SERVING *Our* STATE

Division of Agriculture, Forestry, and Veterinary Medicine

2021

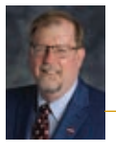
Annual Report

SERVING *Our* STATE

DAFVM ADMINISTRATION

MARK E. KEENUM

President
Mississippi State University



KEITH COBLE

Vice President
Division of Agriculture, Forestry, and Veterinary Medicine

Interim Director
Mississippi Agricultural and Forestry Experiment Station

ASHLI BROWN

Associate Vice President
Division of Agriculture, Forestry, and Veterinary Medicine

SCOTT WILLARD

Interim Dean
College of Agriculture and Life Sciences

GARY B. JACKSON

Director
Mississippi State University Extension Service

LOREN (WES) BURGER, JR.

Dean
College of Forest Resources

Director
Forest and Wildlife Research Center

KENT H. HOBLET

Dean
College of Veterinary Medicine

"We remain committed to our land-grant mission of learning, research, and service to Mississippians."

DR. KEITH COBLE

The Mississippi House of Representatives Agriculture Committee visited the R. R. Foil Research Center, better known as North Farm, to view DAFVM's research projects and equipment in the field. By seeing and learning about DAFVM research in person, legislators better understand the return on investment their constituents are receiving. (Photo by Kevin Hudson)

Dear friends:

The Mississippi State University Division of Agriculture, Forestry, and Veterinary Medicine (MSU DAFVM) remains a vital force in enhancing the state's reputation as a national and international leader in agriculture. Agricultural and forestry production and processing is a $45.8 billion industry in Mississippi. DAFVM stands out among its peers as a nationally ranked source of agricultural and natural-resource research. This year's report focuses on "Serving our State."

When I accepted the role of vice president in February of this year, I was glad to get the chance to build on the great successes DAFVM has already achieved. Our history includes developing seed varieties, working with producers to eradicate the boll weevil, and designing early-season soybean production systems to lessen risks and achieve higher yields. This report details how DAFVM service is impacting our clients and making a difference in all 82 counties of Mississippi.

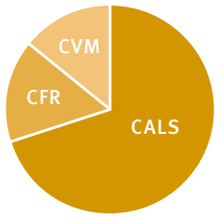
Service to the people is a key focus for all six of our units: the College of Agriculture and Life Sciences (CALS), College of Forest Resources (CFR), College of Veterinary Medicine (CVM), Mississippi Agricultural and Forestry Experiment Station (MAFES), Forest and Wildlife Research Center (FWRC), and MSU Extension Service (MSUES).

Our colleges prepare future leaders in agriculture, life sciences, natural resource management, and veterinary medicine. Research efforts continue in FWRC and MAFES as we discover more about forestry, agriculture, natural resources, and conservation. MSUES agents, specialists, and faculty share information with the people and businesses who will benefit from it. DAFVM remains committed to its land-grant mission of learning, research, and service as we continue training new leaders, conducting relevant research, and sharing up-to-date applications with Mississippians.

Hail State,

Dr. Keith Coble
DAFVM VICE PRESIDENT

Points of Pride



Enrollment IN FALL 2021

CVM
512

CFR
573

CALS
2,563

- Despite COVID-19 challenges, DAFVM research programs continued unabated, with grants and contracts totaling nearly $100 million for the second year in a row.
- In FY 2019, MSU ranked 12th nationally in the National Science Foundation's ranking of research expenditures in agricultural sciences and natural resources and conservation, with a total expenditure of $109 million—an increase of $4.7 million from the previous year.
- Private gifts to DAFVM units in FY 2021 totaled $29 million, the second highest since FY 2000.
- MSUES served more than half a million direct contacts*, nearly one in six Mississippians.
- DAFVM enrollment totals for the 2021–22 academic year remain strong.
- CVM celebrated 40 years of training the best and brightest students interested in animal-health careers. Advancing its first class of veterinarians in 1981, CVM has graduated more than 2,200 students over the years, and students are in the top 10% of a large applicant pool.

* *Some individuals participated in more than one program and may be counted more than once.*

DAFVM Map

RESEARCH & EXTENSION CENTERS

1. Hiram D. Palmertree North MS Research & Extension Center VERONA
2. Delta Research & Extension Center STONEVILLE
3. Frank T. (Butch) Withers Central MS Research & Extension Center RAYMOND
4. Coastal Research & Extension Center BILOXI

MAFES BRANCHES & UNITS

5. North Mississippi Branch HOLLY SPRINGS
6. Pontotoc Ridge-Flatwoods Branch PONTOTOC
7. Northeast Mississippi Branch VERONA
8. Black Belt Branch BROOKSVILLE
9. Delta Branch STONEVILLE
10. Coastal Plain Branch NEWTON
11. E.G. (Gene) Morrison Brown Loam Branch RAYMOND
12. Truck Crops Branch CRYSTAL SPRINGS
13. South Mississippi Branch POPLARVILLE
14. Seafood Processing Lab PASCAGOULA
15. Prairie Research Unit
16. Beaumont Unit
17. White Sand Research Unit
18. McNeill Unit

