Presentation to House Vision 2020 Committee

K-STATE 2025

Dr. Kirk Schulz, President
Kansas State University

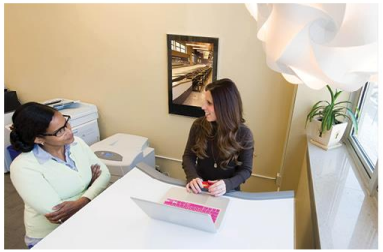
January 27, 2016

K-State 2025: Themes

Kansas State University will be recognized as one of the nation's Top 50 public research universities.

I. Research, Scholarly and Creative Activities, and Discovery

II. Undergraduate Educational Experience



III. Graduate Scholarly Experience

IV. Engagement, Extension, Outreach, and Service

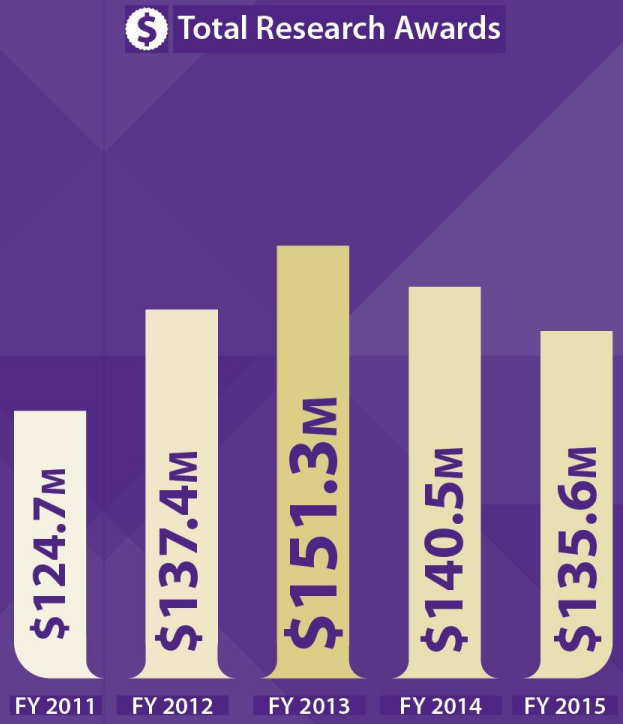
V. Faculty and Staff

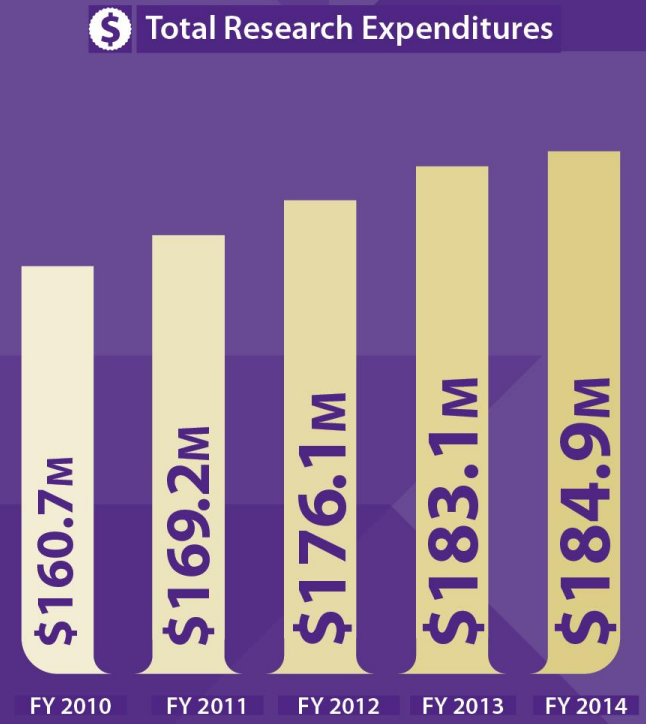
VI. Facilities and Infrastructure

VII. Athletics

KANSAS STATE UNIVERSITY

I. Research, Scholarly and Creative Activities, and Discovery: Snapshots



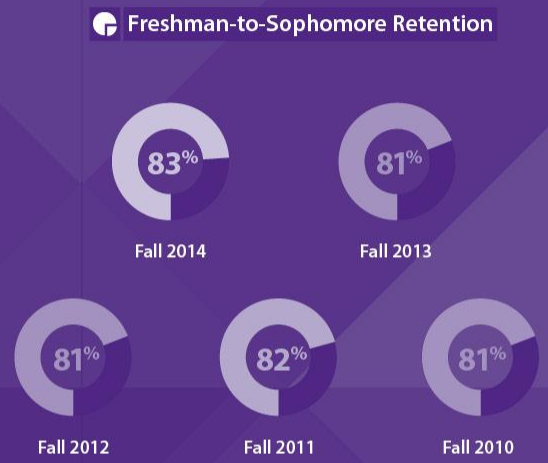


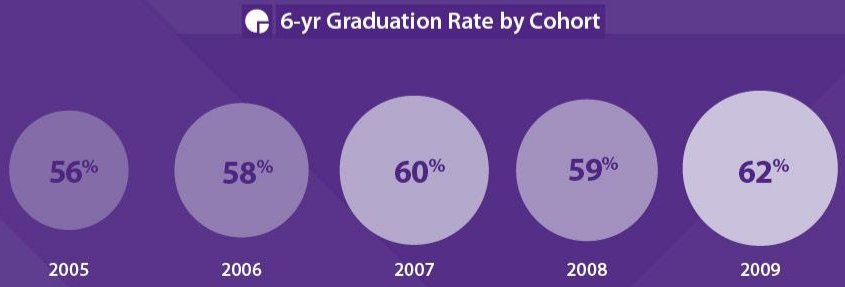
I. Research, Scholarly and Creative Activities, and Discovery

- Leverage Global Food Systems (GFS) grant to grow interdisciplinary GFS research
- Initiate university award recognizing RSCAD excellence
- Task Force on Indirect Cost Recovery Distributions

