

Washington (Washington State University)

Plan of Work for 2023-2027

Status: Final (Approved 9/30/2022)

Executive Summary Overview

Washington State University (WSU) Agricultural Research Center (ARC - the Agricultural Experiment Station of the State of Washington) and Washington State University Extension collaborate to set consistent goals to conduct research beneficial to the citizens of Washington State and to extend relevant research results and research-informed programmatic engagement to stakeholders within the state and beyond. We strive to create outcomes that improve the economic viability, environmental sustainability, community resilience, and quality of life for our people. We recognize that we have unique land grant research and outreach missions to serve the people of Washington to enhance their quality of life. The constraints of the COVID-19 pandemic made clear the need for long-term attention to delivery of Extension and outreach in place for those who have limited ability to directly access WSU central locations. The ARC provides leadership in discovering and accessing knowledge by carrying out high quality research that contributes to a safe and abundant food supply; promotes the well-being of individuals, families, and communities; encourages sustainability of agricultural and economic systems; promotes energy innovation; and encourages careful stewardship of natural resources and ecological systems. WSU Extension creates programs with measurable deliverables and outcomes that leverage the research base of the University and the world to address primary and timely issues in ways that lead to economic development, improved policy and governance, sustainability and resilience as well as personal, family, and environmental wellbeing. The synergy provided by integrating research capacity, problem-solving skills and the statewide engagement of ARC and Extension provides unique capacity to address pressing issues and problems while recognizing different perspectives.

All Washington State University faculty members have responsibilities that include both research and extension, with many having formal joint appointments. This is particularly true within the College of Agricultural, Human and Natural Resource Sciences (CAHNRS), which houses both ARC and Extension. More than 100 faculty in ARC or Academic positions hold partial Extension appointments. An additional 100 or more faculty have full Extension appointments with a primary focus on off-campus program delivery, applied outreach and direct engagement. The focus of our joint efforts is to provide for the primary needs of the people of Washington State.

The state of Washington is beautiful and rich in natural resources and has a highly diverse topography, climate, population and industrial base. Our agricultural systems are among the most diverse in the nation and the state produces nearly 300 different crops that are sold domestically or exported, largely to countries in the Pacific Rim. Washington is especially known for its apples, pears, sweet cherries, wheat, potatoes, beef, milk and milk products and wine, and it produces a major share of many specialty crops, like small fruits (e.g., grapes, berries), seeds (e.g., vegetables, alfalfa), pulse legumes, hops, and mint. The state also has continually evolving demographic dynamics, which influence the cultural and political milieu. The state has a significant Native American population with 29 Federally-recognized tribes. There is a significant Hispanic population, especially in the central and south-central counties,

and a large Asian population in Western Washington. While this diversity is enriching the tapestry of the state by hosting a multitude of cultures, foods, and arts, these demographic shifts also strain social services and challenge educational delivery systems. The health and wellness of our youth are also at risk with over 26% of our adult population categorized as obese and almost 30% of our youth categorized as overweight or obese. Our rural communities are struggling with increased poverty and with differential access to technology, health services, and educational opportunities. In such a diverse cultural and environmental landscape, research, technology transfer, and outreach are challenging but essential.

The agricultural industry is a constantly shifting tableau. Weather variability and climate change have had significant impacts on water availability and facilitate migration of new plant and animal diseases and pests into the state. New varieties of crops, both domestically and internationally developed, compete for market share but also provide our growers with new opportunities; constant changes in disease and pest pressure, input costs, and per bushel prices affect how we grow our crops and what we incorporate into our crop rotations; agriculture labor supplies affect the timing and cost of our fruit harvests; and, as importantly, changes in consumer demand and governmental policy shape, and may even dictate, direction. The dynamics of our communities change as the result of changing demographics, changes in transportation, communication, educational and health care opportunities, and the availability and stability of employment locally.

Our role in dealing with these issues continues to be in both basic discovery research and highly translational applied research that provides information and assistance to our constituents. We use cutting edge technology to develop new processes and solutions and provide this information to our stakeholders. We have strategically prioritized hiring and strengthening research programs in the areas of plant biotechnology and genomics and are leading the nation in several efforts to apply these areas of expertise to issues like cropping systems research and cultivar development for specialty markets as well as genomics database technologies that are the world standards. Our biological systems engineers are working on precision systems for delivering water and fertilizer at appropriate times for efficient crop yield and resource management and on remote monitoring to close the loop and measure local effects on a large scale. Our integrated pest management programs are developing genomics as well as management techniques to minimize traditional chemical pesticide use while effectively managing pests across a broad variety of agricultural crops and urban environments. And our energy extension programs are pioneers in areas like building technology and plant operations efficiency.

