

Montana State University Combined Research and Extension Plan of Work 2021-2025

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I. Plan Overview

1. Executive Summary

The Montana State University College of Agriculture (COA), Montana Agricultural Experiment Station (MAES) and MSU Extension have collaborated with the people of Montana for more than 100 years to address problems and prepare for a better quality of life and improved future through research and the delivery of timely, applied science and information to stakeholders. The 2021-2025 Plan of Work is highlighted by a continuation of this partnership.

The COA and MAES are led by Vice President of Agriculture, Dean, and Director Dr. Sreekala Bajwa, who began her tenure in January 2019. The College of Agriculture has an enrollment of more than 2,000 students, including nearly 250 graduate students, in six departments: Agriculture and Ag Economics (joint with College of Letters and Science), Agricultural and Technology Education, Animal and Range Sciences, Microbiology and Immunology (joint with College of Letters and Science), Land Resources and Environmental Sciences, and Plant Sciences and Plant Pathology. MSU, along with University of Idaho and Utah State University, are partners with Washington State University in the Washington-Idaho-Montana-Utah (WIMU) Regional Program for Veterinary Medicine. The College also hosts MSU's Peace Corps Prep program.

The MAES mission is to “generate and disseminate superior knowledge and technological solutions to increase the competitiveness of communities capturing value from Montana’s agricultural and natural resources, preserve environmental quality, and improve the quality of life for all our citizens.” To fulfill this mission, MAES research focuses on addressing timely and relevant challenges facing Montana’s agricultural sector and effectively communicating that research across a broad range of scientific and non-scientific audiences. This ensures the research is both informed by, and informs, the stakeholder groups who will most benefit from new knowledge.

All Hatch projects at MSU are based within the COA/MAES. Hatch projects span a research spectrum from basic to highly applied research with an integrated focus on developing state-of-the-art solutions to short- and long-term challenges facing Montana, the mountain west region and the United States. Some of the top issues include water use and changes in availability, measuring and understanding the impacts of region-specific climate change on food production and security, assessing barriers and opportunities to increasing input productivity and economic returns to scarce inputs, improving cost-effective management of land and natural resources, and better identifying and managing risks in food production and processing.

In addressing these issues and communicating knowledge to stakeholders, COA/MAES is using a broad range of science-based approaches. These include the implementation of precision and data-intensive agriculture; innovations in plant breeding, pest management, cropping systems, animal genetics, and animal nutrition; assessments of environmental quality and economic and social sustainability; and the use of pioneering microbiology and infectious disease research to address animal and human safety. These are further described within the critical issues.

Eighty percent of MAES faculty are located on the main MSU campus in Bozeman. In addition, MAES has seven off-campus Research Centers (Northern Ag Research Center, Havre; Central Ag Research Center, Moccasin; Eastern Ag Research Center, Sidney; Northwestern Ag Research Center, Kalispell; Southern Ag Research Center, Huntley; Western Ag Research Center, Corvallis; and Western Triangle Ag Research Center, Conrad) and six local campus farms (Bozeman Agricultural Research and Teaching Farm, Arthur H. Post Agronomy Farm, Lutz Farm, Red Bluff Research Ranch, Fort Ellis Research Farm, and Horticulture Farm).

MSU Extension’s mission is to “improve the lives of Montana citizens by providing unbiased, research-based education and information that integrates learning, discovery and engagement to strengthen the social, economic and environmental

well-being of individuals, families, and communities.” Extension is led by Dr. Cody Stone, who was named the executive director in August 2018. Dr. Stone reports directly to President Waded Cruzado and both he and Dr. Bajwa are part of the President’s Executive Council.

Extension has always had a grassroots structure, with agents living and working across the state to ensure deep engagement with producers, families, businesses and communities. Extension also includes campus-based specialists and associate specialists who connect the university and Extension network with communities. Many projects are born directly from the challenges and desires of the state’s people. Often, projects have tremendous impact locally, though from a quantitative viewpoint the impacts may not seem large on a federal level. For management and leadership purposes, the state is divided into three regions—East, Central and West—with Extension department heads leading each region.

