



GROWING

SOUTH DAKOTA

A MAGAZINE BY SOUTH DAKOTA STATE UNIVERSITY / WINTER 2019
COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENTAL SCIENCES



South Dakota
Agricultural
Experiment Station



Research
at SDSU

2018 ANNUAL REPORT

SDSU



Extension

2018 ANNUAL REPORT



FROM THE DEAN JOHN KILLEFER

“The principle goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done”

- Jean Piaget

It was just eleven months ago that Carolyn and I moved to Brookings, honored and humbled by the opportunity to serve as a South Dakota Corn Endowed Dean of this great college at SDSU. It was a time of great excitement and anticipation as we left our former lives at Oregon State University to find our new home and colleagues at South Dakota State University. We were immediately made to feel welcome when we had a group of young men from Farm House Fraternity, as well as others from the college and university, assist us in getting moved into a temporary home. This hospitality was very timely and appreciated considering the snow event that occurred less than twelve hours later. Despite the weekly snows of continuously increasing intensity that occurred during our first month in Brookings, we have had a very warm and welcoming reception here. It is truly great to

OUR EXCITING FUTURE...

be a member of Jackrabbit Nation and to become part of the honored SDSU tradition.

Speaking of tradition, South Dakota State University is the land-grant University serving the citizens of South Dakota, the nation and world through its educational, research and outreach programs. Many of you may have questions about “What is a land-grant University?” “What is the Experiment Station?” and “How is Extension related to the land-grant University?” Through the delivery of this tripartite mission, SDSU is truly the State’s university! Read more about our College and the land-grant mission on page three.

In the SDSU College of Agriculture, Food and Environmental Sciences, our faculty and staff provide educational information to help fill the knowledge gap about how agriculture will sustainably provide food for upcoming generations while protecting and strengthening our natural resources, and at the same time helping to make agriculture stronger. Our researchers and extension staff are working together to help our stakeholders strive for the highest optimal yield, while

taking into account all of the inputs and the benefits related to their production systems. As you will see in these pages of Growing South Dakota, SDSU Extension helps foster learning communities that empower citizens to advocate for sustainable change and strengthen agriculture, natural resources, youth, family and communities. The researchers and staff of the South Dakota Agricultural Experiment Station at SDSU are paving the future path of food production, natural resource management, water quality, soil conservation, human and animal health, and regenerative agriculture not only for our state and nation, but for the world.

South Dakota State University is truly “The State’s University” and I am so honored to serve as the Dean of the College of Agriculture, Food and Environmental Sciences (CAFES). I hope that as you read about the many accomplishments of CAFES in this issue of Growing South Dakota you will see that we really do have such an exciting future ahead of us.

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Growing South Dakota is published four times annually by the SDSU College of Agriculture, Food and Environmental Sciences. A total of 23,000 copies are printed on recycled paper by the SDSU Print Lab at no cost to the State of South Dakota.

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ON THE COVER: Jonathan Kleinjan, left, SDSU Extension Crop Production Associate, and Dr. Karl Glover, Professor of Agronomy, Horticulture and Plant Science and SDSU Spring Wheat Breeder, confer about spring wheat variety trial results during a recent South Dakota Agricultural Experiment Station Northeast Research Farm Field Day near South Shore, S.D.



JOHN KILLEFER SETTLING INTO ROLE AS DEAN

The new dean of the College of Agriculture, Food and Environmental Sciences, John Killefer, has been providing leadership for the college since March 2018.

“There are many exciting things going on in the college and I am glad to be a part of it all,” Killefer says.

One highlight was hosting the Raven Precision Agriculture Center Groundbreaking Ceremony this past fall.

“This facility is becoming a reality and the level of excitement and engagement from stakeholders has been really amazing,” Killefer notes. “Individuals and industry groups impacted by our program continue to want to join our project.”

Another building under construction is the South Dakota

Animal Disease Research and Diagnostic Laboratory.

“The external structure of the facility is nearing completion and I am excited to see how the interior progresses and becomes fully operational,” Killefer says. “This facility will greatly increase teaching and research capabilities and diagnostic capacity.”

Killefer notes he was busy in the fall attending many departmental scholarship and award banquets and the CAFES recognition banquet.

“Attending these banquets was truly humbling and I am honored to be affiliated with such students and faculty,” Killefer explains.

Killefer has enjoyed traveling around the state to the South Dakota Agricultural Experiment Station sites and to meet with various groups and individuals.

“It has been so fun to visit with many audiences and meet so many wonderful people around the state and I am looking forward to meeting many more,” Killefer says.

Killefer came to SDSU from Oregon State University where he served as professor and head of the Department of Animal and Rangeland Sciences since 2011.

Killefer and his wife, Carolyn, have two daughters, Morgan and Taylor. Morgan works as a health physicist with the U.S. Army Corps of Engineers. Taylor is in her senior year at Chapman University in Orange, Calif. She is pursuing degrees in film and TV writing and production, along with pre-law.

In his free time, Killefer enjoys fishing, hunting and traveling.

Sydney Meyer

INTRODUCING THE COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENTAL SCIENCES

Rolling Out a New College Name

The South Dakota Board of Regents approved a request, effective beginning the fall semester of 2018, to change college names and realign departments. The SDSU College of Agriculture and Biological Sciences was renamed the College of Agriculture, Food and Environmental Sciences. Some departments within the college were also realigned as a result of an internal SDSU task force report, input from the SDSU Students' Association, and a review by Dennis Hedge, provost and vice president of academic affairs.

The Department of Biology and Microbiology moved from the former College of Agriculture and Biological Sciences, and is now housed within the newly created College of Natural Sciences. This removed the Biology, Human Biology and Microbiology majors from CAFES.

The College of Arts and Sciences was restructured and renamed the College of Arts, Humanities and Social Sciences. As part of this

restructuring, the Department of Economics was administratively moved from the College of Agriculture and Biological Sciences (now CAFES) to the College of Arts, Humanities and Social Sciences. However, students within the Department of Economics who are pursuing Agricultural and Resource Economics and Agricultural Business degrees will still have their degrees conferred by CAFES.

CAFES CONTINUES TO DELIVER THE LAND-GRANT MISSION

Even with a new name, the College of Agriculture, Food and Environmental Sciences (CAFES) continues the strong tradition of serving the citizens of South Dakota, the nation and the world through its educational, research and outreach programs.

Passage of the First Morrill Act (1862) reflected a growing demand for agricultural and technical education in the United States. While a number of institutions had begun to expand upon the traditional classical curriculum in the early years of our great nation, higher education was still widely unavailable to the children of most agricultural and industrial workers. The Morrill Act was intended to provide a broad segment of the population with a practical education that had direct relevance to their daily lives, and to help ensure that our young nation would prosper.

A key component of the land-grant system is the agricultural experiment station program created by the Hatch Act of 1887. The Hatch Act authorized direct payment of federal grant funds to each state to establish an agricultural experiment station in connection with the land-grant institution there. The amount of this appropriation varies from year to year and is determined for each state through a formula based on the number of small farmers there. A major portion of the federal funds must be matched by the state. In addition to our main campus facilities, we have eight branch stations to meet the special needs of different climate and geographical zones of our state.

To disseminate information gleaned from the experiment stations' research, the Smith-Lever Act of 1914 created a Cooperative Extension Service associated with each land-grant institution. This act

authorized ongoing federal support for extension services, using a formula similar to the Hatch Act's to determine the amount of the appropriation. This act also requires states to provide matching funds in order to receive the federal monies. The Cooperative Extension Service serves as a two-way conduit between the researchers on campus and at our experiment stations, and our stakeholders throughout the state. The discoveries of our researchers are shared with our stakeholders to help improve their situations, and the challenges that our stakeholders face are brought back to campus for our researchers to address. This close connection of SDSU with our many different stakeholders allows us to not only serve the education, research and outreach missions of a land-grant university, but to also be a major economic engine for our state and region.

CAFES Dean John Killefer

Precision agriculture majors Johnna Jorgensen and John Stubbendick (center) break ground for the Raven Precision Agriculture Center while project supporters look on.



RAVEN PRECISION AGRICULTURE CENTER GROUNDBREAKING CEREMONY

South Dakota State University held a groundbreaking ceremony for the future Raven Precision Agriculture Center on the SDSU campus in Brookings on Saturday, Oct. 6 at 1:30 p.m. Following the event, SDSU hosted the first-ever Precision Agriculture Bowl football game vs. Indiana State to celebrate the occasion.

The \$46.1 million Raven Precision Agriculture Center building project is supported by South Dakota stakeholder groups and legislative leaders.

"The faces of the next generation in agriculture are here at SDSU already," said Cole Berkley, a junior SDSU precision agriculture student from Hot Springs, S.D., who shared

remarks at the ceremony. "By improving the learning of this generation, we are improving the future of agriculture in South Dakota."

The building has 129,000 square feet of floor space that will be able to house modern precision farm equipment and will provide collaborative learning spaces for student design projects. Flexible space will be available so scientists from a variety of departments and industry can collaborate in research and education.

"Employers look to SDSU for their strong and well-rounded agricultural students. Now they can select students to work in the vast field of precision agriculture

with great confidence. The new Raven Precision Agriculture Center will tremendously help SDSU to continue providing a high-quality education to students so they are well-prepared to meet the growing demand for work in precision agriculture," Berkley remarked.

SDSU is the first land-grant university in the country to offer both a bachelor's degree and minor in precision agriculture.

"Raven is excited for the future of the Raven Precision Agriculture Center and the positive impact it will have on the next generation of precision agriculture professionals," said Lon Stroschein, Director of Corporate Development for Raven.

"There is no doubt that what we have done here will position SDSU to change the world for many years to come."

- SDSU President Barry Dunn

"We felt strongly that we needed to invest in this partnership with SDSU - not only for the workforce that it will help develop, but also for the collaboration and innovation that it will bring to the field of precision agriculture. What we are doing here really matters."

Ryan Wagner, President of the South Dakota Corn Utilization Council said, "Precision agriculture has revolutionized the way we farm and is still in its infancy. We can only imagine what innovations we will be using five years from now. This world-class facility will generate widespread benefits for farmers throughout the state and its economic impact will be tremendous. It will be a game

changer, not only for South Dakota, but for the entire agriculture industry. South Dakota Corn is proud to support this incredible project."

The new Raven Precision Agriculture Center will have classrooms and laboratories that will help foster innovation and collaboration across the Department of Agricultural and Biosystems Engineering and the Department of Agronomy, Horticulture and Plant Science in the College of Agriculture, Food and Environmental Sciences, as well as the Jerome J. Lohr College of Engineering.

South Dakota Representative Lee Qualm is one of the legislative supporters of the project. He said, "This is so exciting for South Dakota agriculture. The Raven Precision Agriculture Center will be used to develop new technology that will bring jobs to South

Dakota and help the best farmers and ranchers in the world do what they do best."

SDSU President Barry Dunn said this project is tangible proof that the people of South Dakota are willing to imagine the future and SDSU's place in it.

"As president, I spend a lot of time thinking about what this place needs to be not just now, but long after I am gone. There is no doubt that what we have done here will position SDSU to change the world for many years to come," Dunn said.

Final construction plans are in-progress. Construction will be starting in the spring of 2019.

Sydney Meyer

Below left: A rendering of the future Raven Precision Agriculture Center.

Top right: SDSU President Barry Dunn addresses attendees.

Bottom Right: Raven Director of Corporate Development Lon Stroschein





Raven Precision Agriculture Center Sponsors

\$5,000,000+
Raven
South Dakota Corn

\$1,000,000 - \$4,999,999
CHS

\$500,000 - \$999,999
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\$250,000 - \$499,999
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Keith and Kari Alverson
First National Bank of Sioux Falls
South Dakota Association of Cooperatives





GROUNDBREAKING CEREMONY

STUDENT CENTERED

Left to right: Precision agriculture majors John Stubbendick, Johnna Jorgensen and Cole Berkley participated in the Raven Precision Agriculture Center Groundbreaking.

Stakeholders, legislators, alumni, students and friends of SDSU gathered together to celebrate the Raven Precision Agriculture Center Groundbreaking Ceremony.

SDSU precision agriculture students Cole Berkley, Johnna Jorgensen and John Stubbendick played a key part in the ceremony and each highlighted the impact the center will have on students and the future of agriculture.

Berkley is currently a junior from Hot Springs, S.D., and was motivated to pursue precision agriculture as his degree because he wanted to become diversified and well-rounded in all aspects of agriculture. He plans on graduating from SDSU in December 2019 and is pursuing minors in soil science and agricultural marketing.

Berkley spoke during the ceremony about how he saw the center and the precision agriculture program improving the present generation of SDSU students and the future of the agriculture industry.

“The significance of precision agriculture is big,” said Berkley. “As the industry evolves and the next generation takes over, I see the industry taking off. However, in the next 10 years with one to two good years of yield and commodity prices, I think there will be a huge surge in investments towards precision agriculture.”

Berkley spoke to legislative committee members in the beginning stages of the project when the building of the center was being approved.

“I can reflect on this building for the rest of my life knowing I was a part of it since the beginning,” said Berkley.

Jorgensen and Stubbendick stood at the center of the shovel line and participated in the groundbreaking.

Jorgensen is a junior from Mt. Vernon, S.D. and is pursuing degrees in precision agriculture and agronomy. She said that her main focus was agronomy when she first arrived at SDSU, but learning more about precision agriculture led her to believe that a precision agriculture degree would be a good way for her to broaden her education.

“There is an obvious demand from both the students and the professional industry for the precision program to succeed and I am excited, especially as I start



Above left: SDSU President Barry Dunn, Johnna Jorgensen, John Stubbendick and SDSU Dean of CAFES John Killefer.

Above right: Cole Berkley speaking at the groundbreaking ceremony.

to become professionally active in the agriculture community, to see SDSU move into a leading role in the agriculture industry,” said Jorgensen.

To supplement her degrees, Jorgensen is currently taking classes to graduate with minors in agricultural business and agricultural marketing.

“I am truly grateful to have been asked to participate in the groundbreaking ceremony, and even more honored to be a part of the beginning stages of a new program,” said Jorgensen. “The new building will certainly encourage future students to consider pursuing precision agriculture as a degree, but the technologies provided with the building will also allow our SDSU students to strive and succeed in the program.”

Stubbendick is a senior at SDSU and grew up on a 1,500-acre corn and soybean farm in Avoca, Neb. He says that his passion for using data to make on-farm management decisions motivated him to pursue a precision agriculture degree and minors in computer science and agronomy.

“Precision agriculture is the pathway to efficiency and increased productivity in any agricultural environment,” said Stubbendick. “I want to be able to use my skills to assist other farmers in making data-driven decisions. The precedents that are set by the SDSU faculty in this building will shape higher education for agriculture students at all universities, not only SDSU. Students here at SDSU will know that they are taking part in the first ever four-year precision

program and can leave this University with pride.”

All three students have played roles in advocating for this program and the new center. Their participation in the groundbreaking reinforced the student focus of the precision agriculture program and the efforts to build the Raven Precision Agriculture Center.

“SDSU is known for our extremely successful and revolutionary alumni, and I foresee this tradition continuing throughout many more generations of Jackrabbits,” said Jorgensen.

Andrea Schubloom

“With the new tax law—what are some smart ways to support SDSU, now that the rules have changed?”

The passage of the Federal 2017 *Tax Cuts & Jobs Act* doubled the standard income tax deduction for the next five years. According to the Joint Congressional Committee on Tax, the number of itemizers is expected to decline from 45 million Americans to just under 18 million, effectively making cash gifts to charities the least tax-wise way to give.

Gifts of assets like the appreciated land or securities, taking advantage of the Charitable IRA Rollover for those over age 70 ½, or utilizing innovative methods like directing your broker to swap a highly appreciated stock with a charity to reduce future capital gains exposure when you eventually do sell it, can have tremendous benefits for almost everyone. Learn how Jim and Melody Mielke have chosen to support their scholarships at SDSU.

Tangible Personal Property

Jim and Melody Mielke never attended SDSU, yet they feel they’ve benefitted from SDSU educations throughout their professional lives. They wanted their legacy to be the investment in young people pursuing careers in the areas closest to them - agriculture and nursing.

With their farming roots, the Mielkes support their scholarships by gifting grain to the SDSU Foundation.

“This is our legacy,” Melody says. “The students have been so gracious. The personal interaction with students is more than we expected.”

RANKING THE BEST ASSETS FOR CHARITABLE GIFTS

If < 70.5 Years Old

1. Tangible Personal Property
2. Charitable Bailout (privately held C-stock)
3. Appreciated Stock or Land
4. Stock Swap
5. Cash

If > 70.5 Years Old

1. Charitable IRA Rollover
2. Tangible Personal Property
3. Charitable Bailout (privately held C-stock)
4. Appreciated Stock or Land
5. Principal from IRA (up to \$100k/year)
6. Stock Swap
7. Cash

There are significant tax benefits to gifting tangible personal property such as grain, livestock or machinery. The SDSU Foundation is able to make the sale tax-free, and donors like the Mielkes do not recognize any taxable income while still deducting their business expense of raising the livestock or grain. Further, the reduction in taxable income often reduces “provisional tax liability” (Medicare or Social Security taxable income).

For more information on any of these gift options please contact:

SDSU Foundation
Office of Gift Planning
1-888-747-7378 (toll-free)
or visit www.sdstatelegacy.org.



Jim and Melody Mielke

This is not intended as professional advice. Consult with a qualified tax professional before making a charitable gift.

SOUTH DAKOTA
STATE UNIVERSITY®
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IMPACT *Greatness*

SDSU EXTENSION AND SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION AT SDSU FIND STAKEHOLDER SOLUTIONS

Why was their potato crop destroyed by disease some years, and other years produced a bumper crop?

As a young child growing up on his family's diversified farm in Uganda, Africa, this unanswered question frustrated Emmanuel Byamukama. It also sparked an interest in agricultural research which eventually led to his career as a South Dakota State University Assistant Professor and SDSU Extension Plant Pathologist.

"Research is fascinating," explains Byamukama, who works in all areas of SDSU's land grant mission - teaching, research and extension. "It gives me a lot of joy and job satisfaction when I am able to help farmers. Through SDSU Extension we provide growers with research-based, unbiased information so they can make decisions on what practices they want to implement."

To provide research-based information, Byamukama, like all SDSU Extension Agriculture and Natural Resources staff, works closely with the team at the South Dakota Agricultural Experiment Station at SDSU (AES).

"No one person can do everything. Because of the collaborative

relationship SDSU Extension has with SDSU AES, together we can address problems, develop applicable solutions and share them with growers," Byamukama says.

Currently, Byamukama is collaborating with a team of AES agronomists, along with computer scientists and mathematicians from SDSU's Jerome J. Lohr College of Engineering, to develop a tool South Dakota soybean growers can use to protect their fields from white mold.

The research is driven by concerns pouring in from numerous South Dakota soybean growers who annually lose yields and profits because they are unable to effectively treat the white mold fungus.

And, the products are not to blame. The issue is due to treatment timing. In order to be effective, fungicide needs to be applied at flowering, before any indication of a white mold attack.

White mold is a devastating, difficult-to-treat disease, Byamukama explains, because the first visual signs of the fungus in a field are dead soybean plants. However, because a white mold attack is triggered by specific weather conditions, researchers

have found that there are environmental predictors which can be used to forecast the probability of white mold.

Through multi-season field analyses conducted in farmers' fields and in Agricultural Experiment Station test plots, as well as weather data collected in the same locations, Byamukama and the SDSU team are developing white mold prediction models.

Once perfected, the anticipated result will be an online tool that allows farmers to determine whether or not a fungicide application is necessary. And, if it is necessary, the tool will let farmers know when to apply a fungicide.

"This information will help growers protect their soybean yields and, ultimately, become more profitable and sustainable," Byamukama says.

This research project is just one of many examples of the effective working relationship between SDSU Extension and the Agricultural Experiment Station, explains Karla Trautman, SDSU Extension Interim Director.

"This collaboration is the land grant mission at work," Trautman says. "For more than a century, SDSU Extension has served as the



Emmanuel Byamukama (center) talks with producers at a South Dakota Agricultural Experiment Station field day.

communications conduit providing applicable information, based on research conducted at the university, research stations and elsewhere, to South Dakotans who need it."

Because of the grassroots nature of SDSU Extension, many research projects underway at Agricultural Experiment Station sites are initiated in the same way as the white mold research, explains Bill Gibbons, Interim Director, South Dakota Agricultural Experiment Station at SDSU and Interim Associate Dean for Research, College of Agriculture, Food and Environmental Sciences.

"SDSU Extension staff work closely with South Dakotans. Our SDSU Extension team has long been relied upon as a trusted source for information. So, many times, they are the first to learn of issues producers are encountering in the field. If the research is not already available, our extension staff come to the AES team for that research," Gibbons says.

Local research, like that conducted on stations and in farmers' fields across the state by SDSU Extension and AES staff is invaluable, says Byamukama, again referencing the white mold research.

"Because pathogens and environment are location-specific, the conditions that are here in South Dakota would not be the same as those found in Iowa, Minnesota or any other state. To solve local problems, we need to have access to local research," Byamukama explains.

Byamukama and the AES team continued collecting data and testing white mold prediction models throughout the 2018 growing season, they will field-test the system in 2019, in hopes that South Dakota farmers can begin to use the online tool in growing season 2020.

Lura Roti



FROM THE SDSU EXTENSION INTERIM DIRECTOR, KARLA TRAUTMAN

IT'S NEVER TOO LATE TO LEARN...

This past fall, my daughter asked me to accompany her to a calligraphy class. It was a short, three hour introductory session – designed to expose the participant to some of the most basic core skills. Since I had no previous experience, I appreciated the instructor’s approach to demonstrating the techniques and then the required “hands-on” practice to learn them. And, while I certainly don’t use this knowledge every day, I’ve discovered that the new skills have stuck with me – all because I put them to use during that initial learning experience.