MSUES UNITS

19. Crosby Arboretum PICAYUNE
20. MSU Horse Park STARKVILLE

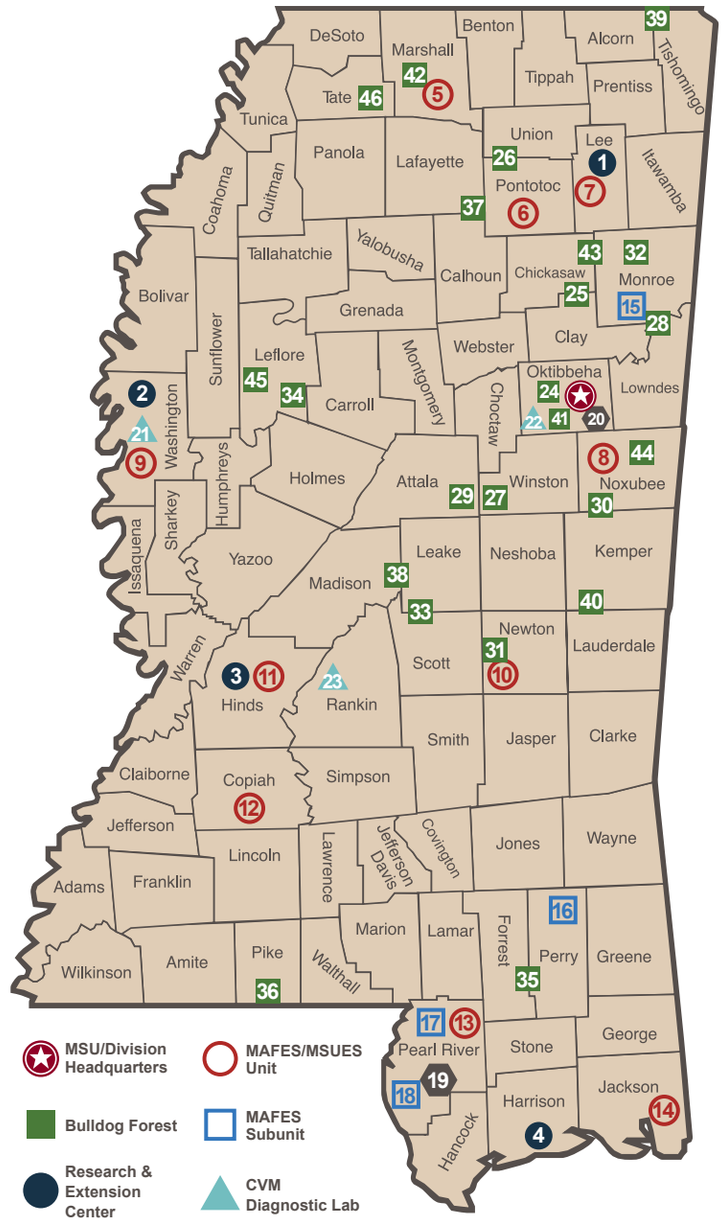
CVM DIAGNOSTIC LABS

21. Aquatic Research & Diagnostic Laboratory STONEVILLE
22. CVM-Diagnostic Laboratory Services MSU
23. Research & Diagnostic Lab/ Poultry Lab PEARL

BULLDOG FORESTS

24. Andrews Forestry & Wildlife Laboratory
25. Brand Forest
26. Brooking Forest
27. C.M. Chafee Forest
28. Columbus Air Force Base Property
29. Gober Forest
30. Hall Timberlands Forest
31. Harris Forest
32. H.K. & J.K. Holloway Reserve
33. Col. K.D. Johnson Forest
34. McGeary Sidon Plantation
35. Mortensen Forest
36. Norma Lea O'Quin Forest
37. Phillips Memorial Forest
38. John & Jane Player Property
39. Sharp Forest
40. Shaw-O'Reilly Property
41. J.W. Starr Memorial Forest
42. Annie Seal Matthew–Porter Forest
43. Margaret Demoville Forest
44. The Triplett Forest
45. The Gulledge Forest
46. The Bowen Forest

Three additional forests are unidentified at the request of anonymous donors.



An MSUES office is located in each of the 82 counties.

THE IMPORTANCE OF INVESTING IN AGRICULTURAL RESEARCH AND EXTENSION

Global agricultural output is growing at its slowest rate since the 1960s, making public investment in agricultural research more critical than ever. The land-grant system of agricultural teaching, research, and Extension has been the envy of the world for decades. Even 10 years ago, the U.S. was at the forefront of agricultural research and outreach. However, countries like China and Brazil are now surpassing U.S. investment.

Research leads to better productivity in the field and is estimated to return $20 for every $1 invested. DAFVM's accomplishments demonstrate its excellent stewardship of research dollars to help farmers compete in world markets. MSU research and Extension outreach have helped our Mississippi agricultural industry survive brutal markets and other risks.

Today, we are developing new production systems, improving production practices, and researching new crop varieties. We are developing autonomous equipment and forest management systems. The list goes on and on: DAFVM is forming the future of Mississippi agriculture and forestry today.

Water conservation: MAFES and MSUES experts at the Mississippi Water Resources Research Institute are increasing water efficiency, protecting coastal waters, improving water quality, and conserving natural resources. The Row-Crop Irrigation Science Extension and Research (RISER) program, delivered by the institute, has allowed participating producers to lower their water usage by as much as 25%. (Photo by Michaela Parker)

Veterinary medicine: CVM celebrated its 40th anniversary of training new veterinary medicine professionals in 2021. Administrators announced that the Animal Emergency and Referral Center in Flowood is expanding. Along with serving animal health needs, research funding also enabled CVM scientists to develop a COVID antibody test that won an international award in 2021. (Photo by Tom Thompson)

Soybeans: USDA has funded DAFVM soybean research over 30 years, enabling Mississippi yields to grow from an average of 26 bushels per acre in the 1990s to 54 bushels per acre in 2020, an average competitive with Iowa and other Midwestern states. MAFES researchers plant and evaluate trial plots, and MSUES agents share results and best practices with producers. CALS students benefit by learning farming techniques as they become producers, consultants, researchers, agents, or even faculty members. (Photo by Kevin Hudson)

CALS

College of Agriculture and Life Sciences

CALS agricultural and biological engineering majors are taking to land and air to study precision agriculture technologies to improve crop production, environmental sustainability, animal health, and water quality. (Photo by Dominique Belcher)

The mission of the College of Agriculture and Life Sciences (CALS) is to advance agriculture and natural resources through teaching and learning, research and discovery, and service and engagement, which will enhance economic prosperity and environmental stewardship and build stronger communities, improve the health and well-being of families, and serve people of the state, region, and world.

As one of MSU's founding colleges, CALS develops leaders by providing an inclusive environment for majors in agriculture and life science. With 17 majors and 45 concentrations, CALS offers students scholarships, hands-on experiences, and access to technologically advanced resources.

CALS continues to serve the state by training the future agriculture and life-science workforce to tackle emerging issues facing the state, nation, and world. The fall 2021 enrollment for the college is 2,563, including 2,105 undergraduate students and 458 graduate students. Students benefit from numerous partnerships that provide internships and hands-on learning, as well as networking and scholarship opportunities available through any of the 40 professional organizations within the college. Newly added online degrees and certificate programs are meeting the growing demand for distance education.

College of Agriculture and Life Sciences

▲ *Rodney Self works with poultry in the cage-free unit. The CALS poultry science major, one of the top ranked programs in the nation, prepares leaders for Mississippi's largest agricultural commodity. (Photo by David Ammon)*

- CALS introduced new online master's degrees in agribusiness management, agriculture with an animal dairy science concentration, and early intervention. These recent offerings join two existing CALS online degrees: a master's degree in food science, nutrition, and health promotion with a health-promotion concentration; and a bachelor's degree in human development and family science with a child-development concentration.

