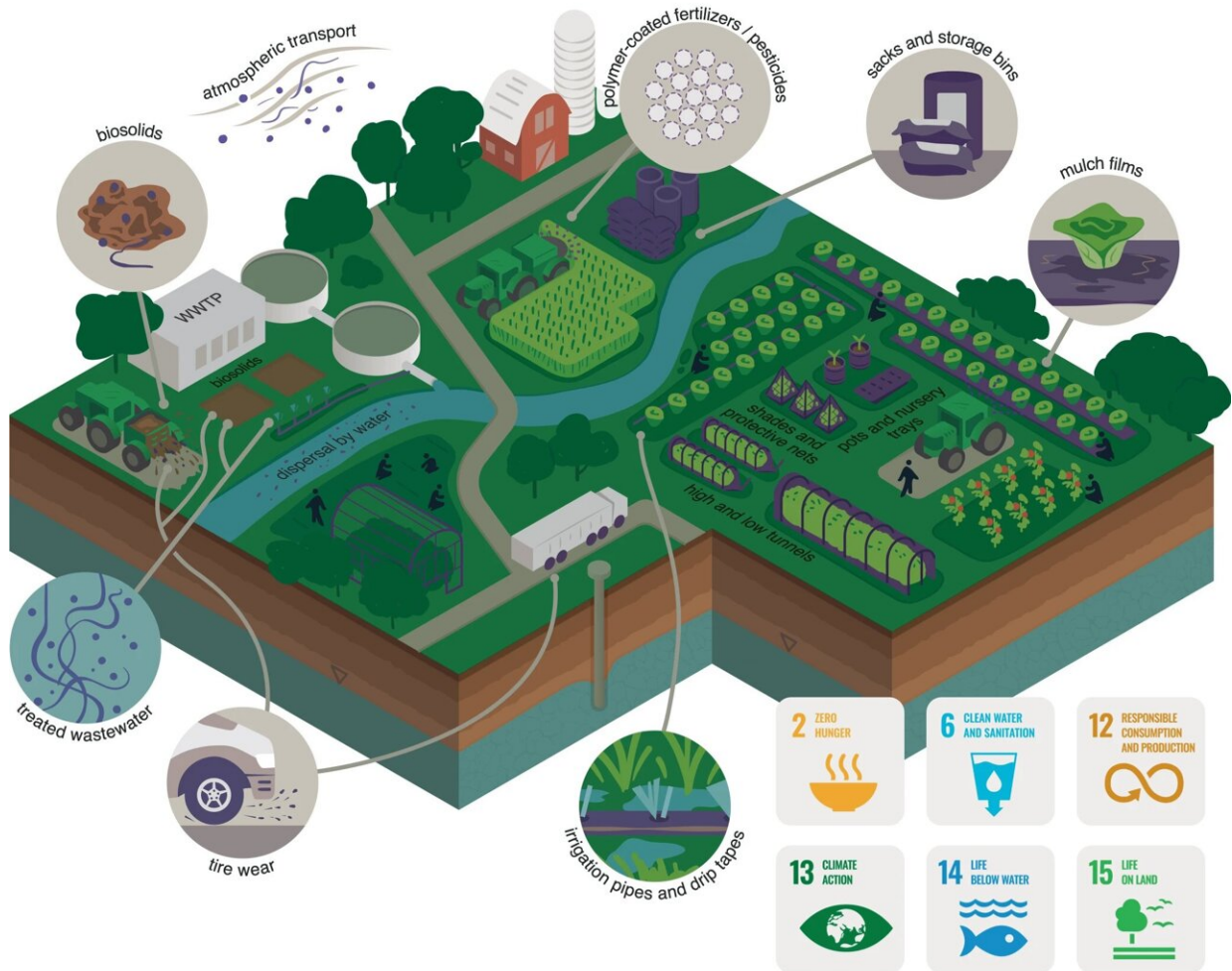
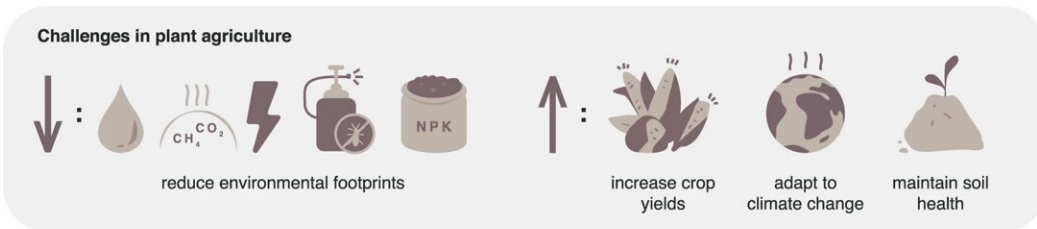


How can the use of plastics in agriculture become more sustainable?