In 1908, the challenge of reaching rural farmers with knowledge and techniques to improve farming practices was explored through the concept of demonstration. It was a simple approach, but it was quickly endorsed by businessmen’ organizations and state educational associations as a critical innovation to the adoption of new technologies. It was the birth of the Cooperative Extension movement and the mission quickly became clear... “to diffuse among the people of the

United States useful and practical information on subjects relating to agriculture, home economics and rural energy, and to encourage the application of the same...”

The advancements of research, and the teaching of knowledge gained from that research, has been foundational to the continued growth of our state and nation. Despite the incredible changes in technology, communication and transportation over the past 100 years, the need for interpreting that change, and providing leadership to it, has remained constant. Bound together in the land grant mission, the collaborative partnership between the South Dakota Agricultural Experiment Station and SDSU Extension is established to provide that leadership. Designed to engage citizen stakeholders, this collaborative relationship forms the foundation for “demonstrating” the connection between new knowledge and innovations generated from scientific research to the applied technical applications that can improve the lives, and livelihood, of the citizens of our state.

The challenges, and opportunities, that face the citizens of South Dakota will continue to evolve. The stories within this publication identify some of the exciting, and innovative, ways in which research and extension have collaborated together to provide knowledge and applied solutions to the challenges that South Dakota producers, families and communities are currently encountering. Together, the South Dakota Agricultural Experiment Station and SDSU Extension will continue to demonstrate and engage you, our stakeholders, in the discovery of new knowledge and the corresponding applied learning that will create the next generation of innovations that will be needed to meet the challenges of tomorrow.

*Contact Karla Trautman at
Karla.Trautman@sdstate.edu.*

LISTENING, LEARNING, LEADING...

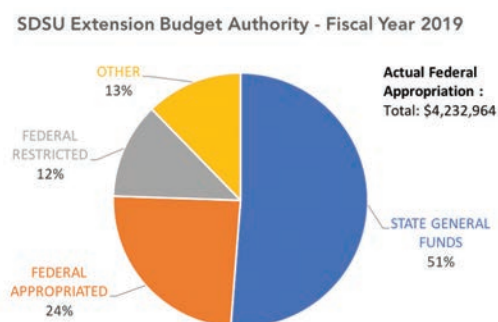
As the outreach arm of South Dakota State University, our state's land-grant institution, SDSU Extension serves as a lifelong education network that provides farmers, ranchers, agribusiness, communities, families and youth with the research-based information and education that they need to be successful. Through our extensive, statewide network of dedicated professionals, SDSU Extension works in collaborative partnerships with agencies and organizations as well as through our engaged relationships with stakeholders, citizens and volunteers to strengthen and develop the skills of South Dakotans in meeting their own, their family's and their community's needs through innovative and transformative strategies and solutions.

SDSU Extension prioritizes its educational outreach for audiences in the agriculture and natural resources sector, tribal and rural communities, youth and families. Specific educational initiatives include:

- 4-H Youth Development
- Agritourism
- Climate Assessment
- Community Capacity Building
- Crop Performance Testing
- Crop Production & Economics
- Entrepreneurship
- Food Safety
- Integrated Pest Management
- Livestock Production & Economics
- Local Foods
- Nutrition & Physical Activity
- Precision Agriculture
- Water and Soil Health
- Wellness
- Workforce Development

Our Mission:

SDSU Extension extends the education and research of South Dakota State University to the people and places of South Dakota through innovative and transformative learning resulting in an improved quality of life.



Our Team:

- Faculty are located on the campus of SDSU or at the West River Research and Extension facility in Rapid City. They have research and outreach disciplinary expertise and responsibility.
- Field specialists are located at one of eight regional centers across South Dakota (Aberdeen, Lemmon, Mitchell, Pierre, Rapid City, Sioux Falls, Watertown, Winner). Field Specialists represent specific expertise and have statewide responsibility.
- 4-H youth program advisors are located at the community level and work from county or tribal extension offices. They serve one to four counties, depending upon location. They provide programmatic and organizational support to county-based 4-H programs.
- Nutrition assistants are located across the state to provide specific nutrition education programs to families who meet participation criteria. These programs assist families with nutritional education and food accessibility for improved health and economic well-being.
- AmeriCorps VISTA members work alongside staff to bring additional capacity to SDSU Extension programming statewide. While each VISTA member's role is unique, all members contribute to advancing education to help bring economically disadvantaged South Dakotans out of poverty. This includes issues addressing obesity/nutrition, chronic disease management, food access, life/employment skills and financial resource management.



SDSU Extension Soils Field Specialist Anthony Bly talks with producers at a field day.

SDSU EXTENSION EMPOWERS SOUTH DAKOTANS THROUGH TRAINING & CERTIFICATIONS

It's a Wednesday afternoon, and instead of managing the hog barns on their Alcester farm, Steve Rommereim left the day's chores with a capable employee and drove to Sioux Falls to participate in the National Pork Board's Pork Quality Assurance (PQA) certification course put on by SDSU Extension.

"I could take PQA training from my veterinarian, but I choose to take it from Dr. Bob Thaler because I've known him for 30 years," explains Steve, President of the National Pork Board. "And, taking a class from someone with SDSU Extension provides a base for so much more knowledge about swine production."

Steve and his wife, Charlotte, understand pork production. Their families have been producing pigs for more than 100 years. Together, the couple operate a pork facility

that finishes 12,000-head per year. With such a large stake in the industry, Charlotte also invests time into advocacy. A registered dietitian and graduate of South Dakota State University, she regularly speaks on behalf of the National Pork Board to dietitians and healthcare providers.

In addition to speaking to the nutritional benefits of pork, Charlotte spends significant time discussing PQA certification – a certification pork producers and their employees must complete to comply with packer and processor requirements. "Having something like PQA when I am speaking to dieticians and other healthcare professionals about pork nutrition, sustainability and animal welfare is important because they understand certifications," Charlotte explains. PQA is among a long and diverse list of certification and training courses SDSU Extension provides

to South Dakotans throughout the year.

Led by experienced SDSU Extension team members, like Bob Thaler, Professor & SDSU Extension Swine Specialist, course participants can take advantage of class time to ask questions, provide feedback or share concerns.

"It's a valuable opportunity for the SDSU Extension team as well," Thaler says. "South Dakotans trust us, because SDSU Extension is an unbiased source of information – we are not selling anything."

Thaler explains that many times, before the course begins or during a break, he has opportunities to visit one-on-one with producers, answering questions or connecting them with valuable resources.

"Our key mission is to provide research-based information and



Charlotte and Steve Rommereim



SDSU Extension Swine Specialist Bob Thaler speaking at a PQA training.

best management practices,” Thaler says. “If you look at our team, you see that we all have strong ties with producers. Because, we all spend time in the field with those we serve.”

Although some certification courses, like PQA, can be found elsewhere, there are certifications which only SDSU Extension offers. SDSU Extension’s Environmental Training for Concentrated Animal Feeding Operations certification (CAFO) is one example; a requirement of the South Dakota Department of Environment and Natural Resources, all who operate concentrated animal feeding operations of 1,000 or more animals must be certified in this program.

And, providing needed certifications and helpful trainings to South Dakotans is part of SDSU Extension’s outreach focus within the land grant mission, explained Karla Trautman, SDSU Extension Interim Director.

“Since 1881, SDSU Extension has provided the valuable research, resources and information developed within the land grant university system to enrich the lives of South Dakotans,” Trautman explains.

Due to the rural nature of South Dakota, providing local or virtual access to trainings and certifications is valuable, says Brad Ruden, the Agronomy Tech Services Manager for Agtegra Cooperative. Ruden and the Agtera team of agronomists make time to attend SDSU Extension programming to help obtain or maintain their Certified Crop Advisor (CCA) or commercial pesticide applicator certifications.

“SDSU Extension provides us with a broad knowledge base that is tied back to our state’s land grant,” says Ruden, an agronomy graduate of SDSU. “It’s valuable that this information comes from local sources. Agronomy and production in the Northern Plains are different from other areas of the country.

SDSU Extension provides our team with local information, researched here in South Dakota, so we, in turn, can provide this to our farmer-customers who rely on us.”

Empowering all ages & stages of South Dakotans

Whitney Reider always knew she was a leader. As captain of her volleyball team, she took it upon herself to seek out and encourage teammates who were having a bad day. But she didn’t have any formal training or a mentor to ask advice of until the Wessington Springs native was selected to serve as a Character All Star during her senior year of high school.

“It was nice to have someone in my community to ask questions of and support us. Audra Scheel was amazing. She walked us through everything,” says Reider of the SDSU Extension 4-H Youth Program Advisor - Sanborn, Aurora & Jerauld/Buffalo Counties.

Character All Stars is an SDSU Extension 4-H train-the-trainer



Whitney Reider was chosen as an SDSU Extension 4-H Character All Star.

One of several courses offered and facilitated through SDSU Extension, the intense, entrepreneur-focused class connects business owners and prospective business owners with the information and resources they need to start or grow businesses.

program which selects teens from numerous high schools across the state and then provides these teens with character development training. Once trained, the teens return to their local school districts and provide a version of the training to their peers. “This was one of my strongest leadership opportunities. Character All Stars is the reason I decided to become a teacher,” Reider says.

Now a junior early childhood education major at SDSU, Reider explains that the experience of hosting workshops in elementary classrooms clarified her career path. “I had never thought about teaching before Character All Stars but helping little kids and seeing how much they love to learn and seeing them interact with one another, I decided teaching is what I want to do.”

Providing leadership, entrepreneurship and economic development training to rural communities where access to training may be limited, is the focus of yet another SDSU Extension program, Small Business Basics.

And, the impact isn’t lost on South Dakota’s rural main streets, says Kelsey Doom, Director of Economic Development and Executive Director for the Wagner Chamber of Commerce.

“It is rare to bring a business to town, so I knew that we should work on building and growing our own businesses,” Doom says. “Small Business Basics helped get citizens over the hump and understand enough so they felt comfortable to take that leap.”

Providing a comfortable environment where South Dakotans feel empowered to take charge of their health, is the focus of Better Choices, Better Health® South Dakota (BCBH-SD). These evidence-based, community-led chronic disease self-management education workshops were originally developed by Stanford University more than 30 years ago.

The program is brought to South Dakotans statewide by a partnership between SDSU Extension, the license holder for BCBH-SD, South Dakota

Department of Health and South Dakota Department of Human Services.

Thanks to certification trainings offered by the BCBH-SD program, more than 88 South Dakotans are trained to serve as leaders who co-facilitate local workshops (not support groups) which focus on providing individuals with peer support and evidence-based skills proven to help manage chronic disease.

In October 2014, South Dakota community members become trained as BCBH-SD Master Trainers in the evidence based chronic disease self-management education curriculum by two Stanford University T-Trainers.

“The T-Trainers had real-life experiences that they were able to share with us to help prepare us,” explains Vicki Palmreuter, a BCBH-SD Master Trainer who has been leading BCBH-SD workshops and training other volunteers in the Rapid City area since 2014. “And, no healthcare or teaching experience is required to become a leader and many volunteers and leaders for BCBH-SD have a chronic disease themselves or care for a loved one who does.”

Research-based, citizen-driven

“With more than a century of service to South Dakotans, SDSU Extension staff understand the power of listening to those we serve in order to provide information and resources to empower citizens to meet their own needs, the needs of their families and communities.

SOUTH DAKOTANS RELY ON SDSU EXTENSION

South Dakotans rely on SDSU Extension for numerous certifications and trainings. Below are some of the trainings and certifications SDSU Extension staff provide.

- Artificial Insemination School
- Baby Sitter Training
- Beef Quality Assurance
- Beef SD
- Better Choices, Better Health
- Best Management Practices
- Board Development
- Certified Processing Authority for Acidified and Acid foods
- Concentrated Animal Feeding Operations
- Customer Service
- Facilitator Training with Marketing Hometown America
- Farm/Rural Stress Management
- Food Entrepreneurs
- FSMA Food Safety Plan
- Grant Writing
- Hazardous Operations Safety Training for Youth Farm and Ranch Workers
- Integrated Pest Management
- Leadership Development
- Master Food Preservers (coming soon)
- Master Gardener
- Master Health Ambassadors (coming soon)
- Mental Health First Aid – coming soon
- Pork Quality Assurance
- Private and Commercial Pesticide Applicator Training
- Robotics and Engineering
- Science, Technology, Engineering and Math (STEM) Facilitation
- Shooting Sports Coaches Certification (Archery, Rifle, Pistol, Shotgun, Muzzleloading, Hunting)
- Skid Steer Safety
- Small Business Basics
- TeachSD
- Trailer Safety with South Dakota Natural Resources Conservation Service
- Tribal Beginning Farmer Rancher
- Walk with Ease

This is evident in many aspects of our organization," says Kenny Sherin, SDSU Extension Community Vitality Program Director. "In many cases, we can customize our services and since we're not here to sell a package, we are here to work with communities, listen to what they need and design around what they need to accomplish what they want."

To learn more about the training and certifications offered by SDSU Extension, visit www.sdstate.edu/sdsu-extension.

Lura Roti



Participants in Small Business Basics



SDSU EXTENSION TEAM PROVIDES MENTAL HEALTH & OPIOID EDUCATION TO SOUTH DAKOTA'S RURAL COMMUNITIES

In 2017, 192 South Dakotans committed suicide. The greatest number reported in the state's history.

This fact is not lost on SDSU Extension, an organization dedicated to serving South Dakotans with research-based information, resources and a trusted team for more than a century.

"The number of suicides reported this past year is very concerning," says Andrea Bjornestad, Assistant Professor & SDSU Extension Mental Health Specialist. "Research has demonstrated that there is a high suicide concern in rural areas. With much of South Dakota being rural, our communities are experiencing this firsthand."

Since 2013, Bjornestad has focused on methods to reverse this trend, researching the mental health status of agricultural producers in South Dakota.

With the opioid crisis knocking at our state's borders and many rural communities without mental health professionals or services, Bjornestad and the SDSU Extension team isn't waiting to respond.

Today, SDSU Extension staff work collaboratively with South Dakota State University faculty, as well as experts from across the region, to implement mental health programming which targets agriculture producers as well as other rural South Dakotans.

"Someone needs to initiate the conversation," Bjornestad explains.

One way to do this is through the Mental Health First Aid program, a national train-the-trainer style program developed and proven in other states. The program engages SDSU Extension staff and community members so they can identify, understand and respond to signs or symptoms of mental health issues or substance abuse.

"Mental Health First Aid is not training community members to serve as counselors," says Bjornestad. "We will train community members who come in direct contact with agriculture producers and others who may be struggling with suicidal thoughts, to understand how they can intervene. We train them on how to connect those in need with qualified mental health professionals who can help."

Suzanne Stluka, SDSU Extension Food & Families Program Director, explains there are many community members, like bankers, agronomists, veterinarians and educators, who, like SDSU Extension staff, serve in a trusted advisory role to many of South Dakota's agricultural producers and their families.

"Our team is on high alert. Because we work so closely with South Dakotans, we've had many tough conversations with those we serve," Stluka explains. "Mental health

intervention is not an area of expertise for our cow/calf, agronomy or community vitality faculty and staff, but they are often the trusted partner producers open up to, so they need to be equipped to help."

Launched in November 2018, and funded through a grant from the Substance Abuse and Mental Health Services Administration (SAMHSA) provided to Purdue University, SDSU Extension staff from across the state will be trained to become Mental Health First Aid trainers. These staff will return to their communities to host one-day workshops to train interested community members.

Why here? Why now?

With more than a century of experience to call upon, this is not the first time SDSU Extension staff have focused on suicide prevention and mental health. Bjornestad explains that mental health is declining among producers today much as it did during the Farm Crisis of the 1980s.

"Chronic stress plays a large role in mental health. There are many things farmers cannot control, stressors that have become chronic, like multiple years of low market prices, natural disasters and health care costs," Bjornestad says.

She adds that when these stressors are coupled with typical challenges farmers and ranchers face - uncooperative weather, livestock illness or machinery breakdowns - it can put agriculture producers at high risk for depression, suicidal

thoughts or ineffective coping behaviors, such as substance abuse.

SDSU Extension tribal local foods associates, Jason Schoch and Patricia Hammond, see Mental Health First Aid trainings as a beneficial resource which they will provide to the Pine Ridge Reservation community as part of an AgrAbility grant.

"Providing a support system for people is so important here, because behind every challenge is a mental health component," Hammond explains.

Because of the critical role mental health plays in the lives of those they serve, Hammond and Schoch made mental health the focus when they applied to U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA) for the grant.

"When we met with tribal partners to discuss how we could best serve their community, the most consistent barrier that came up was mental and behavioral health," Schoch explains. "We will be working with prospective new farmers living with disabilities and help them begin farming, in a subsistence way, through assistive technology and support networks."

In addition to Bjornestad, Schoch and Hammond will be working closely with other community stakeholders like Becky and Dallas Chief Eagle with All Nations Gathering Center.

"We named our grant, Tatanka Ki Owetu, or The Renewal, because many see hope in this grant. We are focusing on mental health through building a subsistence food system that allows farmers to help feed their family, friends and community," Hammond explains.

"SDSU Extension is building on our long-term investment and relationships we have built here."

Because of the relationships SDSU Extension staff have built in communities across South Dakota, Extension and University staff are also preparing to implement a preventative approach to the opioid epidemic through two projects; Protecting the Homestead: Prescription Opioid Misuse in the Dakotas and, Expanding the Homestead: Technical Assistance to Prevent Opioids Misuse in the Dakotas.

Collaboratively implemented with North Dakota State University Extension, program content is customized for youth and adults, explains Amber Letcher, Associate Professor and SDSU Extension 4-H Youth Development Specialist.

"Our goal is to provide as much information as possible to help South Dakotans understand that opioids exist for a reason and how to avoid misuse," says Letcher, who partnered with Kristine Ramsay-Seaner, South Dakota State University Assistant Professor in Department of Counseling and Human Development and Meagan Scott, Assistant Professor

and NDSU 4-H Youth Development Specialist.

Developed in Indiana, the projects are proven and only take an hour of participants' time.

"We want to create awareness of what to look for and what to do if you are concerned about the mental health of a friend or family member," says Ramsay-Seaner.

The Homestead projects will launch in North and South Dakota in rural counties that are identified as mental health shortage areas by the Health Resources and Services Administration.

"It makes sense to collaborate on this because we have a lot of similarities between our two states. By working together we have access to more resources and we can share our talents and skillsets," Scott says. "We are both extremely rural states with little access to mental health professionals. And, when it comes to addressing opioid misuse, both of our states are focusing on prevention."

The team will provide the information to rural communities in North and South Dakota through online webinars as well as face-to-face presentations. The project is funded through a grant from USDA-National Institute of Food and Agriculture and SAMHSA.

Lura Roti

Amber Letcher,
Associate Professor and
SDSU Extension 4-H Youth
Development Specialist



Andrea Bjornestad,
Assistant Professor &
SDSU Extension Mental
Health Specialist



Jason Schoch,
SDSU Extension Tribal
Local Foods Associate



Kristine Ramsay- Seaner,
SDSU Assistant Professor
in Department of
Counseling and Human
Development



Suzanne Stluka,
SDSU Extension Food &
Families Program Director





The Spink/Hand County 4-H Science of Agriculture team won the 2018 Science of Agriculture Event held in Brookings May 8, 2018. Team members include: Hailie Stuck, Kiarra Stuck, Alana Howard and Maya Howard. Each individual of the first place team received a \$1,000 scholarship.

TEENS ANSWER QUESTIONS THROUGH RESEARCH & COMPETE IN SCIENCE OF AGRICULTURE EVENT

South Dakota teens applied research methods to answer real-world questions impacting our state's number-one industry of agriculture through the SDSU Extension 4-H Science of Agriculture project.

On May 8, 2018, teens from across the state presented the results of nearly nine-months of research to a panel of judges on the campus of South Dakota State University during the inaugural Science of Agriculture Event.

"We developed this project to help teens develop their science, technology, engineering, and mathematics or STEM skills. And, as an opportunity for them to gain first-hand experience in applied research," explained Christine Wood, SDSU Extension 4-H Science Technology Engineering and Math (STEM) Field Specialist.

Piloted in 2017, the Science of Agriculture project is designed to expose teens to the engineering process. The Science of

Agriculture project begins with a question developed by a team of teens early in the school year. Then, through hands-on research, data evaluation and working with experts and professionals in the field, the team collaborates to find solutions.

"The hands-on nature of this project allowed students to make connections to how science can be applied to answer real-world questions," said Wyatt DeJong, Winner High School Agri-Science Instructor/FFA Advisor and 4-H Leader. "The more students are exposed to the how - how science and research is really used - the wiser they become."

DeJong co-coached a team of Winner High School sophomores, along with Laura Kahler, SDSU Extension 4-H Youth Program Advisor - Gregory and Tripp Counties.

The Winner High School 4-H Science of Agriculture team asked the question: What are the most

profitable range management practices that are good for cattle production, soil/range health, and will build pheasant populations?

The question, 17-year-old Loren Moeller explained, was motivated by the abundance of local cattle operations and pheasant hunting in the area.

"Tripp County has a lot of beef cattle, so we're trying to find ways cattle producers can manage grazing to benefit pheasants," Moeller said. "Pheasants are a big thing in our area of South Dakota and we want to find ways to increase their populations because they have been declining rapidly due to recent winter weather."

During their judged presentation, the team explained that the ability for pheasants to have ideal habitat during the 23-day nesting period is crucial to population density. And, the team explained that as a rural, farm/ranch community, pheasant habitat in the Winner area is primarily found on private land cattle producers use for grazing.



The Winner High School 4-H Science of Agriculture team: (left to right) Ethan Vesley, Loren Moeller, Ryder Mortenson and Colby Kaiser.

Their hope is to find grazing practices that work well for cattle and pheasants.