- CALS and Mississippi Gulf Coast Community College (MGCCC) created new academic opportunities for students in agricultural science and culinology. After completing 30 credit hours at MGCCC, students can be seamlessley admitted at MSU. The 4-year pathway begins with 2 years of classes at MGCCC's George County Center in Lucedale and continues with 2 years at MSU.

- CALS developed a new internship program in 2021 with the Mississippi Aquarium in Gulfport. Four CALS students educated the public about the Mississippi Gulf Coast.

- CALS landscape contracting and management students in the Department of Landscape Architecture claimed first place overall at the 2021 National Collegiate Landscape Competition.

- A CALS student in food science, nutrition, and health promotion paired with an MSU microbiology student to place third in the Research Chefs Association 2021 National Student Culinology Competition with a plant-based pizza pocket.

- MSU was named one of the Best Maker Schools in Higher Education by *Make:* magazine and *Newsweek* news organization for the Idea Shop, a partnership between the CALS School of Human Sciences and the MSU College of Business.

Top: Brett Farmers, an entomology graduate student, examines young cotton, as insects are responsible for an average annual loss of 7.7% of total crop production in the U.S., with an economic loss of $17.7 billion. (Photo by David Ammon)

Bottom: Sarah Montgomery examines a ewe at the H. H. Leveck Animal Research Center, also known as South Farm. The CALS Department of Animal and Dairy Sciences prepares graduates to work in livestock production. (Photo by Dominique Belcher)

CFR

College of Forest Resources

Forestry graduate student Darcy Collins plants trees to diversify managed forests under a preexisting canopy, and she observes and documents their growth. (Photo by David Ammon)

The mission of the College of Forest Resources (CFR) is to promote, support, and enable the management, conservation, and utilization of forest and other natural resources to benefit the stakeholders of Mississippi, the nation, and the world.

CFR is the only college in the state that offers a 4-year degree to train leaders in natural-resource management. Through four majors and 15 concentrations, students receive hands-on educational and research opportunities to become natural-resource leaders. Official CFR enrollment for fall 2021 is 573, which includes 429 undergraduate and 144 graduate students.

For the first time in CFR history, the 2020 Forestry Summer Field Program was canceled due to COVID-19. But the college hosted two sessions of the program in 2021 to prepare students for the rigors of a professional forestry degree. The 9-week program immersed students in the practice of forestry. All CFR majors are encouraged to engage in professional experiences with summer jobs or internships, and nearly 100% of students get practical experience in the field before graduation. CFR, which has more than 4,000 alumni leading conservation efforts throughout the world, an internationally renowned faculty, and exceptional students, remains a preeminent program for students interested in making a difference in the environment.

College of Forest Resources

▲ *Eliot Jones of Chattanooga, Tennessee, is majoring in forestry with a concentration in forest management. Jones, who has camped across 25 different states, hopes to use what he learns in CFR to ensure the outdoors will continue to serve future generations. (Photo by Robby Lozano)*

Left: Forestry students participate in a 9-week summer field program to gain hands-on experience. (Photo by Dominique Belcher) Right: Dr. Beth Stokes, an associate professor in the Department of Sustainable Bioproducts, examines reclaimed wood. The department teaches students how to use different wood-based materials to develop cost-effective, biodegradable, and environmentally safe products. (Photo by Michaela Parker)

- CFR has added new online master's degrees in sustainable bioproducts and wildlife, fisheries, and aquaculture conservation education. These new offerings join the forestry master's degree available online through the MSU Center for Distance Education.

- For the 4th year in a row, MSU's student chapter of the Society of American Foresters is the top chapter in the nation. MSU has won first place nine times in the last 25 years and has placed in the top three consecutively for more than two decades.

- The MSU campus is now a Bee Campus USA, a designation of the Xerces Society. The MSU Bee Campus committee, spearheaded by CFR wildlife, fisheries, and aquaculture faculty, staff, and students, provides opportunities to teach students and the community about the importance of pollinators.

- 2021 was a record year for giving, with nearly $14.8 million in gifts and pledges from donors who valued the products produced by CFR. Development and advancement are essential to programmatic sustainability and resilience. Unrestricted gifts and endowed programs grow research capacity, enhance student and faculty recruitment, and buffer challenging budgetary cycles.

- Undergraduate student research remains an important component of the CFR undergraduate experience. A study conducted in the college found that program participants increase science readiness and knowledge, discover new scientific knowledge, and are more likely to pursue graduate education and research careers.