Extension leverages Smith-Lever dollars with county contributions to support salaries and operational costs for Montana’s 93 County and Reservation Extension Agents. State dollars, grants and other funding sources cover the expenses for the 54 campus-based specialists and associate specialists who translate applied research to deliver impactful programs to Montana’s diverse demographics. Extension’s main program areas are Ag and Natural Resources; Family and Consumer Sciences; 4-H Youth Development; and Community Development.

Many MSU faculty members have appointments that span teaching, research and outreach, with their FTE split between COA, MAES and Extension. Extension also has faculty in the College of Education, Health and Human Development, and College of Letters and Science. Collectively, Hatch, Smith-Lever, State of Montana and county and local funding continue to allow MSU’s faculty scientists to meet the changing needs of Montana, explore unique solutions to pressing questions, and solve global problems. These funds provide a foundation for COA/MAES and Extension to successfully compete for complimentary grant funding.

MSU continues its role as the hosting institution for the Western Sustainable Agricultural Research and Education (SARE) program. SARE is a USDA program that operates with competitive grants conducted cooperatively by farmers, ranchers, researchers and ag professionals to advance farm and ranch systems that are profitable, environmentally sound and good for communities. All SARE-funded projects are required to include research, education and outreach components in their design.

Another distinction for Montana is being home to the most land-grant institutions of any state in the nation. In addition to MSU, which is part of the original Morrill Act of 1862, there are seven tribal colleges that received the designation through the Elementary and Secondary Education Reauthorization Act of 1994. These institutions and their tribal affiliations are: Aaniiih Nakoda College (Gros Ventre and Assiniboine), Blackfeet Community College (Blackfeet), Chief Dull Knife College (Northern Cheyenne), Fort Peck Community College (Sioux and Assiniboine), Little Big Horn College (Crow), Salish Kootenai College (Bitterroot Salish, Kootenai, and Pend d’Oreille Kootenai of the Flathead Nation) and Stone Child College (Chippewa-Cree). In addition, four of the reservations partner with MSU Extension through the Federally Recognized Tribal Extension Program (FRTEP). The Blackfeet, Flathead, Fort Belknap and Fort Peck reservations all have Extension agents who live and work in the community and perform duties much like county agents. The Northern Cheyenne reservation has an externally funded Extension office.

MSU recently adopted a new 2019-2024 Strategic Plan: Choosing Promise <http://www.montana.edu/strategicplan/index.html>. The plan includes three central priorities: Transformational Learning, Scholarship that Improves Lives and Expanding Engagement. In addition, the plan identifies four grand challenges of particular focus for MSU. These are:

Caring for our environment: environmental science, design, engineering, architecture and social structure;
Promoting wellness in our communities: access and equality in education and health outcomes, community-based participatory research, biomedical sciences and entrepreneurship;
Food and fuel security: sustained food systems, precision agriculture, energy production, transmission and storage;
Securing the future of Montana: cybersecurity, photonics and optics, defense, governance and public policy.

Along with significant ongoing communication with stakeholders, this new strategic plan strongly informs the priorities for COA/MAES and Extension. COA/MAES and Extension, along with the rest of the university, have determined specific

metrics that will be tracked over the next five years to determine success in achieving the goals of Choosing Promise. These will be reflected in subsequent plan of work documents, as well as through MSU's critical issues and project initiations.