September 25 2023



UN Sustainable Development Goals

Applications of plastics in plant agriculture. There are multiple applications of plastics in plant agriculture. Plastics help to reduce irrigation water, pesticide, and fertilizer demand, leading to reduced greenhouse gas emissions and increased crop yield, which impacts several UN Sustainable Development Goals. There are also diverse sources of incidental plastic pollution on croplands; for example, during the dispersal of wastewater biosolids or treated wastewater from wastewater treatment plants (WWTP), including tire wear particles contained therein. Credit: *Communications Earth & Environment* (2023). DOI: 10.1038/s43247-023-00982-4

It is impossible to imagine modern agriculture without plastics. 12 million tons are used every year. But what about the consequences for the environment? An international team of authors led by Thilo Hofmann from the Division of Environmental Geosciences at the University of Vienna addresses this question in a recent study in *Communications Earth & Environment*. The research shows the benefits and risks of using plastics in agriculture, and identifies solutions that ensure their sustainable use.

Once celebrated as a symbol of modern innovation, [plastic](#) is now both a blessing and a curse of our time. Plastic is ubiquitous in every sector, and agriculture is no different. Modern agriculture, which is responsible for almost a third of global greenhouse gas emissions and is a major drain on the planet's resources, is inextricably linked to plastic.

The new study from the University of Vienna was conducted by Thilo Hofmann, environmental psychologist Sabine Pahl and environmental scientist Thorsten Hüffer, along with international co-authors. Their research reveals that plastic plays a multi-faceted role: from mulch films that protect plants to water-saving irrigation systems, plastic is deeply embedded in our food production.

Plastic enhances yields while shrinking our ecological footprint

According to the Food and Agriculture Organization of the United Nations (FAO), over 12 million tons of plastic are integrated into the agricultural process every year. From securing plants with clamps to protecting them with nets, plastic has found its place in all areas of agricultural production.

The use of plastic in agriculture undeniably conserves important resources. The front-runner is mulch films, which account for about 50% of all agricultural [plastics](#). Mulch films not only control weeds and pests, but also preserve [soil moisture](#), regulate temperature, and improve [nutrient uptake](#), thus helping to reduce the ecological footprint of agriculture. In China, not using mulch films would require an additional 3.9 million hectares of cropland to maintain the status quo of production.

The dark side of plastic in our food systems

But the intensive use of plastics in agriculture also has downsides: impaired [soil fertility](#), dwindling crop yields, and the chilling prospect of toxic additives seeping into our food chain. Conventional plastics persist in the environment, with residues accumulating in our soils. Tiny plastic particles can be ingested by plants. Although research into the uptake of nanoplastics is still in its infancy, preliminary data suggests that plastics can enter our food chain through agriculture.

Our transition from plastic should be slow and calculated

In navigating the challenges of plastic in agriculture, the spotlight falls on a strategy that champions the rational use of plastic, its efficient

collection post-use, and the innovation of cutting-edge recycling methods, the authors state in the new study. "In cases where plastics remain in the environment, their design should ensure complete biodegradation. Furthermore, it is crucial that toxic plastic additives are replaced by safer alternatives," explains Thilo Hofmann

While bio-based materials present a tempting alternative, they are not without caveats. A rushed pivot to such materials without adequate consideration of their life cycles could unintentionally put more strain on our ecosystems and food networks.

The measures proposed by the authors are in line with global initiatives like the UN Plastics Treaty (UNEA 5.2). Adopting these practices will foster more [sustainable use](#) of plastics in [agriculture](#), according to the scientists.

While a complete replacement of plastics is untenable at present, the judicious use of alternatives with minimal environmental impact seems to be a promising way forward. With mandatory monitoring, [technological advancement](#) and educational initiatives, reducing our reliance on plastic and its adverse environmental impacts should be possible.

Further information on this topic was published in [Environmental Science & Technology](#).

More information: Thilo Hofmann et al, Plastics can be used more sustainably in agriculture, *Communications Earth & Environment* (2023). [DOI: 10.1038/s43247-023-00982-4](https://doi.org/10.1038/s43247-023-00982-4)

Provided by University of Vienna

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