As part of this core mission, the ARC has made significant commitments to focus on a dozen high priority research areas that advance our land-grant mission in discovery and development research. These research areas include (1) precision and automated agricultural systems, (2) soil-plant interactions: chemical, physical, and biological processes, (3) sustainable food production from livestock, (4) developing food processing, safety, quality, and supply solutions for production of high quality and safe food, (5) reducing the impact of pests and diseases affecting Washington agriculture, (6) crop improvement and sustainable production systems, (7) enhancing sustainability across diverse agricultural systems, (8) advancing forest/rangeland health and economic stability, (9) integrated research and societal engagement to address global water challenges, (10) functional genomics in animal improvement, food safety, and human health, (11) molecular plant sciences: plant productivity in a dynamic environment, and (12) bioenergy and bioproducts. WSU Extension delivers significant outreach related to natural resource stewardship; food safety; health and wellness; youth and family

development; governance, sustainability and community economic development. Beginning in 2021, Forest Health -- with an emphasis on fire management -- also began to be an area of focus.

WSU researchers garner millions of dollars annually in extramural support to leverage their capacity grant funds into discovery and development research important to the citizens of Washington State. Over the past two years, in addition to the normal host of smaller research grants that are annually awarded to our diverse faculty, WSU researchers have been involved in initiating multiple large (>\$5 million each) grants, including leading and participating in two \$10 million Sustainable Agricultural Systems grants, multiple SCRI grants, with WSU leading several, and a \$20 million grant to establish the AgAID Institute, short for USDA-NIFA Institute for Agricultural AI for Transforming Workforce and Decision Support.

There are numerous societal, environmental and scientific challenges that can be addressed by cutting-edge research and through the application of that research to the practical issues that face the residents of Washington. Every year we assess and evaluate our research portfolio to strategically prioritize our efforts to ensure the greatest impact is derived from both our research and extension programs. As a result, we can continue to deliver important outcomes including economic benefits to agricultural and natural resource-based industries, government entities, communities, and individuals. Additionally, our research and outreach help ensure that the people of Washington State maintain a high quality of life by limiting the negative impacts of chronic disease, food insecurity, and obesity. Finally, our programs help ensure that the beauty of the state and its natural resources are sustained for future generations.

Merit and Scientific Peer Review Processes

At WSU, merit evaluation takes place at several levels. Prioritization for specific programs is manifested by allocations of effort and limited funds. Since 2017, we have implemented a strategic prioritization of our Hatch capacity funds in order to better align with stakeholder needs and researcher capacity. Our research projects are organized into a dozen collaborative topic areas that are based on organic associations and are reflective of college strengths. Review and evaluation of research projects occurs prior to project submission and on an annual basis through REEport (legacy reporting for some projects still this year) and NRS.

Individual WSU faculty program plans are developed through statewide planning processes informed by the NIFA Plan of Work, the College of Agricultural, Human and Natural Resource Sciences Strategic Plan, and the WSU Strategic Plan. All faculty members choose which collaborative topic area project they wish to be primarily associated with. Faculty members are reviewed annually on a set of performance expectations that include: effective program planning, implementation, and evaluation of impact; scholarly work and creative outreach materials; success with grants and extramural funding; leadership and teamwork; professional development; and service to the public and the institution. Annual merit ratings are assigned based on accomplishment within these categories, which are also the performance expectations considered for tenure and promotion of Extension Faculty. All faculty report at the end of the calendar year into our electronic Activity Insight database, which can be accessed quickly at any time during the year that the information is needed. The progress of faculty work is reviewed by Program Directors, Department Chairs, Associate Deans and the Dean as an integral part of the annual performance review process. WSU faculty receive over 60% of their total funding from extramural sources, including USDA grants, grants from other agencies, foundation grants, and commodity

commission grants. These funding agencies subject our proposals to expert peer review by scientific panels and by industry professionals and growers. All WSU Extension publications undergo a double-blind peer review. Reviewers include faculty at WSU or other Grant Universities, state and federal agencies, or research faculty at non-Land Grant universities.