II.
III.

Undergraduate and Graduate Experience: Snapshots





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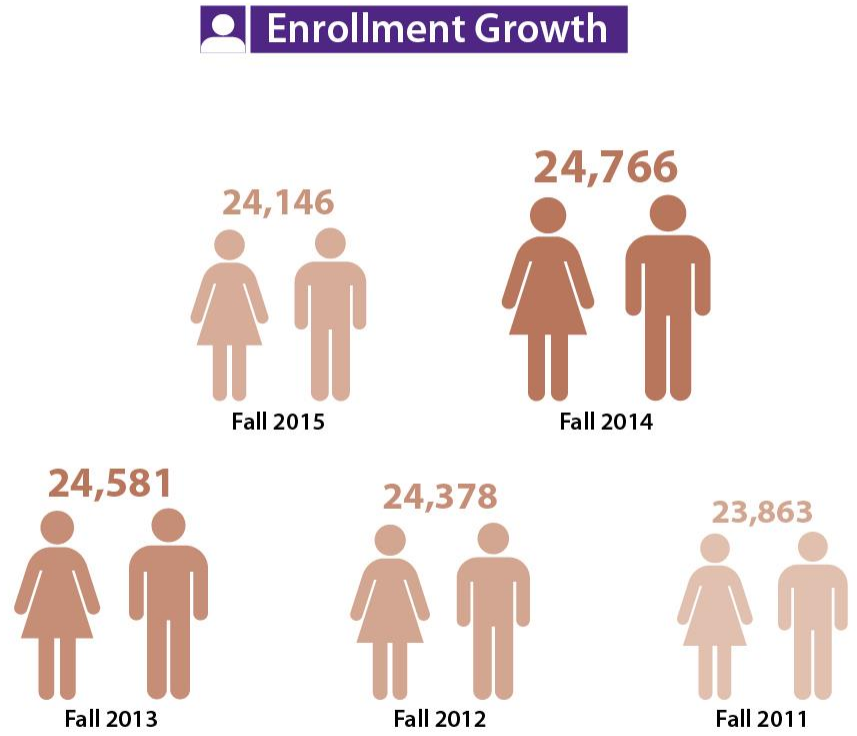
II.
III.

Undergraduate and Graduate Educational Experience

- Launch Enrollment Management Task Force
  - Craft university-wide enrollment goals for 2016-2021
  - Will address all student groups (UG and Graduate)
- Student Success Collaborative to support academic advising
- Develop GRA tuition and stipend funding strategy



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IV. Engagement, Extension, Outreach, and Service

- First tenants in new K-State Office Park:
  - Garmin International Inc.
  - U.S. Engineering
  - Veterinary and Biomedical Research Center
- 4-phase project will lead development of our north campus corridor, provide opportunities for student internships, and fuel local/regional economic growth

V.

Faculty and Staff: University Climate Survey

- First comprehensive climate survey in K-State history
- Results released in April 2015:
  - 7,411 respondents: high response rate compared to peers
  - 84 percent comfortable or very comfortable with climate at K-State
- Forums held in fall 2015 recommended needed actions to address areas for improvement
- Full report: k-state.edu/climatesurvey

V.

Faculty and Staff: Investment in our Future

- Task Force to recommend
  - New 3-year (2016-2019) K-State faculty and staff compensation improvement plan
- New automated hiring process
- Increase number of faculty and staff nominated for regional/ national awards

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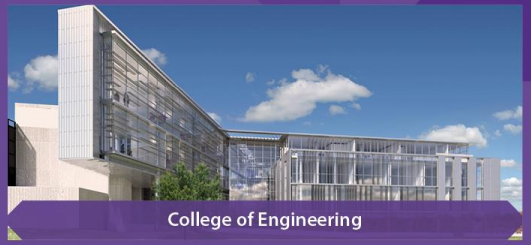
VI. Facilities and Infrastructure: Continued Investment

Wefald Residence Hall



College of Engineering

$73.3 million invested in academic facilities for FY15

Berney Family Welcome Center

$207.1 million planned investment in academic facilities for FY16

College of Business Administration

College of Architecture, Planning & Design

KANSAS STATE UNIVERSITY

VI. Facilities and Infrastructure: Space Migration

- Transparent space migration process implemented
- 2015 space migration decisions announced *k-state.edu/spacemigration*
- Second space migration outcomes to be announced by May 6

Calvin Hall
Arts & Sciences – dean's office, history, political science, security studies, general use classrooms, teaching/research computer labs

Foundation Tower
ITS, Engineering Extension, and Financial Services

Holtz Hall
Tutoring Center (from Leasure and Lafene Health Center)