CVM

College of Veterinary Medicine

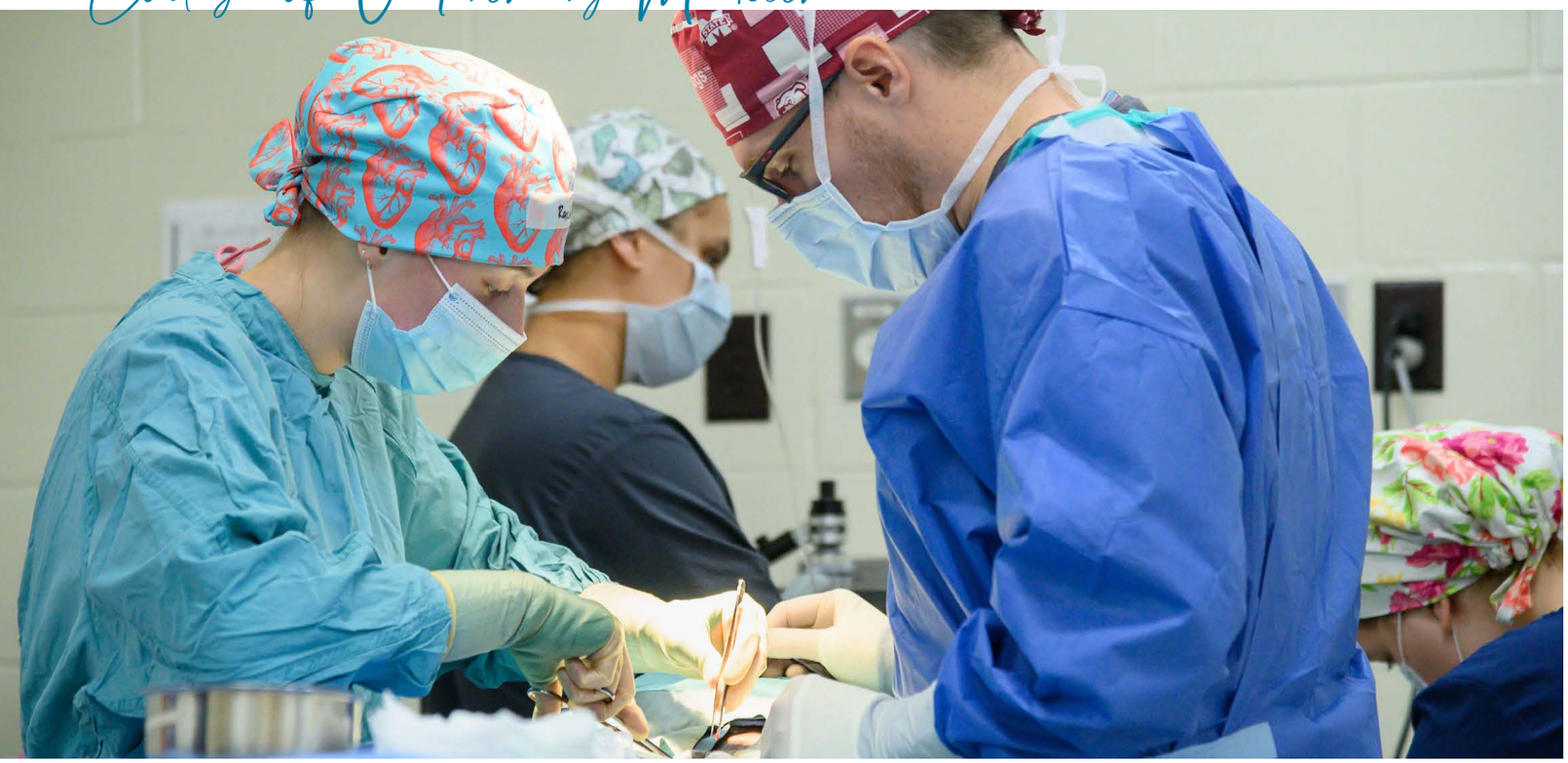
▲ *A group of Doctor of Veterinary Medicine (DVM) students prepare for their upcoming licensing exam. In the U.S. and Canada, after earning a DVM, graduates must also pass the North American Veterinary Licensure Examination (NAVLE) to practice. For the past 5 years, CVM graduates have had a NAVLE pass rate of 98%, compared to a 94% national average. (Photo by Tom Thompson)*

The mission of the College of Veterinary Medicine (CVM) is to protect and improve the health and well-being of animals and humans, while contributing to the economic development of Mississippi and surrounding regions by providing quality professional veterinary education, advancing research in veterinary and biomedical fields, and serving the community through excellent diagnostics, clinical care, and shared learning.

2021 marks the 40th anniversary of CVM's first graduating class, and the college remains committed to providing quality education, advancing research, and serving Mississippians and their animals. CVM increased enrollment and graduated a record number of veterinary medical technology students in 2021, and the college recently completed renovations to almost 20,000 square feet of clinical, laboratory, and classroom space to improve experiences for students and clients.

In 2021, clinical faculty and staff cared for more than 18,000 animals in need, and CVM's diagnostic laboratory system provided approximately 388,800 diagnostic tests and consultation services. As of early December, more than 17,000 COVID tests had been processed for MSU in one of the CVM biosafety level-2 laboratories. Studies continue, including addressing catfish and cattle vaccines, antimicrobial resistance, diabetes, and other important issues. With the $5.6 million expansion of the Animal Emergency and Referral Center in Flowood currently underway, CVM remains committed to serving our great state.

College of Veterinary Medicine



▲ *A DVM student conducts an exam on an injured barred owl brought to the college's Animal Health Center by a good Samaritan. Because CVM does not require students to select a focus area, called "tracking," graduates have a strong multispecies foundation. (Photo by Tom Thompson)*

Left: A DVM student performs a procedure under the direction of Dr. Jacob Shivley, associate clinical professor. The typical CVM graduate has completed approximately 55 surgeries. (Photo by Tom Thompson) Right: Dr. Alejandro Banda, a CVM clinical professor at the Poultry Research and Diagnostic Laboratory in Pearl, injects samples from poultry into chicken embryonated eggs to replicate avian respiratory viruses. (Photo by Tom Thompson)

- To ensure campus COVID-19 tests were processed effectively and efficiently, CVM began processing samples collected at the Longest Student Health Center in fall 2020 and continued through 2021, with more than 17,027 tests completed as of early December.

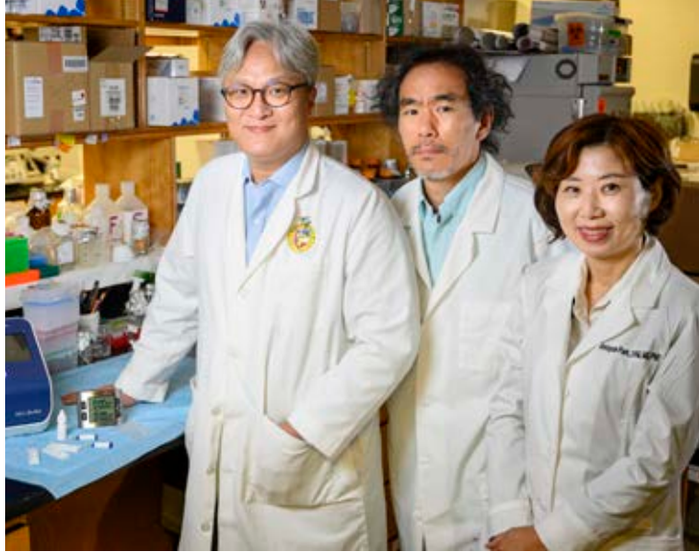
- A CVM research team's patent-pending affordable method for rapidly detecting COVID-19 neutralizing antibodies received the Innovation Award at the TechConnect World Innovation Conference and Expo in Washington, D.C.

- In 2021, CVM graduated 31 veterinary medical technology students, its largest class yet, and welcomed a new DVM class of 114. These increased class sizes help ensure the state has access to an adequate number of well-trained veterinary professionals.

- CVM's Mississippi Veterinary Research and Diagnostic Laboratory System provided more than 388,800 essential surveillance services and diagnostic tests to practicing veterinarians, individual producers, pet owners, and the livestock and poultry industries across the state, as of Nov. 30.

