



The world's most essential industry: Food, soils, and crops

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Trade disruptions, reduced amounts of stored food, climate change, instability in some countries' governments, and the limited availability of critical resources may be creating a perfect storm that could result in an inability to meet the world's food requirements. Photos courtesy of Flickr/JAXPORT, Flickr/USAID, Adobe Stock/JJ Gouin, and Adobe Stock/Ajdin Kamber.



The growth of civilizations and our complex societies has depended on discovery of techniques to increase food security. Many global problems threaten today's food security, including pandemics, energy uncertainty, extreme climate events, fragile supply chains, political discord, and war. Regardless of the issues that confront us, our ability to sustainably produce food is paramount. Historically, food security involved individuals saving portions of the food they collected for later use. As time progressed, plant domestication resulted from the selection of seeds to be used for systematic planting and harvest. Draft animal domestication and inventions such as the plow, harness, and yoke followed and further expanded food production. After some early missteps in our understanding of how to best manage soil, the importance of soil as a natural resource and as part of the food production equation became clear. Discoveries on how to best to sustain and improve food production continue today and form the core of the critical questions we currently work on.

Starting with production changes, including aggressive efforts in soil conservation, since the 1950s, corn yields have increased almost 2 bu/ac/yr. More recent data shows that in South Dakota, Minnesota, Iowa, and Nebraska, corn and soybean yields increased 35% from 2000 to 2020, allowing increased food to be grown on the same or smaller land base, often with less chemical inputs. These increases in yield and sustainability are attributed to multiple factors, such as improved genetics, management practices including soil-conserving techniques that attempt to mimic natural systems, and better equipment. They could not be possible without basic and applied scientists, producers, engineers, and funding agencies working together to create solutions to critical issues, including soil health, water quality, and pest management.

Mitigating problems and growing enough food for an increasing world population will continue to challenge agronomists, crop scientists, and soil scientists worldwide. Food production today is part of the global supply chains for fertilizer, seed, and energy. Disruptions in one county can impact food production in many other counties. Trade disruptions, reduced amounts of stored food, climate change, instability in some countries' governments, and the limited availability of critical resources may be creating a perfect storm that could result in an inability to meet the world's food requirements. When food security is threatened, it is likely that land use changes, including bringing low quality areas into production, will accelerate, further adversely impacting climate change and plant and animal diversity. A unified approach to address all of these threats is to increase the pace of discovery of how to intensify food production on land with soil best suited for cultivation while limiting adverse impacts to ecosystems.

Your Expertise on These Critical Topics Is Necessary

As members of ASA, CSSA, and SSSA, you are the experts that can provide input on these critical topics.

Members of CSSA work to identify traits that will allow plants to thrive under increasingly difficult growing conditions and put them into new cultivars for farmers. These traits include resistance to current or emerging disease and insect threats; tolerance of more difficult environments (hotter, drier, flood prone, erratic temperature swings, etc.); ability to grow in increasingly saline or less nutrient dense soils; and increasing levels of healthier components in seeds, fruits, or vegetables. CSSA also works to create stronger and more nutritious forage crops and more trouble-free turf and ornamental grasses and improve technologies to create seeds that will lead to healthier plants. CSSA scientists work at the level of the whole field and may measure

plants or traits by hand or with drones equipped with unique cameras that analyze the traits automatically; and they work down to the level of the DNA where they may look at a single gene or the entire genetic code of an individual all at once.

Members of SSSA work to provide data and created knowledge about how soils form and function. Their goal is to understand how fundamental processes impact possible recommendations for an appropriate land use or land management decision. Because of the prevalence of soils, soil scientists can find themselves working in either an agricultural or environmental applications of their science. While the underlying fundamental soil processes are largely the same, it is the application of the knowledge that changes their points of impact. Crossover between these areas is common and supported. As a result, a well-educated soil scientist can work on crop or forest production, environmental quality, wetland functioning, ecosystem services, remediation and land reclamation, waste management, and management of urban systems.

Members of ASA strive to integrate soils, crops, management approaches, economics, and pest information into economically viable and sustainable systems. ASA members work at multiple scales ranging from whole-field to small plots and often have research focuses in precision farming, statistics, remote sensing, greenhouse gas emissions, climatology and modeling, crop rotations, minor and commodity crops, organic systems, nutrient management, weedy and invasive plants, spatial statistics, on-farm research, crop rotations, building cropping systems that improve soil health, and land management and conservation. It is common for our members to work collaboratively with students, farmers, and other scientists.

Our three Societies often work together on basic and applied research, outreach, and educational programs on how to balance a healthy ecosystem with how to grow the

plants in the most efficient and environmentally friendly manner. This can be done by improving collaborations and communications of people passionate about agriculture with diverse ideas, testing solutions, and then putting them into action. ASA, CSSA, and SSSA have the infrastructure needed to create diverse teams leading to the implementation of creative solutions. We encourage you to become actively involved in your Society's communities and divisions. For more information, visit:

- ASA: www.agronomy.org/membership/sections-communities
- CSSA: www.crops.org/membership/divisions
- SSSA: www.soils.org/membership/divisions



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