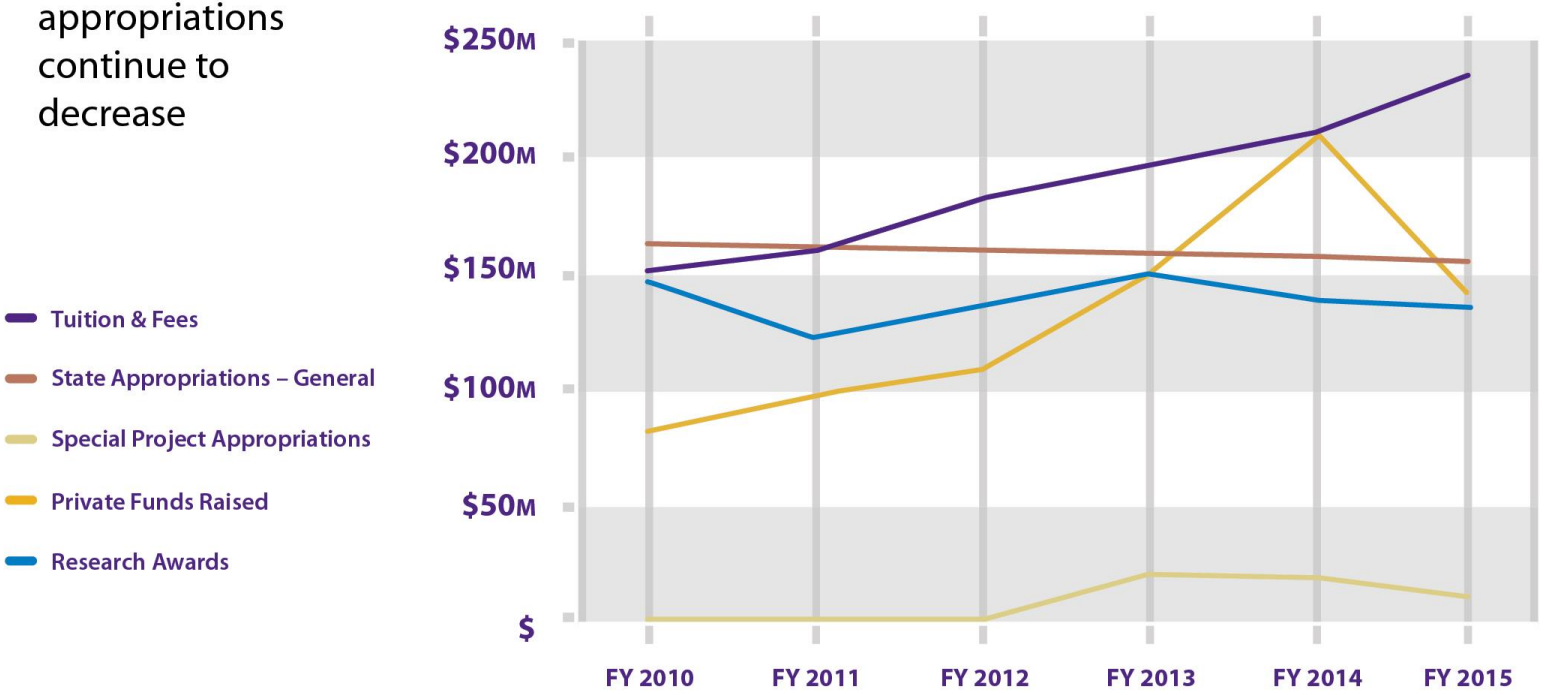
Nichols Hall
Communication Studies, School of Music, Theater, and Dance, Center for Engagement and Community Development, and Geology (use of classroom spaces)

VII. Athletics

- Coach Bill Snyder elected to the College Football Hall of Fame
- 22 All-American, 35 All-Big 12 and 125 Academic All-Big 12 selections
- Big 12-leading APR scores in five sports (FB, MGolf, VB and M/W CC)

Changing Funding Model

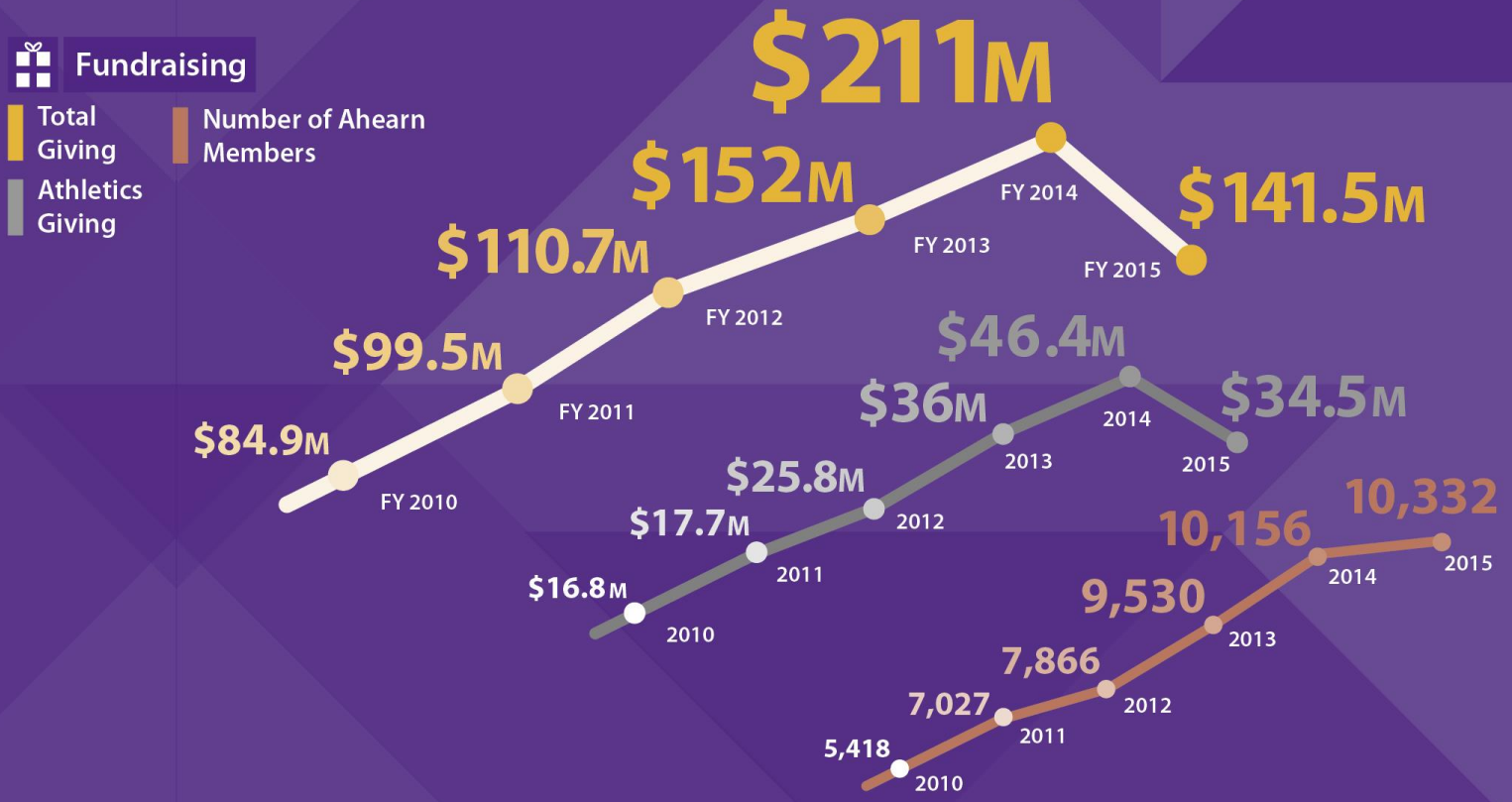
- General state appropriations continue to decrease



