

# **An analysis of the system-wide costs and benefits of using engineered nanomaterials on crop-based agriculture**

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A team of researchers affiliated with several institutions in the U.S. has conducted an analysis of the system-wide costs and benefits of using

engineered nanomaterials (ENMs) on crop-based agriculture. In their paper published in the journal *Nature Nanotechnology*, the group describes their analysis and what they found.

As scientists have come to realize that vast improvements in [agricultural practices](#) are needed if [future generations](#) are going to be able to grow enough food to feed the expected rise in population. They have increasingly turned to technology-based solutions, rather than just looking for biological advances. One such approach involves the design and use of ENMs on [crops](#) as a means of improving [pest control](#) and fertilizer efficiency. Prior research has shown that some ENMs can be mixed into the soil as a form of pest control or as a means of diverting fertilizer directly to the roots, reducing the amount required. In a similar vein, some prior research has shown that ENMs can be applied to parts of the plant above-ground as a means of [pest control](#). What has been less well studied, the researchers note, is the overall impact of ENMs on crops and the environment. In this new effort, they have tested the impact of ENM use on various crops and how they impacted the environment in which they were used.

The researchers tested metal-oxide-based ENMs and carbon nanotubes that have been designed to improve fertilizer efficiency, and found their use was no better than crops with no ENMs added. They did, however, find that when ENMs were used as seed coatings or as a leaf spray, they provided additional protection from pests. They next attempted to test the impact of ENM use on the environment and found that there was a potential for such materials to make their way into the water system. They also found there was a potential for ingestion by humans eating the treated crops, with unknown consequences. But they also found that there appeared to be more of an impact on the environment during the manufacture of the ENMs than during their use. They conclude by suggesting that much more research is required on ENMs before they are used as commercial products.

**More information:** Leanne M. Gilbertson et al. Guiding the design space for nanotechnology to advance sustainable crop production, *Nature Nanotechnology* (2020). [DOI: 10.1038/s41565-020-0706-5](https://doi.org/10.1038/s41565-020-0706-5)

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