- Ongoing research and diagnostic testing conducted by CVM continues to have a tremendous impact on the state's economy. By the end of November, scientists at the college's Aquatic Research and Diagnostic Laboratory in Stoneville had, through consultation or testing, addressed approximately 1,000 producer requests.

Rankin County 4-H'er Abbye Buchanan received the Prudential Spirit of Service Award in Mississippi for her Red Cross Totes for Hope campaign. Organizing 4-H'ers with the Central Mississippi Hub for Volunteers and Nonprofits, she worked to gather, pack, and deliver totes full of personal-care items to veterans. (Photo by Kevin Hudson)



A CVM research team's patent-pending affordable method for rapidly detecting COVID-19 neutralizing antibodies received the Innovation Award at the TechConnect World Innovation Conference and Expo in Washington, D.C. (Photo by Tom Thompson)

Zaira E. Adams, a senior food science, nutrition, and health promotion major, presents an upscale spring lunch for campus participants. Demonstrating healthy, nutritional meals improves Mississippians' quality of life. (Photo by David Ammon)

SERVING *Our* STATE

DAFVM's six units work together in support of the state's $45.8 billion agricultural and forestry industries. MAFES researchers work to identify the best varieties and agronomic conditions for crop production. FWRC researchers focus on issues related to forestry, wildlife, natural resources, and wood products. CALS and CFR faculty, together with MSUES faculty, agents, and specialists, share best practices with producers. CVM faculty conduct research and apply their knowledge to address disease in livestock, wildlife, pets, and even humans. Our team will continue its mission to serve the people of Mississippi as we educate future professionals, conduct relevant research, and share timely information with the people who need it most.

MAFES scientists are developing precision tools to detect insect and weed pressures, as well as nutrient needs, to help farmers apply the appropriate inputs where they're needed, when they're needed. (Photo by David Garraway)

MAFES scientists work with the MSU Geosystems Research Institute to perfect precision tools that assist farmers with planting, plant population estimates, and inspection of crops and animals. (Photo by Dominique Belcher)

4-H'ers of all ages came together for the 2021 Mississippi State Fair. Services for the youth development program continued statewide with annual events like Dixie National Junior Round Up, State 4-H Club Congress, Mississippi 4-H S.A.F.E.T.Y. State Invitational, Cook-Out Contests, and 4-H summer camps. (Photo by Kevin Hudson)

MSUES

Mississippi State University Extension Service

With more than 1,000 Mississippi students participating, Fun with Geocaching in Forestry and Wildlife is one of the most popular new MSUES programs. In the scavenger-hunt outdoor game, young people focus on the environment as they learn to use GPS by using a set of clues to georeference hidden "caches." (Photo by Michaela Parker)

The Mississippi State University Extension Service (MSUES) provides research-based information, educational programs, and technology transfer focused on issues and needs of the people of Mississippi, enabling them to make informed decisions about their economic, social, and cultural well-being.

Education and service to state residents is MSUES's top priority, and, despite the challenges COVID-19 presented in 2021, MSUES continues to deliver. With one in six Mississippians receiving Extension education—online and in person—personnel logged almost half a million direct interactions showing MSUES continues to extend knowledge and change lives.

With offices in all 82 Mississippi counties, MSUES agents, specialists, and educators share education, services, programs, and activities in five major subject areas: agriculture, natural resources, 4-H youth development, family and consumer sciences, and government and community development. In-person services are complemented by social media, digital webinars, online meetings, podcast series, and our website, *extension.msstate.edu*, all of which serve Mississippians where they are.

Mississippi State University Extension Service

▲ *When producers want to diversify and expand their operations, they contact MSUES. Whether beekeeping, livestock, fertilizer, or vegetable production, MSUES agents, specialists, and faculty help clients get answers to their questions, improving yield and profitability. (Photo by Kevin Hudson)*

- Economic impacts of MSUES agricultural and natural resources outreach totaled at least $245.3 million in FY2018–19, the equivalent of supporting 4,889 jobs.

- MSUES offers row-crop producers a range of services, including information on best practices for irrigation management, variety selection, and weed and pest control for soybeans, cotton, corn, and other crops, contributing to the state's $2.6 billion industry.

- MSUES conducted COVID outreach statewide and shared educational, research-based information and materials with approximately 58,000 individual contacts in person, by phone, and online.

- Poultry production remains the state's top single agricultural industry, valued at $2.16 billion in 2020, and MSUES supports producers in every stage of the process, with programs focused on housing, flock management, and disease and pest control.

- More than 50,000 4-H'ers participated in Mississippi's youth development program, including Rankin County 4-H'er Abbye Buchanan, who received the state Prudential Spirit of Community Award for her 4-H community service benefiting local veterans.

- Elected officials from all 82 Mississippi counties participated in MSUES professional-development training, including almost 200 municipal clerks and 99 tax assessors.

- Natural resources and conservation events and activities attracted nearly 15,000 participants, many earning credits toward maintaining forestry and logging credentials.

Top: Winston County 4-H'ers were just a few of the many young people who participated in the 4-H Robotics Challenge at the Mississippi State Fair. (Photo by Kevin Hudson)

Bottom: MSUES instructor Terrence Norwood reviewed maps with Winston County Tax Assessor and Collector Darlene Bane, just one of 99 tax assessors around the state to access MSUES training services in 2021. MSUES educators worked with elected officials from every county in the state. (Photo by Kevin Hudson)

FWRC

Forest and Wildlife Research Center

▲ *FWRC faculty members, including Dr. Courtney Siegert (left), Dr. Qin Ma, Dr. Austin Himes, and Dr. Heidi Renninger, visited a hybrid poplar plantation research site in Monroe County. (Photo by David Ammon)*

The mission of the Forest and Wildlife Research Center (FWRC) is to expand, through research, the fundamental and applied knowledge upon which the forestry, forest products, and wildlife and fisheries disciplines are based; and to assist in conserving, developing, and using the forest, forest products, wildlife, and fisheries resources of Mississippi, the nation, and other countries through research, technology transfer, and other service activities.

FWRC continues to find new and innovative methods to conserve, manage, and optimize forests, forest products, wildlife, and fishery resources. With more than 200 active research projects, FWRC scientists answer pertinent natural-resource questions for landowners, biologists, and industries to help conserve, manage, sustain, and grow natural resources. FWRC sponsors research that contributes to the economic and environmental vitality of Mississippi's natural resources through advanced management and conservation.