In February 2020, the COA/MAES adopted its College and Experiment Station-specific strategic plan, <http://ag.montana.edu/strategicplan.html>. The five-year plan was developed over a 9-month period with input from faculty, staff, students, alumni, and Montana community members who look to COA/MAES to provide impactful research and education. The plan is intended to guide the College and Experiment Station over the next five years and sets out goals that will ensure the growth and success of transformative education, translational research, and engaging outreach programs that benefit Montana and beyond. The plan has seven focus areas, with 2-3 specific objectives for each focus area. The focus areas include:

- A people-driven environment
- Impactful research and development
- Transformational teaching and learning
- Effective and inclusive engagement and outreach
- Strengthening and growing internal and external partnerships
- Strategic stewardship of resources
- Transparent and effective communication

The COA/MAES strategic plan was developed to provide direction for the College and Experiment Station to make significant advances toward meeting its missions, and also to align with the MSU Choosing Promise strategic plan.

The critical issues identified by MSU align with the basic program areas that have traditionally been part of COA/MAES and Extension. The specifics will continue to be refined with the new plan of work process. The critical issues are Agriculture and Natural Resources, Family and Consumer Sciences, Community Development, and Youth Development.

2. FTE Estimates

| Year | 1862 Extension | 1862 Research |
|------|----------------|---------------|
| 2021 | 150.0 | 280.0 |
| 2022 | 150.0 | 280.0 |
| 2023 | 150.0 | 280.0 |
| 2024 | 150.0 | 280.0 |
| 2025 | 150.0 | 280.0 |

II. Merit / Peer Review Process

Department heads within COA/MAES review Hatch projects at the department level. A committee of peers then reviews the project and passes it to the director for final approval. The peer review committee, selected by the director after consultations with COA department heads, includes the principal investigator's (PI) department head, MAES administrator, one department peer reviewer and two additional faculty external to the PI's department. Researchers present seminars to the review committee and interested stakeholders, including faculty, staff, students and constituents.

Because there are not any Montana Agricultural Experiment funds allocated outside of the COA, expert reviews occur with Montana State faculty external to the COA, as a requirement of the review process. Reviewers provide written recommendations on project relevance and importance; relationship of the project to previous research; objectives; approach and methods; scientific and technical quality; resources; and environmental, economic, and/or social impacts. The MAES administrator and department head share responses with the PI. If projects do not meet the expectation, the

director will not approve them and will defer them until the researcher meets the key elements satisfactorily. Local advisory committees to the research centers, as well as the Montana Extension Advisory Council, provide annual and long-term guidance. The director requires researchers to propose new projects for a three-year period, while researchers with favorably reviewed, ongoing projects continue for five years.

Beginning in Fall 2019, COA/MAES has begun an on-boarding program for recently hired COA/MAES faculty. The program provides College and Experiment Station-specific information about a variety of topics relevant to faculty. One of the topics covered in the on-boarding program is the Hatch project process. The session covers information about the purpose of Hatch projects, how to effectively write proposals, the importance of providing descriptive annual summaries of activities, and tips for effectively describing impacts of research and outreach efforts. The goal of the new program and the specific session is to more quickly develop faculty's ability to contribute effective information to COA/MAES and the USDA.

Extension faculty are required to complete at least one Engagement Plan within Activity Insight, a web-based faculty activity reporting program utilized by Montana State University. The Engagement Plan requires information including assumptions, targeted audience, needs assessment, inputs, outputs (activities and methods), evaluation studies planned, data collection plans, and anticipated outcomes. These plans are reviewed at least annually as part of the performance review. Needs assessments include stakeholder and peer input from local, county, state and regional sources, depending on the project.

Extension faculty are also required to complete at least one annual Engagement Results report for their active plans, and for other projects that happen during the year based on emergent needs of communities and constituents. The Engagement Results report includes a summary of the issue/need, what was done about it and the actual measured quantitative and qualitative results; as well as a list of community partners who were involved in design, implementation and evaluation of the project. These reports are also part of annual performance reviews and are reviewed by supervisors, department heads, Extension administration and as needed by the university administration. Faculty also report to county commissioners, college department heads, community partners, 4-H foundations and other partners who provide funding and other resources

III. Stakeholder Input

1. Actions to Seek

COA/MAES and Extension continually seek and obtain stakeholder input on program priorities. People who attend Extension or MAES programs or are referrals from other agencies are asked to indicate which issues are important to them, their families and communities. Radio, newsletters, newspapers, and electronic distribution lists are used to inform clientele about the opportunity to make requests for assistance. Informational booths are set up at agricultural trade shows, home and garden shows, farmers' markets, county fairs, and health fairs to reach people who are not regular clientele. These conversations reveal concerns/issues that might not be heard otherwise. When common issues surface through these methods, they are considered in the program planning process.

