



# Science Frontiers in Agronomy, Crop and Soils

The United Nations estimate the global population will increase to 9.1 billion by 2050, requiring at least a 70 percent increase in production to meet the demands of this population. Our challenge is to sustainably increase production of nutritious food, fiber, and reliable sources of energy while protecting shared water, soil, and air resources in shifting and increasingly uncertain climatic and socio-political conditions.

The American Society of Agronomy, the Crop Science Society of America, and the Soils Science Society of America are dedicated to improving our knowledge of natural resource management to better manage our natural resources to meet the demands of a growing world population.

## The Grand Challenge

*Sustainably improve the human condition for a growing global population in a changing environment.*

**This one grand challenge unites us.** Each scientific discipline and sector of the economy will offer their own unique solutions to this grand challenge. Here we layout our vision and recommendations that will enable innovative, science-based solutions.

## Science Frontiers

The following science frontiers identify the most promising opportunities in the next decade whose investigation will establish a foundation of information that will propel the scientific discipline beyond the current state of knowledge while addressing the grand challenge.

AMERICAN SOCIETY OF AGRONOMY	CROP SCIENCE SOCIETY OF AMERICA	SOIL SCIENCE SOCIETY OF AMERICA
Sustainable Intensification	Crop Frontier: Crop Improvement and Adapting to Climate Change	Food, Energy, And National Security Through Soil Education
Enhancement of Ecosystem Services Provided by Agriculture	Human Frontier: Connections between Food and Health	Climate Change and Soil Processes
Socially and Economically Viable Agriculture Systems	Global Frontier: Sustainable Environmental Management	Healthy Soils, Healthy People
		Soil and Water Quality





## Critical Needs

*Each of the science frontiers will require cross-cutting areas of critical infrastructure to be in place.*

### Augment Federal Funding for Food and Agricultural Science within Relevant Federal Agencies

The core research programs at federal research agencies, such as USDA, NSF and DOE Office of Science, are fundamental to research development and essential for scientific progress. They provide the long-term foundation for new ideas that stretch the imagination and lay the groundwork for innovations for the future. They support the maturation of new technologies needed for nearer-term small and large programs and missions. Maintaining these core activities is a high priority.

### Empower and Employ the Future Science Workforce

A diverse and robust workforce is essential if the U.S. is to face the challenges and opportunities in the food, agricultural and natural resources sectors. There is a growing gap between the supply of new graduates trained in agriculture-related fields and the demand for professionals by global food and agriculture employers and academia. We must empower the potential food and agriculture related workforce to seek professional level opportunities that the public and private sector offer.

### Cultivate the Application of Innovative, Science-based Agronomic Practices through Education and Extension

A significant part of the public good derived from agricultural research is the delivery of unbiased research-based information and education to the public. The nationwide Cooperative Extension System network, for example, is integral to the core mission of federal and state land-grant institutions. The role of extension in providing U.S. farmers with innovative, science-based agronomic practices may be the model best suited for use in other countries to meet global challenges.

### Improve Computational Capabilities by Integrating Databases for Genetic Resources and Agricultural Research and Equip a Workforce Trained in Digital Data Infrastructure

Creating a digital data infrastructure that not only stores a wide range of data but also easily and reliably searchable is a challenge faced by many scientific disciplines. Improved integration and interoperability of data resources, including genetic databases and other scientific collections, will be fundamentally important to meet 21st century agricultural challenges.

### Promote Innovation through Partnerships between the Public and Private Sectors

Public-private partnerships improve the capacity of researchers to address the grand challenge by bringing together the necessary experience, knowledge, investment, technologies and resources. Creating the right environment for partnerships will often require collectively addressing regulatory and legislative frameworks – including protection of intellectual property rights and science-based consideration of new technology by regulatory agencies – to turn new ideas into innovative products.