Forestry scientists work with industries to find optimal locations to build new facilities, while also working with landowners to find new markets for timber. Sustainable-bioproducts scientists study how to expand the use of wood through products like cross-laminated timber, which improves the strength of wood used in building materials. In wildlife, fisheries, and aquaculture, FWRC scientists work to conserve wildlife and fish species, enhance waterways, and help farmers adopt economically and environmentally beneficial conservation practices on their land. FWRC scientists study the economic and ecological benefits of growing trees for biofuel production and ecosystem activities, aiming to produce better, hardier hybrid poplars and eastern cottonwoods to harvest for biomass energy.

Forest and Wildlife Research Center

▲ *Taylor Gibson, a wildlife, fisheries, and aquaculture graduate student, examines characteristics that influence artificial nest box use and reproduction in wood ducks, black-bellied whistling ducks, and hooded mergansers. (Photo submitted)*

- FWRC scientists are showing farmers how to maximize profitability and environmental stewardship simultaneously with the MSU Precision Conservation Tool, a decision-making software for farmers that identifies precise locations on their land where conservation practices are most economically beneficial.

- To help increase profits for timber producers and wood-mill consumers, FWRC scientists are developing a precision model to help timber producers better understand the impacts of market variables and streamline decision-making for forest-industry stakeholders.

- FWRC scientists are developing a bio-based material to produce graphene from wood for use in concrete production. The technology avoids the use of harsh chemicals and can potentially reduce cement usage in concrete production by up to 20%. Cement production alone contributes as much as 8% of global carbon emissions annually. The technology significantly lowers production costs, improves strength, and reduces the material's carbon footprint.

- FWRC researchers have discovered that opening hotels—"fish hotels"—for checking in on imperiled, hard-to-find aquatic species is a valuable business. Built specifically for the frecklebelly madtom catfish, the new housing aids fisheries biologists in their study of freshwater species and efforts to develop more effective conservation strategies.

Top: FWRC graduate students study the effects of the historic backwater flooding of 2019 and chronic wasting disease on the white-tailed deer population in Mississippi. (Photo submitted)

Bottom: At the many research forests around the state, FWRC staff and students examine how tree density impacts wildlife quality of life. (Photo by Robby Lozano)

MAFES

Mississippi Agricultural and Forestry Experiment Station

MAFES scientists are making discoveries to rid row crops of harmful insects. (Photo by David Ammon)

The mission of the Mississippi Agricultural and Forestry Experiment Station (MAFES) is to advance agriculture and natural resources through teaching and learning, research and discovery, and service and engagement to enhance economic prosperity and environmental stewardship, build stronger communities and improve the health and well-being of families, and serve people of the state, the region, and the world.

MAFES delivers research that improves agricultural and animal production systems, ensures food safety and quality, advances sustainable agriculture, promotes human health and well-being, and helps build sustainable communities. MSU ranks in the top 15 nationally in research and development expenditures in agricultural sciences, a direct result of work performed by MAFES scientists throughout the state. MAFES leverages state funding to generate additional economic impacts to the state. For every dollar invested in MAFES, scientists generate an additional $1.61 in additional funds.

MAFES serves as a statewide resource in 16 locations with farms where scientists conduct research applicable to regional soil types, weather, and terrain. Scientists in MAFES conduct variety trials statewide to help farmers and ranchers determine the best row crops, vegetable crops, and forages to grow in their region. Graduate research is key to finding solutions to problems faced by Mississippians. As the only state agency devoted to conducting original research to improve agricultural production, MAFES is dedicated to finding solutions that will increase agricultural yields and profits while minimizing environmental impacts. MAFES research improves health, food security, and livelihoods in Mississippi and beyond.

Mississippi Agricultural and Forestry Experiment Station

▲ *MAFES scientists study ways to protect crops from insects, which cost U.S. agricultural producers about $120 billion each year. (Photo by Kenner Patton)*

Left: In animal production systems, MAFES scientists are developing efficient, cost-effective, and humane systems that optimize environmental stewardship. (Photo by Megan Bean) Right: MAFES scientists explore different food-borne bacteria to determine their resistance to biocides and ensure proper sanitation and bacterial control. (Photo by David Ammon)

- As alluvial aquifers decline, MAFES scientists are developing best management practices in irrigation. A new water-management system installed at MSU's R.R. Foil Plant Science Research Center is being evaluated for its ability to allow quicker field drainage and subsurface irrigation.

- MAFES scientists are establishing national economic metrics for the U.S. aquaculture industry to analyze the economic viability, impact, and management measures to help producers and stakeholders now and in the future.

- MAFES scientists are perfecting precision tools to assist farmers with planting, plant population estimates, and inspection of crops and animals to ensure health. Precision tools detect insect and weed pressure, and nutrient needs. These tools help farmers apply appropriate inputs where and when they're needed.

- Working with vegetable and fruit producers to improve yields, MAFES scientists are positively impacting the agricultural industry. For example, one scientist helped a vegetable producer improve yields by 70% and increase profits by 40%. MAFES scientists are extending the growing season, limiting physical labor, and improving the yield and quality of fruits and vegetables.

- DAFVM professionals perfected the boll weevil trap and the method for eradication, thanks in large part to federal research funding. In 1960, Congress funded the Boll Weevil Research Laboratory at MSU. In 1977, a successful pilot boll-weevil eradication project laid the foundation for a national eradication program. In 2009, the boll weevil was declared eradicated from Mississippi, because of public investment in DAFVM research and Extension.

AGRICULTURE & FORESTRY'S

ECONOMIC CONTRIBUTIONS[1]

▲ *Logging, wood and paper products, and wood manufacturing generate 134,178 jobs that pay $453 million. The total industry value for these sectors was $9.8 billion with $600 million in value added. (Photo by Kevin Hudson)*

AG & FORESTRY INDUSTRIES SUPPORT STATE ECONOMY

$45.8 BILLION
generated by
direct & indirect sales

17.3% of all economic activity

264,135 JOBS

16.3% of all jobs

$11.7 BILLION
total compensation
for employees

16.3% of all wages & salaries

$18.1 BILLION
in value-added
to activities

15.2% of new wealth generated

$3.24 BILLION
total taxes
contributed

$1.05 billion food and fiber system revenues paid to state and local governments

[1]From Extension Publication 3583, "Economic Contribution of Agriculture and Forestry Production and Processing in Mississippi: An Input-Output Analysis," by Dr. James E. Henderson, professor and head, Coastal Research and Extension Center; Dr. James N. Barnes, associate Extension professor, Department of Agricultural Economics; Dr. Josh Maples, assistant professor, Agricultural Economics; Dr. Will Maples, assistant professor, Agricultural Economics; and Dr. Shaun M. Tanger, assistant professor, Coastal R&E Center

[2]Based on the most recently available USDA Economic Research Service information

"A dollar invested in agriculture turns over seven times in the economy versus manufacturing, for example, which I believe a dollar turns over four or five times."