To answer their question, the team worked with several experts; Pheasants Forever biologists, SDSU Extension wildlife and range specialists, as well as DeJong and Kahler. Working with mentors is key to the Science of Agriculture's success, explained Van Kelley, Department Head of Agricultural and Biosystems Engineering at SDSU.

"Connecting with university faculty, SDSU Extension personnel - or really, any professional in the field of science or research - early on is beneficial because it alerts students to opportunities," Kelley said.

He added that the hands-on nature of the Science of Agriculture project may open the door to an interest in STEM careers. "I think back on my own experience, having someone show me how engineering science could help me solve problems in things I was interested in, is the reason I pursued the career I did," Kelley said.

Unlike more traditional science fairs they had participated in prior to this project, Ryder Mortenson, 16, said he actually enjoyed the Science of Agriculture project. "It was the fact that we got outside the classroom for hands-on experience and we got to get down to earth with what we were doing," he said.

To collect data for their project, Mortenson, Moeller and their teammates; Colby Kaiser, 16 and Ethan Vesley, 16 worked with cattle producers to review their grazing practices. They made on-site visits to five area ranches and documented vegetation and access to key pheasant habitat resources such as shelters, waterways, foodplots and treelines.

Based on factors essential to pheasant nesting success, the team hypothesized which grazing practices would serve the dual purpose of profitability for cattle producers and increase pheasant populations.

At this point, the team believes: "Overall, the main grazing practice is rotational grazing. It can benefit not only the pheasant population by giving the nests a break so the chicks can grow without being stepped on by a cow, but also helps

the cattle industry by not grazing the grass too short to where it will never recover."

This spring, following nesting, the team is going to do follow-up research to obtain a better understanding of whether or not their hypothesis is true.

"We have more questions, but that is OK because now we have more things to work on for next year," Vesley said.

The team plans to continue their research and compete again next year. Following their judged presentation, Science of Agriculture participants toured SDSU research labs, meeting with faculty and researchers.

The Winner High School 4-H team placed second. The Spink/Hand County 4-H Science of Agriculture team, which included the following team members: Hailie Stuck, Kiarra Stuck, Alana Howard and Maya Howard placed first. Each individual of the first place team received a \$1,000 scholarship.

The Science of Agriculture program is sponsored by SDSU Extension 4-H, the SD 4-H Leaders Association, and the SD Community Foundation. Judges for the event include: Rocky Forman, South Dakota Farmers Union; Shane Swedlund, Raven Industries and Tabitha Scott, USDA NRCS.

Lura Roti

SDSU EXTENSION COMMUNITY GARDENS

BRING HOPE

TO PINE RIDGE INDIAN RESERVATION



Sa Kayutapi
Watermelon

Weeding after dark isn't easy. Neither is fighting cravings to stay sober. And, working in the garden was the one thing that got her through the cravings. So, that's just what Jackie Solano did - if cravings hit at midnight, she would grab a flashlight and walk to the community garden and weed until they passed.

"The garden saved me. When I go there, I am at peace with myself," explains Solano, who was addicted to meth, but has been clean for 18 months now. "I like to be in the garden because it makes me happy to build something and watch it grow."

Even today, now that Solano is free from cravings and is focused on rebuilding a sober life with her husband and their son, the garden continues to bring her joy.

"Gardening keeps me busy and the food we grow there helps feed families who don't have enough to eat," Solano says.

The garden Solano credits with helping her remain drug-free, is one of nine community gardens SDSU Extension developed together with members of the Oglala Lakota tribe through the SDSU Extension Native American Beginning Farmer Rancher Program and Supplemental Nutrition Assistance Program-Education (SNAP-Ed).

Designed to address food insecurity, the program looks different today than it did when it was first introduced to the Pine Ridge community. Originally, the thought was that vegetable production could provide much needed income to community members.

However, it soon became clear that selling fresh produce to some, while other family and community members could not afford to buy food was not a model the Lakota people were comfortable with, explained Jason Schoch, SDSU Extension Tribal Local Foods Associate.

"As we listened to community members, two things became apparent; people are uncomfortable selling food, when so many are hungry and don't have the resources to buy food, and there is nearly no access to land for large-scale farming, whether that is vegetable farming or what we typically think of as commercial agriculture," Schoch said.

Schoch explained that due to the fractionated nature of land, a family may have for example 300 acres, however, those 300 acres could potentially be co-owned by dozens, if not hundreds of individuals. Access to capital is also a big challenge. The average income for a resident of Pine Ridge is \$7,500 a year.

"We are really trying to empower the majority of tribal members to become involved in agriculture - not traditional crops and cattle - because the majority don't have the land or capital to make that work. We're working with community members, helping them

develop community gardens, small acreage and micro-sized farms, as well as gardens in their own yards - because this is a model that has proven to work," Schoch said.

With this focus, a program that began with only 18 interested tribal members in its first year, has expanded to include more than 736 participants.

"SDSU Extension didn't come here and say, here's what you need to know. We began by asking, 'what do you want to know?'" Schoch said. "Our grassroots approach seems to be a good fit for Lakota culture which is very much bottom up. Leadership styles historically were more along the lines of servant-leadership versus top-down leadership."

It became apparent to Schoch and his colleague, Patricia Hammond, SDSU Extension Tribal Local Foods Program Assistant, that the act of gardening was being embraced

for its therapeutic benefits almost as much as it is for the vegetables, herbs and berries produced.

"We aren't traditionally gardeners, but getting out in the sun and reconnecting with nature makes us all feel better because we're able to provide food for ourselves and others," explained Hammond, who grew up on the Pine Ridge Reservation, and spent several years prior to working for SDSU Extension serving the Pine Ridge community through educational gardening programs geared toward teaching science to youth.

Focusing on the mental health benefits of gardening, SDSU Extension recently asked a veteran to share his story of how gardening served as therapy to work through Post Traumatic Stress Disorder (PTSD).

"The first day, there were seven attendees. The next day, 49 showed up because those seven went home

and told their family and friends that this could help them," Schoch said.

"Many in our community are dealing with PTSD from trauma - historic and ongoing," Hammond added. "Gardening helps get through trauma. They find calmness being in nature."

Emit King, would agree.

King, like Solano, began working in the community garden as a volunteer. Because his mother drank and used drugs when she was pregnant with him, King was born with several challenges and battles major depressive disorder. Couple these conditions with the recent death of an uncle, who was King's father figure, and King says at the time he began volunteering in the garden, he was considering suicide.

"Gardening helps me relax, it's therapeutic for me. It's helped me



Patricia Hammond, SDSU Extension Tribal Local Foods Program Assistant and Emit King work in one of nine community gardens designed to address food insecurity on Pine Ridge.

overcome feelings of ending my life," King said.

King became connected to the SDSU Extension community gardens through Hammond's daughter, Alex. She got to know King in school and suggested that Hammond ask him to volunteer in the garden. As Hammond got to know King, she was impressed with his work ethic and enthusiasm for gardening. He began to open up to Hammond and rely on her for advice beyond gardening. She became his mentor. Today, King affectionately refers to Hammond as "momma bear."

In addition to helping him overcome suicidal thoughts and gain confidence, gardening brings King joy because through gardening, he helps provide food to his community.

"Last summer, Jackie and I took a box of vegetables over to the elder center. They loved it and asked us to bring more. It makes me feel wonderful how happy this food makes them."

Research-based information, tools and resources

Although community and backyard gardens are much smaller than traditional crop farming, gardeners face similar challenges. Too little rain or one hail storm and all they've worked for can be lost. Through the Native American Beginning Farmer Program, SDSU Extension offers workshops in building low-cost, high tunnels, raised beds and drip irrigation.

A high tunnel is a hoop-shaped structure, covered in strong plastic, which allows for earlier planting and protects crops from weather hazards like frost and hail.

By teaming up with partner agencies, like Natural Resources Conservation Service (NRCS), SDSU Extension connects community members with programs that help cover the cost of materials for high tunnels. Over the next three years, NRCS Environmental Quality Incentives Program (EQIP) and the Oglala Sioux Tribal Land Office, will provide 30 high tunnels to Pine Ridge communities, schools and tribal members. SDSU Extension will provide the production education, together with other partners who will help teach tribal members how to build the structures.

"It's a team effort amongst partners," Schoch said. "Our approach to gardening is very practical and as low cost as possible."

For example, they encourage the pathways in gardens to be at least lawnmower width apart and teach how to build raised beds as well as constructing small scale hoop houses by attaching PVC pipe to the wooden frames, providing some extension to the growing season.

Working with community partners, the SDSU Extension team is also helping community members build Walipinis (earth-sheltered cold-frames), designed using tires, which draw heat from the earth and, when

topped with a high tunnel roof, can allow for year-round growing of some vegetables.

"I've been inside these structures when it was 20 below zero outside and 55 degrees inside," Schoch said.

Walipinis are one more way SDSU Extension, their tribal non-governmental partners, Oglala Lakota Cultural and Economic Revitalization Initiative (OLCERI) and Re-Member, are working with tribal members to develop sustainable food sources and build food security on the Pine Ridge Reservation.

"Building something for future generations is an important tenant of Lakota culture," Schoch said. "Tribal people are still very tied to the land. Historically, Lakota people were not farmers, they were hunter gatherers, however, the younger generation understands that they no longer have the land base to support buffalo, so they need something new."

"Gardens and small-acreage farming brings hope in a place where there is so much disparity," Hammond added.

To learn more about SDSU Extension's work on Pine Ridge, contact Jason Schoch, SDSU Extension Tribal Local Foods Associate at Jason.Schoch@sd-state.edu. For more information about our partners OLCERI and Re-Member, visit www.Olceri.org and www.re-member.org.

Lura Roti



ENERGIZE! EXPLORING INNOVATIVE RURAL COMMUNITIES CONFERENCE

More than 100 rural community leaders from across South Dakota came together to participate in the Energize! Exploring Innovative Rural Communities Conference in downtown De Smet in May, 2018. The SDSU Extension Community Vitality Team joined the Community of De Smet to host this new-to-the-state event.

As participants gathered for discussions in the town's business locations, shop owners and managers shared their entrepreneurial journeys. Speakers and presenters provided insight based on their experiences & knowledge related to a variety of topics including: Funding for Community Projects, Entrepreneurial Experiences, Value Added Agriculture, and Engaging Community Members. An Agritourism Round Table discussion focused on Agritourism Opportunities in South Dakota was also part of the program.

The keynote speaker for the event was Sarah Calhoun, owner of Red Ants Pants.

Calhoun is the Executive Director of the Red Ants Pants Foundation and Producer of the Red Ants Pants Music Festival. Along with the keynote, Calhoun also presented two sessions with the first entitled, Funding Community Projects: How to Throw a Party in a Cow Pasture on a Zero Dollar Budget, and the second presentation, Entrepreneurial Experiences: Start a Brand with No Experience?

The idea for creating and hosting the Energize! Exploring Innovative Rural Communities Conference came when members of the SDSU Community Vitality Team spent two days in April of 2017 attending a "Connecting Entrepreneurial Communities" Conference in McCook, Nebraska. That conference, hosted by University of Nebraska Extension, offered an interesting venue twist: conference sessions were held in main street businesses. First tried by Michigan State University with success, the University of Nebraska Extension staff duplicated the innovative idea in McCook. Now SDSU Extension has reproduced the idea in De Smet.

Resource providers were also available during the day's events to discuss tools to assist communities and entrepreneurs alike. The following were represented: South Dakota Community Foundation, Lake Area Tech, South Dakota Department of Tourism, Dakota Resources, South Dakota Small Business Development, South Dakota Rural Life and Census Data Center, South Dakota Planning Districts, East River Electric and SDSU Extension Community Vitality.

"The combination was powerful, with all groups learning from each other," said Paul Thares, SDSU Extension Community Vitality Field Specialist and one of the event coordinators.

To learn more about how the SDSU Extension Community Vitality works to strengthen South Dakotans and their communities, contact Kenny Sherin, SDSU Extension Community Vitality Program Director, at kenneth.sherin@sdstate.edu.

Lura Roti

SDSU EXTENSION LAUNCHES NEW WEBSITE

SDSU Extension launched a new website in December. The iGrow.org website served South Dakota for many years, but it was time for an upgrade. The website, found at extension.sdstate.edu, offers new content and features for a more user-friendly experience and to better provide timely information and educational resources to South Dakota.

“A big reason we decided to launch a new website was to create a more mobile friendly experience since about half of our users were accessing the website from mobile devices,” says Lindsey Gerard, SDSU Extension iGrow Technology Coordinator.

Hundreds of people contributed feedback to help build the new website. SDSU Extension used the feedback to create new content and features that better meet the needs of users.

New content and features include:

- The website is mobile responsive, so it will resize to fit all screens.
- There is a new section dedicated to food.
- The newsletters are being revamped and users can sign up for all newsletters at one time.
- Users can select categories and filters to narrow search results.
- The staff listing is searchable.



- Content is tagged to author profiles, so users can click on the author of an article to contact them or see more articles written by them.

SDSU Extension experts will continue to contribute timely and relevant information to the website daily.

ENERGIZE! CONFERENCE COMES TO LEMMON APRIL 30 –MAY 1

The SDSU Extension Community Vitality Team and community of Lemmon will host the Energize! Exploring Innovative Rural Communities Conference April 30 - May 1, 2019 in downtown Lemmon businesses.

Designed to energize South Dakota's rural communities by inviting them to network with community leaders from across the state, share success stories, get ideas and take action to improve their own communities; the conference will offer several sessions including: Funding for Community Projects, Entrepreneurial Experiences, Agritourism and Value Added

Agriculture and Engaging Community Members.

“This event will have information for communities, resources and ways to become involved, as well as information for current and potential entrepreneurs,” said Paul Thares, SDSU Extension Community Vitality Field Specialist.

The event will feature Brent Comstock as the keynote speaker. Comstock is the CEO of BCom Solutions, LLC. Comstock is an entrepreneur, speaker and 23-year-old venture capitalist.

Comstock will share a message of tactical inspiration focused on building sustainable models of growth for rural America. In addition, he will have two breakout sessions where he shares information on engaging youth in rural America.

Registration information

To register or for more information on Energize! Exploring Innovative Rural Communities Conference, contact Paul Thares with any questions at 605-374-4177 or Paul.thares@sdstate.edu.

Lura Roti



SDSU EXTENSION EMPOWERS YOUTH WITH DISASTER PREPAREDNESS TRAINING

SDSU Extension, is working to empower South Dakota teens, their families and communities through MyPI. My Preparedness Initiative or MyPI, is a two-time national award-winning youth disaster preparedness/youth leadership program developed by Mississippi State Extension and adopted by SDSU Extension.

“This hands-on training program is designed to get teens to take ownership of their preparedness plans so they can take an active role in protecting themselves and those close to them,” said Ryan Akers, MyPI National Project Director and Associate Extension Professor with Mississippi State Extension.

Developed in 2013 following severe storms and devastating flooding in rural communities throughout Mississippi, the program was designed to train teens in several basic areas of disaster preparedness then to equip them with the necessary skills to train and prepare their own family and six other families they know.

“Many times when disasters occur - whether it be a natural disaster, house fire or car accident - many youth think they are supposed to stay out of the way and wait for professional help to arrive,” Akers said. “This program shows them that responding to a disaster is not necessarily an “adult thing,” and preparedness certainly is not.”

MyPI provides teens with basic skills to be safe before, during and after a disaster in numerous areas of preparedness including: basic disaster preparedness, fire safety and utility control, basic disaster medical operations, light search and rescue, disaster psychology and more.

“The idea is not to make youth completely self-sufficient, but to give youth the skill set to do basic things until more help arrives,” said John Keimig, the SDSU Extension Youth Safety Field Specialist, who serves as the MyPI program coordinator in South Dakota.

Through MyPI, students complete a technology track, career track and disaster simulation with the option to receive CPR and AED certification. MyPI also gives youth the option to gain additional training in specific types of natural disasters which may be common in their region of the country.

Through the program’s capstone leadership program, for every 25 teens graduated, 175 households will have enhanced preparedness measures through the development of emergency supply kits and family communication plans.

Since 2018, the training has been implemented in Clay, Harding and Pennington counties with hopes of implementing the program in Minnehaha, Beadle and Brown counties in 2019.

“So far in my county I have eight youth actively working toward their MyPI certification and a couple more interested,” said Harding County 4-H Youth Program Advisor Laurie Elmore.

In November 2018, the Harding County MyPI youth teamed with the Buffalo Fire Department and Harding County EMTs to host an emergency training. EMS training officer Annette Slaba educated MyPI participants on recognizing illicit drug use symptoms and treatment precautions, signs of sepsis and provided hands-on training with emergency equipment.

Additionally, there was a mock vehicle accident that involved eight victims. As a requirement of the program, MyPI youth helped the Buffalo Fire Department triage, extract, package and transport the victims.

With her goal of graduating 15 youth by July 2019, Elmore will need to host another complete training course in the spring.

In Pennington County, classes have been taught at both Rapid City Steven's High School and Rapid City Central High School.

Jane Amiotte, Pennington County 4-H Youth Program Advisor, taught courses to 22 students at Rapid City Stevens High School and another 15 students at Rapid City Central High School through the schools' internship classes.

"The students have gained a lot of information that can help them, their family, their neighborhood and community if there ever was a disaster to happen," Amiotte said.

Like Harding County, the Pennington County MyPI program



Above: Students in the Pennington County MyPI program participated in emergency training classes.

Right: Harding County MyPI participants teamed with the Buffalo Fire Department and Harding County EMTs to host an emergency training.

also held their disaster simulation in November 2018 where students from both high schools worked together to complete the scenario. Pennington County Emergency Management helped by providing moulage artists and grading the students during the scenario. A total of 36 students and 26 victims participated.

"The students will become part of the Pennington County Teen Community Emergency Response Team and could be called out to assist in the aftermath of a disaster if they choose to do so," Amiotte said.

By the time they graduate, teens will make a widespread community impact in addition to gaining leadership characteristics, civic responsibility, self-esteem and empowerment.

"Sometimes youth feel that they are helpless and cannot help when something bad happens," Amiotte



said. "Through this program we give youth the skills and knowledge so that they can become first responders and help themselves or others."

"We all have a place in helping secure our communities and our teens are empowered when they feel that they are a part of the solution, instead of an unused resource or barrier," Akers said.

This program is supported by the Smith Lever Special Needs Grant Program from the USDA National Institute of Food and Agriculture.

To learn more, contact John Keimig, SDSU Extension Youth Safety Field Specialist, at john.keimig@sdstate.edu.

Andrea Schubloom

CENTERVILLE



BUSH FOUNDATION CHANGE NETWORK DEVELOPS AND EQUIPS COMMUNITY LEADERS

Since fall 2018, 17 individuals have been participating in the second cohort of the South Dakota Change Network. Sponsored by the Bush Foundation, the Change Network helps South Dakotans to lead change within their organizations and communities in a more equitable and inclusive manner.

The following individuals were selected for the 2018 cohort: Caitlin Bordeaux, Saint Francis; Keith Braveheart, Vermillion; Casey Burrus, Herrick; Naomi Even-Aberle, Rapid City; Bea Fischer, Aberdeen; Amber Hansen, Vermillion; Heidi Hepola, Aberdeen; Betta Jay, Flandreau; Pam Lange, Belle Fourche; Leslie Larson-Cutshaw, Clear Lake; Sandra Kern Mollman, Vermillion; Tamie Nickelson, Frederick; Emily Firman Pieper, Flandreau; Jay Pond, Rapid City; Paul Schipper, Sioux Falls; Cary Thrall, Lead and Erica Weston, Oglala.

To be selected for the Change Network, participants must first go through an application and interview process with program leaders.

“We try to put together a group that is not all the same,” said SDSU Extension Community Vitality Specialist Kari O’Neill. “Our job is to pick a group that is diverse from all ages, backgrounds and ethnicities. That helps them to learn from each other.”

Participants selected for the Change Network attend educational trainings where they have many opportunities to network with their fellow participants and other leaders across the state.

“It’s a very different educational background than a lot of leaders get,” O’Neill said.

The Change Network has an emphasis on leadership and works

to build participants’ skills in diversity, inclusion and equity. By doing so, the Change Network’s goal is to then equip the leaders to strengthen their own organizations and communities in which they live through grant-funded projects.

Each participant first chooses a “champion” who serves as their mentor and supporter throughout their project. Often times, those chosen as champions are people that have already helped to make a change that the participant is hoping to make or serve in the same organization or community as the mentee.

Additionally, each participant is assigned a confidant that serves on the leadership group for the Change Network and provides guidance throughout the participants’ projects. The participants meet with their confidant between meetings, read and discuss books and partake in group phone calls.

Each member of the cohort is trained to fill out a logic model, a \$5,000 grant application and a budget. The confidant then follows up with their assigned participant to assist with their project.

Projects from South Dakota's first cohort in 2017 are still flourishing. Jill Baker of Sioux Falls chose to focus her project on providing resources and support to local veterans and their families. She hosted the first "Bridging the Gap Festival" on January 18, 2019.

Peter Strong of Rapid City is the owner and manager of Racing Magpie Art Studio. There he leases out studio space to promote native artists in South Dakota. Additionally, he allows the artists to sell their pieces and participate in showings.

Viola Waln of Parmalee has a strong knowledge of native

prairie plants and grasses. With that knowledge, she teaches elementary students to collect and use the plants to make bath bombs and cook soup.

Economic Development Director for the city of Centerville Jared Hybertson has been working on welcoming new populations to the community. Because of the increasing number of dairies in the area, he has hosted a festival and had a mural painted so that new populations feel more involved and accepted in the community.

Baker, Strong, Waln and Hybertson of the 2017 cohort represent just a few of the wide variety of projects that participants of the Change Network implement across South Dakota. O'Neill hopes that more people choose to complete the program in the future and increase the connections between leaders spanning the state.



