

International research team argues for combination of organic farming and genetic engineering

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For more sustainability on a global level, EU legislation should be changed to allow the use of gene editing in organic farming. This is what an international research team involving the Universities of Bayreuth and

Göttingen demands in a paper published in the journal *Trends in Plant Science*.

In May 2020, the EU Commission presented its 'Farm-to-Fork' strategy, which is part of the European Green Deal. The aim is to make European agriculture and its [food](#) system more sustainable. In particular, the proportion of [organic farming](#) in the EU's total agricultural land is to be increased to 25 percent by 2030. However, if current EU legislation remains in place, this increase will by no means guarantee more sustainability, as the current study by scientists from Bayreuth, Göttingen, Düsseldorf, Heidelberg, Wageningen, Alnarp, and Berkeley shows.

Numerous applications derived from new biotechnological processes are severely restricted or even banned by current EU law. This is especially true for gene editing, a new precision tool used in [plant breeding](#). "Expanding organic farming further under the current legal restrictions on biotechnology could easily lead to less sustainability instead of more. Yet gene editing in particular offers great potential for sustainable agriculture," says Kai Purnhagen, lead author of the study and Professor of German & European Food Law at the University of Bayreuth.

Organic farming focuses on greater farming diversity and prohibits the use of chemical fertilizers and pesticides. Therefore, it can have a beneficial effect on [environmental protection](#) and biodiversity at the local level. However, compared to conventional farming, organic farming also delivers lower yields. Consequently, more land is needed to produce the same amount of high-quality food. "As global demand for high-quality food increases, more organic farming in the EU would lead to an expansion of agricultural land elsewhere in the world. This could easily result in environmental costs that exceed any local environmental benefits in the EU, as the conversion of natural land into agricultural land is one of the biggest drivers of global climate change and

biodiversity loss," says co-author Martin Qaim, Professor of Agricultural Economics at the University of Göttingen.

The combination of organic farming and modern biotechnology could be a way to resolve this dilemma. "Gene editing offers unique opportunities to make food production more sustainable and to further improve the quality, but also the safety, of food. With the help of these new molecular tools, more robust plants can be developed that deliver high yields for high-quality nutrition, even with less fertilizer," says co-author Stephan Clemens, Professor of Plant Physiology at the University of Bayreuth and founding Dean of the new Faculty of Life Sciences: Food, Nutrition & Health on the Kulmbach campus. In addition, gene editing is used to breed fungus-resistant plants that thrive under organic farming without copper-containing pesticides. Copper is particularly toxic to soil and aquatic organisms, but its use to control fungi is nevertheless permitted in organic farming because of the lack of non-chemical alternatives to date. "Organic farming and gene editing could therefore complement each other very well and, combined, could contribute to more local and global sustainability," says Qaim.

However, the use of [genetic engineering](#) in organic farming requires legal changes at the EU level. "There is certainly no political majority for this at present, because genetic engineering is viewed very critically by many. Yet perhaps improved communication could gradually lead to greater societal openness, at least towards gene editing, because this form of genetic engineering enables very targeted breeding without having to introduce foreign [genes](#) into the plants. Highlighting this point could dispel many of the widespread fears of genetic engineering," says Purnhagen.

More information: Kai P. Purnhagen et al. Europe's Farm to Fork Strategy and Its Commitment to Biotechnology and Organic Farming: Conflicting or Complementary Goals?, *Trends in Plant Science* (2021).

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