Soil Microbe Transplants Could Help Restore Damaged Ecosystems

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Researchers at the Netherlands Institute of Ecology and Wageningen University found not only that a small amount of donor, healthy soil helped to restore ecosystems, but also that the land restored to the specific type of ecosystem the soil was taken from. One plot of restored heathland is pictured on the right, while a control plot, which received no soil, is on the left. Jasper Wubs

By Meaghan Lee Callaghan

After humans have used and abused land, ecosystem restoration efforts can transform the landscape into what it once was – a forest, grassland, wetland. But sometimes, even with our best efforts, the wanted plants and other organisms just don't take hold.

In a new study released in *Nature Plants* on Monday, scientists say they may have found a missing, vital component: microbes.

While the last couple of years have brought new understandings of how microbes interact with the human body, scientists have known that microbiota--or the bacteria, fungi, and invertebrates that live within the soil--are integral to ecosystem success. And some scientists had long theorized that transferring healthy soil from one site to unhealthy soil in other site could help restoration efforts.

With this 6-year experiment conducted by Dutch researchers, plots of old farmland were converted into grassland and heathland via soil inoculation, where the researchers spread small amounts of healthy soil over the old soil.

While the researchers worked off of long existing theory, this experiment showed a practical application, with some surprising results. The researchers found that the sections of land that were inoculated with healthy soil from heathland turned into heathland, and grassland to grassland.

They also found that it didn't take that much healthy soil to foster restoration. At the thickest point, the healthy soil measured one centimeter, and that's an "overstatement," said Jasper Wubs, lead researcher on the project and doctoral candidate at the Netherlands Institute of Ecology and Wageningen University.

"The fact that we can do this with a very small amount of donor soil is very surprising," said Wubs.

Jim Harris, an expert in microbial ecology at Cranfield University in the UK, who was not involved with the experiment, said that the study showed the "high effectiveness of quite a low density of inoculum."

"What this does is not only take the conceptual area forward, but also takes the practical side forward," Harris said. "Here is a clear demonstration that transplanting soil microbiota can indeed bring about restoration. It's going to be a game changer."

As the experiment showed restoration with a small amount of donor soil, organizations who restore land could be assured more successful results over larger expanses of land. But, the researchers admit that special attention needs to be paid to the area where the healthy, donor soil is taken.

"We have to be careful there," said Wubs. "We don't want to mess up a well-developed community."

While Wubs said that the team monitored the donor area and confirmed that the ecosystem was not badly affected by taking away the soil, he thinks that research should continue to find a way to make donor soil without harvesting from the wild--to "somehow cultivate soil communities as a resource," he said.

But until then, carefully monitored harvesting of healthy soil could be the solution to a smoother ecosystem restoration process.