Stakeholder committees include the sustainable agriculture focus group, MAES State Advisory Council, Ag Coalition (includes representation from the Agricultural Business Association, Farm Bureau Federation, Montana Stockgrowers, Montana Grain Growers, Montana Farmers Union, Montana Water Users, Montana Wool Growers, Seed Growers and Seed Trade), Montana Extension Advisory Council (MEAC), Montana Association of Counties (MACo), county commissioners, Montana League of Cities and Towns, health and human service groups, 4-H Foundation, disaster planning and recovery and other state and local groups. Faculty routinely participate with these groups and the Natural Resources Conservation Service (NRCS) to provide training and expertise. The Ag Coalition meets periodically with the vice president of agriculture to review program priorities, new initiatives, fundraising efforts, and legislative activities.

Extension agents also use county profile information to make sure that participants in planning and evaluation sessions reflect the diversity of the area. Input is considered throughout the planning, development, implementation and evaluation process.

2. Methods to Identify

Advisory committees
Internal focus groups
External focus groups

Open listening sessions
Needs Assessments
Surveys

MAES's seven agricultural research centers have local advisory groups that meet multiple times per year. A state MAES Advisory Council meets three times per year to discuss program focus and direction, Montana legislative priorities, and productivity/impact regarding research and program priorities. These meetings are open to the public. Administrators and faculty in the COA, MAES and Extension serve on agricultural association committees that annually direct and fund research and outreach activities. These committees use a variety of collection methods, but the most common are face-to-face meetings, telephone and some video conferencing. The newly implemented COA/MAES strategic plan also includes several objectives to build and maintain enduring partnerships to inform and advance the land-grant mission. This includes increasing communication and interaction with commodity and allied organizations by increased engagement between faculty and external stakeholders, and making a concerted effort to increase input from historically under-represented stakeholder groups.

For Extension, membership on county advisory councils is generally achieved by sending an invitation to traditional stakeholder groups requesting the name of an individual who can represent their views and provide input for Extension programming. A similar invitation is sent to non-traditional groups, with personal contact made to explain the role of the representative. Programs that serve specific clientele, such as SNAP-Ed and EFNEP, ask clientele directly for input or may ask them to serve on a specific advisory committee for the program area.

Membership on the Montana Extension Advisory Council (MEAC) is based on geographic representation, areas of interest, and some previous relationship with Extension. Recruitment from specific sectors such as health care, government agencies and community development are also targeted. County Extension agents, state specialists, program leaders and regional department heads are asked to make recommendations for membership to MEAC. Those who are selected serve a 3-year term and meet biannually.

3. Methods to Collect

Through direct participation with stakeholder groups, broad participation in committees, and directed meetings, COA/MAES and Extension listen to and consider defined problems or questions that research, outreach and education programs can address. Each institution also targets select meetings with non-traditional groups on a regular basis. The most common method of gathering stakeholder input is from informal interviews with regular clientele of MSU Extension and MAES. Often this occurs in intentional program planning sessions to which these people are invited, requested to attend or are required to be present by their role or position. Examples of these groups may be county/reservation councils, 4-H councils, livestock associations, weed boards, human resource coalitions, local and state agricultural organizations, Ag Research Center advisory committees or special interest groups. Some of these groups have leadership boards that are asked for specific input.