"It all centers around being more inclusive, more equitable and being more diverse in what they do," said O'Neill. "We are really trying to connect the group more and get them more known in South Dakota."

Anyone interested in learning more about the South Dakota Change Network or how to get involved can contact Kari O'Neill via email at kari.oneill@sdstate.edu.

*Andrea Schubloom and Lura Roti
Photos courtesy of Jared Hybertson*

SDSU EXTENSION WORKS WITH PARTNERS TO DEVELOP FARM TO SCHOOL GUIDEBOOK

The South Dakota (SD) Department of Education, Child & Adult Nutrition Services is partnering with South Dakota State University (SDSU) Extension and Dakota Rural Action (DRA) to lead a 2017 USDA Farm to School grant, an effort to better connect school cafeterias and students with local farmers and ranchers. The award was for \$24,158. As part of the grant, state-wide training opportunities have been provided on farm-to-school procurement

that brings together stakeholders from across the supply chain, including schools, producers, etc., to network and build business connections. In addition, they have worked to develop a South Dakota

Farm to School Guidebook that will assist schools and producers with implementing farm-to-school efforts across South Dakota. The guidebook is slated to be released in March 2019.



SDSU TO PARTICIPATE IN EVERY ACRE COUNTS

The South Dakota Habitat Conservation Foundation alongside South Dakota State University and The USDA's Natural Resources Conservation Service announced a new project in December 2018. Every Acre Counts is designed to give agricultural producers new ways to manage low producing acres while increasing their bottom line.

“Ag producers in South Dakota care about the land and we realize that our practices have far-reaching impacts for agriculture and conservation. Every year, producers, like me, are faced with tough planning decisions. The opportunity to develop partnerships like this demonstrates the importance of our ag industry in South Dakota and our dedication to land stewardship,” stated Christine Hamilton, president of the South Dakota Habitat Conservation Foundation. “This successful collaboration will result in new knowledge about profit margins with various combinations of practices, and outcomes that improve overall land and conservation management.”

The South Dakota Habitat Conservation Foundation has

contributed \$1 million to the project, with matching funds from the USDA Natural Resources Conservation Service.

“The primary focus for this project will be the optimal use of marginal lands impacted by wet conditions, saline or sodic soils, and eroded areas such as hilltops,” said Barry H. Dunn, SDSU president.

“Millions of acres of cropland across South Dakota are impacted by these challenges, with over 7 million acres impacted by saline conditions alone. The financial burdens of attempting to produce crops in these marginal areas can be negative to a producer's bottom line. And, together, we want to change this.”

Anthony Bly, SDSU Extension Soils Specialist, and Economics Professor Matthew Diersen, SDSU Extension Risk and Business Management Specialist, will lead the project. Teams of South Dakota Agricultural Experiment Station researchers and SDSU Extension personnel will work with producers and landowners across the state.

Four regions of South Dakota have been selected to kick-start the project. Moody, Lake and

Minnehaha counties with eroded and wet areas; Brown, Spink, Clark and Day counties with saline/sodic and wet areas in addition to Edmonds, Potter and Faulk; and Aurora, Brule, Buffalo and Jerauld counties with saline/sodic and eroded areas.

SDSU will work with selected landowners in the four regions and their crop and financial consultants to precisely characterize the technical metrics of their existing operations and generate an accrual-based economic analysis. That information will then be incorporated into a profit-mapping software to pinpoint and quantify marginal acres. In addition, federal, state and local habitat and conservation programs will be used to leverage funding.

The vision is to build out from the initial adopters to recruit neighbors and create a critical mass of participants in the four regions, said Dunn. Focusing the work in these specific areas enables a greater efficiency in delivering the programs to surrounding landowners, producing easy, but effective outreach.

“Marginal lands can delay farming operations from planting to harvesting for days or even weeks, potentially impacting profitability on the good ground,” said Jeff Zimprich, state conservationist for NRCS, Huron. “By considering the capability and thus the profitability acre-by-acre versus field by field, producers will increase the efficient use of all inputs. This project is designed to benefit the economic stability and environmental sustainability of South Dakota agriculture.”

Landowners who want more information, particularly those in the four regions where the project will begin, should contact Bly or Diersen.

“We hope this initiative will demonstrate that additional returns are possible as a result of adopting the right mix of conservation practices in the appropriate parts of our fields,” concluded Hamilton.

SDSU Marketing and Communications

Right: Ryan Heiniger, Pheasants Forever; Eric Magedanz, Pheasants Forever; Cody Rolfes, Pheasants Forever; Brandon Hope, farmer near Sinai, S.D.; Becky Watkins, natural resource management student; Evan Schnitzler, precision agriculture student; Katelin Frerichs, natural resource management student; Cole Berkley, precision agriculture student; Nicholas Uilk, instructor in the Agricultural and Biosystems Engineering Department; Jonathan Jenks, distinguished professor in the Natural Resource Management Department; Michele Dudash, Natural Resource Management Department Head

SDSU Students Are First to Participate in Precision Agriculture and Conservation Joint Training Program

Four students in the South Dakota State University Departments of Agricultural and Biosystems Engineering and Natural Resource Management participated in a precision agriculture and conservation undergraduate training program this fall as part of a joint pilot capstone course.

The goal of the project was to demonstrate to students and farmers that precision agriculture technology can be used to pinpoint areas in farm fields that historically result in low yields and low or negative returns on investment, and how alternative uses for these areas can increase profit while improving soil and water quality, increasing biodiversity and providing critical wildlife habitat needs.

The training program is supported by a \$50,000 gift from Mark and Kathy Walker of Olathe, Kan., through Pheasants Forever. The gift will span the course of five years and covers the cost for participating students to take part in the program.

Precision agriculture students Evan Schnitzler of Dassel, Minn., and Cole Berkley of Hot Springs, S.D., and natural resource management students Katelin Frerichs of Buffalo Center, Iowa, and Becky Watkins of LaMoure, N.D., joined together as a team for the inaugural training program. They conducted a profitability analysis of a local farmer’s land and identified marginal acres that had a negative return on investment for crop production. The team then assessed the potential financial impacts of utilizing these specific acres for alternative practices, such as cover crops, pollinator plots or native grass/forb production.



RUSS DALY RECOGNIZED WITH 2018 F.O. BUTLER AWARD

FOR EXCELLENCE IN SERVICE IN EXTENSION/OUTREACH

South Dakota State University recognized Russ Daly with the 2018 F.O. Butler Award for Excellence in Service in Extension/Outreach. Daly is an SDSU Professor in the Veterinary & Biomedical Sciences Department, the SDSU Extension Veterinarian and State Public Health Veterinarian.

"Dr. Daly has dedicated his life to serving the community and stakeholders of South Dakota, the nation and the world by providing the highest quality outreach through applied research, scholarly output, consultations and the development of relationships with the public," said Jane Christopher-Hennings, Head of the Veterinary & Biomedical Sciences Department at SDSU.

Service to South Dakotans, their livestock and companion animals, has been the mission of Daly's diverse career.

"Veterinary medicine is a wonderful profession that has provided me with so many different opportunities," said Daly, who began his career as a rural, large and small animal veterinarian. "Throughout my career I have had the wonderful opportunity to truly understand the relationship between people and their animals and work to keep humans and animals healthy."

Growing up on a diversified grain and livestock farm in Brown

County, Daly said he always knew he wanted to pursue a career that would allow him to remain closely connected to land and livestock. Initially, he didn't consider veterinary medicine.

When he first enrolled at SDSU, it was as an agricultural engineering student. It wasn't a good fit. Daly tried other majors, but he wasn't content.

Then, while reading a profile article on a local veterinarian in *The Collegian*, Daly's career goal became clear.

"A light bulb went off. This was the career I'd been looking for. As a veterinarian I could stay involved in agriculture, be part of a small community and be intellectually challenged every day with the science and medicine involved in keeping animals healthy," Daly said.

In 1990, Daly received his Doctorate of Veterinary Medicine from Iowa State University and was asked to join the private practice in Montrose, South Dakota where he had completed his preceptorship. During his years in private practice, along with pets, Daly's clientele represented nearly all aspects of animal agriculture. He worked with cow/calf herds, feedlots, dairy herds and swine facilities.

"Rural South Dakota is a great place to be a veterinarian," he said, adding that today, he calls upon his experience often. "I learned so

much from the livestock producers I worked with," he said. "At first, as a new veterinarian, I wasn't very confident - it took time, mentorship from more experienced veterinarians, mentorship from livestock producers I worked with and a lot of experience."

Throughout his career, Daly says it is the human aspect of his work that is most rewarding.

"The most enjoyable part of veterinary work was interacting with clients. In private practice I got to know their families and operations well, and many clients became my friends," Daly said.

In fact, it was the opportunity to serve more South Dakotans that appealed to Daly when he was asked to join the SDSU Extension team and South Dakota State University faculty in 2005.

Daly saw his new role as a way to utilize his practical, private practice experience and collaborate with SDSU faculty and researchers to solve health challenges facing South Dakota's livestock producers and the general public.

"I get to investigate interesting questions and try to find answers," he said.

In addition to owners of pets and livestock, today as professor, SDSU Extension Veterinarian and State Public Health Veterinarian, Daly's



clientele has expanded to encompass students, human and animal health researchers, faculty and veterinarians across the state and country.

Daly's ability to connect with those he serves is not overlooked, explained Dustin Oedekoven, DVM, South Dakota State Veterinarian, S.D. Animal Industry Board in a letter of recommendation.

"Dr. Daly's resume is impressive and speaks volumes as to the many qualifications that he possesses which make him an ideal candidate for the F.O. Butler Award. It is not only that which is listed on his resume, however, that makes him deserving of the award. Rather, it is also the humble and dedicated manner in which Dr. Daly interacts with those whom he serves," Oedekoven wrote.

As the SDSU Extension Veterinarian, Daly works closely with veterinarians across the state to understand livestock and pet owners' resource and information needs. Through bi-weekly news columns, journal articles and seminars, Daly provides research-based information and

education to veterinarians and their clients.

When a disease outbreak occurs or a new disease appears in the state, Daly relies on the state's veterinary network to keep him informed, aiding his work with researchers at the

South Dakota Animal Disease Research and Diagnostic Laboratory to implement testing procedures, develop tests and treatment plans.

In his role as State Public Health Veterinarian, Daly works closely with those in human medicine. Together with medical doctors, he helped launch South Dakota One Health, a working group focused on public health education and prevention of zoonotic diseases. Zoonotic diseases are those that can be transmitted from animals to humans or humans to animals.

"There is a lot of contact between humans and animals, particularly in South Dakota where agriculture and livestock production is such an important part of our economy," explained Susan Anderson, MD, Professor and Chair of the Family Medicine Department at the University of South Dakota Sanford School of Medicine and Director of the Frontier and Rural Medicine Program. "Dr. Daly has worked as a vet in a small community. He understands what it is like to live and work in rural South Dakota - these are the populations we are trying to impact."

When Daly joined SDSU Extension and SDSU, he was hired based on his field experience and ability to communicate. While maintaining a demanding work schedule, Daly received a Master of Science in 2013 from SDSU.

Daly pours his heart, soul and intellect into every aspect of his work.

In 2013, he served as interim department head of the SDSU Veterinary and Biomedical Sciences Department, and Director of the South Dakota Animal Disease Research and Diagnostic Laboratory (ADRDL); he serves on the South Dakota One Health working group; he is chair of the National Association of State Public Health Veterinarians Animal Contact in Public Settings Compendium Committee; serves as chair of the SD Veterinary Medical Association Continuing Education Committee and coordinates outreach for the SDSU Veterinary and Biomedical Sciences Department and South Dakota Animal Disease Research and Diagnostic Laboratory.

In addition to the F.O. Butler Award for Excellence in Service in Extension/Outreach, Daly has been named Outstanding Faculty Member in Extension by the SDSU Chapter of Gamma Sigma Delta Honor Society of Agriculture and has been nominated as the Ag-Bio Teacher of the Year.

Lura Roti

2018 SDSU EXTENSION YEARS OF SERVICE AWARDS





30 Years of Service:

- A: Karla Trautman
- B: Robert Thaler
- C: Paul O. Johnson

15 Years of Service:

- D: Jodi Loehrer
- E: Linda Quade
- F: George Perry

10 Years of Service:

- G: Connie Tande

5 Years of Service:

- H: Amanda Bachmann
- I: Anthony Bly
- J: Emmanuel Byamukama
- K: Heidi Carroll
- L: Samantha Dvorak
- M: Christine Wood

- N: Chris Graham
- O: Karla Hernandez
- P: Paul Thares
- Q: Shannon Sand
- R: Charles Martinell
- S: Jason Schoch

SDSU EXTENSION AND PARTNERS WORK TO INCREASE AWARENESS AND OPPORTUNITIES OF SOUTH DAKOTA AGRITOURISM

In 2018 SDSU Extension Community Vitality, the South Dakota Dept. of Tourism and partners formed a South Dakota Agritourism Work Group to explore opportunities to encourage, promote and support agritourism across South Dakota. In addition to SDSU Extension, other partners in the work group include the South Dakota Dept. of Agriculture, South Dakota Value Added Agriculture Development Center, South Dakota Specialty Producers, Southeast Tech, South Dakota Bed & Breakfast Association, Sioux Falls Convention & Visitors Bureau and USDA Rural Development.

According to Webster's dictionary, agritourism is the practice of touring agricultural areas to see farms and often to participate in farm activities.

"It is a niche in the tourist industry that connects visitors to agriculture," said SDSU Extension Community Vitality Specialist Peggy Schlechter. "We might think the chores we do to maintain our operations are not too exciting, but to many people, all those chores are something new."

As a way of moving agritourism forward in the state, the work group started to collect and share ideas with producers. They conducted a survey at events such as DakotaFest, the South Dakota State Fair and the South Dakota Local Foods Conference that revealed nearly 70% of participating

farmers and ranchers are interested in learning more about agritourism.

"A lot of people in tourism and in agriculture do not know what agritourism is," Schlechter said. "Putting them together makes great sense in South Dakota because they are two of our top industries."

Schlechter is confident that by bringing the two industries together, South Dakota will be able to provide consumers with a unique and hands-on educational experience while building trusting relationships between them and producers in agriculture. Additionally, Schlechter believes that agritourism will provide South Dakota farmers and ranchers with another source of income while adding diversity to their operations.

"This is a way for farmers and ranchers to tell their story," Schlechter said.

A roundtable discussion about tourism was included at the May Energize! conference hosted by SDSU Extension. After the discussion, a participant shared the idea of forming an agritourism trail along Highway 14. The trail would be an opportunity for South Dakota citizens and out-of-state citizens alike to experience agriculture firsthand in a variety of ways by visiting operations across the state.

The Highway 14 agritourism trail steering committee was formed in October 2018 and consists of

a variety of South Dakotans that work in economic development or as agriculture producers. As they start their promotion efforts, the committee hopes to have an official name for the trail by mid-February 2019.

Schlechter serves as one of the facilitators of the steering committee and hopes that more people continue showing interest in the trail.

"We have to start somewhere because what these people learn they will share with other people," Schlechter said.

Throughout the year, there will be educational webinars for interested farmers and ranchers on pricing, dealing with liabilities, biosecurity, and time management. If funds allow, interested producers will gather in fall 2019 for a pilot bus tour to practice giving their own tours and provide feedback to one another.

"If you visit other places, there are a lot of agritourism opportunities and South Dakota is a little behind on that," Schlechter said. "I think it is one of the things people are looking for. Let's give them something that is interesting and show them what South Dakota is all about."

*Lura Roti
and Andrea Schubloom*

Photo courtesy of Crystal Neuharth



JOHN BALL PROVIDES STUDENTS WITH UNIQUE REAL-WORLD EXPERIENCES

John Ball, a professor in the South Dakota State University Agronomy, Horticulture and Plant Science Department, received the Malo Teaching Excellence Award at the department's annual scholarship recognition event for his dedication to student learning.

"John's commitment to teaching is extraordinary," said Agronomy, Horticulture and Plant Science Department Head David Wright. "He fosters an environment of intellectual excitement and students want to learn when he teaches."

Ball has been teaching at SDSU since 1991. He has taught a wide range of classes, most of which are related to arboriculture and horticulture. He currently teaches Woody Plants, Forest Ecology, Horticultural Pests, and Arboriculture and Urban Forestry.

"Throughout Ball's career at SDSU, he has been recognized by his students as being one of the best instructors in the department and on campus," said Distinguished Professor Douglas Malo, who retired this spring after 43 years as a professor in the Agronomy, Horticulture and Plant Science

Department. Malo and his wife, Rosalie, have sponsored the Malo Teaching Excellence Award and endowment since 2005 to recognize outstanding professors. Recipients of the award are selected based on peer and student recommendations and teaching accomplishments.

Ball believes it is important to provide his students with real-life experiences. His additional positions as the SDSU Extension Forestry Specialist and South Dakota Department of Agriculture Forest Health Specialist help him accomplish this goal. One example is the students in his Forest Ecology class are responsible for providing the state with an estimated number of trees that are infested with pine beetles each year.

He provides his students with many other unique opportunities, including trimming trees on the SDSU campus and for various other locations throughout the state. Students in his classes also get to practice climbing trees, using aerial lifts and cutting trees.

"I am a big fan of getting students out and doing hands-on work because I want them to have an



Left: John Ball (left) at Macchu Picchu with horticulture students.

Above: One of Ball's arboriculture classes removed a cottonwood tree at Black Hills State University in Spearfish.

understanding of what a job in this field will really be like," Ball said.

Taking students on international trips is one of the highlights of his career so far. Ball has taken students to South America and Europe numerous times for horticulture-focused trips. Several times he has brought SDSU students to work with students at SDSU's sister college, Unidad Académica Campesina in Carmen Pampa, Bolivia. He tries to go on an international trip with students every few years.

"I find it really enjoyable and rewarding to get students out to experience different cultures," he said.

As a professor, Ball strives to find and unlock students' potential.

He said, "It's so fun to help students get a solid foundation for their futures and then after college to see them progress in their careers is really rewarding. To think I have a small role in what students choose to do is really cool."

Sydney Meyer



FROM THE SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION INTERIM DIRECTOR, BILL GIBBONS

Teamwork! Team first! There's no I in Team!

These are all common phrases we hear from coaches and players being interviewed about a successful game or season. It's pretty obvious that there is truth in these statements, for how many times have you witnessed a group of individuals that play as one unit overcome a team that might have a "superstar" but plays like a bunch of selfish individuals?

While we see this team vs individual dynamic play out most visibly in sports, it is true throughout all aspects of life. We are all much stronger together than we are as separate individuals. This philosophy especially holds true for the Land Grant mission of teaching, research, and extension. Our "team" encompasses not only SDSU faculty and staff, but also students and our urban and rural stakeholders from throughout South Dakota and the region.

Many of you have participated in our research and outreach activities, as we develop new

technical innovations and then bring them to you, our stakeholders, for evaluation under real-world conditions. The feedback you provide in terms of performance, efficiency, practicality, cost, and other metrics is invaluable in helping our research and extension personnel further improve these innovations. Oftentimes your suggestions are the difference between a new technology that achieves widespread adoption, and one that only makes it as far as an article in a scientific journal or a presentation at a conference. Therefore, rest assured that we highly value your contributions to helping our "team" develop and deliver impactful outcomes to stakeholders.

A strong dynamic in our "team" has been that of stakeholders identifying problems or concerns, and them bringing these issues back through our extension network to researchers. A good example has been the increasing amount of cropland acres that are impacted by saline/sodic conditions. Over the past decade, our wetter-than-normal conditions have brought salts to the surface in many locations throughout the state, resulting in easily visible whitish patches that can be several

acres in size. It has been estimated that over 7 million acres in South Dakota alone are impacted by saline/sodic conditions. Crops do not grow in these areas, and producers are asking for our assistance in developing strategies to restore and re-vegetate these areas. SDSU research and extension personnel are assessing a range of management strategies, including use of precision technologies, alternative forage/crop rotations, and salt-tolerant soil microflora. We will be collaborating with landowners throughout South Dakota to test restoration strategies in field conditions.

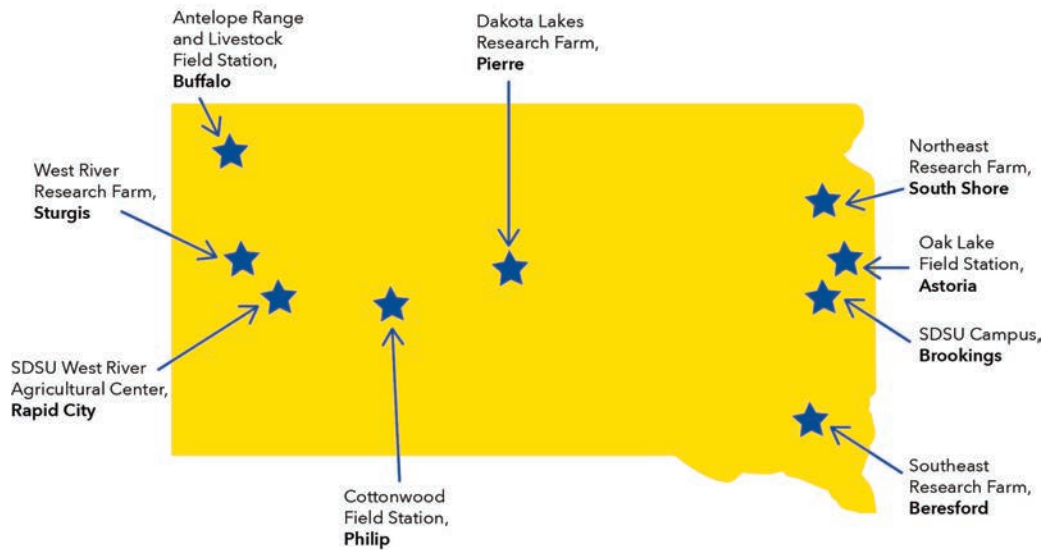
Let us know your other problems, concerns, and challenges. Our research and extension personnel have expertise in a broad range of areas. Some problems might require a very deep dive into a specific technical area, while solutions to other complex issues might arise from interdisciplinary teams tackling the problem from several angles simultaneously. You are valuable members of our "team" and we need and value your thoughts, ideas, and other contributions.

