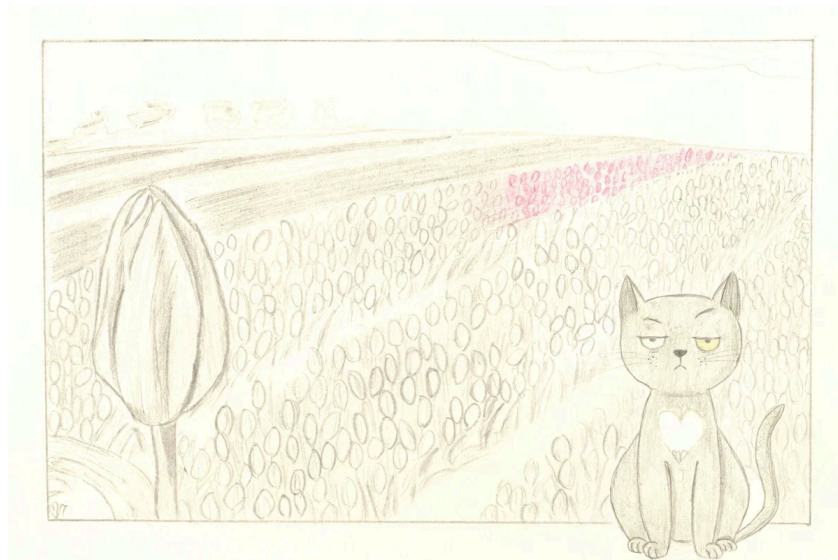


SmartyPuss reflects on monocultures

One crop, one field, one big mistake. Here's why the way we farm is impoverishing our soils, and what diversity could fix.



Wherever you are, a trip to the countryside typically leads to a view of fields reaching far and wide. Whatever plant is grown on these fields, be it ornamental flowers such as tulips or food staples like corn or wheat, often only one type of plant is grown within a field. The plants are grown in monoculture.

Monocultures may seem efficient, but are harmful to the environment¹. When only a single plant variety is used on a field, we are creating a highly simplified ecosystem. And that is a problem.

Plants take up carbon dioxide from the air, metabolize it, and put that carbon back into the soil as organic matter. Healthy soils are, therefore, a major carbon sink, reducing the amount of CO₂ in the air. Whether similar or different plants are grown in a field affects the amount of carbon that is stored in the soil². When wheat is grown in the same place year after year, less carbon is stored in the soil compared to fields where

other crops, such as corn, pea or barley, are rotated in successive years³. As plants differ in the depths the roots can reach, growing a variety of plants ensures carbon is captured throughout different layers of the soil.

Plants have an entire microbial ecosystem “at their feet” and these microbes have important jobs to do, such as nutrient cycling. Nitrogen, for example, is fixed by bacteria in the soil, while other bacteria release nitrogen back into the air. Nitrogen fixation helps the plant take up nitrogen, while the release of nitrogen avoids excess buildup in the soil. The balance between fixation and release is key, because too much nitrogen, such as that caused by extensive fertilizer use, can leak into rivers and groundwater polluting the environment⁴. On the other hand, too much nitrogen released in the air increases the amount of a potent greenhouse gas.

Crop diversification can help keep the balance between nitrogen fixation and release. When a variety of plants is rotated in cereal fields, microbe-assisted nitrogen release into the air is reduced, meaning that more nitrogen stays in the soil for plants to use for growth⁵. Crop variation also increases the diversity in mycorrhizal fungi⁶. These mutualistic fungal partners extend the plant’s reach in the soil to extract nutrients, while also improving water uptake.

Beyond nutrients, monocultures also leave crops more exposed to diseases and pests. For peanut plants, microbes associated with monocropping were more vulnerable to Fusarium wilt, caused by a fungus that limits water and nutrient uptake⁷. When cereals are planted as a monoculture or planted together with legumes, diversification through the addition of legumes reduces the abundance of pests that feed on the crop⁸. Intercropping also increased the species richness of beneficial insects, including pollinators (bees, hoverflies), but also parasitoids and predators (wasps, beetles, and other insects) that keep pest populations in check.

When considering polyculture at the global level, crop rotation practices can increase yield, lead to more nutritious food, and augment revenue for farmers⁹. Adding more biological diversity in agricultural practices through space or time leads to more diverse and healthier ecosystems. Biodiversity thus begets biodiversity.

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