County and state advisory committees are also used to gather input. Advisory groups are generally comprised of a cross section of the leadership and citizens in the county. Efforts are made to involve underserved and underrepresented clientele by contacting agencies and organizations that regularly work with those groups. They are asked for input and/or for names of people who can provide input. Local extension agents follow up with personal conversations to explain the goals of the organization and the process.[AS4][SS5]

At the state level, one of the most valuable sources of input is the Montana Association of Counties. Extension makes presentations during MACo's Annual Meeting, followed by an open session for mutual dialogue. These types of discussions also happen during newly elected county commissioner orientation and have proven very beneficial. Extension administration, through regional department heads, also gathers stakeholder input from county commissioners through regular and systematic visits at the county level.

Surveys are used to gather information at the state or local level. Additionally, Montana's open meeting law requires inviting the public, and the organizer must publish an agenda per Montana Code Annotated 2-3-101.

Throughout 2020 and 2021, Extension will be planning and implementing a comprehensive grassroots-oriented needs

assessment for all disciplines in Extension. The identified needs will inform programming priorities for local faculty, field offices, and specialists and associate specialists. It is anticipated results of this will affirm most Extension programming efforts; validate new areas of need in the state; and bring clarity to budget priorities.

4. How Considered

As a land-grant institution, Montana State University has a solid foundation of past and future program initiatives that promote stakeholder input and strong interactive dialogue through which COA/MAES and Extension administrators, faculty, scientists and staff set the tone for this collaborative environment. MAES and Extension serve jointly as the primary conduit for connection and delivery of education and new knowledge throughout Montana.

Information gathered through the stakeholder input process is used to determine program needs and direction. In some cases, educational teams made up of county Extension agents, specialists, clientele and researchers are formed to develop and implement programs.

The statewide Montana Extension Advisory Council (MEAC) meets twice a year. MAES Advisory Committees and the Ag Coalition Committee meet several times throughout the year to offer input and feedback. The Director of Extension and Vice President, Dean, and Director of COA and MAES meet at least monthly and provide system-wide updates and discussion about program priorities and funding.

Montana stakeholders indicate they are concerned about similar issues receiving attention across the nation. Many worry about agricultural market uncertainty, job security, and accessing health care in their communities. Agricultural producers are concerned about a positive profit margin, trade and agricultural policy interventions, combating detrimental pests, increasing soil quality and management practices, and improving mental health. Rural families are concerned about mental health, disproportionately high youth and adult suicide rates, and wonder if local schools will remain open or conversely if overcrowding and transiency will continue to cause issues.

In those areas where education and research can help address the issue, Montanans look to Extension and MAES as a trusted resource so they can make choices and decisions that are best for their families, businesses and communities. Budgets and staffing decisions are influenced and aligned accordingly, from the input provided by the aforementioned groups.

IV. Critical Issues

1 Agriculture and Natural Resources

Description:

COA/MAES and Extension are focused on providing timely, relevant and local research, resources, education and opportunities in support of Montana's leading economic, cultural and traditional industries related to agriculture and natural resources.

The USDA 2019 Montana Agricultural Statistics Report ranked Montana first in the U.S. in production of garbanzo beans and lentils; second in production of barley, canola, dry edible peas, flaxseed, honey, safflower, durum wheat, and other spring wheats; and third in production of alfalfa hay, and winter wheat. In addition, Montana ranked seventh in lamb crop and breeding sheep, and wool production and eighth in the U.S. in calf crop and seventh in beef cows. Collectively, crop and livestock production was valued at \$4.4 billion dollars in 2018. Basic, fundamental and applied research related to improving the sustainability and profitability of animal and crop production are a primary emphasis. Additional focus is placed on pest and invasive species management, small acreage management, horticulture, climate science, farm and ranch management and agricultural economics, and mental health/stress.

Montana has more than 60,000 miles of perennial streams providing irrigation, drinking water and recreation; as well as 25 million acres of forest that provide open space, clean water, wildlife habitat and recreation. Montana also has a long history of oil and mineral extraction, boom and bust cycles and boom towns that turn into ghost towns. As appropriate, COA/MAES and Extension pursue opportunities to better understand and support

projects related to coal deposits, oil, windfarms and geothermal energy potential. An emphasis is placed on projects that support the health of soil, water, range, forests and watersheds.