Stakeholder input: Action Taken to Seek Stakeholder Input

Stakeholder involvement is sought through a variety of means, including:

Relationship building through advisory councils, boards, regular meetings with key partners state-wide
Workshops

Presentations at Commodity Commission Board and other state agency board meetings

Hosting Field Days statewide (curtailed during the COVID pandemic, but resumed in early 2021)

Engagement with Master Gardeners, Master Beekeepers, 4-H and other volunteer-engaged programs

Electronic media (email, listservs, websites, social media platforms, newsletters) Radio

Direct mail

Telephone contacts

Personal visits

Social media at the College, Extension, Center, Program and individual faculty levels

Articles and stories in local, state, and regional periodicals, newspapers, magazines

Electronic surveys (using Qualtrics, Remark or Survey Monkey, and Turning Point software and clicker technology at workshops)

Stakeholder input: Methods to Identify Individuals and Groups

Annual assessments of general population characteristics, agricultural trends, natural resource- related issues, human health trends, and business dynamics are carried out as needed and are largely based on analysis of data collected by agencies external to the University, such as the US Census Bureau, National Agriculture Statistics Service, Washington Department of Natural Resources, Washington Department of Health, Washington Department of Agriculture, and the Washington Department of Commerce. To meet specific needs, these are supplemented in some cases by focused internal or stakeholder commissioned studies. These data help WSU faculty and staff and the commissioning stakeholders identify target audiences and define specific needs. We then develop appropriate research and outreach to address these needs.

Stakeholder input: Methods for Collecting Stakeholder Input

The ARC and WSU Extension use local and statewide advisory committees to provide input to the leadership, the faculty, and staff of Washington State University. These include the College of Agricultural, Human and Natural Resource Sciences (CAHNRS) Advisory Council, the Center for Sustaining Agriculture and Natural Resources Advisory Committee, advisory committees at each of the

four Research and Extension Centers, and county, departmental, and program-specific advisory committees such as the William D. Ruckelshaus Center Advisory Board.

When appropriate, feedback is sought through designed focus groups and designed surveys. This form of feedback is critical for evaluating new approaches, technology applications, and new outreach methods. Additionally, technical surveys are often designed by either an Evaluation Specialist or the Division of Governmental Studies and Services to assess public attitudes, most recently in partnership with the Washington Association of Sheriffs and Police Chiefs and the Washington State Patrol. Needs assessment is an expectation of all WSU Extension faculty members. These processes are deeply engrained in our program development processes. Alternative mechanisms have been developed to garner input from non-English speaking communities, refugee communities, and from other underserved populations. In these cases, WSU Extension often employs individuals from these communities who understand the cultures and traditions. This improves communication and assessment of need.

The ARC and some parts of Extension work closely with the 22 agricultural commodity commissions in the state to clearly understand the needs of their clientele. Joint work with these commissions often involves collaborative project design and follow-up presentation of results. In addition, the leadership of CAHNRS and WSU Extension sit on several statewide boards and numerous statewide committees and councils. These venues provide opportunities for soliciting and receiving input from numerous segments of society including tribes, state and federal agencies, the private sector, and the general public. Input is generally solicited in processes involving application of resources, including developing priorities for research and outreach, project design, and program delivery.

Stakeholder input: A Statement of How the Input Will Be Considered

Input from stakeholders strengthens our ability to assess need and demand, and to identify potential partners, identify emerging issues, and to evaluate the effectiveness of our research and extension programs in addressing these issues and needs as we move forward with Research and Extension activities, initiatives and programs. Our programs are directly influenced by stakeholder feedback and input.

The highest priority for our stakeholders is to support innovative research and extension outreach that effectively addresses important issues that are critical to profitability, sustainability, and their health and well-being. Many stakeholders prioritize natural resources concerns related to water quality, water quantity, forest health, rangeland health, and stewardship. Local food systems and the desire for community connections with our food supply is another recurring theme, as is the desire to have us investigate new methods and practices for organic food production. Concerns over human health and diet, along with the growing incidence of obesity in our population have been clearly stated as priorities as well as a desire to implement educational outreach to change behaviors. Consumer food safety education, positive youth development, and outreach to sustain rural communities are among several other stakeholder-defined issues that are being addressed by our current work, which continue to include access to affordable health care, the opioid crisis and emergence of new drugs in the state, such as delta-8-cannabinol, and trust in government. Emerging issues this year include water availability and utilization under drought conditions, the continued impact and management of wildfires, urban/rural competition within the state and associated development and impact on agricultural systems.

Critical Issues

Community and Economic Development

Initiated on: Nov 26, 2019

State: Washington

Term Length: Long-term (>5 years)

Healthy and resilient communities, whether incorporated cities/towns, unincorporated villages, or communities of affinity, are essential to the well-being of individuals and the strength and success of society. WSU's community development, economic development and resilience research and extension activities seek to impact society by targeting these various scales of societal structure and interaction. Direct engagement is focused through the Extension Community and Economic Development program, informed by the Community Capitals Framework. Rural and urban bioeconomies are supported by research efforts targeting new crop and industry development within the state, region and nation.