*Contact Bill Gibbons at
William.Gibbons@sdstate.edu.*

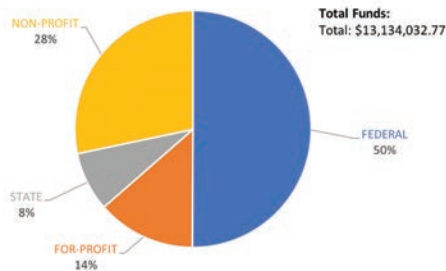
IMPACTING SOUTH DAKOTA

Research often begins on the South Dakota State University campus in Brookings and the nearby livestock units and research plots. Applied research is conducted in real-life settings at field stations operated by the South Dakota Agricultural Experiment Station across the state. The SDSU West River Agricultural Center is the western front door to research activities that benefit our stakeholders west of the Missouri River. The unique location of each research facility allows for diverse and responsive research to meet the needs of South Dakotans.

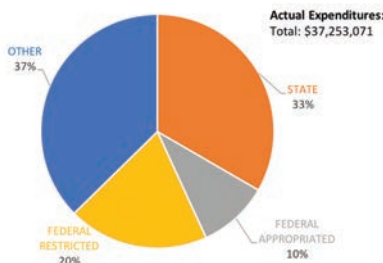
Research Station Locations



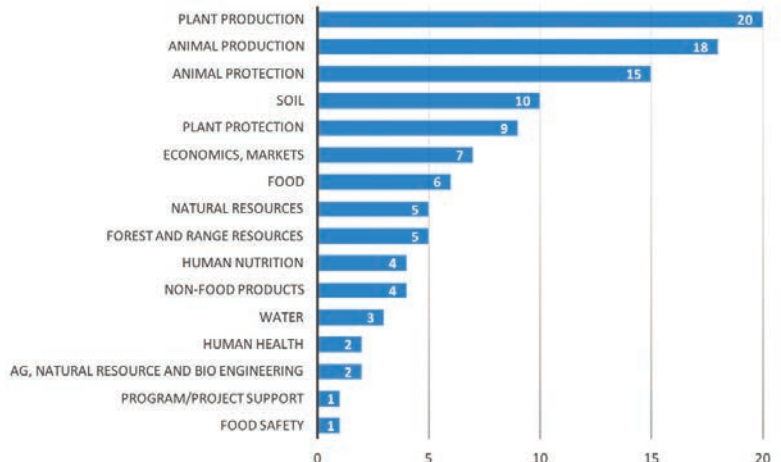
SDAES External Research Funds - Fiscal Year 2018



SDAES Budget Authority - Fiscal Year 2019



SDAES Project Areas



RETURN ON STAKEHOLDER INVESTMENT

SDSU Researchers Aim High to Maximize Research Dollars to Benefit South Dakotans

During President Barry H. Dunn's inaugural speech in 2016, he challenged SDSU to "Imagine" what we could do together to create a better world. He noted that, "Imagination is the most powerful tool we have to achieve our personal dreams," and that it also helps us "fulfill the collective responsibility we have to one another."

President Dunn also challenged SDSU to increase our research productivity and subsequent positive impacts on our stakeholders, as well as society in general. This issue of *Growing South Dakota* contains several stories describing the research our faculty, staff and students are conducting across a broad range of disciplines. Keep in mind that this is just a snapshot of a few of the many projects underway. You can learn about other research activities through our College and departmental webpages, the SDSU Extension website, numerous workshops and field days held across the state, social media outreach, and of course by calling or visiting campus.

I'm happy to report that our College of Agriculture, Food and Environmental Sciences (CAFES) team has been quite successful in responding to President Dunn's research challenge. One metric we use to track research productivity is external grant funding. In FY17 researchers in the South Dakota Agricultural Experiment Station received \$15.6 million in funding,

and that grew by 23.5% to over \$19.3 million in FY18. Through the first quarter of FY19, our researchers have been awarded almost \$7.2 million in funding, or 37% of what we received in all of FY18. When we add in extramural funding received by SDSU Extension, these grant funding totals rise to \$18.5 million in FY17, \$20.9 million in FY18, and \$8.8 million through the first quarter of FY19.

Return on Investment

One major factor that triggered growth in competitive grant funding was the investment by the South Dakota Legislature in FY14 in eight new research-focused faculty positions at South Dakota State University. Through the end of FY18, the researchers in these positions have been awarded over \$6 million in competitive funding, which amounts to a return on investment of over 2.3 to 1. One of these researchers, Crystal Levesque of the Animal Science Department, received one of the nine projects awarded nationally in the first round of New Innovator Awards from the Foundation for Food and Agricultural Research. FFAR reviewers noted, "Dr. Levesque's innovative research is aimed at increasing protein production from pigs, while reducing inputs and environmental impacts. Focusing on dietary requirements during sow pregnancy, Dr. Levesque's research will provide a basis for precision feeding formulations for sows to optimize reproductive

performance. This research will not only reduce the environmental impacts of pig production, but could also lead to substantial savings in feed cost to the industry as a whole." To support this work Levesque received \$300,000 from FFAR and was able to match that with \$270,000 from ADM Nutrition and \$90,000 from Evonik Degussa, for a total project budget of \$660,000.

Diego Diel of the Veterinary and Biomedical Sciences Department is another of the eight faculty recently hired to fill research-focused faculty positions. Diel obtained approximately \$1.1 million in funding in 2017 alone, including a \$500,000 USDA award that focuses on developing vector platforms and novel vaccine candidates for use in livestock. Diel also works on emerging viral diseases of swine and on livestock feed biosecurity, with funding from the National Pork Board, the Swine Health Information Center and from industry collaborators.

Beyond our excellent faculty and grant support staff, another factor that has contributed to research funding success is top-quality research infrastructure. Through the generous support of many stakeholders and the taxpayers of South Dakota, SDSU is now home to several world-class research and teaching facilities, with several more soon to be under construction. The availability of top-notch research facilities is an important

criterion that funding agencies use in their decision-making process. This can include specific research tools such as our recently acquired genome sequencing equipment, new facilities such as our Cow-Calf Education and Research Facility and Swine Education and Research Facility, and research stations and

farms where field- scale work can be conducted.

Our faculty, students and facilities position us as the go-to destination for companies, entrepreneurs and ag producers that provide us with a robust and diversified economy. Companies have responded with

increased interactions: research activity of our faculty, sponsored research and scholarships, and contributions to building projects.

*Bill Gibbons,
Interim Director of the SD
Agricultural Experiment Station*

TOP TEAM DRIVES RESEARCH FUNDING SUCCESS

Our growth in competitively funded research is even more remarkable in light of the stagnant or declining pool of public agricultural research dollars available and the greater number of scientists who compete for these dollars nationwide. A major reason for our increasing success has been the addition of a highly effective grant preparation support team, which assists our researchers in developing highly competitive proposals. Ann Taecker and Shirley Jensen work diligently with our faculty, staff and students to ensure that their proposals have been thoroughly vetted to meet the administrative, technical and financial requirements of each funding agency. Moreover, they often help researchers craft the narrative of their proposals into more concise and compelling arguments to justify funding. The importance of Ann's and Shirley's contributions is best expressed by the faculty they have assisted. Below are just a few of the comments I've received this year.

Sandeep Kumar, who received a \$3.985 million USDA grant with the title Back to the Future - Enhancing food security and

farm production with integrated crop-livestock production systems, said, "Ann and Shirley carefully edited the proposal application package to ensure it was complete and error-free. They spent many hours assisting me, even after normal office hours, so that we were able to meet the application deadline. Without their help it is very difficult to submit these larger proposals."

Padu Krishnan, who received a \$449,523 USDA grant entitled Building a better oat - Improving our understanding of North American-produced food quality oats, said, "As a reviewer on several USDA and National Science Foundation panels, I know the mechanics of proposal writing is what often trips up applicants. Ann and Shirley are a superb team that closely coordinates with researchers in the proposal development and submission process. I was very confident of a successful outcome when we submitted my latest USDA grant because I knew that it had received the necessary attention to detail, thanks to Ann and Shirley."

Tong Wang, who received a \$499,985 USDA grant titled Saving



Left to right: Missy Vande Weerd, Assistant to the Director of AES, Ann Taecker, Bill Gibbons and Shirley Jensen.

grassland of the Great Plains - Is management intensive grazing (MIG) a socioeconomically viable option? As a new faculty member with limited grant writing experience, Tong noted that, "Ann helped me revise the narrative portion of my proposal to make a more compelling justification, and also provided excellent suggestions to ensure the proposal and supporting documents were consistent with the format required by USDA. Shirley helped me prepare a strong budget and budget justification. With their help, a seemingly impossible task became possible, and I'm convinced their assistance led to my first funded proposal."

Bill Gibbons



MELANIE CAFFE TAKES OATS FROM SEED TO SALE

Taking research from the seed plots to companies for commercial use earned Melanie Caffe the 2018 Pat and Jo Cannon Intellectual Property Commercialization Award.

The award recognizes faculty members whose inventions have the potential for regional economic development and successful commercialization through a technology transfer process with industry partners.

While presenting the award, William Aylor, former SDSU assistant vice president for technology transfer and commercialization, said, “Caffe is the principal research scientist leading the SDSU Oat Breeding Program. During her time at SDSU, she has been part of six invention disclosures including the oat variety Sumo, a variety with resistance to crown rust and exhibiting good milling characteristics.”

He said, “Caffe has been instrumental in the expansion of SDSU plant genetics through the first licensing of SDSU oat varieties worldwide. She has established a robust oat breeding effort to support expanded oat production in South Dakota and the region. Her breeding program takes into consideration the traditional goals of high yield, test weight, and disease resistance, but also targets key properties desired by the milling industry and consumers.”

Producers looking for alternatives

Caffe said there is interest in growing oats among farmers as it is a low input crop. “In this area, it works great to put oats into a crop rotation for breaking the pest cycle. By adding oats to crop rotations, the crop improves soil health which leads to better soil structure and improved soil microbiome. In the long term, this improves yields for other crops which have fewer

diseases. That results in more profit for farmers.”

While surprised with the award, Caffe credits her predecessor the late Lon Hall, for the accolades she receives. It takes almost 10 years to get results from the breeding program so the work he began is now being recognized. Caffe began work in the SDSU Agronomy, Horticulture & Plant Science Department in June of 2014. The intense planning and initial trials began because of Hall’s expertise. She said, “Lon Hall definitely deserves praise for this insight. He was great at his job.”

The new research area at the SDSU Plant Science Research Support Facility on campus allow Caffe to work closely with Paul Richter from General Mills, a Minneapolis-based food company that provides food quality brands to more than 100 countries on six continents. Her program helped recruit General

Mills to Brookings. They share equipment and ideas about how to provide the traits required for consumer satisfaction. The company looks for milling characteristic and fiber that is soluble that provides heart-healthy products such as Cheerios. The heart-healthy claim is FDA approved.

“We collaborate with the General Mills team to send some of our lines to their off-season nursery in New Zealand during the winter to save time on the variety development process,” Caffè said. “That’s advantageous.”

Grain Millers is the world’s largest organic oat processor and produces about one-fourth of all oats in North America, according to their website. Caffè works with this company to target desired consumer traits in new oat varieties. Grain Millers along with the South Dakota Crop Improvement Association are essential in supporting the oat breeding activities at SDSU.

Licensed varieties

Caffè said two new varieties, Sumo and Saddle, were released in the last

two years. The variety called Sumo fits the organic market, with disease resistance and high test weight. It is licensed to a seed company and it is in the process of becoming available for sale.

In 2017, a commercial licensing agreement was signed between SDSU and a seed company in Australia to test some of SDSU’s varieties. If the variety is good there, then the seed can be commercialized to farmers in Australia. SDSU also has licensing agreements with seed companies in South Africa for two varieties released by the previous breeders. Royalties from the new varieties in these countries help sustain the breeding program.

Each year in South Dakota, oats accounts for approximately 250,000 acres. Caffè says the most popular variety is Hayden which performs well as a high-yielding variety.

New crosses are continually in the works. At this time, Caffè said there are materials featuring newly started lines and some initiated by the previous breeder. As soon as weather allows in the spring, their crew plants 6,000 plots. Locations



include the nursery in Volga, the Northeast and Southeast Research Farms, Winner, Miller and a West River location. Environmental differences along with soil and weather are important variables in the research.

Plantings include on-farm organic trials supported by Sustainable Agriculture Research and Education Program. Twenty varieties will be evaluated in this trial including Sumo.

Caffè said, “We have a wonderful team. My technician, Nicholas Hall, works hard to get the plots planted and harvested each year. Our team also include students who help with day to day activities of the breeding operations. Those efforts get new varieties into the hands of producers. That’s what it’s all about.”

Connie Groop



Recent SDSU Oat Introductions

- Warrior - 2018
- Saddle - 2017
- Sumo - 2016
- Natty - 2014
- Hayden - 2014
- Goliath - 2012
- Horsepower - 2011
- Shelby 427 - 2009
- Streaker - 2009

GEORGE PERRY EARNS OUTSTANDING RESEARCHER AWARD

Intense dedication to understanding the efficiencies in breeding beef cattle led to George Perry being named the Outstanding Researcher in the College of Agriculture and Biological Sciences (now College of Agriculture, Food and Environmental Sciences) at South Dakota State University in 2018.

Associate Dean and Director of Academic Programs Don Marshall presented the award to Perry who is a Professor of Animal Science specializing in reproductive physiology. Perry is nationally recognized for developing a highly productive research program focused on the application of technology for improving reproductive efficiency in beef cattle.

“I really enjoy what I do and I’m passionate about the beef industry,” Perry said. Downplaying his role, he said, “The award is recognition of what the lab accomplishes. The work goes back 10 to 15 years with the continuous building of the program. It’s recognition of the wonderful grad students and the work they have done. It’s great to be recognized for the projects we work on.”

Cattle people know that when increased numbers of cows are bred, more pounds of beef are produced. Perry grew up around cattle on a farm in south-central Texas, an area known as great cattle country. After graduating from Texas A&M University, he got his

masters and Ph.D. at the University of Missouri in animal science. He spent time in Montana working for the USDA and completing his doctorate before joining South Dakota State University fifteen years ago.

At the ceremony, Marshall said, “Dr. Perry mentored 11 graduate students to the completion of their degrees as well as several undergraduate students and interns during his career. Many of those students received regional and national awards for undergraduate or graduate research. Those outputs were enabled by grants and gifts exceeding \$4.2 million. Many of the management practices used in food animal production are truly forms of ‘precision agriculture.’ Dr. Perry’s research advances our understanding of beef cow reproductive physiology which leads directly to precision management practices that increase conception rates in cattle, reduce costs of production and increase calf value.”

In an overview, Perry said their research studies calving intervals and calving distribution and how that is impacted by Fixed Time Artificial Insemination programs in producer herds. By understanding this, it can save beef producers time and labor, plus allow animals to be managed in groups rather than individually.

Calving distribution is important in cattle herds. “We are looking at what we can do to get more cows to

breed early in the season. Research shows those cows with a higher conception rate earlier in the breeding season have greater longevity in the herds and wean more pounds of calves. The number-one factor impacting weaning weight is the age of the calf. If management decisions cause late-season breeding, it can have long-term negative effects on the cow. We try to understand the biology to get more cows to breed early.”

The work also examines what can be done to improve production management in the U.S. to get more cows to show estrus and thus impact conception rates. A connection between estrus expression and concentration of the hormone estradiol has been linked to embryo survival.

Some of Perry’s work focused on the hormone estradiol which triggers the brain for the onset of estrus. The research continues to look at natural ways for cows to produce the hormone.

“On the male side, we are looking at factors that impact male fertility. Is there something we can measure to determine the fertilization rate and sperm longevity in the female reproductive tract?” Perry said.

The SDSU Cow-Calf Education and Research Facility provides the starting point for some of the research opportunities. The research trials often begin with a limited number of animals for



intense work before the practices are implemented on the farms. For Perry, field trials are necessary as they need to work with several groups of 500 animals or more to understand feed efficiency and reproduction.

“The research is directed to issues beneficial to the industry. The work begins with a hypothesis. It then is explored on the campus and at research stations. After more intensive work, the benefits are reviewed. We test those results in large numbers using the herds. Typically, we will have somewhere between 1,000 to 3,000 animals on studies each year with cooperator herds.”

“One of the things I enjoy the most is the interaction with producers,” Perry said. “I’m not just in the lab discovering things and not just doing field trials. It’s being able to see the stuff we work on and see how it impacts those in the beef industry. In fact, one producer has worked with our crew for more than 12 years.”

It’s helpful to know what to expect at a location. “Because of our long working relationship, we know their normal management practices. For our study, often their normal practices become our control group. We want to make sure what we implement will keep things the same or improve their operation.”

In a herd several years ago, the producer culled all open cows and kept enough replacement heifers to maintain his herd size. That was the norm. Now he has records from previous calf performance from his cows. He’s making management decisions to produce a better-quality product. If new heifers are brought in, he’s making culling decisions and selection decisions based on the carcass data where he can see how the individual cows perform. That’s how Perry can see that the research they are doing is impacting local producers.

“This is the precision part of beef,” Perry said. “On the crop side, they

use GPS. Precision actually means using data to increase efficiency. Precision ag to livestock production means more efficiency in feed conversion, improved reproductive technology or cows that breed early every year. You can see the precision grow in all of this.”

Field research is important

From the first of May to end of July, Perry and his crew work non-stop seven days a week. They take February, March and April to plan and line up producers for their research trials.

The crew has grown in the last 10 years. There are currently two students working on their Ph.D. and one working on a master’s degree in the lab. There are also two undergraduate students and a technician.

“We cover the entire state. Some work carries into other states. We collaborate on research and work with multistate research groups in the northern Plains and across the nation. We have an active collaboration with USDA in Clay Center, Neb.”

Perry said, “The hardest part of the job is the struggle to find funding for our projects and being able to accomplish what we want to with the funding we have. There is no end to the research I’d like to explore.” Perry also received the FO Butler Award for Excellence in Research in 2016.

Connie Groop



COLLABORATION WITH SCIENTISTS IN OTHER COUNTRIES NETS HONOR FOR HEIKE BÜCKING

South Dakota State University recognized Heike Bücking with the 2018 Faculty Engagement in International Research Award. Bücking is plant science professor in the Department of Biology and Microbiology.

Since Bücking began her work at SDSU in 2009, she has developed international collaborations to expand the reputation of SDSU in the worldwide agricultural research community.

Bücking said, “I was very surprised to receive the award and I appreciate those in the department who encouraged me and those who nominated me for this recognition. It feels good to be honored for these accomplishments and indicates that my efforts are appreciated.”

Bücking said the award acknowledges research directed at

problems farmers and producers face around the world. Efforts to increase soil health improves farming practices for crops as producers are able to lower fertilizer applications and create improved soil conditions.

“I feel fortunate that I’ve met very interesting people who collaborate with me across the globe,” Bücking said. Bücking was the driving force behind a productive collaborative project with Suez Canal University, which was funded jointly by the Science and Technological Development Fund in Egypt and the National Science Foundation (NSF).

“My work with Suez Canal University focused on bacteria that are able to solubilize phosphate in the soil. The Suez scientists and SDSU scientists worked on this problem and received an award for

their collaboration. As a result, the scientists from Egypt visited the SDSU campus to learn techniques in our lab and they returned home to apply these techniques at their institutions.”

The nomination indicated, “Dr. Bücking is an internationally recognized expert on beneficial plant microbe interactions and has traveled to many countries to present her research findings. Foremost among her international accomplishments is her lead role in NSF-funded research on a group of microbes called arbuscular mycorrhizae (AM), which are beneficial to plants. Leading an international research team, Bücking’s discovery in this important area of plant research has changed the way the interactions between the microbes and plants are viewed.”

Bücking's international collaborations helps recruit graduate students and visiting research scientists. Working with scientists located in Europe, the main collaboration took place at the University of Amsterdam. The resulting research led to publication in prestigious scientific journals which was well received. Other scientists came from the Czech Republic, Belgium and the United Kingdom.

Bücking continues to collaborate with partners in China. She hosted a Chinese scientist at SDSU for a year. That opportunity led to an invitation to travel to China in June of 2017, where she met with Chinese scientists and travelled around the country to learn about agriculture in China. She ended up being introduced to three scientists from China who came to SDSU as a result of her visit.

Around the globe, soil health concerns drive major research projects. Bücking also spent six

weeks in Ukraine, a country with rich topsoil being farmed in huge tracts. There was tremendous interest in her presentation which drew many questions on how to use microbes for improved soil health.

"Soil health is very much an international interest," Bücking said. "Areas of soil health are under-researched but they play a tremendous role in producing crops worldwide."

"I have traveled to a lot of places, South Korea, China, Ukraine, Europe and India," she said. "The problems facing modern agriculture and questions are the same on an international scale."

Passing on knowledge

In her experience, Bücking said many students have misconceptions about soil science. Some students start to study biology because they want to go into the medical fields. The study of plant science and plant improvement are very important areas that need to be addressed. She

encourages undergraduates to look at programs in plant science. She notes one of the problems the ag industry faces is that there are too few students to meet the demand. That's a challenge to meet the needs of a secure food supply and a growing population with environmental concerns.

Bücking said, "When students drive along the Interstate, they see crops growing in the adjacent fields. They don't realize how much research effort goes into those fields. Many questions need to be asked to provide for those fields to continue to produce for the future. The younger generation needs to ask and answer those questions. It's a great career opportunity for them."