Key Funding Priorities

- Implementing transparent university budget request and decision-making process
  - Developed by University Budget Advisory Committee to align with 2025 priorities
  - Details at *k-state.edu/budget/fy16/about.html*
- Innovation and Inspiration

Private Giving: Snapshots



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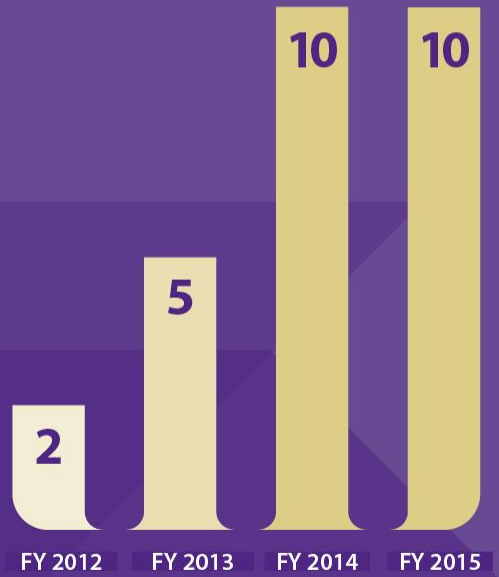
Private Giving: Increasing Endowment

Increased Endowment

Benefits K-State 2025 areas:

- Chairs
- Professorships
- Undergraduate and Graduate Scholarships

New Endowed Faculty Funds



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Adapting in Time of Change

- Future of higher education dependent on being adaptive
- Must expect continual change from both internal and external drivers
- K-State in era of major changes: changing funding models, meeting needs of students, facilities and infrastructure
- Change is hard, but necessary

Thank you for your time today and your service.

KANSAS STATE UNIVERSITY

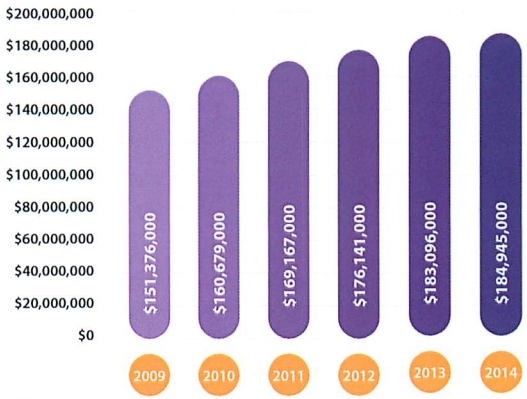
K-State Research Snapshot: Driving Innovation for Kansas

01 Research Funding and Expenditures

- K-State faculty members submitted a record $533.5 million in external funding proposals during fiscal year 2015. We received a total of $137,589,870 in awards, the third-highest amount in K-State history. **Increased external funding from federal, state and private sources drives increased research expenditures**, which are funds the university invests in salaries, equipment, project support and infrastructure.

  This investment is critical to building the knowledge base necessary to drive economic development.

- K-State's annual research expenditures have **grown 22 percent in the last six years.** Final 2015 numbers will be available in early 2016.



02 Project Highlights

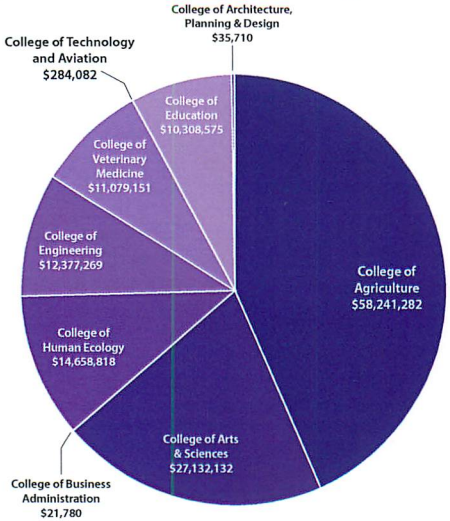
- **Innovative research programs**: K-State initiated Global Food Systems (GFS) Innovation and Water Seed Grant Programs in 2015 to encourage faculty members to **develop multidisciplinary projects that solve complex problems**, attract interest from external funders, and train graduate students. Nine awards totaling $500,000 were made to GFS teams, and four awards totaling $122,000 were made to water teams. GFS funds were from a special state allocation; water support was a strategic investment of institutional funds. **All projects in both programs focus on workforce and economic development.**

- **Undergraduate research:** As the nation's first operational land-grant university, K-State has a storied heritage of supporting undergraduate research. K-State received the state's first National Science Foundation Recognition Award for Integrating Research and Education. **K-State now trains more undergraduate researchers than ever before, enhancing workforce potential in Kansas and beyond.**

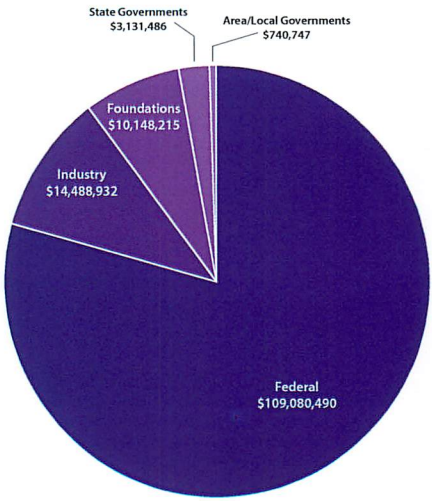
- **Animal health:** K-State is a vital member of the globally recognized Animal Health Corridor — the 300-mile corridor between Manhattan, Kansas, and Columbia, Missouri — which is home to more than 300 companies devoted to animal health. Multidisciplinary collaborations have led to development of a vaccine to protect poultry from multiple strains of avian influenza, development of pigs resistant to a devastating disease that has cost the U.S. pork industry more than $10 billion since the late 1980s, and research and policy leadership in the area of antimicrobial resistance.