Term: Long

Science Emphasis Areas

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

2 Community Development

Description:

COA/MAES and Extension recognize that the health of Montana communities depends on the spirit and ability of the people to survive challenges including healthcare provider shortages, food deserts, housing shortages, economy, weather, aging demographics, limited resources, leadership development, and more. In some Montana counties, over 90 percent of land is federal- or state-owned, causing resource management challenges. Local and county governments include more than 11,000 public employees who are responsible for more than \$1 billion in funds; yet often those in charge have no technical background or education directly related to their role as public servant. There is a large transfer of wealth taking place across the state which has made the development of community foundations a priority to provide for the ongoing success of very small communities. Food deserts are common, and the loss of a grocery store can mean the end of a municipality.

Extension and COA/MAES focus on community development through research, education and outreach that empowers local people to lead in the development of entrepreneurial ventures, creation of community gardens/city beautification/tourism, leadership development in rural communities, and even infrastructure projects that are identified locally as critical needs. Whether as facilitators, researchers, educators and/or workers/participants, MSU Extension and MAES/COA faculty and staff partner closely with local communities to develop solutions for a sustainable future.

Term: Long

Science Emphasis Areas

Education and Multicultural Alliances
Environmental Systems
Family & Consumer Sciences
Food Safety
Sustainable Agricultural Production Systems

3 Family and Consumer Sciences

Description:

- * Societal costs of poor health related to nutrition and physical activity, are on the rise. When considering obesity and attributable medical expenditures alone, costs are estimated today at \$125 billion annually in the U.S.
- * Almost 20% of Montana children live in poverty, even higher on reservations.
- * Accessing healthy, nutritious and affordable foods is a major challenge for many families.
- * Montana has an abundance of nutritious, seasonal, wild and homegrown foods appropriate for food preservation.
- * Montana has ranked in the top five of all U.S. states in suicide rates for more than 40 years.

* Family economic education can extend financial resources and increase the ability of families to meet their own needs, thereby reducing costs to society. Understanding estate law can prevent tremendous financial loss for families.

* Montana's population is aging, with unique needs for elderly citizens. Changes in health, self-sufficiency, access to nutritious food, and appropriate healthcare are challenges for many elderly. Many elderly are taking on responsibilities for the benefit of their extended families. For example, over 6,000 Montanans are the primary care providers for their grandchildren.

* Approximately 118,000 unpaid caregivers provide 110 million hours of care to loved ones at a value of \$1.4 billion.

Extension, COA/MAES will continue to conduct research, education and outreach that improves healthy living, food preservation skills, food safety knowledge and practice, food accessibility, caregiver support and resources, mental health support and nutrition education.

Term: Long

Science Emphasis Areas

Education and Multicultural Alliances

Environmental Systems

Family & Consumer Sciences

Food Safety

Human Nutrition

Sustainable Agricultural Production Systems

Youth Development

4 Youth Development

Description:

During stakeholder input processes, youth issues continue to surface as a priority for Montanans. The MSU Extension 4-H program provides opportunities for life skill and competency development focused on helping youth to become strong, contributing members of their families, communities, and world. Stakeholders recognize the 4-H program as an effective, proven venue for youth to explore topics related to citizenship, healthy living and science, as well as to learn about leadership, volunteerism and community service. Youth involved in 4-H learn how to lead, follow and be contributing members of a team, and to apply their knowledge and skills in other environments. MSU researchers provide mentorship and learning opportunities to youth through Ag Research Center activities, school field trips and Field Days.

Term: Long

Science Emphasis Areas

Agroclimate Science

Education and Multicultural Alliances

Family & Consumer Sciences

Food Safety

Human Nutrition

Sustainable Agricultural Production Systems

Youth Development