

Office of Research, Washington State University (WSU)

Grand Challenges Seed Grant Program

Description

The Washington State University Strategic Plan emphasizes the University's commitment to enhancing research, scholarship, and creativity at WSU. The 120-day Study, conducted in support of the Strategic Plan, identified five grand challenge areas for WSU research: Sustaining Health, Food-Energy-Water Nexus, Opportunity and Equity, Smart Systems, and National Security. Appendix I describes Key themes for each Grand Challenge.

The Office of Research seeks to identify multidisciplinary research teams that will address significant questions related to key challenge areas. The Grand Challenges seed grant program is envisioned to enable WSU faculty to pursue and develop (i) proof-of-concept for high-risk/high-reward ideas in order to position them for eventual success in obtaining competitive large federal center-type, or private sector funding; (ii) projects that establish or demonstrate a strong capacity for public engagement and outreach to underserved communities; and (iii) workshops and other group activities that lead to development of new ideas and expansion of multidisciplinary research.

Eligibility

All tenured/tenure track faculty at all campuses are eligible to serve as principal investigators. Each Principal Investigator may submit only 1 proposal as lead.

Timeline

- January 15, 2016 – RFP released
- February 15, 2016 – Letter of Intent indicating only the “Area of Focus” due (required to help convene the review panel/s)
- April 1, 2016 – Proposals due to the Office of Research
- April 8, 2016 – Proposals sent to reviewers
- May 15, 2016 – Decisions announced
- July 1, 2016 to December 31, 2017 – Award period
- March, 2018 – Presentations at Showcase
- June 30, 2018 – Final report due

Areas of Focus

Proposals are to include new research ideas based on the Grand Challenge key areas. Detailed descriptions of the Grand Challenges can be found in Appendix I.

Award Details

A total of \$250,000 in one-time funds is available for this program. The Office of Research expects to make multiple awards of up to \$75,000 each for a period of up to 18 months. Proposal budgets will need to include personnel benefit costs if faculty or staff salary is included; overhead and facilities/administrative costs do not need to be included.

The Graduate School will contribute an additional \$5,000 for each Research Assistant (RA) working on projects funded through this program.

Deliverables and Outcomes

Strategic Plan-Related outcomes of Grand Challenge seed grants are:

- Enhanced federal funding leading to higher R&D expenditures
- Enhanced impact (publications and citations)

The deliverables from these seed grants are:

- (1) For type (i) projects – A multidisciplinary large (> \$1 million) federal grant proposal must be submitted during FY 17-18 and an annual progress report listing outputs, outcomes, and impact.
- (2) Type (ii) and type (iii) projects – An annual progress report listing outputs, outcomes, and impact.

Pre-Submission Instructions

Letters of Intent must be submitted by February 15, 2016 to res.dev@wsu.edu. A brief description (one paragraph) of the proposed work and area of focus is required. The Letter of Intent can be submitted in the form of an email.

Application Instructions

- Full proposal deadline is April 1, 2016 at 5 PM.
- Proposals should be sent to res.dev@wsu.edu.
- Proposal: No more than 5 pages, plus 1 page for estimated budget and budget justification (11-point, Times New Roman, 1-inch margins). Proposals must include (i) principal investigators' names and affiliations, (ii) projected milestones and outcomes, (iii) follow-on grant application strategy, (iv) budget and cost-share from departments/colleges (if any).
- Each proposal narrative should:
 - Identify the application category as one of the following: (i) proof-of-concept for high-risk/high-reward ideas in order to position them for eventual success in obtaining competitive large federal center-type, or private sector funding; (ii) projects that establish or demonstrate a strong capacity for public engagement and outreach to underserved communities; and (iii) workshops and other group activities that lead to development of new ideas and expansion of multidisciplinary research.
 - Define and focus on one Grand Challenge question that addresses a compelling problem or challenge, the resolution of which would have significant impact. The Grand Challenge question should have the long timeframe (10 years or longer) required for a compelling, inspirational problem of broad interest.
 - Describe the methodology and approach to develop a team and a plan to address the Grand Challenge question. The specific approach will depend on the proposal category above.
- Provide a two-page bio for each PI, including funding and publication history during the past 5 years. Bios do not count toward the 5-page limit.