- **Industry partnerships:** K-State has entered into more than 25 master agreements with industry and state government agency sponsors to streamline research projects and attract future funding. Researchers are engaging industry collaborators through inventive events such as a Petfood Innovation Workshop that drew 200 attendees to meet faculty and student researchers and participate in hands-on workshops to make pet treats.

03 External Funding by College and Source



FY 2015 Extramural Grant Dollars by College

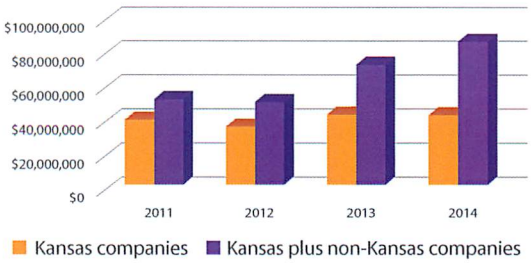


FY 2015 Extramural Grant Sources by Dollar Amount

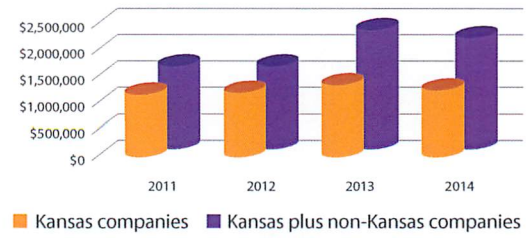
04 Research Builds Economic Growth

Private companies license technology resulting from K-State research, which translates into product sales. Licensing revenue is a return on investment that contributes to Kansas economic growth. In summer 2015, the Association of University Technology Managers indicated that **K-State research produces the 22nd most licensing revenue per active license among U.S. public research universities.**

Estimated Product Sales



Licensing Revenue

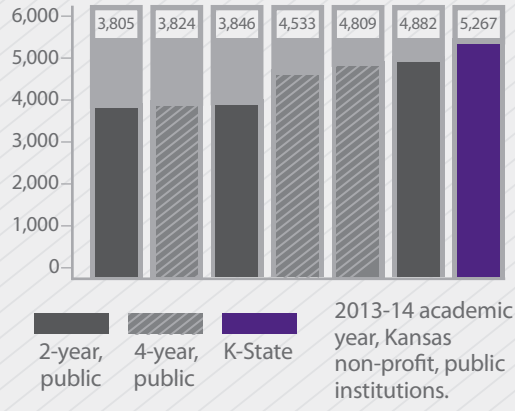


K-STATE STUDENT SNAPSHOT

AVERAGE ACT SCORES
OF INCOMING DOMESTIC FRESHMEN

2014-2015	24.9
2013-2014	24.1
2012-2013	23.9
2007-2008	23.8
2003-2004	23.6

PELL GRANT RECIPIENTS



2013-14 academic year, Kansas non-profit, public institutions.

** 2014-2015 numbers will be reviewed in early 2016.*

AVERAGE FRESHMEN GPA (CUMULATIVE)

2015	3.04
2014	2.99
2013	2.92
2012	2.93

ENROLLMENT DIVERSITY
GROWTH IN DOMESTIC, MULTICULTURAL STUDENT POPULATION

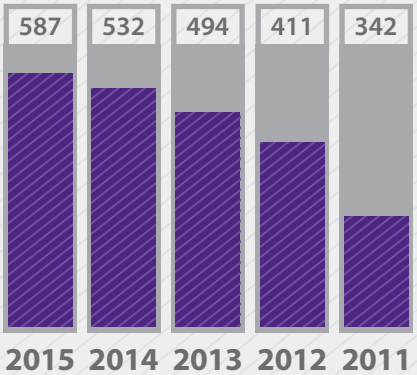
2015	3,605
2010	2,946
2005	1,976
2000	1,716

FRESHMEN RETENTION RATE

2015	83.5%
2014	83.2%
2012	81.9%
2010	81.82%

KANSAS FRESHMEN

with an ACT composite of 29 or higher and a 3.6 high school GPA.



KANSAS STATE UNIVERSITY | Vice President for Student Life

Prepared with the help of Dr. Emily Lehning, Molly McGaughey and Robert Gamez.

KANSAS STATE UNIVERSITY

The mission of Kansas State University is to foster excellent teaching, research, and service that develop a highly skilled and educated citizenry necessary to advancing the well-being of Kansas, the nation, and the international community. The university embraces diversity, encourages engagement, and is committed to the discovery of knowledge, the education of undergraduate and graduate students, and improvement in the quality of life and standard of living of those we serve.

FALL 2015 ENROLLMENT

24,146

ACADEMIC YEAR 2014-2015 ENROLLMENT
(12 MONTHS)

UNDERGRADUATE RESIDENT	17,370
UNDERGRADUATE NON-RESIDENT	4,840
TOTAL	22,210
GRADUATE RESIDENT	3,279
GRADUATE NON-RESIDENT	2,209
TOTAL	5,488
INSTITUTION TOTAL	**27,698**

DEGREES AWARDED
(2015)

ASSOCIATE	43
BACHELOR'S	3,987
MASTER'S	1,109
DOCTORAL	303
TOTAL	**5,442**

% OF GRADS EMPLOYED IN KANSAS*	17-81%
AVERAGE SALARY*	$31,630 - $83,482

STUDENT SUCCESS RATE **75.0%**

SIX-YEAR GRADUATION RATE **59%**

FALL 2014 FACULTY/STAFF

STAFF WITH FACULTY STATUS	1,762
STAFF	3,419
TOTAL	**5,181**

BUDGET

FY16 PROJECTED BUDGET BY FUNDING SOURCE

STATE APPROPRIATION	$104,804,066	14.2%
TUITION	$213,254,130	29.0%
RESTRICTED FEES FUND	$112,676,701	15.3%
FEDERAL GRANTS	$196,117,934	26.7%
ALL OTHER REVENUE	$108,830,550	14.8%
TOTAL	$735,683,381	100.0%