FORMER STATE REP. JOHN CORLEY,
FARMER AND RANCHER IN LAMAR COUNTY

Agriculture and forestry are the top industries driving Mississippi's economy. In 2019 alone, agriculture and forestry accounted for **123,983 jobs paying $5.63 billion in wages and salaries**, and these sectors accounted for **$26.3 billion in sales with a value-added generation of $7.6 billion**.

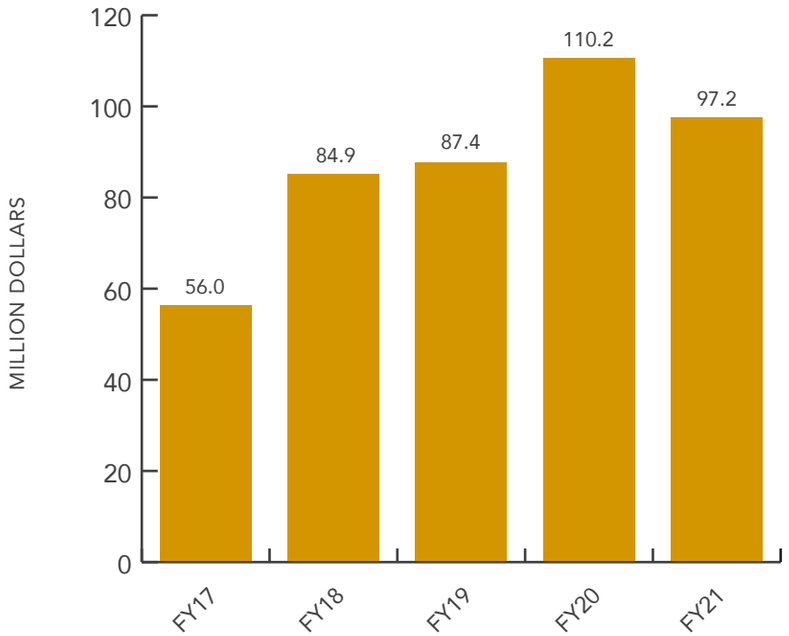
But there is a bigger picture, and DAFVM faculty members have demonstrated the total economic contribution of agricultural and forestry activities to employment and income statewide. More than half of Mississippi's almost **3 million residents** reside in 66 rural counties, and most of the state's **30 million acres of farmland, pastures, and forests** are located in rural counties.[2] There's **one agricultural or forestry employee for every six workers in the state.** These workers include farmers, loggers, foresters, and even food-service workers and community food-aid relief employees.

Top: With 43,400 Mississippi jobs in livestock production in 2019, including cattle, dairies, poultry, eggs, aquaculture, and other animal production, the industry contributed $9.8 billion to the state, including $3.4 billion in value added. Workers received $2.5 billion in wages and salaries. (Photo by Kevin Hudson)

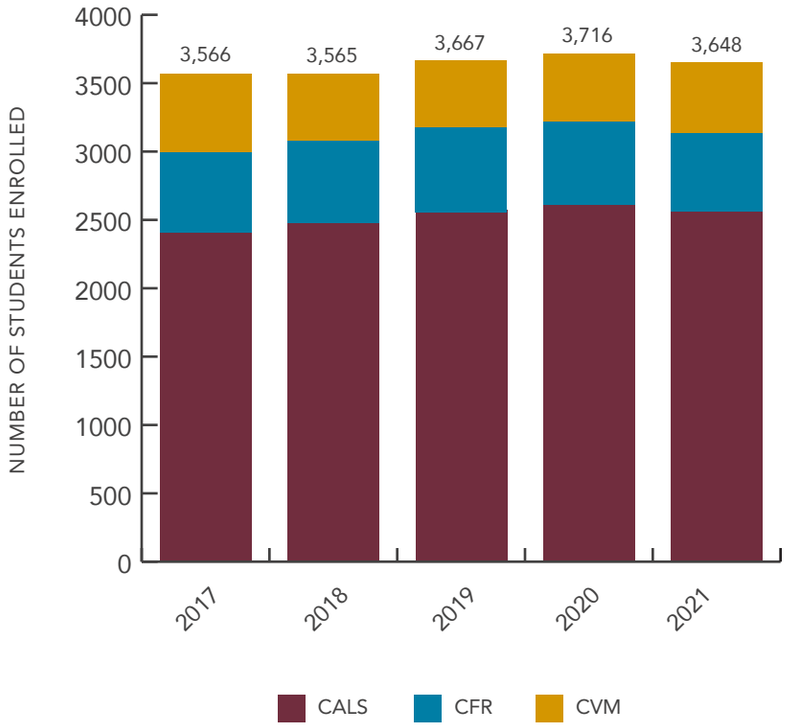
Bottom: Soybean, cotton, grain, and other types of farms contribute $2.1 billion in sales with $956 million in value added. These industries add 4,055 jobs to the state economy and $961 million in wages. (Photo by Kevin Hudson)