Evaluation Process

The evaluation process will be overseen by the Office of Research Advancement and Partnerships (ORAP). ORAP will commission an external evaluation panel with expertise appropriate to the proposed project. ORAP will evaluate and summarize the review panel's input. The Vice President for Research will make the final awards.

Evaluation Criteria

(4=Excellent/High Potential Impact and/or Likelihood to Attract Extramural Funding; 3=Very Good/Moderate Potential Impact and/or Likelihood to Attract Extramural Funding; 2=Good/Limited Likelihood of Impact and/or Likelihood to Attract Extramural Funding; 1=Fair/Unlikely to Have Impact and/or Attract Extramural Funding)

Criteria	Points	Weight
Quality of the proposal: A. Grand Challenge question; should be specific well-defined, achievable, inspirational, and of broad societal impact and multidisciplinary B. Overall impact of the proposed plan; clear milestones and outcomes.	1-4 1-4	0.05 0.2
Ability to execute the proposed plan: Research methodology and approach including suitability for WSU	1-4	0.25
Ability of project to generate additional outside financial support OR Ability to establish or demonstrate a strong capacity for public engagement and outreach to underserved communities locally, nationally, or internationally, ideally through ongoing partnerships	1-4	0.25
Quality of the team: The specific role of each faculty member listed on the proposal is explicitly and clearly described and the component of the project that depends on each faculty member's effort is clearly stated.	1-4	0.15
Appropriateness of the budget	1-4	0.10

Award Terms and Conditions

- Awardees are required to present at the Faculty Showcase following the project's termination date.
- The awards are for an 18-month period beginning July 1, 2016. If necessary, a one-time only, no-cost time extension may be considered on the basis of strong justification.
- If the PI leaves the university prior to the completion of the grant, all remaining funds are to be returned to the Office of Research.
- Any funds remaining after the grant's approved period of performance are to be returned to the Office of Research.
- Acknowledgement of the WSU Grand Challenges Seed Grant support will be included in any published work or presentations directly resulting from this award.

External Proposal Submission

Any proposal to an external funding source that is directly related to the seed grant project should be submitted no more than six months after the award period ends. Information pertaining to the submitted proposal will be disclosed in the final report.

Final Report

By accepting this award the PI agrees to submit a final report to the Office of Research. This report will allow the university to evaluate the effectiveness of the program. The final report deadline is June 30, 2018, six (6) months after the end of the grant period of performance. In addition to activities, research results, and accomplishments resulting from the award, the report will document any publications, presentations, exhibitions, media coverage, sales or marketing, projects, papers, proposals/awards, or other accomplishments that resulted from the WSU Grand Challenges Seed Grant funds.

Questions

Questions can be sent to: res.dev@wsu.edu. Please use "Grand Challenges Seed Grant Program 2016" in the subject line.

Or call: Geeta Dutta at (509) 335-5980.

Appendix I

WSU Grand Challenges

Advancing Opportunity and Equity

Building an informed and equitable society by expanding individual opportunity and promoting justice

Key Research Themes

To address this Grand Challenge WSU has identified four key themes and accompanying areas of focus for its efforts, though the scale and complexity of issues regarding opportunity and equity should encourage faculty to work both within and across these categories.

Theme 1: Examining the causes and consequences of inequality of opportunity

Understanding the causes and consequences of inequality for individuals and communities requires using both humanistic and scientific inquiry to produce thoughtful and culturally sensitive approaches that, wherever possible, engage the experiences and concerns of the communities they study. Faculty in multiple disciplines seek to investigate the complex roots of issues like poverty and discrimination based on race, gender, ethnicity, disability, and sexualities, as well as the continuing effect of those problems on individuals and societies. Efforts to understand the causes and consequences of inequality of opportunity also demand the development of robust analytic, modeling, and data collection strategies that consider the interrelation among inequality of opportunity in education, the labor market, the criminal justice system, and political realms. Survey research constitutes a critical tool in these efforts.

Theme 2: Promoting equity for individuals and communities

As we grow in our understanding of the history and current inequality and lack of opportunity in our society, we also look to the future, and in particular to how a more inclusive and just society can bring about greater engagement and achievement for all its members. We can begin to address these challenges by increasing our efforts to expand the diversity of the nation's scholarly and professional workforce and eliminate barriers to work opportunity; to develop and evaluate innovative programming that reaches across social, cultural, and political divides; to identify and remedy barriers to economic and intergenerational mobility; and to improve the access to and delivery of high-quality, cutting-edge health care.