"This work provides a lot of satisfaction," Bücking said. "I am continually fascinated by what I do. I believe there are other bacteria that can provide solutions for farmers to improve environmental sustainability. Being able to travel around the world is very rewarding and makes every day that I go to the lab worthwhile. By training students, they are able to contribute to a more modern plant science field."

Connie Groop





JOY SCARIA'S RESEARCH FOCUSES ON THE NEXT GENERATION OF TREATMENT TO KEEP ANIMALS HEALTHY

South Dakota State University recognized Joy Scaria with the 2018 Dr. Sherwood and Elizabeth Berg Young Faculty Award. Scaria is an SDSU assistant professor in the Veterinary & Biomedical Sciences Department.

The Dr. Sherwood and Elizabeth Berg Young Faculty Award was established in 1999 to recognize an outstanding faculty member early in his or her career, and to support their professional development in executing the land-grant mission of SDSU.

In the presentation, Dr. Daniel Scholl, SDSU Vice President for Research and Economic Development, said, "Dr. Scaria has built a highly prolific service

laboratory and developed a strong research program of global significance that transects animal and human health, with a focus on gut microbiomes, mechanisms of pathogenic bacteria, and probiotic therapies to treat antibiotic-resistant and other pathogenic bacteria."

Scaria secured over \$6 million in new funding. His new whole genome sequencing center within the Veterinary and Biomedical Sciences Department and South Dakota Animal Disease Research and Diagnostic Laboratory contributes substantially to the FDA Genome Trak program and FDA Veterinary Laboratory Investigation and Response Network.

The overuse of antibiotics is a concern worldwide. Scaria's work seeks to find alternatives to antibiotics. Scaria's intense research effort is directed to the microbiomes of humans and animals, specifically swine, poultry and cattle. This field of research began about 10 years ago and is exploding in terms of knowledge.

In Scaria's work, it is necessary to understand that each living organism has an internal complex ecosystem of bacteria called the microbiome. For a healthy animal, there are at least a trillion microbes which contribute immunity, produce vitamins and help to digest nutrition-like fibers which are absorbed and used by the body. The number of genes in gut microbiota

is 10 times greater than the human genome.

Scaria's work focuses on the functions of these bacteria. He seeks to understand what roles the microbes play in keeping humans and animals healthy and what causes disease.

One way to study the microbiome is to isolate the DNA from feces and sequence it to find the numbers and the types. There are trillions of bacteria in the microbiome of a healthy animal with at least 500 species identified.

Defining the bacteria is critical

"When we have an animal in a healthy state and it shifts to a diseased state, we want to correct that by supplying what is missing. By sequencing, we know what is out there and then we can find an application or a treatment," Scaria said.

"It is very challenging as it is a new process used in the industry. Of the 500 species identified by sequencing, we currently don't have the technologies to culture more than 30 percent."

Scaria moved to Brookings in September 2014 as part of his post-doctoral training after graduating from Cornell University in New York.

His original work focused on sequencing microbiome cultures. Once at SDSU, he focused on culturing bacteria. This process is much more difficult as the challenging work needs to be

completed in an anaerobic chamber while following the routine in a normal lab.

Two paths

Researchers in the genome sequencing center study new gut microbes from healthy humans in one part of the lab while another part focuses on animals such as pigs, chicken and cattle.

"Once we have these species cultured and the information stocked in the library, then we can screen for the beneficial properties for human use. This gives us proprietary rights to develop probiotics. In animals, we refer to the probiotics as direct-fed microbials."

One key is the improved ability to culture bacteria from the gut. But there are limited species that can be cultured.

A second part is a new technology using mini-bioreactors arrays. The typical bioreactors in a lab range in size from 3 to 5 liters to thousands of liters. The bioreactors mimic conditions of the gut in an oxygen-free environment where nutrients and temperature remain at a controlled rate.

Bioreactors used to study these conditions are very expensive and take up a lot of lab space. Using 3D printing technology to miniaturize the devices, Scaria's lab can make ones that have a 15-ml capacity, resulting in numerous bioreactors in a tiny space providing much more data.



Traditional labs use three or four experiments at a time so it takes a long time. By using up to 72 mini-bioreactors, the SDSU lab can perform tests on 72 different strains or combinations.

"By doing 1,000 tests in a year at SDSU, this allows us to screen in an efficient manner for less cost," Scaria said. "Developing a reference library is one of the key goals identified by the president of the University. This work will make us a center for probiotic culture."

The two goals are to provide probiotics for human use and to provide direct-fed microbials for improved animal health for pigs, poultry and cattle.

Gold-rush time

Scaria explained, "When pharmaceutical companies develop a new drug, they start with a few thousand compounds then screen them, cutting that down to four or five. The company defines them,

then a few new drugs are approved for the market. We are working toward something similar, instead of compounds, we will have bacteria, and will screen to get the best ones to take to market.”

SDSU started early with the process and has an advantage as many labs are trying to follow suit.

Scaria explained, “It’s like the California gold rush, instead of digging for gold, it’s a race to identify the new bacteria that can replace antibiotics.”

Scaria’s research can have a huge impact as it seeks to identify probiotic mixes to treat intestinal infections, such as *Clostridium difficile*. Gut infections can cause vomiting, abdominal cramps and diarrhea, according to the Digestive Disease Center. While food-borne illnesses, such as *E. coli* and *Salmonella*, go away within a week, symptoms of *Clostridium difficile* infection, known as CDI, persist, Scaria explained.

The Centers for Disease Control and Prevention reports that nearly 500,000 patients suffer from CDI each year. Of these, nearly 30,000 died within 30 days after being diagnosed. Antibiotic use is a factor in 80 percent of CDI cases, Scaria pointed out.

When a doctor gives an antibiotic as a treatment, the antibiotic can kill other things in the gut. The medication will cure the infection. But some bacteria can grow in that environment and survive the treatment. About 25 percent of the



time the infection comes back. If the animals go on antibiotics again, then more of the healthy bacteria die and that can lead to increased fatalities.

When people get infected from food-borne diseases and there is an outbreak, it costs millions of dollars in human health treatment. There is also the direct cost of the recall to the producer and increased regulations. It’s a loss for producers and the industry, and expensive for the patients.

Providing alternatives to antibiotics will improve human health which is a huge benefit for all.

Scaria explained, “The push to use fewer antibiotics by using my technique of using healthy bacteria provides the next generation of treatment for animal agriculture that will apply to multiple species.”

If producers are not able to use antibiotics, it can be a real problem as there are few options that are cost-effective.

The overall goal of the lab is to develop products that can be licensed to and commercialized through industry partners. Scaria said, “Once we have mixes of qualified strains of bacteria equal in providing similar treatment as antibiotics, that can be something great for agriculture.”

Connie Groop



CRYSTAL LEVESQUE'S RESEARCH TARGETS PRECISION SOW FEEDING

While precision farming depends on precise placement of nutrients for growing seeds, the precise feeding requirements needed for sows is also intensely studied at South Dakota State University.

Crystal Levesque, assistant professor in the SDSU Animal Science Department, is in the second year of a \$600,000 study entitled, "Evaluation of the dietary requirements of pregnant sows." This research is funded through the New Innovator in Feed, Agriculture and Research award from the Foundation for Food and Agriculture Research (FFAR).

"The study is progressing well, we've finished three research trials," she said. "We will meet with those


who have contributed and matched dollars for the project. We'll decide the next steps in generating data on the amino acid requirements needed for sows in gestation."

Under the bigger umbrella, Levesque focuses on precision livestock feeding, "We can feed protein and provide energy. We want to ensure all animals are getting the right amounts of amino acids and proteins at the right time to meet their needs with minimal excess."

When feeding sows in a group, more aggressive animals will get more feed and smaller ones may get less. Those getting more end up larger or over-conditioned, which is not desired.

Equipment at the new SDSU Swine Education and Research Facility is helping Levesque find answers to her research questions. "One set of tools we have are electronic sow feeders," Levesque said. "The feeders have the capacity to blend different diets and provide defined amounts of feed to each sow, minimizing competition between animals. This potential for phase feeding manages nutrients for all sows in a group. This is a real advantage from the cost perspective and environmentally. Wasted nutrients end up going into the (manure) pit. We capture benefits on all sides."

At each stage of life, animals have different nutritional requirements to develop different tissues. Market hogs need to build muscle.



Levesque teaches students about the electronic sow feeders at the SDSU Swine Education and Research Facility.



Piglets need to grow bone structure. Gestating sows are complex as there is a need to keep the sow's body in condition as well as building fetal tissue and mammary tissue, each requiring a unique proportion of amino acids.

Levesque's study looks at the amino acids needed at different stages of pregnancy and the efficiency of tissue development. Models assume the needs stay the same. But Levesque said it depends on the gestational stage and the efficiency of nutrients being used in early and late gestation.

"If the assumption is incorrect, then this influences the accuracy of the prediction," she said. "We are trying to add information to the models to become even more accurate in providing precision nutrition for each animal.

Besides changes in gestation, often sows having their first litter are not yet at full body size. They are trying

to grow fetal tissue while their body demands nutrition. A gilt is bred when she reaches 210 days of age and 300 pounds, depending on her genetic make-up. However, her body will often not reach full maturity until she has produced three litters.

"The hierarchy of nutrient demand shifts during late gestation," Levesque explains. "The developing fetuses become the primary target for dietary nutrients and the sow takes what's left over."

How do the nutritional needs change for those sows that have had two or three litters? An additional consideration is how nutritional needs vary from a sow that has a litter of 10 piglets vs. 18 piglets. She said, "We expect that the parameters change. If we don't match the sow's diet with her nutrient requirements, she will compensate by robbing from her own body stores to take care of the fetuses."

Levesque continued, "What if we are not quite meeting the nutrition needed for her and the piglets and what if that happens repeatedly? Does she have lesser quality piglets in the future? Those are the questions we're pecking away at in small pieces. Overall, we want to determine the feed needed for optimal sow performance and to produce high-quality piglets."

Improving piglet health is good for pigs and farmers alike.

Surgery suite

The sow complex in the Swine Education and Research Facility has a fully equipped surgery suite that can handle animals up to 1,000 lbs.

In the facility, "We can place special venous catheters in the hogs that allow us to collect blood samples without having to restrain the animal. This allows us to take samples repeatedly to understand changes in hormone profiles. This is an important tool, especially during sensitive stages, such as in gilts while they are standing in estrus, without disturbing their natural state. That is not practical in a normal barn setting."

The ultimate goal of the research is to use phase feeding in a commercial setting using electronic sow feeders where a single feeder can track, and dispense, the feed for whole groups of sows.

Each sow has an electronic ID tag in her ear. When she walks up to the gate of the feeder, the device recognizes her and provides her feed allotment. As long as her head

is in the feeder, the feed trickles in. She can leave and come back later. Once she gets her allotted amount for the day, the feeder closes and she won't get more until the next day.

If a sow consumes more energy than she needs, the excess can go into producing excess body fat which can limit room for mammary tissue to develop, limiting the amount of milk she produces.

The first stages of research work with only 40 to 50 animals at a time, as it is labor intensive. Urinary catheters placed in all sows are used to help collect excreted nutrients to measure how much protein is stored in the sow and the fetuses. The animals are watched closely so they stay healthy. Levesque is also planning to implement practical feeding trials with groups of 50 to 60 animals.

But they have to be careful. "We want to start with using small groups before moving to a larger commercial barn. The risk of running a sow trial is if things go sour, that it impacts a lot more animals than just the sow eating the feed. Feeding sows actually means we're feeding a litter of piglets, so it's important to get it right."

That's why industry involvement is crucial, according to Levesque. The question comes down to, "Have we done enough research to take it to a larger scale or do we need to ask more questions?" Having industry partners involved is critical to the success of the program.

Involving students at the graduate and undergraduate level in the project is helpful as their perspective may challenge the status quo and provide new ideas. These are the people training to work in the industry and the

project gives them a chance to develop skills and to test out their ideas.

Research is ongoing as once answers are found, more questions crop up.

"We watch what is going on in other locations and have a lot of opportunities for studies that weren't available to us before. There are always more questions to be answered," Levesque said. "For me, one of the huge advantages of this FFAR New Innovator award is the industry support shown for this project. That means a lot to me. The training opportunities are pretty exciting."

Connie Groop



Below Left: The sow complex in the SDSU Swine Education and Research Facility has a fully equipped surgery suite.



Below: The electronic sow feeders have the capacity to blend different diets and provide defined amounts of feed to each sow.

WANLONG LI USES
CRISPR TECHNOLOGY
WHILE STRIVING TO
MEET GOAL OF
INCREASING WHEAT YIELDS



In order to feed a hungry world, a goal to increase wheat yields by 50 percent in less than 20 years challenges researchers across the world. One professor at South Dakota State University believes reaching the goal is possible.

Associate Professor Wanlong Li of the SDSU Department of Biology and Microbiology explained there is a need to push scientists to meet the goal. Funding comes through the National Institute of Food and Agriculture's International Wheat Yield Partnership (IWYP) Program.

Li said, "If all conditions are perfect, breeders can increase the wheat yield by one percent per year. But in some areas, the yield continues to decline. That is why scientists from many countries focus on increasing the wheat yield."

"The goal is to meet the 20-bushel an acre increase in wheat yields by 2034. We have to reach that and I believe we can. We can accomplish this through a combination of germplasm innovation and cutting-edge technologies such as genome editing."

SDSU is one of seven universities nationwide to receive funding to develop new wheat varieties as part of the IWYP Program.

According to the Food and Agriculture Organization report, wheat is the most widely grown crop in the world and provides 20% of the daily protein and of the

food calories for 4.5 billion people. Wheat production levels have not satisfied demand, triggering price instability and hunger riots. With a predicted world population of 9 billion in 2050, the demand for wheat will increase by 60%. To meet this need, annual wheat yield increases must rise from the current level of below 1% to at least 1.7%.

Wheat has been a major part of Li's life. He grew up in the north-central part of China. That was many years before he knew he'd be focusing on genetics, genomics, evolution and germplasm enhancement of polyploid wheat. His current projects include CRISPR editing of wheat grain regulatory genes for increasing grain yield potential.

Growing up, Li said, "We always planted wheat, it was important to have it to make bread and noodles. If we could not get enough wheat, we were hungry." He was trained in wheat genetics and breeding in China. Through cooperative efforts, he came to the U.S. and worked on wheat genomics projects at the Wheat Genetics Resource Center at Kansas State University.

Li arrived at SDSU in June 2009 and continued his research on wheat genetics and genomics as part of hiring for the South Dakota Drought Research Center, which was funded by Gov. Mike Rounds in 2008.

The process

Many approaches can increase efficiency. Li said one way would increase the grain numbers and the

grain size. This approach works in rice which is a very important crop in Asia. It serves as a model for cereal crops: wheat, corn, barley and rye. Because of the evolutionary divergence about 65 million years ago, these grains share a lot of genetic information.

Research by Chinese and Japanese groups directed at rice identified many of the genes which control the grain numbers. Li said this information helped identify similar wheat genes.

Researchers selected 20 genes for editing whose function is to reduce the kernel size. Using the CRISPR technology, they are knocking out these genes in wheat. In the resulting plants, this increases the grain size and grain numbers. This results in increased yields.

First transgenic plants

After one year, Li said the group achieved an efficient genome editing system for wheat and achieved the needed wheat gene mutations. Currently, they are measuring what effect these changes have on the grain size. They are transferring these mutations from that variety to the South Dakota spring wheat varieties, and also to durum wheat.

"We are happy, we have generated the first batch of transgenic plants at SDSU and they have grown well in the new greenhouse," Li said. "The new facilities provide several rooms with ideal conditions in the new greenhouse complex to grow wheat at constant temperatures."

The most difficult part of the research is the transformation.

“To make CRISPR editing work in wheat, we need to transfer gene coding for enzymes which makes cuts in DNA into wheat cells. Wheat is among the most difficult grains for transformation and there are few labs that can do wheat transformation in the U.S.”

“We transform those genes into wheat, then they make the mutations in target genes of wheat and we remove the transgenes. We backcross two times, remove those transgenes and take out only the mutation we want for breeding for the new varieties.” The final product removes the bad genes. It is safe to plant the seeds from the resulting plants in a farmer’s field, with no concern for GMO regulations.

Sea wheat grass key to wheat threats

Finding and working with sea wheat grass really is an amazing story, according to Li. The wheat stem is hollow. Because of this, many varieties are susceptible to wheat stem sawflies. Li has been seeking introgression of the solid stem trait from sea wheatgrass, speculating that it can provide new resistant germplasm to sawflies and increase biomass for biofuel production.

In 2014, an epidemic in the SDSU greenhouse of wheat streak mosaic virus killed most of his plants and only two lines survived—sea wheat grass and a wheat/sea wheat grass hybrid. Experiments in summer of

2016 confirmed that these two lines are resistant to the virus, but the parent wheat plant is not. In 2015, he planted some grasses in his backyard at his home. That spring was very wet and he could see that the hybrid was resistant to waterlogging as well. Further testing showed resistance to scab, salinity and low nitrogen. The species proved to be very successful for wheat improvement.

“We are sequencing the sea wheat grass genome so we can transfer individual grass chromosomes to wheat and then transfer the grass chromosome fragments to the wheat genome using a special approach. In this way, the wheat breeders can use our materials with scab resistance, waterlogging, and sawfly resistance,” Li said. “This project is incredible!”

Many places face waterlogging problems, especially in areas where flooding is extreme such as in Arkansas and Louisiana, and countries like Bangladesh. A wheat that survives waterlogging can improve production significantly.

There is no cure for wheat streak mosaic which makes this research very important. The sea wheat grass exhibits resistance under extreme temperatures.

There is irony in Li’s work. SDSU hired him to research ways to provide drought tolerance in wheat. With excess rain, the drought tolerance research changed to focus on waterlogging with positive results for wheat producers.



Above: Sea wheat grass Li grows in the SDSU greenhouse.

Li would like to know what problems farmers see in their fields so they can develop research trials to address issues. With the new technologies of CRISPR and gene editing, many doors open to future research which can address concerns of growers.

Li is collaborating with SDSU wheat breeder Karl Glover and wheat virologist Marie Langham.

Li believes funding will be available for more research in this field. Partnerships have developed with scientists across the United States, the United Kingdom, Canada, Australia and South Africa. Once the basic research is completed, the scientists collaborate and share their results and materials.

Connie Groop



KARL GLOVER FOCUSES ON TOUGH SPRING WHEAT VARIETIES FOR SOUTH DAKOTA FARMERS

Developing new varieties of wheat is an intense, almost magical process. South Dakota State University wheat breeders scrutinize fields in New Zealand, Arizona and South Dakota for characteristics that drive new varieties for producers.

At each location, the steps are critical to expand the choices for seed. Expert wheat breeder Karl Glover in the Department of Agronomy, Horticulture & Plant Science at South Dakota State University identifies and evaluates promising characteristics of plants that can benefit those raising wheat.

About 75 percent of spring wheat acres in South Dakota are sown to varieties developed at SDSU. The spring wheat breeding program tests approximately 13,000 replicated and non-replicated performance trial plots annually for agronomic productivity,

disease resistance and end-use quality characteristics.

Glover began wheat research at SDSU in 2002. Since then, he has released 10 spring wheat cultivars that are growing in farmer's fields. "After being released, the next year is when the certified seed growers will grow the material for a season to increase the available seed," Glover explained. "Once certified, the seed will be available to anyone who wants it. It's a time-intensive process."

Glover said it's important to realize the important roles that both South Dakota Foundation Seeds and the South Dakota Crop Improvement Association provide in increasing the seed initially and in selling it, too.

Glover gave an example of the petunias you'd buy at a local store. There are differences in flowers

including leaf shape, leaf color and flower color. Whether it's wheat or flowers at a garden center, someone has made selections to get the plants to that point.

"That's my job, selecting plants with the desired qualities available to farmers," Glover said. "Compared to flower color or leaf shape, it is more difficult to spot differences in wheat. I walk a field and can tell what it is or what it is not. I can tell my varieties from others. There are kinds of wheat used for cereal grain and others that are better for baking flour. Those characteristics are most clear to a miller or baker. We try to increase yield with more bushels per acre. Materials released in 2003-04 generally produce five bushels less than those more recently developed. We seek improved characteristics. People want new options."

He said, “By looking at a field, I’m not able to accurately say how much it will produce, or how much protein the flour produces. But I can see this plant has a shorter plant height. I’ve had luck since I’ve started with shortening the stature of South Dakota spring wheat choices, but it’s still a work in progress. There are always changes to consider.”

When Glover started at SDSU, South Dakota had developed some of the earliest maturing spring wheat in the nation.

He said, “My predecessor, Fred Cholick, was known for selecting early materials because they usually would beat the heat. (The varieties) Brick and Focus, that I released, are earlier than any others of which I am aware. Depending on the weather forecast, every year people look for different features. We have also developed a few that are quite late. Boost is a cultivar that matures eight days later than average.”

A winter nursery/breeding program in New Zealand and Arizona speed up the lengthy selection process. It takes roughly 10 years to create, evaluate and prepare sufficient seed to release a new wheat variety.

From the crosses done in 2017, it will be close to 2027 before selected varieties could be in fields, Glover said. “We start with 400 to 500 new crosses and evaluate the new populations. We look for something from that group of 500 planted in 2017 to flourish.”

The earliest portion of the process takes place in Yuma. Glover checks the stands, makes the selections and tells the crew which ones to harvest. They thrash the rows and send seed to SDSU. They choose around 30 seeds from each unique cross. Seeds planted in the greenhouse are in rows six feet long. The crosses made in November 2017 finished the cycle in April 2018.

In April 2019, those seeds will be planted in fields located east of Brookings at the SDSU Aurora Research Farm and also at the SDSU Northeast Research Farm at South Shore, S.D. Each row will turn into a plot at those locations with F2 (second-generation cross) plants. The variation needs stabilization.