FY16 PROJECTED EXPENDITURES BY PROGRAM

INSTRUCTION	$200,713,485	27.3%
ACADEMIC SUPPORT	$46,162,505	6.3%
STUDENT SERVICES	$30,851,019	4.2%
INSTITUTIONAL SUPPORT	$37,277,541	5.1%
PHYSICAL PLANT/ CENTRAL SERVICES	$41,224,748	5.6%
RESEARCH	$78,894,196	10.7%
PUBLIC SERVICE	$14,691,816	2.0%
SCHOLARSHIPS & FELLOWSHIPS	$185,710,633	25.2%
AUXILIARY SERVICES	$53,239,405	7.2%
CAPITAL IMPROVEMENT/ DEBT SERVICE	$46,918,033	6.4%
TOTAL	$735,683,381	100.0%

FACILITIES
(2014)

NUMBER OF BUILDINGS	261
REPLACEMENT VALUE	$2,618,289,809
RENEWAL COST	$386,805,371

ENDOWMENT
(PRIVATE GIVING)

MARKET VALUE AS OF 6/30/2015	$488,936,000

*DEPENDING ON AWARD TYPE

KANSAS STATE UNIVERSITY
BUDGET BY PROGRAM
Fiscal Year 2015-2016

Program	Millions	% of Total
EDUCATION AND GENERAL:		
Instruction	$237.3	37.6%
Research	$165.1	26.2%
Public Service	$70.2	11.1%
Academic Support	$50.9	8.1%
Student Service	$26.9	4.3%
Institutional Support	$38.1	6.0%
Physical Plant	$42.4	6.7%
TOTAL, EDUCATION AND GENERAL	$630.9	100.0%
OTHER:		
Student Grants and Loans	$60.1	32.1%
Auxiliary Enterprises, Service Clearing & Local Agencies	$126.9	67.6%
Capital Improvements	$0.5	0.3%
TOTAL, OTHER	$187.5	100.0%
GRAND TOTAL	$818.4	

NOTE: This budget includes Main Campus, Veterinary Medical Center, and Research and Extension. The College of Technology and Aviation is included in the Main Campus budget.

KANSAS STATE UNIVERSITY
BUDGET BY FUND
Fiscal Year 2015-2016

Funding Source	Millions	% of Total
State Appropriations	$166.9	20.4%
Student Tuition	$230.4	28.2%
Hospital and Diagnostic Fees	$7.0	0.9%
Federal Land-Grant Funds	$9.9	1.2%
Gifts, Grants, Research Contracts & Other	$279.0	34.1%
Auxiliary Enterprises	$50.3	6.1%
Service Clearing	$23.5	2.9%
Local Agencies	$51.4	6.2%
TOTAL BUDGETED	$818.4	100.0%

Fall 2015 Total Enrollment **24,146**

Budgeted Full-Time Equivalent (FTE) Staff (Including Local Agency):

	Main Campus	Veterinary Medicine	Research & Extension	Total K-State
Faculty	1,514.09	108.24	217.14	1,839.47
Unclassified Professional	1,221.09	77.56	667.01	1,965.66
University Support Staff	1,304.21	156.84	223.06	1,684.11
TOTAL FTE	4,039.39	342.64	1,107.21	5,489.24

A visionary plan for
Kansas State University

2025

2014–2015 PROGRESS REPORT

K-STATE

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Photos: Division of Communications and Marketing, Tracey Bamberger, Courtney Passow, 1st Infantry Division and Fort Riley

KANSAS STATE UNIVERSITY

About Kansas State University

Mission

The mission of Kansas State University is to foster excellent teaching, research and service that develop a highly skilled and educated citizenry necessary to advancing the well-being of Kansas, the nation and the international community. The university embraces diversity, encourages engagement and is committed to the discovery of knowledge, the education of undergraduate and graduate students, and improvement in the quality of life and standard of living of those we serve.

Colleges

Agriculture; Architecture, Planning & Design; Arts & Sciences; Business Administration; Education; Engineering; Human Ecology; Technology and Aviation; and Veterinary Medicine

Graduate study

The Graduate School offers 71 master's degrees, 43 doctoral degrees and 39 graduate certificates in multiple disciplines across campus.

Extension

Kansas State University Research and Extension conducts practical research and delivers those results to improve the lives of Kansans.

Students

More than 24,100 from all 50 states and more than 100 countries

Degrees

More than 250 undergraduate majors and options

Athletics

A total of 16 men's and women's teams competing in the Big 12 Conference

Locations

Manhattan, Salina, Olathe and online

Letter from the President and the Provost and Senior Vice President

We are pleased to share with you the K-State 2025 progress report for 2014-2015. This is our fourth annual progress report since the K-State 2025 visionary plan was launched in 2011. Throughout our history as the nation's first operational public land-grant institution, students, faculty, staff, administrators, alumni, donors, partners and friends have made us the institution we are — a public student-centered research university working to build an educated citizenry on behalf of our communities, our state, our nation and the world. Today, the university embraces a bold future, pursuing excellence in education, research and service as we reach toward our goals defined in K-State 2025 for Kansas State University.

Thanks to the many dedicated people who are part of the K-State community, we continued to make progress advancing K-State 2025 goals and outcomes in all seven themes. This has once again been a record-setting year in research expenditures, overall student enrollment, student body diversity and freshman-to-sophomore retention rate. We saw significant increases in our endowment pool and the number of doctorates awarded. For the fourth consecutive year, private philanthropy exceeded $100 million. Working with the Kansas State University Foundation, we completed the "quiet" phase of our $1 billion Innovation and Inspiration campaign, raising more than $766 million over the past five years to advance our K-State 2025 vision.