BUDGET OVERVIEW

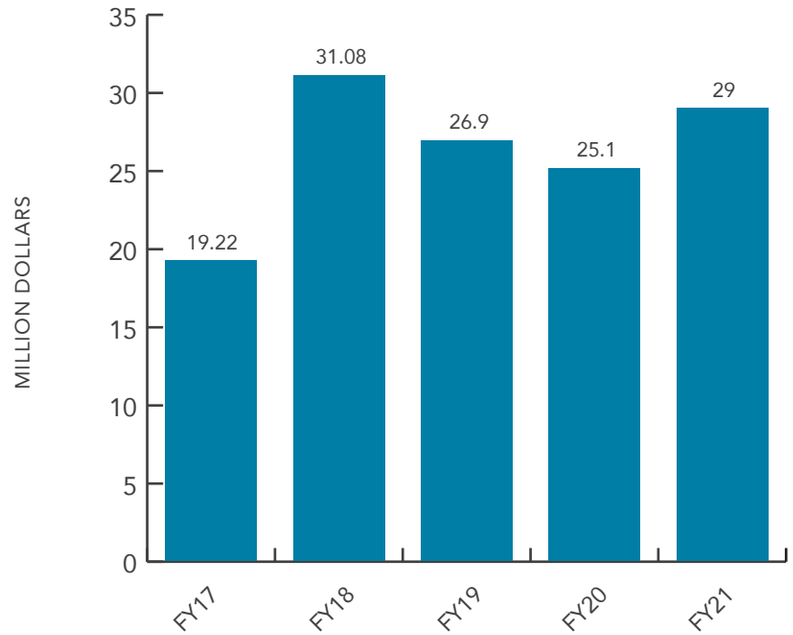
GRANTS & CONTRACTS RECEIVED



ENROLLMENT



PRIVATE CONTRIBUTIONS



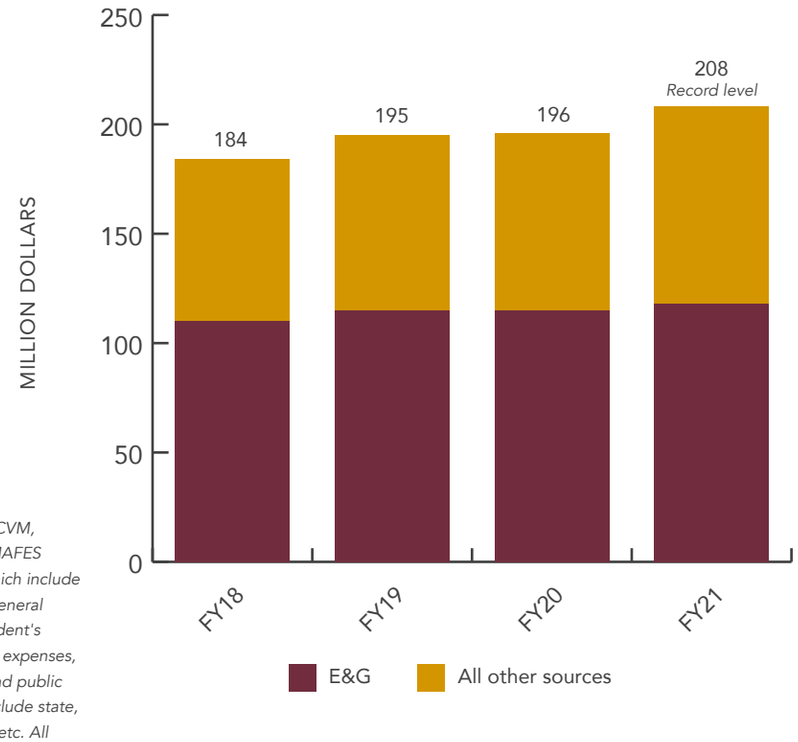
Ranked #12 Nationally

TOP 12 SINCE 1998

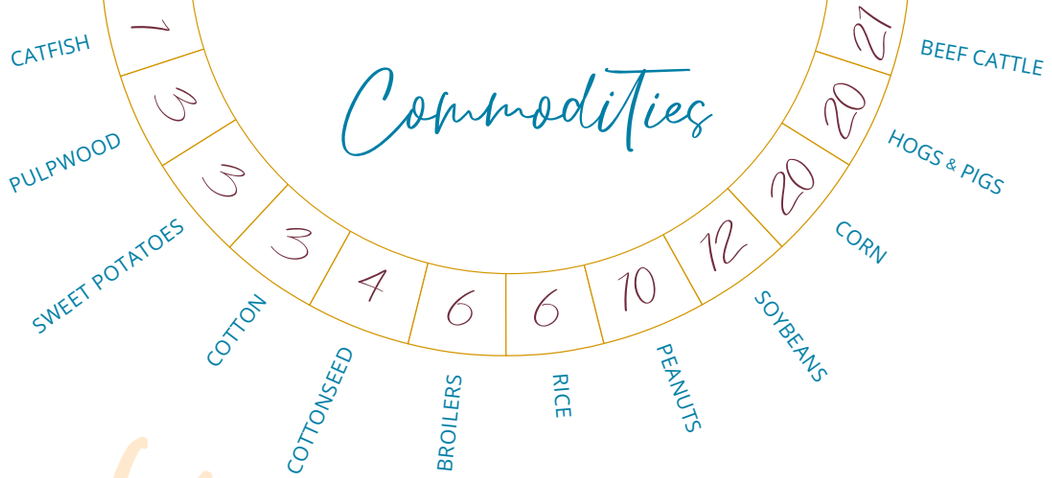
In Total Higher Education R&D Expenditures in Agricultural Sciences and Natural Resources and Conservation | FY 2019

Source: National Science Foundation Higher Education Research and Development Survey | FY 2019

TOTAL EXPENDITURES



This graph combines CVM, FWRC, MSUES, and MAFES E&G expenditures, which include the educational and general spending for each student's education and related expenses, organized research, and public service. E&G funds include state, federal, tuition, sales, etc. All other sources include restricted and designated funds.



Ranked among the TOP 21 STATES in the production of 12 AGRICULTURAL COMMODITIES

Mississippi

$8.33 BILLION

2021 *farm-gate* value of ag and forestry production *(includes government payments)*

$16.05 BILLION

2020 *value added* to the Mississippi economy by ag and forestry

$97.2 MILLION

Grants & contracts *received* by MSU in agricultural sciences and natural resources and conservation *FY 2021*

Soybean Yields
55 bushels/acre

Cotton Yields
1,150 pounds/acre

Cotton Production
1 million bales

Peanut Yields
4,100 pounds/acre

Corn Yields
185 bushels/acre

Corn Production
130 million bushels

Soybean Production Value
$1.49 billion

Forestry Production Value
$1.29 billion

Poultry Production Value
$2.65 billion

Photos by Kevin Hudson

NEW FACILITY NAMING
Opportunities

MEAT SCIENCE AND MUSCLE BIOLOGY LABORATORY

The 15,000-square-foot building includes a harvest area, demonstration area, and freezer space, as well as research laboratories and a classroom.

ANIMAL AND DAIRY SCIENCES BUILDING

This three-story building contains about 34,500 square feet of offices, conference rooms, classrooms, and labs.

POULTRY SCIENCE BUILDING/CONNECTOR

This two-story building contains 26,500 square feet of offices, conference rooms, classrooms, and labs. The ADS/Poultry Science connector is about 7,000 square feet.

If interested, contact: WILL STAGGERS 662-325-2837

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