Glover explained, “We will evaluate the tall, short and in-between plants at harvest time

in August of 2019. Of the 500 plots, there may only be 300 that are really interesting. We collect 20 heads from each of those plots, choosing those in the mid-range.”

After harvest, the information pertaining to yield and quality is reviewed. They throw away seeds from about one-third of trials. The winter nursery speeds up the process by growing two cycles per year. Regional replicated tests continue for more than three years.

After making the crosses, around three years of inbreeding are required in the nurseries to achieve a certain level of uniformity, then at least three additional years of advanced yield trial evaluation is required.

Glover said, “After three years of decent performance in advanced yield trials, then we can give the material to the SDSU Foundation Seed group. They begin the process of increasing it, through usually planting at least half an acre in California. The desert produces much higher wheat yields than what would be expected in South Dakota. South Dakota Foundation Seeds then plant those resulting seeds around Brookings for at least

one year, to get the thousands of bushels required for Crop Improvement Association members. They grow it, and once it receives certification, they can sell the result as certified seed.”

Nurseries in New Zealand and Arizona allow Glover to accomplish the same thing on different time cycles.

Lincoln, New Zealand, is nearly as far south of the equator as Brookings is north, which makes it perfectly suited for growing South Dakota wheat, Glover explains.

“In September, we send the seed to New Zealand for planting. Wheat harvested in February arrives at SDSU in late March. The day and night periods are the same during New Zealand summers as in South Dakota summers. Location doesn't matter to the plants.”

Arizona fields planted in late October are harvested in late April. Water is controlled through irrigation in Arizona fields. New Zealand is more like South Dakota. If not enough rain falls, then Glover can have problems getting enough seed for his trials. Arizona production is nearly always

abundant. In Arizona, days can be hot but are still much shorter than South Dakota's summer. The plants produce many more tillers and stay green longer. When it's time for harvest, most material is not completely ripe. Glover explains the Arizona crew harvests the material in a shock and lays it on the desert floor to dry in the sun for about a week before harvest.

The 30 seeds can often produce a harvest of around two pounds of grain because the wheat produces more and larger heads.

While making progress in wheat variety production, there are some things that baffle Glover.

“I only go to Arizona once a year to view the plants. The process takes years to understand why some things happen. In my 15 years, I still don't fully understand everything. With certain parental lines, we don't see consistency when we bring materials back to South Dakota. I may think it is an early maturing variety in Arizona, but then it ends up being late in South Dakota. Plant height is another issue, something that is too tall in Arizona, may be just fine in South Dakota, but that is not always the

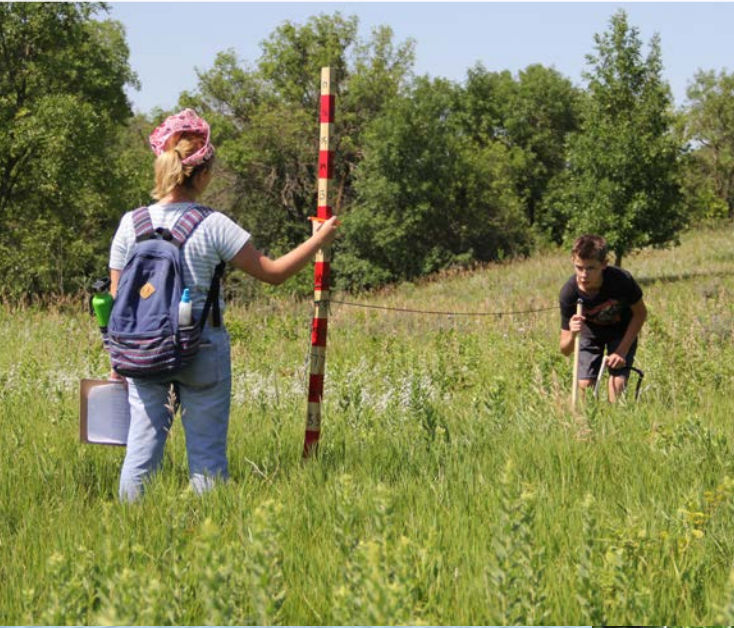
Recent SDSU Spring Wheat Introductions

- Boost - 2015
- Surpass - 2015
- Focus - 2014
- Prevail - 2013
- Advance - 2011
- Forefront - 2011
- Select - 2010
- Brick - 2008

case. Sometimes, my thesis gets blown out of the water, but it does seem that some parents behave better than others.”

Glover works closely with SDSU Extension staff members such as Jonathan Kleinjan to help explain the SDSU Spring Wheat Program to interested stakeholders at events such as summer research farm field days.

Connie Groop



OAK LAKE FIELD STATION CELEBRATES



The unique location and attributes of the South Dakota State University Oak Lake Field Station have made it ideal for teaching and research for the past 30 years.

“A dynamic glacial and cultural history, unique soils and high diversity of plant and animal life contribute a combination of attributes not found in other areas within the region,” says Oak Lake Field Station Director Nels Troelstrup. “The 570 acres of grassland, oak forest, wetland and lake environments provide an ideal setting for hands-on learning and research opportunities.”

The field station was inhabited and utilized by Native Americans and settled by Europeans in the 1870s. The area has undergone dramatic changes with settlement and the development of agriculture in the Northern Plains, however in the midst of change, the field station preserves a small part of the natural heritage.

Winona and St. Peter Railroad Company acquired the land in 1875 and the first steam locomotive to the territory traveled through the Oak Lake Field Station. The bell from the locomotive sits in the SDSU President’s Office today. SDSU acquired Oak Lake through a land trade with the Minnlakota Girl Scout Council in December of

1988. The station was home to the Oak Lake Girl Scout Camp since 1969. The Minnlakota Girl Scout Council traded the property to the state of South Dakota under the condition that it would be managed as a biological field station by SDSU.

The late Chuck McMullen, former Biology and Microbiology Department Head, served as the first director of the field station. In August of 1993, Troelstrup became the new director.

“Once I became the director, I started to think about what was needed for the station to be fully functioning,” Troelstrup said.

Several years later, the Oak Lake Field Station received a \$13,000 planning grant from the National Science Foundation Division of Biological Infrastructure to conduct a review of facilities, administration and programs. Ten field station directors from across the country participated in the planning session and a strategic plan was developed as a result of the review team’s recommendations.

The strategic plan focused on maintaining and remodeling existing facilities, providing incentive programs to stimulate additional teaching and research activity, reducing service activities not tied to the field station mission,

increasing field station operating and maintenance budgets, and increasing support personnel.

The station’s mission is, “To increase the understanding and appreciation of the Northern Great Plains and foster ecosystem stewardship through education, research and service.”

At the time, the administration building used for research and teaching included a classroom that could hold a maximum of 15 students and a lab that could hold two people. The building did not have heating. A bunkhouse was available for extended research stays. There was also a dining hall that accommodated approximately 100 people which is still in use today.

A new administration building was built in 2003 and includes a full lab, a classroom that can hold 35 students and an office. The building is fully equipped for teaching and research. In the fall of 2018, the old house was replaced with a new three-bedroom house for extended research stays.

Originally, the Oak Lake Field Station was maintained by one groundskeeper free of charge and in exchange for housing at the station. Today, the groundskeeper is a full-time paid position split with the SDSU South Dakota

Cooperative Fish and Wildlife Research Unit. In addition, the field station now has an office staff of two people.

A fondness for education, agriculture and the natural beauty of the Oak Lake region led Astoria native Alvera Rogen and her family to establish the \$100,000 Rogen-Trooien endowment in 1996. Rogen grew up on farmland that is now part of the field station. This endowment was established to support operations and maintenance programs at the field station.

In 2001, Lois Haertel established an endowment in honor of the late Jon Haertel to support undergraduate research on vertebrate animals at the field station. Jon served as a faculty member in the SDSU Biology and Microbiology Department for many years.

Recently, a third endowment was established by the late Charles McMullen and Marcia McMullen to support additional undergraduate research at Oak Lake. Both served SDSU for many years and were avid supporters of the station.

The station is overseen by the Campus Oak Lake Committee and Community Oak Lake Advisory Group. The Campus Oak Lake Committee, made up of SDSU faculty, helps to oversee the field station's programming needs. The Community Oak Lake Advisory Group, made up of community members, advises the station director on station policies and programs, facilitates fundraising,

helps communicate with the public and participates in public events.

The Oak Lake Field Station practices management activities to ensure its conservation. These include prescribed burning, mowing, manual weed control, wetlands restoration and warm season grassland restoration. These activities are designed to restore and promote natural field station habitats.

The wetland restoration project was completed in 2016 by the U.S. Fish and Wildlife Service to restore a dried wetland on the station. Wetland animal and plant species continue to multiply in the restored wetland each year. The field station also has a reference wetland similar in size to the restored one, which creates an ideal situation for conducting research.

Undergraduate and graduate research projects are conducted at the Oak Lake Field Station each year. The station awards up to three undergraduate research grants annually. In total, about seven research projects are hosted at the station each year including faculty and graduate projects. Research at the station has resulted in the publication of 75 popular articles, 27 technical reports and 48 scientific journal articles.

Additionally, many classes in the Department of Natural Resource Management utilize the field station for hands-on, experiential learning, as well as

several other courses at SDSU. Oak Lake has hosted instruction of over 20 university courses, including some from outside institutions.

The station also hosts a number of private group meetings, university retreats, adult education workshops and youth science camps.

Currently, Oak Lake Field Station hosts 2,200 user-days of activity each year, which is a total of the amount of users and the number of days they used the facility. Since its acquisition, the station has hosted 65,663 user-days of activity.

Oak Lake Field Station is supported and administered through the SDSU College of Agriculture, Food and Environmental Sciences and the Department of Natural Resource Management. The station is a facility of the South Dakota Agricultural Experiment Station.

Sydney Meyer



Oak Lake Field Station Director
Nels Troelstrup.

ELDER FINANCIAL EXPLOITATION: FAMILY RISK AND PROTECTIVE FACTORS

Axton Betz-Hamilton, Assistant Professor of Consumer Affairs in the College of Education and Human Sciences, is conducting studies on family risk and protective factors as related to elder financial exploitation (EFE). EFE perpetrated by family members is a significant problem affecting both victims and their families and is estimated to impact 5.2% of elders age 65 and older. EFE can result in victims being denied credit, having their estate plans thwarted, experiencing feelings of shame, embarrassment and even physical ramifications.

Betz-Hamilton plans to empower victims by helping them identify potential perpetrators and address

potential risk factors relevant to themselves and their families through two studies. In the first study, she will conduct in-depth interviews to understand victims' experiences with EFE within families. In the second study, Betz-Hamilton will explore potential risk and protective factors associated with family EFE via powers of attorney through a survey and follow-up in-depth interviews.

Betz-Hamilton hopes her findings will assist victims and family members in identifying those who may be a perpetrator of family EFE, consequently engaging law enforcement officials in an effective investigation

and subsequent justice. In return, Betz-Hamilton also envisions her research as a means for families to proactively protect themselves from potential perpetrators by being able to identify family members that are at risk of EFE.

Additionally, her research will assist potential victims and their family members in identifying individual characteristics, family patterns and social factors that may set the stage for later family EFE. This knowledge can then help to change these characteristics and patterns prior to an elder becoming a victim.

Andrea Schubloom

INVESTIGATING THE ROLE OF LINEAR UBIQUITIN SIGNALING IN PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS-INDUCED INFLAMMATION AND CELL DEATH

Jaime Lopez-Mosqueda, Assistant Professor in the Department of Biology and Microbiology, is looking to determine how porcine reproductive and respiratory syndrome virus (PRRSV) is able to circumvent the host innate immune system and establish an effective infectious state in swine herds.

PRRSV infections result in high mortality rates among breeding herds and cause infected animals to be more susceptible to secondary infections from other viruses and bacteria. In the United States alone, it is estimated that PRRSV directly causes \$600 million in losses every

year. Because immunizations have proven to be largely ineffective and there is an inadequate understanding of the interactions between PRRSV and the host innate immune system, Lopez-Mosqueda hopes to gain a better understanding of how the virus bypasses the host immune system to design better vaccines and treatments to eradicate PRRSV.

To achieve this increased understanding, Lopez-Mosqueda will characterize PRRS viral proteins as potential inducers of inflammation and programmed cell death in host cells, which is largely regulated by ubiquitin signaling system. He will use a combination of advanced

proteomic methods and bioinformatics to analyze the cellular pathways in host cells that are modified by the PRRS viral proteins.

As a result of his research, Lopez-Mosqueda expects to see increased productivity, risk management and profitability in the U.S. swine industry. Additionally, he expects his results to yield new protein targets for the rational design of vaccines and pharmacological inhibitors of viral proteins.

Andrea Schubloom

PROTECTING THE HOMESTEAD: OPIOID MISUSE PREVENTION IN THE DAKOTAS



Associate Professor and SDSU Extension 4-H Youth Development Specialist, Amber Letcher, has received a National Institute of Food and Agriculture-sponsored grant to explore opioid misuse and prevention in rural South Dakota and North Dakota farm families. The multi-state grant is the result of a collaborative effort between SDSU Extension and NDSU Extension. Agriculture-related challenges and stressors such as unpredictable weather, economic changes, or injury affect the whole family and are risk factors for prescription opioid misuse.

Over 85% of counties in both South and North Dakota are classified as mental health professional shortage areas, meaning the

number of mental healthcare providers is not adequate based on need. To address the risk of opioid misuse among farming/ranching families, Letcher's project will implement an evidence-emerging prescription opioid misuse prevention program while coordinating a public health campaign in South and North Dakota.

Extension professionals and healthcare providers will be trained to implement the "This is (Not) About Drugs" youth program, and "The Opioid Public Health Crisis" adult program with farming/ranching families in counties identified as shortage areas for mental healthcare support. To further educate families and professionals, a series of webinars and educational

resources such as a project website and newsletters will be created and distributed through a public health campaign.

As the result of Letcher's project activities, she expects farming/ranching families to report attitudinal changes in their view of prescription opioid misuse and greater access to informational resources about opioid misuse. Additionally, Letcher expects Extension professionals to increase their self-efficacy in responding to opioid-related concerns in their communities. Individuals or organizations interested in the programming are encouraged to contact Letcher at amber.letcher@sdstate.edu for more information.

Andrea Schubloom

UTILIZATION OF ADVANCED MOLECULAR BIOLOGY TO IMPROVE HEALTH AND PERFORMANCE IN DAIRY CATTLE

Assistant Professor in the Department of Dairy and Food Science, Johan Osorio, is exploring how the utilization of advanced molecular biology improves the health and performance of dairy cattle. Giving birth to new life is a common event to all mammals, however there are striking differences across species on how birthing and the onset of lactation can affect the dams' health. For example, it has been estimated that energy and protein requirements in dairy cows can increase up to 5 times from late gestation to lactation.

Nutrigenomics is a fruit of the post-genome era, and is a

scientific branch of nutrition that studies how molecules contained in the diet can modify the biology of single cells and the organism as a whole by turning on or off specific genes. Nutrigenomics can have a profound impact on understanding the overall health status and performance of dairy cows. An emerging application of nutrigenomics is in early detection of diseases that are still in the subclinical stage. This will allow for more timely and effective interventions by dairy producers. The latter can considerably decrease the recovery time from a disease and result in lowering treatment costs while improving milk production.

Osorio's main goal is to improve the health and consequently the postpartal performance of transition dairy cows through nutrigenomic approaches. He plans to improve the health and transition of dairy cows with his program by helping producers fine-tune the metabolism of transition dairy cows based on nutrigenomic data, which in turn will assist producers in identifying cows at risk of developing diseases. Osorio believes that these capabilities will serve as important tools on modern dairy farms with profound financial impact to the dairy industry.

Andrea Schubloom

AGRICULTURAL BEST MANAGEMENT PRACTICES ON SUBSURFACE-DRAINED (TILED) LAND FOR REDUCTION OF NUTRIENT AND PESTICIDE LOADING INTO RECEIVING WATER BODIES

John McMaine, Assistant Professor in the Department of Agricultural and Biosystems Engineering and SDSU Extension Water Management Engineer, is utilizing lab and applied field experiments to evaluate and demonstrate performance of various practices designed to reduce the movement of nutrients and pesticides from agricultural lands. His goal is to develop, enhance, and communicate improved management technologies to farmers to enable them to reduce nutrient losses that potentially impact water resources.

Excess nutrients and pesticides, from both urban and agricultural settings, can unintentionally enter streams, rivers, wetlands and lakes as runoff or subsurface flow. These nutrients can cause increased algal growth, decreased dissolved oxygen in water bodies, and can lead to long-term damage to aquatic ecosystems such as harmful algal blooms in the Great Lakes, the

dead zone in the Gulf of Mexico or excessive algal growth in Lake Mitchell.

By developing and enhancing in-field and edge-of-field water management technologies, McMaine will provide new management recommendations to address concerns about agricultural impacts on quality and quantity of water resources. McMaine plans to use his research to help establish a program that continues to develop new technologies and enhance existing technologies. To achieve this, field experiments will utilize plot- or field-scale treatments of different best management practices (cover crops, no-till, controlled drainage, drainage water recycling, and constructed wetlands), addressing subsurface flow, surface flow and water quality.

To overcome barriers to application, McMaine plans to host workshops and field days for end-users that incorporate hands-on learning about various practices and practice performance as well as how to implement and maintain water management technologies.

McMaine expects his results to show an increased understanding of nutrient dynamics and nutrient management under different scenarios on drained agriculture land which ultimately will lead to reduced loss of nutrients and improved water quality.

Andrea Schubloom



Right: McMaine's experimental plots at the Southeast Research Farm near Beresford, S.D.





SOIL FERTILITY PRACTICES TO SUSTAINABLY ENHANCE CROP PRODUCTION AND NUTRIENT USE EFFICIENCY IN SOUTH DAKOTA

Assistant Professor and SDSU Extension Soil Fertility Specialist Jason Clark is looking at ways to sustainably enhance South Dakota crop production and nutrient use efficiency.

Over the past few decades crop removal of nutrients from the soil has increased, the timing of uptake by crops has shifted to later in the season, tillage practices are shifting to less tillage, and cover crops are being added into rotations for grazing and soil health purposes. Therefore, it is important that the rate, timing, source, and placement guidelines for fertilizer applications are updated to optimize crop yields while most efficiently using fertilizers and

protecting water quality. Clark's ultimate goal is to build a nationally recognized applied field research program that investigates the integration of cultural and nutrient management practices to enhance the economic potential and sustainability of crop production systems in South Dakota.

To achieve this, he plans to first conduct a survey to document current nutrient management practices across the state of South Dakota to determine common practices. These common practices will be compared to newer practices, such as reduced tillage and the use of cover crops. Different fertilizer rates, application

timings, nutrient sources, and application methods will be compared under different tillage and cover cropping practices throughout South Dakota.

Clark expects his results will provide guidance to South Dakota growers regarding management practices that optimize fertilizer use, crop yield, and profit, while reducing fertilizer losses associated with negative impacts on air and water quality. Additionally, Clark expects his findings to result in an improved understanding of how incorporation of no-till and cover cropping practices influences fertilizer needs.

Andrea Schubloom

AN ECONOMIC ANALYSIS OF FOOD INSECURITY AND OBESITY: IMPLICATIONS FOR CONSUMERS, INDUSTRY AND GOVERNMENT

Andrea Leschewski, Assistant Professor in the Department of Economics, is analyzing the economics of the collective role consumers, government and the food industry have in reducing food insecurity and obesity in the United States. As of 2014, nearly 100 million Americans were considered obese, and in 2016 over 40 million Americans had inadequate access to a sufficient quantity of nutritious, affordable food.

One in four Americans receives assistance from food and nutrition programs operated by the USDA, which include the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Assistance Program for Women, Infants and Children,

and the National School Lunch Program. Additionally, the food industry is taking active steps to reformulate current food products to reduce harmful micronutrients, fortify food products with nutrients lacking from the U.S. diet, and use front-of-package nutrition labels. Despite these efforts by government and industry, rates remain high in the U.S. with 12.3% of Americans experiencing food insecurity and 32% of Americans considered obese.

This project is a collaborative effort with researchers at Michigan State University and the USDA Economic Research Service. As a result of this project Leschewski expects to provide a holistic view of how consumers, industry and government can address food insecurity and obesity.

To do this, Leschewski will identify socio-economic characteristics associated with expenditures on foods relevant for food and nutrition policy to provide insight the consumer choices between healthy and unhealthy foods. She will also evaluate the effectiveness of current and proposed food and nutrition assistance, food and nutrition education, and food access policies and programs. Lastly, she plans to provide the food industry with needed feedback on whether their current health-based marketing efforts are having the intended effect on consumer food expenditures and health outcomes.

Andrea Schubloom

MESOCARNIVORES IN MULTI-USE LANDSCAPES: THE INFLUENCE OF PROTECTED AREAS AND AGRICULTURAL LANDS ON THE SPATIAL DYNAMICS OF FURBEARERS IN THE NORTHERN GREAT PLAINS

Robert Lonsinger, Assistant Professor in the Department of Natural Resource Management, is studying the influence of protected areas and agricultural lands on the spatial dynamics of furbearers in the Northern Great Plains. Two leading causes of habitat loss and fragmentation are the conversion of land for agriculture and urban/suburban development. Private landowners, agricultural industries, and the general public often oppose conservation and management of species for which there are real or perceived conflicts.

Carnivores are among the most controversial species, but are critically important to ecosystems. They require relatively large spaces and have low reproductive rates, making them particularly sensitive

to habitat loss and fragmentation caused by agricultural practices or urban development. When these habitat patches are part of a human-dominated landscape, the potential for conflict between carnivores and domestic animals is increased, as is the potential for disease transmission between wild and domestic carnivores.