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences

Natural Resources

Initiated on: Nov 26, 2019

State: Washington

Term Length: Long-term (>5 years)

WSU scientists, educators and specialists will conduct research and extension programs leading to a better understanding of the interaction between human development and terrestrial, aquatic, and atmospheric conditions, investigate carbon sequestration innovations and technologies and improve soil health, manage and mitigate urban storm water runoff, restore riparian areas, provide wood and fuel using sustainable production practices, develop innovative mechanisms for revegetating mining sites, watersheds, and native prairies, and understand habitat requirements of key and endemic species. Extension educators will work with researchers and local communities to develop customized, science-based solutions to local problems and to enhance understanding in target audiences about new tools to more effectively manage and sustain natural resources.

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences

Nutrition, Health and Wellness

Initiated on: Nov 26, 2019

State: Washington

Term Length: Long-term (>5 years)

WSU's extension and research efforts support a full-spectrum culture of health across Washington, from urban centers to rural communities. A strong emphasis on food and nutrition as essential components of health incorporates research, education, training, and engagement on prevention and intervention in

critical health issues such as obesity and opioid/substance misuse, among others. Extension programs such as EFNEP and SNAP-Ed are important elements of this effort, as are prevention science, clinical intervention, and recovery support. Research efforts also focus on development of improved food packaging/storage methods and of new crop varieties with enhanced properties that increase food nutritional quality, as well as on understanding the biological factors and environmental contributors that affect health and wellness of diverse members of our state and nation. Understanding the utilization and function of natural food ingredients that promote human and animal health and support for and development of the crops that produce such ingredients are research focus areas that approach this key topic through a One Health lens.

Science Emphasis Area

Education and Multicultural Alliances, Family & Consumer Sciences, Food Safety, Human Nutrition

Strong Families and Youth Development

Initiated on: Nov 26, 2019

State: Washington

Term Length: Long-term (>5 years)

Youth and the families that raise them are a critical component of our society. Youth are viewed as the embodiment of our futures, as a gateway to stronger engagement with the adults in their lives, and as the locus for conducting the most effective proactive engagement strategies. A national emphasis on categorizing all youth-based activities as 4-H engagement provides a framework for efforts to support youth and their families. In order to address multiple challenges and opportunities, research-based programs are delivered by extension professionals and supervised volunteers. These programs include 4-H club programs, and school and after school youth and family-based programs, such as Strengthening Families, that focus on enhancing preventive mechanisms. Washington State University Extension's 4-H Youth Development programs create opportunities and deliver educational programs that advance life skills for young people, families and their communities. Educational efforts build not only the capabilities of youth but also build the skills of the adult volunteers who mentor them.

Science Emphasis Area

Education and Multicultural Alliances, Family & Consumer Sciences, Food Safety, Youth Development

Sustainability, Security and Resilience

Initiated on: Nov 26, 2019

State: Washington

Term Length: Long-term (>5 years)

Global environmental and climate stressors such as extreme weather events, heat and drought, and the flooding, wildfires and disease and pest pressures that accompany them, can have severe impacts on livestock and crop plants, directly threatening global food security and creating environmental, economic, policy and political stressors and challenges. Populations of pathogens and pests, including weeds, continue to evolve to challenge our genetic, chemical and management control practices. WSU

researchers seek evidence-based solutions to ensure a readily available, affordable food, fiber and fuel supply in response to such challenges that continue to evolve and thwart efforts at control and as people move from rural, agriculture areas to urban population centers. WSU research and extension faculty are committed to the sustainability, security, and resilience of our communities, our State, and especially our agricultural economy that is vital to the well-being of our citizens and for the consumers of our products locally, regionally, and nationally. Genomics and other modern tools are applied by WSU researchers to produce important improvements to crops and livestock including enhanced nitrogen and water use efficiencies, drought resistance, heat resistance, flood resistance, increased soil microbe interactions that support nutrient uptake from the soil, pest and disease resistance, decreased nutrient input requirements, increased nutritional quality, and increased yields or sustained yields under adverse conditions. Efforts in other sectors include engagement on the quality of governance and on public policy issues, as well as in the arenas of public safety and disaster resilience.

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences, Food Safety, Human Nutrition, Sustainable Agricultural Production Systems

Technology Development and Discovery

Initiated on: Oct 01, 2022

State: Washington

Term Length: Long-term (>5 years)

Technology development and adoption is a driving force for community economic improvement and resilience, as well as crop and livestock development and improvement. WSU researchers and extension specialists develop and educate the public on new technologies to be used by the agricultural, natural resource management and associated industries, such as food processing, packaging and distribution. Other areas of intense technology development, education and adoption include research that targets development of biofuels, bioproducts and biomaterials and their utilization, remote sensing, and the application of robotics, artificial intelligence and other computational/machine-based approaches, with particular emphasis on environmental sensing. These are applied to natural resource, livestock and cropping systems.

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Education and Multicultural Alliances, Environmental Systems, Sustainable Agricultural Production Systems