Theme 3: Furthering economic, educational, and social policies that impact opportunity, societal cohesion, and engagement.

To realize fully a just and equitable future, we must also build upon our knowledge of the causes and consequences of inequality to help develop, implement, and sustain educational, economic, social, and political structures that effectively support all members of society. Doing so requires us to pay particular attention to the wide range of policy issues that influence opportunity, societal cohesion, and engagement, as well as the ways in which historical and global perspectives shape views on contemporary issues.

Theme 4: Improving formal and informal education throughout the lifespan

Research into the promotion of equity and the development of effective policy must also be accompanied by sustained attention to processes of education, which are a primary lever for increasing opportunity and addressing inequities in society. By considering the many different experiences and learning opportunities across the human lifespan—from early childhood through K-12 schooling, higher education, career, and retirement—we pursue a comprehensive approach to enabling people at all levels of society to achieve their highest potential.

FOOD-ENERGY-WATER Nexus

Key Research Themes

The following research themes are aimed at developing safe and abundant FEW resources. These themes are inextricably interlinked. Food from 'field to fork' depends heavily on water and energy. Energy production needs water, but climate impacts of energy choices affect water and food. Societal perspectives, economics, policy and social justice issues permeate throughout the FEW nexus.

Theme 1: Societal perspectives, policy and governance

Beyond scientific and technical innovation, sustainability depends on policy innovation and public involvement. Understanding public, industry and policy perspectives is essential for advances in research to translate into FEW

sustainability. FEW solutions must encompass understanding of economic, social, cultural and policy barriers in order to reconcile diverse interests and value systems across different sectors. Value gaps cannot be bridged without cross-sectoral conversation, transparency, and accountability. FEW research must accordingly identify impact metrics and success indicators for contribution to good governance and public well-being. Because perspectives and impacts vary differentially amongst diverse populations, best research practices include assessment of varying vulnerabilities, and aim for local, flexible solutions that can be scaled up rather than top-down ‘one-size-fits-all’ solutions.

Theme 2: Food: Enhancement of production systems and products

A central challenge in food system enhancement is increased production of affordable, nutritious, safe food, given needs of growing populations, global desire for dietary improvement and Westernization, and competition from materials and bioenergy over limited land. The changing climate is increasing agricultural stresses from production to processing, preservation, and transportation. Supplies of fresh water and fertilizer inputs are diminishing.

Systems approaches to food developed by agricultural and atmospheric scientists, hydrologists, pathologists, ecologists, economists, policy analysts, and sociologists can maintain soil health, maximize water efficiency, minimize environmental impacts, and meet food needs for all.

Sustainable food systems can evolve more readily when growers, policy makers, distributors, retailers and consumers are educated on environmentally and socially responsible practices for producing healthy, safe and affordable food. Education and outreach through WSU’s strong Extension network are therefore essential to the FEW challenge.

Theme 3: Energy: Meeting needs while protecting the environment

Securing energy resources is one of the most important problems of our time. Fossil fuels are important in the US energy portfolio, but they pollute, drive global climate change, and they are finite. Transition to renewables is urgently needed. Reliable production, storage, and transmission of energy are critical to maintaining the national economy, and define an energy-secure and sustainable America. A systems approach to overall energy needs is crucial to decrease foreign dependence and meet US needs for safe, affordable, sustainable energy. Conservation and smart grid distributed production are key to meeting future demands.

Theme 4: Water: Safety and sustainability

The water challenge is to ensure safe, abundant supply for multiple, competing needs while minimizing degradation of quality and ecosystem health. Needs grow more urgent as climate variability and the frequency and intensity of drought and heat events increase. Progress requires both specialized and interdisciplinary approaches to understanding biological, physical, chemical, socioeconomic, and technical dimensions of the regional and global water cycle.

Water security solutions are not restricted to provision but include increased efficiency. Food, energy, and social systems that promote greater water efficiency are key areas for innovations that consider impacts and synergies within the full water cycle. Advances will be made through systems-level thinking that identifies and incorporates interdependencies and feedbacks among ecosystem components as well as the socioeconomic dynamics of water users in order to increase efficiencies in existing systems, technologies and management tools. Innovations are needed in technology, management, and governance to move solutions to the public sector.

