

Sustainable agriculture is the balance between meeting current production and ecosystem needs while supporting the environment for future generations. This balance takes many factors into consideration—air, water, land, soil, climate, pests and pollinators, disease, and more. For this Insight, we discuss three facets of the world around us: climate, pollinators, and soil.



Climate

We know that climate change will bring warmer and wetter weather, but we also have a better sense of what that means for the future of agriculture. Although the growing season may become longer, research points to an increase in pests and diseases for both plants and animals; an increase in the risk of flooding, erosion, nutrient loss, and compaction; and decreased planting and harvesting windows all potentially decreasing crop productivity and quality.

Even though most farmers do not accept climate change is the cause, many are willing to adapt to its impacts, and we have a good sense of who that might be. Farmers with more formal education who report experiencing direct negative climate impacts, as well as larger farms that are likely to be kept in the family, are most likely to adapt to climate change. How? By changing their crop insurance, installing more drainage tile, retiring land for conservation, or increasing the use of conservation tillage.

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Additional resources at u.osu.edu/agroecosystemresilience/handouts-and-slides



Pollinators

Neonicotinoids are a type of insecticide that are typically coated on soybean and corn seeds to prevent early-season pests and are used on nearly every seed currently sold in the United States. Recent College of Food, Agricultural, and Environmental Sciences (CFAES) research on neonicotinoid-coated corn seeds found that, although these insecticides do negatively impact honey bee populations when the seeds are planted, these impacted populations tend to recover quickly, leaving no long-term impacts.

However, the mode of delivery and the type of treated plants are important when considering impacts on pollinators. Insecticides containing the same neonicotinoids sprayed on flowering plants, commercially or residentially, can have lasting impacts on bee populations. Our researchers specifically found dramatic impacts on bumble bee populations, which are one of our most prolific pollinators.

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Additional resources at u.osu.edu/beelab/pesticides-and-bees





Soil

Maintaining healthy, fertile soil is essential to sustaining yield and supporting our environment. So, what's the new dirt on soil?

We know that improving soil health generally increases yield, especially when considering soil biological health. What are new techniques for growers? The latest science from CFAES researchers tells us that soil health improves when you do any of the following three things: add perennials to rotation, increase soil organic carbon, or increase soil protein. These approaches were particularly beneficial for Corn Belt agroecosystems.

Researchers also found that increasing crop diversity has mixed outcomes. On conventional farms, crop diversity has been shown to improve soil health. But on organic farms that use tillage for weed control and crop incorporation, increased crop diversity can diminish overall soil health.

But how do we know if soil health is improving? Although we know soil health testing is readily available, recent research in CFAES tells us that we should rely less on mineralizable C to understand biological soil health and more on soil organic carbon and soil protein. Also, farmers should observe soil texture, as it tells a bigger part of the story than we first realized.

And remember—improved soil health, particularly soil biological health, means increased carbon sequestration, which is garnering more attention in our agricultural communities.

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Additional resources at soilfertility.osu.edu/soil-health-testing



Recommendations

- 1) Continue supporting improvements in soil health, both for increased yield now and for sustained yield in the future. Healthy soil improves carbon sequestration, filters water, supports wildlife diversity, and functions as a living ecosystem vital to food and livestock production.
- 2) Climate adaptation policy should target small farms with less capacity since large farms already have more capacity to adapt. Policies should also encourage edge-of-field filtration practices to offset any negative impacts to water quality due to increased drainage tile usage, a common management practice to remove excess water on fields.

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