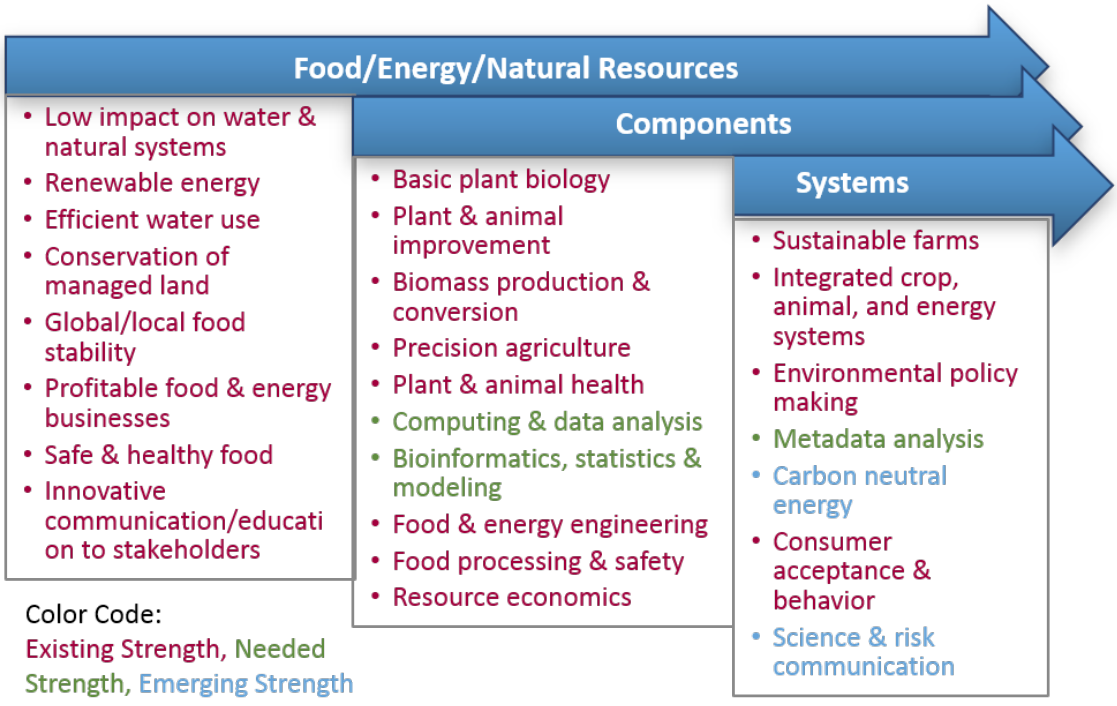
Sustainable Resources:

SUPPLYING FOOD, ENERGY, AND WATER FOR FUTURE GENERATIONS

Defining the Challenge

The challenges of providing abundant high quality food and sufficient fresh water supplies for the next generations are inextricably linked to the development of renewable energy systems that safeguard the environment and health. The demands on our arable land to produce more food for a growing population are exacerbated by competing needs for diminishing supplies of fresh water as well as for bioenergy and biomaterials. Although most current energy production systems produce greenhouse gasses that intensify climatic changes and uncertainties, reliable production, storage, and transmission of energy are defining characteristics of an energy-secure and sustainable America. Washington State University is uniquely situated in the inland northwest, enabling its scholars to leverage the natural renewable resources and historic legacy sites within this region to learn from our natural environment and develop and communicate strategies that link optimized agricultural practices, water management, and energy production.



WSU's Role in the Solution

WSU scholars pursue solutions at the nexus of agricultural, water, and energy challenges. WSU provides leadership in fundamental genetics, metabolism, physiology, and pathology of plants and animals that underlie future improvements in food production efficiency with limited resources. Further expertise in sustainable food production systems, crop improvement, mechanization, food processing, and pest management will safeguard the security of food, energy, and water resources. WSU is home to one of the National Institutes for Water Resources and has a strong presence in integrative research, accounting for physical, biological, and social aspects of water science and water management and utilization across competing uses. WSU is also a recognized leader in next generation energy production technologies, with an established infrastructure and invaluable expertise in materials development and process management across these renewable energy domains. In this context, WSU research in materials and device development has led to pioneering programs in biologically inspired storage strategies, advanced battery materials, and alternative fuels that will ensure a secure, reliable energy future.

WSU is making advances in disciplines ranging from traditional energy resource generation to wind, solar, and bioenergy. WSU has an established infrastructure and uncommon expertise in materials development and process management that spans these renewable energy domains. Strategic partnerships, such as a productive relationship with Pacific Northwest National Laboratory and collaborations with utilities throughout the region (Avista Utilities, Puget Sound Energy, Tacoma Public Utilities, and many others), position WSU as an energy research leader. WSU faculty programs are also leveraged by one of the nation's largest concentrations of USDA Agricultural Research Service (ARS) scientists, who are seamlessly integrated into the WSU faculty structure. By engaging researchers at its urban campuses, four Research and Extension Centers, and rural Extension facilities, which are present in every county of the state, WSU ensures that the "translational component" of meeting the Grand Challenges can be met through region-specific communication and education. Moreover, WSU has strengths in the entire supply chain of programmatic areas from discovery through development and translational efforts that ensure our fundamental research efforts will have impact in addressing these Grand Challenges.

Key Research Themes

- Food: Enhancement of production systems and products
  - Optimized agricultural practices
  - Improved crop varieties and animal breeds
  - Available and affordable food
  - Nutritious and safe foods
- Energy: Meeting needs while protecting the environment
  - Efficient and sustainable energy production
  - Available and affordable energy
  - Development of renewable sources of energy
  - Healthy environments and energy production
- Water: Safety and sustainability
  - Safe and abundant water supply
  - Effective water management
  - Water use and healthy environments
  - Aquatic ecosystems
- Societal perspectives and government policy relating to sustainability
  - Political engagement and public policy development
  - Effective communication and education
  - Production incentives and stewardship
  - Rational economic approaches to sustainability

Descriptive Sentences of Each Key Research Theme

1. **Food: Enhancement of production systems and products.** Research in plant and animal genetics, metabolism, physiology, pathology, and food science is critical to improve the quality, quantity, and sustainability of food production. Applied research built upon these basic understandings will transform food production systems to increase productivity and quality, increase safety and security, and minimize environmental impacts.

2. **Energy: Meeting needs while protecting the environment.** Robust energy production systems, such as bio-, hydro-, nuclear, and wind energy, must be developed to reduce reliance on fossil fuels while minimizing impacts on water quality, biodiversity, and greenhouse gas production. Reliable and efficient energy storage and transmission are also key aspects of a sustainable energy future.

3. **Water: Safety and sustainability.** To ensure a safe and abundant water supply, while safeguarding a sustainable food and energy supply, systems must be developed that maximize food and energy production while minimizing use or degradation of natural resources such as water, soil, forests, and wildlife habitat. Advances will be made by increasing efficiencies in existing systems and creating novel systems, informed by life cycle and economic analyses.

4. **Societal perspectives and government policy relating to sustainability.** Understanding the perspectives and actions of the public, industry stakeholders, and policy makers is essential if advances from research will be adopted and translated into sustainable food, energy, and water production systems. Connecting the basic and applied science of food, energy, and water systems with an understanding of the economic, social, and policy barriers to change, and accurately communicating the science to non-expert stakeholders, is critical to securing a sustainable future.