SUSTAINING HEALTH

THE UNCOMPROMISING PURSUIT OF HEALTHIER PEOPLE AND COMMUNITIES

Building an informed and equitable society by expanding individual opportunity and promoting justice

WSU is positioned to engage across traditional disciplinary boundaries to tackle the challenge of sustainably improving health and well-being across society. Through our state-wide reach, including medically-underserved communities, WSU can engage with health care providers and community members to improve preventive and restorative care delivery for both infectious and non-communicable diseases, and to ensure that therapies are accessible, affordable, and effective. More broadly, WSU’s state-wide campuses and extension centers are home to an impressive contingent of scientists and clinicians actively engaged in basic and translational health research with domestic and international impact. WSU is positioned to improve mental and physical health by advancing knowledge of our natural, social, and built environments and the social systems that influence the food we eat, the air we breathe, the water we drink, and the creative arts we enjoy. Through collaborations and synergies across

WSU programs such as the Allen School for Global Animal Health and health sciences programs in Spokane, along with related areas of WSU strengths--from cell and molecular biology to the psychosocial, neurological, and policy underpinnings of physical and mental well-being-- WSU can play a comprehensive, holistic, and unique role in addressing the challenge of promoting and sustaining health for all people, including those in underserved communities.

Key Research Themes

To address this Grand Challenge WSU has identified three key themes.

Theme 1: Understand the continuum between optimal health and disease

Basic research aimed at investigating, characterizing, and understanding human health and disease at the molecular, cellular, organismal, and behavioral levels is fundamental to health promotion, disease prevention, and treatment across the lifespan. WSU research programs span approaches from the molecular level through humans and animals in their environmental context. From the basic biochemistry of toxin exposure to the health implications of environmental degradation, from the biology of antimicrobial resistance to global emerging disease surveillance, from the neurochemistry of circadian rhythms to the safety risks associated with shiftwork, and from the alteration of synaptic function by psychostimulants to the behavioral treatment of opiate addiction, there is great potential for WSU researchers to collaborate and increase our impact on sustaining health by generating new knowledge at the foundations of health and disease.

Theme 2: Health maintenance, disease prevention, and changing the course of disease

Understanding what constitutes “health” and “disease” is a key step, but this fundamental knowledge must be translated into inventions and clinical practices if we are to help people maintain health, prevent illness, and slow or reverse disease progression. The university has a foundation of critical expertise in conducting clinical and other intervention trials to advance the discovery and development of novel therapies and vaccines. We are particularly well-positioned to build on our basic, translational, and clinical research capacities to address how population health is influenced by environmental quality. With advances in understanding genetic variation among individuals, these therapies can be tailored to achieve maximum benefit with minimal ill effects. In addition to strengthening our research focus on disease mechanisms, a goal will be to develop and maintain mutually beneficial relationships with providers and patient advocates to enable evidence-based treatment and prevention interventions that will have a profound impact on decreasing the mortality and morbidity associated with human disease.

Theme 3: Promoting healthy communities

The burden of chronic diseases related to lifestyle, epidemic levels of substance abuse, and threats to health and well-being from continuing health disparities represent problems of enormous social significance both locally and around the globe. To address these challenges in ways that result in healthier communities requires building on WSU’s relevant expertise in fundamental biological mechanisms of health and disease *and* the economic, social, and cultural determinants of human behavior. By marshalling these areas of expertise, we can address both ‘downstream’ influences on health, such as poor diets and substance abuse, and ‘upstream’ determinants of health including economic and social disparities and policy factors that affect health care access. Moreover, effective communication and outreach are needed to deliver evidence-based health information to communities and diverse populations. Somewhat unique to the expertise and mission of WSU is the potential to improve the production, processing, and distribution of safe and nutritious foods needed to sustain human health around the world. Further, we recognize that what is optimal in terms of dietary patterns and nutrient intake is likely to vary with the genetics and culture of individuals and their communities. Understanding the physiology underpinning these differences will not only allow the provision of “personalized” nutrition recommendations to individuals and populations but will also lead to the development of “smart crops” and “smart foods” designed for various genetic predispositions and disease risks.