Lonsinger believes that understanding how different carnivore species respond to habitat loss and fragmentation can improve wildlife management and benefit society. In his project, Lonsinger will survey carnivore populations and habitat patches to characterize how different habitat features associated with an agriculturally-dominated landscape influence where carnivores occur, where they are likely to colonize, and where

they are likely to stop occurring. Carnivore populations to be surveyed could include coyotes, foxes, bobcats, raccoons, skunks, and non-native domestic dogs and cats.

As a result of his studies, Lonsinger expects his findings to produce actionable management recommendations that can improve sustainable management practices for maintaining mesocarnivore biodiversity, reducing conflicts between mesocarnivores and agricultural industries and urban interests, reducing conflicts between mesocarnivores and game management, and improving wildlife disease management.

Andrea Schubloom



GROWTH MANAGEMENT STRATEGIES TO OPTIMIZE FEEDLOT CATTLE PRODUCTION

Assistant Professor in the Department of Animal Science, Zachary Smith, is developing growth management strategies to optimize carcass weight and USDA Quality Grade in beef cattle production. Smith's underlying research theme will be precision use of growth enhancing technologies (GET) to match the genetic merit and plane of nutrition for the beef cattle.

For more than 60 years, beef cattle producers have safely used various types of GETs to improve carcass leanness, increase average daily gain and alter dry matter intake. The most common and widely used type of GET available to producers is steroidal implants with anabolic activity. It has been reported by the Animal and Plant Health Inspection Service that more than 90 percent of cattle entering feedlots are administered an anabolic implant at least once.

Steroidal implants with anabolic activity are critical tools for efficient U.S. beef production, and the use of steroidal compounds is widely accepted. Implants increase frame size and delay fattening. It has been demonstrated that genetic propensity for gain and marbling can impact the relative influence that implants can have on carcass gain and USDA Quality Grade.

Smith will conduct four experiments in his study. The first will focus on optimizing the use of GETs by treating 36 predominantly Angus steers with either a

traditional anabolic GET, an altered anabolic GET, or a non-implanted control. Blood samples will be collected along with biopsies of the longissimus muscle to analyze changes in blood metabolites and genes important to skeletal muscle growth. In his second experiment, 160 crossbred steers will be utilized in a randomized complete block design feedlot study where steers will be stepped up to the final finishing diet 84 days prior to study initiation. The study treatments will include ractopamine hydrochloride using various doses and delivery patterns during a 28-day feed supplementation study. Cattle will then be tracked through the grading rail to assess impacts on carcass quality and tenderness.

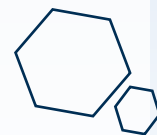
The third experiment will utilize 96 predominantly Angus steers with the variable factors being gene-max score and initial implant strategy to determine initial implant strategies for Angus influenced steers with high and low genetic propensity for gain and marbling. In the final experiment, Smith will use average daily gain and a backgrounding implant as the treatment variables to determine implant strategies for differing rates of gain during the backgrounding period. To accomplish this, 240 predominantly Angus steers will be utilized in a two by three factorial arrangement study.



Currently, Smith is conducting a 240 head, 30 pen feedlot study at the Ruminant Nutrition Center related to the use of cattle bedding and potency of terminal implant. Smith suspects that poor pen conditions can alter a cow's requirements for maintenance, thus changing the feed available for productive functions such as gain. Using various potency implants that match the cattle's caloric needs, Smith believes one might be able to mitigate the depression in marbling score that often occurs when a potent implant is administered to cattle in sub-optimal pen conditions.

With his findings, Smith expects to adapt growth enhancing technology and nutritional management of beef cattle to optimize the carcass weight and Quality Grade of beef cattle.

Andrea Schubloom





BEEF BUCKS, INC. NAMED 2018 SDSU FRIEND OF THE BEEF INDUSTRY

Beef Bucks, Inc., has been named the 2018 South Dakota State University Friend of the Beef Industry. The Beef Bucks program is a non-profit organization that strives to promote the beef industry and educate consumers.

"Beef Bucks is a very innovative program that enhances the visibility of beef and the industry," said John Killefer, South Dakota Corn Utilization Council Endowed Dean of the College of Agriculture, Food and Environmental Sciences. "It has made a very positive impact on the beef industry."

Beef Bucks was formed in De Smet in 1997 by Bob and Nancy Montross, Delina Nagel and Joanne Hillman with a goal of offering beef to anyone and anywhere.

Beef Bucks are pre-paid checks available for \$5, \$10, and \$20 and are sold on a dollar-for-dollar exchange. Beef Bucks are also available on a VISA debit card that

is loadable for \$25-\$500 with an acquisition fee of \$4.50. They can be used to purchase beef or beef meals at any restaurant, steakhouse, grocery store or retail meat market across the United States that accepts checks or debit cards. Beef Bucks can be bought at numerous locations throughout South Dakota and a full list is available at beefbucks.org.

Millions of dollars' worth of beef have been shared using Beef Bucks in more than 40 states. The program even provides a \$1,000 Beef Bucks prize on the television show, "Wheel of Fortune," something it has been doing for nine years.

Beef Bucks also provides scholarships to several students attending institutions of higher education each year, including SDU. To support the scholarships, implementation of the program and the many projects Beef Bucks is involved with, Beef Bucks has

put together and sells a beef recipe book and sponsors an annual golf tournament.

The non-profit organization is run by a volunteer board of directors that includes Joanne Hillman of Sioux Falls, President; Eileen Moller of Mitchell, Vice President; Bob Montross of De Smet, Treasurer; Nancy Montross of De Smet, Executive Secretary; Judy Blindauer of Mitchell; Jim Woster of Sioux Falls; and Todd Olinger of Woonsocket.

Beef Bucks, Inc. was honored on the field during the September 15 SDSU Beef Bowl football game. The organization was represented during the football game by Bob and Nancy Montross who are pictured above with Animal Science Department Head Joe Cassady, Dean John Killefer and SDSU President Barry H. Dunn.

Sydney Meyer

DAVID A. THOMPSON ENDOWED CHAIR OF THE DEPARTMENT OF DAIRY AND FOOD SCIENCE ANNOUNCED



Top Left: David Thompson's gift will support the new David A. Thompson Endowed Department Chair of Dairy and Food Science.

Bottom Left: Dairy and Food Science Department Head Vikram Mistry

John Killefer, South Dakota Corn Endowed Dean of the College of Agriculture, Food and Environmental Sciences, announced on Sept. 21, 2018 the David A. Thompson Endowed Department Chair of Dairy and Food Science.

The gift from David Thompson consists of a \$2 million endowment and also includes an additional amount to begin impacting the program immediately.

"These types of endowments are rare and we are truly fortunate to receive this generous gift from David Thompson," Killefer said. "This gift will provide a long-term boost to further grow our Dairy and Food Science programs and the impact they will have in the future for our students."

Vikram Mistry, who has been a Dairy Science faculty member at SDSU since 1986, and professor and department head since 2002, will be the first holder of the chair.

"We are very grateful for Mr. Thompson's generous support of our programs," Mistry said. "He has already inspired us to excel. In addition, his support will have a lasting impact on the lives of students and will help shape the dairy and food industry of the future."

In addition to having an immediate impact on the department, the generous endowment will be used

to both recruit and support those who serve in the Dairy and Food Science Department Head position in the future. The person holding this endowed chair will provide leadership to elevate all aspects of the land grant university mission, which includes education, research and extension, within the department.

Thompson grew up on a dairy farm near Milbank, S.D., and is a 1964 South Dakota State University dairy manufacturing graduate. During his time as a student, he served as student manager of the SDSU dairy plant for two years.

Following graduation, Thompson began a 31-year career with Abbott Laboratories. He started out in the Mitchell location making Similac infant formula. By 1974, he had become vice president of operations with the Ross Division of Abbott Laboratories.

In 1981, Thompson moved to Abbott's corporate office in Chicago, where he served as vice president of materials. A year later, he was named vice president of human resources for Abbott worldwide.

In 1983, Thompson was named senior vice president of Abbott and president of the Abbott Diagnostic Division. During his 12 years of leadership, the division grew revenue from \$180 million to more than \$2 billion. Thompson helped guide the Diagnostic Division to

become the largest and most profitable division in the company. One of Thompson's greatest accomplishments was helping Abbott develop the first licensed test to detect HIV in blood in 1985.

"The education and practical plant experience I received at SDSU really prepared me for my first job at Abbott making Similac," Thompson said. "SDSU is one of the few universities in the country that offers a dairy plant to give students hands-on experience. I'm privileged and excited to be able to give back and help the department to continue to improve by attracting the best people to run the department. I'm especially pleased that Dr. Mistry is the first to receive this honor as he has made many important positive changes to the

department and is a great influence on his students."

Following his retirement from Abbott in 1995, Thompson served on several public company boards and is currently the lead director for Exact Sciences Corp., which developed Cologuard, the first FDA-approved noninvasive test for colon cancer.

"I owe a lot of the success in my career to the education I received at SDSU and my experience at the SDSU dairy plant that truly gave me a leg up," Thompson said.

In 2017, Thompson was honored as an SDSU Distinguished Alumni in recognition of his outstanding professional contributions. In addition to this transformational

gift, he also provides scholarship support each year to the Department of Dairy and Food Science. Further, he also made a generous personal gift toward the construction of the SDSU Davis Dairy Plant.

Carrying on the family tradition, Thompson's grandson, John Oakley, is a junior studying dairy manufacturing at SDSU. Josh Oakley, another grandson, graduated from SDSU with a dairy manufacturing degree in 2014.

An investiture ceremony to formally recognize this generous endowment will be held in the spring.

Sydney Meyer

SDSU EXTENSION HOSTS NORTHERN PLAINS CLIMATE WORKSHOP

SDSU Extension State Climatologist Laura Edwards organized the first Northern Plains Climate Workshop on October 9-11, 2018 at the Sioux Falls Convention Center.

The training provided extension and outreach professionals opportunities to learn about the latest climate trends, consider impacts of climate in their

disciplines and geographic areas, plan for weather hazards, communicate in extreme weather events and climate adaptation efforts in the region.

There were 56 total attendees from 10 states and two tribes, including extension personnel from eight land-grant institutions and representatives from a regional climate center, USDA climate hubs,

National Oceanic and Atmospheric Administration, USDA-ARS, U.S. Department of the Interior and a tribal water group.

The North Central Region Water Network sponsored the workshop through the North Central Climate Collaborative (NC3) team.



BILL GIBBONS RECEIVES 2018 DISTINGUISHED PROFESSOR AWARD

The Distinguished Professor Award is given in recognition of a professor who has proven outstanding professional accomplishment in the College of Agriculture, Food and Environmental Sciences. In addition, this individual exemplifies good character, professional integrity and outstanding citizenship within the university community. For his professional accomplishments at South Dakota State University, Bill Gibbons was the 2018 recipient of the Distinguished Professor.

Gibbons wears many hats at SDSU, including currently serving as Interim Director for the South Dakota Agricultural Experiment Station, Interim Associate Dean for Research for the College of Agriculture, Food and Environmental Sciences, Interim Assistant Vice President for the Office of Technology Transfer and Commercialization, and Professor in the Biology and Microbiology Department.

Originally from Brookings, Gibbons attended SDSU on a basketball scholarship in 1976. However, after a career-ending knee

injury, he re-doubled his academic efforts to obtain a double major in biology and microbiology in 1980 and a third degree in chemistry in 1981. After pursuing undergraduate research opportunities in ethanol fuel production at SDSU's first-in-the-nation ethanol fuel plant, he continued this line of research while receiving his master's in microbiology in 1982 and doctorate in agronomy and microbiology in 1987.

"I initially became interested in the field of microbiology due to the challenge of studying and working with microscopic organisms," said Gibbons. He thanks Dr. Paul Middaugh for hiring him to work with ethanol production research during his junior and senior years at SDSU and Dr. Carl Westby for advising his graduate degree work. "I was inspired by participating in this groundbreaking work to help the nation overcome the global energy crisis, while simultaneously improving farm economics by providing a new market for corn."

As a professor of biology and microbiology at SDSU, Gibbons' primary responsibilities are within research regarding industrial microbiology and biotechnology in which he leads a team of researchers from varying departments and colleges to develop and commercialize value-added processes. In addition, he advises multiple graduate students and undergraduate researchers and teaches a biotechnology course.

As Interim Associate Dean for Research and Director of the South Dakota Agricultural Experiment Station, he is also responsible for coordinating and facilitating research in the College of Agriculture, Food and Environmental Sciences and the college's statewide network of research farms and stations.

In his duties as Interim Assistant Vice President for the Office of Technology Transfer and Commercialization, he assists researchers at SDSU by protecting and commercializing innovative technologies developed in their laboratories.

With his multiple roles at SDSU, Gibbons also notes how interacting with the people at SDSU and in the community is one of the most enjoyable aspects of his job.

"Our people are friendly, hardworking and collegial. The diversity of my roles is also something I enjoy. I am able to help support researchers from idea creation through commercial application," Gibbons said.

For his phenomenal career at SDSU, numerous accolades and dedication to research, Gibbons serves as an exemplary individual deserving of the Distinguished Professor Award.

*Sadie Vander Wal,
Ag Communications student*

LAST BEAM PLACED ON STRUCTURE OF ANIMAL DISEASE RESEARCH AND DIAGNOSTIC LABORATORY

The last beam was placed on the structure of the Animal Disease Research and Diagnostic Laboratory on August 15, 2018. SDSU President Barry H. Dunn placed the final signature on the beam.



Left (left to right): SDSU College of Agriculture, Food & Environmental Sciences Dean John Killefer, SDSU President Barry Dunn, SDSU Veterinary and Biomedical Sciences Department Head Jane Hennings, SDSU Vice President for Division of Research and Economic Development Daniel Scholl, McCown Gordon Construction Director of Operations Daniel Lacy, SD Senator Larry Tidemann, State Veterinarian and SD Interim Secretary of Agriculture Dusty Oedekoven.

Above: Construction progress of the Animal Disease Research and Diagnostic Laboratory taken on January 15, 2019.

VERONICA SHRIVER RECOGNIZED WITH 2018 F.O. BUTLER AWARD FOR EXCELLENCE IN SERVICE



Veronica Shriver has worked for the Animal Science Department as a Senior Computer Support Specialist for 19 years. She constantly meets the challenge of new technologies and is described as patient and a solution focused troubleshooter.

Shriver has provided dedicated services at the community, regional, national and international levels as a 26-year member of the Air Force Reserve and South Dakota Air

National Guard. She fulfilled missions in Turkey, Kuwait and Saudi Arabia.

As a volunteer with the American Red Cross, she serves in leadership positions including Lead Captain for the Brookings Area Disaster Action Team, Mass Care and Feeding worker, and Emergency response vehicle driver. She was also recognized as a 2017 Dr. April Brooks Woman of Distinction.

SECOND ANNUAL SDSU SWINE DAY HELD NOV. 6, 2018

Pork producers from across South Dakota came together for the South Dakota State University Second Annual Swine Day held on Nov. 6, 2018 at McCrory Gardens in Brookings, S.D.

"SDSU Swine Day is an opportunity to learn more about the swine industry in South Dakota as well as the groundbreaking research going on at the swine units," said Ryan Samuel, SDSU Extension swine nutrition specialist. "Issues relevant to the swine industry continue to be investigated by SDSU researchers for betterment of the industry locally and abroad."

The day began with a keynote address by Chris Hostetler, the National Pork Board's Director of Animal Science, who spoke about the current state of the U.S. pork industry.

A U.S. Pork Industry's Pig Farmer of Tomorrow and SDSU alumnus, Adam Krause from Clear Lake, S.D., gave tips on being a spokesperson for the pig farming industry through personal contact and social media.

After a lunch sponsored by the South Dakota Pork Producers Council, SDSU Extension Swine Specialist Bob Thaler spoke about his experience as a Fulbright Scholar in Vietnam in 2018.



Above: A Pig Farmer of Tomorrow and SDSU Alumnus, Adam Krause, gave tips on being a spokesperson for the pig farming industry.

The SDSU swine faculty also highlighted some of their recently completed and ongoing research.

SDSU EXTENSION AND PARTNERS HOSTED THE 2018 NORTH AMERICAN MANURE EXPO

SDSU Extension and partners hosted the 2018 North American Manure Expo (NAME) at the Swiftel Center in Brookings, S.D. on August 15-16, 2018. The event attracted approximately 1,400 attendees from the United States, Canada, England, Belgium, China, the Netherlands, Australia and New Zealand.

NAME is an annual, international event that includes an industry trade show, manure technology demonstrations and tours, and educational sessions. Since its inauguration in 2001, NAME has grown to be North America's largest manure-specific trade show and educational event.

consultants, specialists and many others to see the latest advances in the manure management industry and to learn from the region's top experts regarding manure handling and nutrient management," said David Kringen, chair of the 2018 NAME and SDSU Extension Water Resources Field Specialist.



"This year's Expo provided the opportunity for livestock producers, professional manure applicators,

The event also showcased the state's animal feeding industry and its ongoing commitment to environmental stewardship through tours of local beef, swine and dairy operations.

Left: Field demonstrations at the 2018 North American Manure Expo. Photo courtesy of Robert Meinen, Penn State University.

A FORK IN THE ROAD....

In 1962, a soldier was back in his hometown of Bronson, Iowa. He was on leave after serving overseas in the Pacific for more than a year.



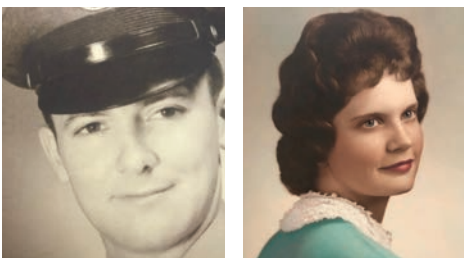
He hadn't seen his old high school sweetheart for several years. He'd received a "Dear John" letter from her after entering the military. It wasn't because she didn't love him anymore, but she still had two years left of high school and wanted the freedom to go out with friends, go to movies, dances and prom. She realized this would likely include dating other boys. He understood, but was heartbroken.

As he left the house to begin the long trip back to his base to finish out his remaining few months of service, he came to the T-intersection just west of town. Turn right, and he'd catch the blacktop highway that would take him back to finish out the rest of his military obligation. Go left, and he'd have about four miles to his old sweetheart's parent's farm.

He had heard that she was now dating someone and that they might even be engaged. He literally sat at that stop sign for several minutes, deciding what to do.

Funny how decisions like this can change the direction of your life. Literally, turning one direction as opposed to another when you are in your early twenties can change everything about the rest of your life. My hope for our young Jackrabbits is that they recognize the moments when they are at these pivotal intersections, and then make the right choices.

As for that soldier??? Well, he is gone now, but he spent the next 55 years with his sweetheart. My sister and I are sure glad he turned left, and that Mom was home when he pulled down the lane.



Mike Barber '97

Jackrabbits Land Legacy

**The land is your legacy.
SDSU understands that
because it's our legacy too.**

**Your gift of land, land assets
and other real property can
fund scholarships, research,
and academic programs in
areas most important to you.**

**The SDSU Foundation can help
make sure your financial and
personal goals are met to preserve
your family's heritage and make an
impact at SDSU.**



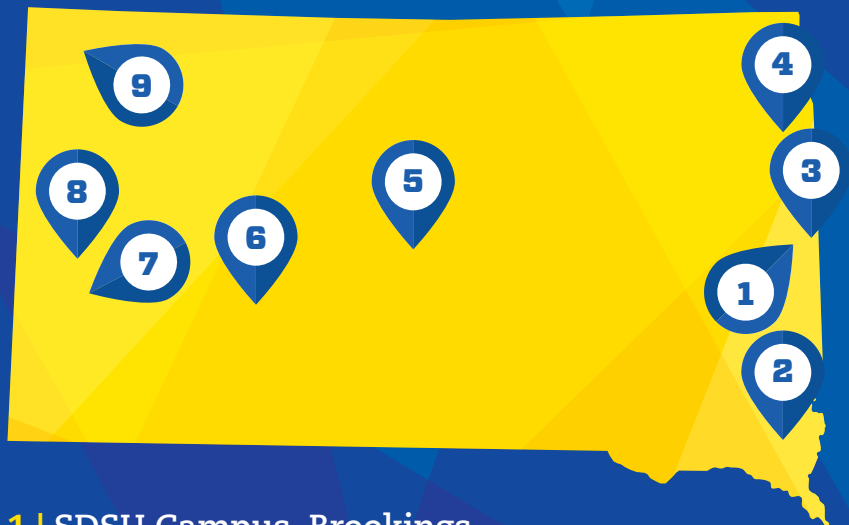
IMPACT *Greatness*

Lohr Building | 815 Medary Ave. | Brookings, SD 57006
www.sdstatefoundation.org/jackrabbitslandlegacy

Join us for 2019 Research Station Field Days

at Select South Dakota Agricultural Experiment Station Locations

South Dakota State University researchers conduct ongoing studies in real-life settings at field stations operated by the South Dakota Agricultural Experiment Station across the state. The unique locations of each of these research facilities allow for diverse research that is responsive to the needs of the farms and ranches, businesses and lives of South Dakotans.



- 1 | SDSU Campus, Brookings
- 2 | Southeast Research Farm, Beresford
- 3 | Oak Lake Field Station, Astoria
- 4 | Northeast Research Farm, South Shore
- 5 | Dakota Lakes Research Farm, Pierre
- 6 | Cottonwood Range & Livestock Field Station, Philip
- 7 | SDSU West River Agricultural Center, Rapid City
- 8 | West River Agronomy Research Station, Sturgis
- 9 | Antelope Range and Livestock Field Station, Buffalo

2019 South Dakota Agricultural Experiment Station Research Farm Field Days

JUNE 27

Dakota Lakes Research
Farm Field Day

JULY 9

Southeast Research
Farm Field Day

JULY 11

Northeast Research
Farm Field Day

JULY 18

Volga Research
Farm Field Day

AUGUST 7

Southeast Research
Farm Forage Field Day