We continued efforts to hold ourselves accountable and better measure our progress at all levels. We took steps to more closely align our budgeting and fundraising goals with our K-State 2025 goals and priorities. With strategic plans now in place at the college, major unit and department levels, in the coming year we will explore ways to communicate and report performance across the aligned plans.

K-Staters are working hard and working together to achieve success and answer strategic challenges along the way. We know that achieving our goals will not be easy. Adapting to a changing funding model while ensuring an affordable, outstanding educational experience for our students is just one challenge. Public institutions in our state and throughout the country face declining public funding support. Less than 20 percent of the university's operating budget now comes from the state, and the remainder of the budget comes from three sources: tuition, grants and contracts, and private philanthropic support. We are building scholarship funds, creating endowed chairs and professorships, and investing in new academic facilities, thanks in large part to the philanthropic giving of our alumni and friends.

You can follow our progress in reports, updates and other information available on the K-State 2025 website at k-state.edu/2025.

We have much to celebrate and many successes yet to come. Reflecting on the past four years, the progress forward is often remarkable. We invite your continued participation as we proceed on our path to become a Top 50 public research university by 2025.

Kirk H. Schulz
President

April C. Mason
Provost and Senior Vice President

2025

Introduction

Visionary Goal

By 2025, Kansas State University will be recognized as one of the nation's Top 50 Public Research Universities.

THE VISIONARY PLAN

In September 2011, Kansas State University launched K-State 2025, a visionary plan for the university. The result of an ambitious and inclusive planning initiative begun in 2010, the visionary plan defines us as a modern, student-centered land-grant university with a bold future. It expresses our desire to pursue excellence in all we do. It charts our path to be recognized as a Top 50 public research university by 2025.

WHY IT MATTERS

The higher education world is competitive, and prospective students, staff and faculty are keenly aware of how universities are perceived. The prestige of Kansas State University helps recruit and retain top students, faculty and staff. Friends, alumni and corporate partners supporting Kansas State University want to invest in a university they perceive as moving upward to new heights of achievement.

Today's world is also highly competitive for our graduates. As K-State 2025 goals are achieved and K-State is nationally recognized as an institution that prepares outstanding graduates through an excellent educational experience, the value of the K-State degree will increase. This helps our graduates applying for jobs and graduate schools throughout their professional lives, doctoral students searching for careers as researchers, and faculty members competing for research grants and funding.

WHERE WE STAND

This progress report highlights key activities and accomplishments during the fourth year of implementing the K-State 2025 visionary plan. Academic year 2014-15 was another record-breaking year for Kansas State University, with many advances made possible through the efforts of our faculty, staff, students, administrators, donors, alumni, and partners. With 10 more years to go to reach 2025, the university is on a path to success.

THEMATIC GOALS

- Research, Scholarly and Creative Activities, and Discovery
- Undergraduate Educational Experience
- Graduate Scholarly Experience
- Engagement, Extension, Outreach, and Service
- Faculty and Staff
- Facilities and Infrastructure
- Athletics

COMMON ELEMENTS

- Diversity
- International
- Sustainability
- Communications and Marketing
- External Constituents
- Culture
- Funding
- Technology

I. Research, Scholarly and Creative Activities, and Discovery

Goal

Create a culture of excellence that results in flourishing, sustainable and widely recognized research, scholarly and creative activities, and discovery in a variety of disciplines and endeavors that benefit society as a whole.

ACTIVITIES AND ACCOMPLISHMENTS

- Total research expenditures, a K-State 2025 benchmark metric, increased to a record $184.9 million for FY14, growing 15 percent over five years.
- Researchers submitted a record 1,656 grant proposals, and received 962 awards totaling more than $137.6 million for FY15, the third highest total in university history.
- Communication, training and support for the K-State research community was enhanced through such initiatives as RSCAD Momentum, a new weekly newsletter; a Twitter feed; an expanded research website; and improved research training through the Collaborative Institutional Training Initiative, which provides high-quality, current and peer-reviewed research and ethics training.
- The Center for the Advancement of Digital Scholarship was established to increase the visibility and reach of K-State scholarship, provide copyright consultations and support the K-REx institutional repository, New Prairie Press, Open Access and Scholarly Communication initiatives.
- The university established a course-based methodology to improve the tracking of undergraduate participation in research and scholarly and creative activities and to recognize this research on student transcripts.

For additional information, reference pages 26-29.

- Crossing Borders: An Interdisciplinary Journal of Undergraduate Scholarship, created to encourage multidisciplinary research and share the work of students with a wider community of scholars, was launched by New Prairie Press, an online imprint of K-State Libraries.
- K-State researchers are leading cutting-edge research into critical global food challenges through our four Feed the Future labs: Collaborative Research on Sorghum and Millet, Applied Wheat Genomics, Reduction of Post-Harvest Loss and Sustainable Intensification.
- Biosecurity Research Institute researchers continued their collaboration on National Bio and Agro-defense Facility-funded transition projects as construction of the new federal facility moved closer to becoming a reality with a formal groundbreaking in May 2015.
- The university's Sensory Analysis and Consumer Research Center ranked as the No. 1 program nationwide, just one example of our increasing number of research centers gaining national and international reputations for outstanding work.
- Fourteen patents for new biomedical technologies, livestock health improvement, safer pest control and more were awarded to our researchers in 2014, a 40 percent increase over our average of four to six patents a year.
- The university ranked 22nd in the nation for producing licensing revenue per active license among U.S. public research universities, and 28th in the nation for licenses and options to license per 100 disclosures according to the Association of University Technology Managers.
- Technology Acceleration Partners LLC, or TechAccel, was founded as a third-party startup company to establish partnerships with global agriculture and animal health industry leaders to address technology innovations for increasing food production, improving food quality and enhancing animal health.

LEADING THE WAY

Innovation is at the forefront for Kansas State University researchers.

Xiuzhi "Susan" Sun recently showed her biomedical invention PepGel to more than 22,500 visitors at the Smithsonian Innovation Festival in Washington, D.C. K-State was one of 20 participants invited to showcase an invention.