Smart Systems

Improving quality of life and driving economic growth

Washington State University is well-positioned to take on this challenge, building on our research strengths in smart systems, materials science, computational sciences, math and statistics, health sciences, design disciplines, social sciences, and education. A core existing strength at WSU is the application of smart technologies for single users. This Grand Challenge extends that strength into a variety of applications including city-scale integration and in key sectors of society such as manufacturing, farming, and health care. When applied to industrial

complexes or entire cities and regions, in collaboration with the design disciplines and social sciences, smart environments allow individuals to be more productive and self-sufficient, buildings to be more energy efficient, communities to be more connected, and infrastructure to be more sustainable and secure.

Key Research Themes

To address this Grand Challenge WSU has identified four key themes.

Theme 1: Foundational technologies

Materials that optimize resource management, are environmentally friendly, and yield enhanced performance provide the foundation of advanced infrastructures that will improve the quality of life, as described above. These may include emergent materials, whose essential physical properties may be more than the sum of their components, and which provide a basis for new materials design strategies that leverage basic physics and chemistry in tandem with computational design. More effective sensors, lighter and stronger structural materials, multi-physics and multi-functional materials, and bio-based renewable materials are all included in materials advances necessary to develop the systems that will become commonplace. Functional materials, self-assembled structures, and pest resistant plants represent a type of “smart system” in and of themselves. In general, however, the foundational technologies of computational and data sciences use real-time information from sensors embedded in advanced systems, making them “smart.” Machine learning includes the ability for a system to adapt to the environment and make decisions based upon what has occurred previously.

Theme 2: Components and Application of smart and sustainable systems

“Smart” systems are systems that provide automated reasoning about the system and take actions automatically to ensure the safety of the system and optimize performance. These systems rely on networks of sensors, actuators, controllers, communications devices, and computational data mining and decision-making components. As these systems become more sophisticated, going beyond machine-to-machine communications, smart environments and smart systems hold the possibility of automation in practically all fields. Advanced applications of smart systems are evolving all around us including smart homes, smart cars, smart manufacturing facilities, smart farms and food production systems, smart power grids, and smart cities. These applications can improve quality of life by adapting to the individual needs and activity patterns of the individuals who live in, utilize, and rely on these systems. Smart systems can monitor the health and wellbeing of both physical environments and human users and take actions as needed to maintain this wellbeing and ensure safety. The application of smart systems also requires massive computation capabilities. The Internet of Things and other sensor-rich system generate copious amounts of data, whether from sensor networks or computing calculations. Computational effort is required in designing materials and systems, as well as in operating smart environments. Computers, through machine learning and strategic data analytics, must be able to recognize actions and respond accordingly. Because of the availability of high performance computing, these smart and adaptive systems can now scale from lab-based experimental conditions to deployment in large, complex communities.

Theme 3: Adoption and implications of smart systems

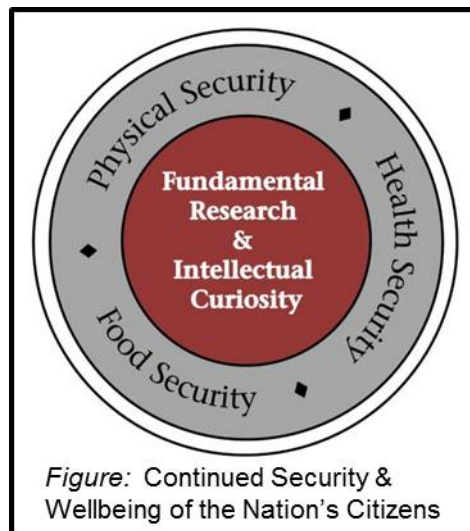
Many of society’s most pressing problems are collective, and solutions will require people to cooperate and coordinate. How might smart infrastructures be designed to enhance the ability of people and groups to solve collective problems? Individual and public acceptance and barriers to acceptance, human-machine interactions, economic disparities, privacy and usability are all important dimensions of smart technologies that need to be evaluated. How can smart infrastructures be designed so as to shift household and community norms, practices, and structures in ways that sustain rather than damage the natural environment? How can smart systems be implemented in ways that contribute to human flourishing? Answering these questions will prove as central to the success of smart systems and environments as the development of foundational technologies that underpin such systems and the application of those technologies in cities, factories, and farms.

Fundamental Research in Support of National Security

The security and protection of the nation's citizens and the infrastructure governing their wellbeing is the Federal Government's foremost responsibility. Over the years, the threats have become increasingly diverse and sophisticated due to rapid technological advances, globalization involving rapid movement of people and goods, and the continually changing geo-political landscape. As shown in the Figure, national security in the 21st Century encompasses protection against very diverse threats.

