can improve biodiversity, but also highlights our limited understanding of the impact of this land-use change for cultural ecosystem services, where more research is required."

"The implications of our results for policy makers are that farm-scale biodiversity can be supported as bioenergy crops are expanded in the landscape, although there are potential risks associated with large field sizes of these types of crops. Regarding the impact on cultural ecosystem services, further public engagement is required to determine the visual impact and public acceptability in local communities."

More information: Caspar Donnison et al, Land-use change from food to energy: meta-analysis unravels effects of bioenergy on biodiversity and cultural ecosystem services, *Environmental Research Letters* (2021). DOI: 10.1088/1748-9326/ac22be

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