National security needs will continually evolve in the future and, very often, in unpredictable ways. Hence, it is essential that as a nation we invest in fundamental research and education to address the diversity of national security needs well into the future. Academic institutions must continually advance the relevant science and technology frontiers to ensure an intellectually vibrant climate to attract the best young minds who will make novel and substantive contributions to the nation's security and wellbeing. Regarding national security needs, it is important to recognize that the research activities may need to transcend national boundaries and involve partnerships with other nations.

Washington State University is committed to innovation and excellence in fundamental research and education across a broad range of disciplines, summarized below, to be an academic research leader in support of national security. The research themes in this challenge encompass both physical and life sciences. The specific topics selected had to satisfy two key criteria: a current research strength and significant potential for future growth and diversification.



Research Themes

Theme 1: Matter at Extreme Conditions

Study of matter at extreme conditions of pressure and temperature, and often at short time scales, is central to many fundamental and exciting scientific challenges in the physical sciences (condensed matter physics and chemistry, plasma physics, astrophysics, planetary science, materials science, and mechanics), and provides the foundational research for addressing national security objectives related to both military (conventional and nuclear security) and energy (fusion, mining, oil and gas production) needs. The intellectual endeavors associated with understanding extreme states of matter will continue to stimulate technological breakthroughs in advanced materials, computational capabilities, propulsion systems, sensor technologies, and space exploration. Looking ahead, there is the exciting prospect of tailoring and developing novel materials/structures and systems for specific applications involving extreme environments.

Theme 2: Science of Nuclear Nonproliferation

Rising demand for clean energy has led to increasing worldwide interest in civil nuclear power and nuclear fuel cycle development, but peaceful use of nuclear technologies is tarnished by historical military applications, large-scale accidents, and ineffective waste management practices. Basic research in the chemistry of reprocessing and developing a scientific basis for nuclear safeguards is essential for ensuring safety and security as the use of nuclear technologies expands around the world. Also, innovations in nuclear forensics analysis and identification of new signatures of nuclear technologies enable advances in national security capabilities and verification of declared activities. Furthermore, study of the impact of the radiation environment on the chemistry and physics of materials supports the development of advanced reactor systems, state-of-the-art sensors for radiation environments, and improved waste forms.

Theme 3: Promoting Global Health Security by Strengthening Infectious Disease Surveillance

Health security, the protection from threats to health, is recognized as one of the most important non-traditional security threats around the globe. In resource-limited nations, health security applies not only to human health but also to animal health because animals not only provide direct economic and nutritional sustenance for humans, but also serve as reservoirs for zoonotic and emerging diseases to humans. Ebola in particular has exposed the fragility of the world's capacity to detect and respond to infectious disease threats. Risks of global

interconnectedness together with constantly emerging organisms require a dramatic increase in health systems' abilities to prevent, detect and respond to infectious disease threats throughout the world, especially in resource-limited countries. A health threat anywhere can easily turn into a health threat everywhere.

Theme 4: Promoting Global Food Security – Leading through Research and Development

There is no doubt that the health of farmers and their communities are tied to the health of the environment they live. Food insecurity and environmental degradation has reached alarming proportions in developing countries around the globe. The situation is characterized by frequent food shortages either man made or caused by natural disasters. This is reflected in high prices causing hunger and starvation which affects millions people every year. When food insecurity turns into civil unrest the US National Security states "...we will leverage our leadership in promoting food security, enhancing resilience, modernizing rural agriculture, reducing the vulnerability of the poor..." Land holdings are shrinking in size and becoming more fragmented. Traditional practices that preserved the biodiversity of natural resources are dying out and marginal areas have been brought under cultivation. Continuous cropping is now the norm, often in monocultures with little or no fallowing and few inputs. The rising demand for agricultural land has caused serious water pollution and deforestation. Adapting to these conditions is fundamental to the wellbeing of the farmers responsible for not only their health but the health of their environment. Several success stories show how research and extension programs have improved on-farm yields and output for small-scale farmers, a group that represents 85 percent of the world's farming community. Community-led efforts have conserved soil, water, forests, and biodiversity for use by current and future generations. And market-based interventions have strengthened the ability of small-scale farmers and food-insecure consumers to gain access to production inputs, rural services, and agricultural commodities.