PepGel can quickly transform from its jelly-like state to a liquid-like state. This gives it lots of biomedical uses. As a liquid, it acts as an impenetrable container for drugs and cells to be injected into the body and then hold them in the desired location. As a gel, it lets cells grow in 3-D like they do in the body rather than in 2-D like they do in a petri dish. This means that PepGel can be used as scaffolds for tissue engineering and wound repair.

PepGel was patented in late 2014.

II. Undergraduate Educational Experience

Goal

Build a connected, diverse, empowered, engaged, participatory culture of learning and excellence that promotes undergraduate student success and prepares students for their professional, community, social and personal lives.

ACTIVITIES AND ACCOMPLISHMENTS

- The university achieved its highest freshman-to-sophomore retention rate in school history.
- The university remained the No. 1 choice among Kansas high school seniors and set records again for overall, multicultural and international student enrollments as well as freshman ACT average.
- Scholarship funding and financial assistance increased through our colleges, Global Campus and the university, including the allocation of nearly $4.5 million in institutional scholarships and need-based assistance over the past four years.
- The Kansas State University Open/Alternative Textbook Initiative, an effort to reduce textbook costs for students with investments in open source alternatives, received national attention in the report, "Open Textbooks: The Billion Dollar Solution," released by the Student Public Interest Research Groups.
- Investments in tutoring and academic advising include tools such as the new Advisor Center, which integrates the Education Advisory Board Student Success Collaborative advising platform with our student information system, providing our academic advisors for the first time with real-time analytics to help identify and assist students.
- The Office of Undergraduate Research & Creative Inquiry initiated a competitive grant program to support the expansion of undergraduate research.

For additional information, reference pages 26-29.

- "A Walk in My Shoes: First-Generation College Students," a documentary produced in our College of Education in concert with K-State's First Scholars program, aired on public television and received comments from first lady Michelle Obama, a first-generation student herself.
- Enrollment in student success programs continued to grow, with record numbers participating in K-State First, which grew from 1,453 students in 2013-14 to 1,957 this past year and by 148 percent since 2011-12.
- Our Residential Connecting Across Topics, or CAT, communities produced a 98.8 percent fall-to-spring retention rate and tripled in size during the past year. The overall number of CAT communities doubled over two years, substantially expanding our integrated living/learning community system offerings to students.
- Kansas State University continues to be first nationally among public and state universities in the number of Rhodes, Marshall, Truman, Goldwater and Udall scholarship recipients since 1986.
- The number of students studying abroad grew by 41 percent during the last four years compared to about 10 percent nationally.
- The university tripled international exchange agreements with top 150 global universities and doubled the number of students doing semester exchanges at these universities and the number of incoming exchange students.

LEADING THE WAY

Kansas State University's freshman-to-sophomore retention rate was a record for the fall 2015 semester. One reason for this success is the university's first-year experience program, K-State First.

The program helps students transition to college life and establish a foundation for their academic career at the university:

- The First-Year Seminar courses meet general education requirements and offer students greater interaction, interesting content and a smaller student-teacher ratio.
- Several Connecting Across Topics learning communities give first-year students with similar interests the opportunity to live and learn together with mentoring from a professor and an experienced undergraduate learning assistant.
- The K-State Book Network, the common book reading program, provides opportunities for freshmen students to connect both inside and outside the classroom.
- The Guide to Personal Success program offers first-year students one-on-one mentoring with a faculty or staff member, graduate student or alumnus.

III. Graduate Scholarly Experience

Goal

Advance a culture of excellence that attracts highly talented, diverse graduate students and produces graduates recognized as outstanding in their respective professions.

ACTIVITIES AND ACCOMPLISHMENTS

- The number of doctorate degrees awarded, a K-State 2025 benchmark metric, increased for the second consecutive year from 166 to 190 and by 17 percent overall since 2011-12.
- Funding support to graduate students was enhanced through efforts of the colleges and the Graduate School, including the new Presidential Doctoral Scholarship Program to assist with recruitment of outstanding doctoral applicants in interdisciplinary studies; the Marie R. Bonebrake Graduate Award; and the Arts, Humanities and Social Sciences Small Grant Program to support direct research costs for graduate students in their final year.
- Three new graduate certificate programs were established to meet the needs of today's professionals: Leadership Dynamics for Adult Learners; Social Justice Education; and Dialogue, Deliberation and Public Engagement.
- The Graduate School made changes to further advance graduate programs, increase efficiencies and improve communication, including modifications to our online application and admissions system, dashboards to provide real-time data to graduate programs and departments, an enhanced website, and two associate deans — focusing on enrollment management and student services and on academics and research.
- Career development activities for graduate students were expanded with 27 professional development workshops and the initiation of a Dissertation Writing Retreat.
- An inaugural graduate student alumni reunion reconnected these alumni with the Graduate School, academic departments and the university.

For additional information, reference pages 26-29.

LEADING THE WAY

Graduate student Courtney Passow, pictured center, is taking her research to international levels.

Passow, doctoral candidate in biology, spent part of summer 2015 interacting with Nobel laureates in physics, physiology, medicine and chemistry. She was one of 672 young scientists selected worldwide to attend the prestigious Lindau Nobel Laureate Meeting in Lindau, Germany.

While at the meeting, Passow networked with Nobel laureates, graduate students and postdoctoral researchers to learn how to develop her own research.

Passow is studying the underlying physiological and genetic mechanisms of adaptation to natural stressors. She focuses on Poecilia mexicana, a small live-bearing fish that lives in the presence and absence of hydrogen sulfide, a natural toxicant. Her major professor is Michael Tobler, assistant professor of biology.

For her academic and research achievements, Passow also received the university's 2015 Sarachek award, which helped her attend and present her research at the Ecological and Evolutionary Genomics Gordon Research Conference in Biddeford, Maine.

IV. Engagement, Extension, Outreach, and Service

Goal

Be a national leader and model for a re-invented and transformed public research land-grant university integrating research, education and engagement.

ACTIVITIES AND ACCOMPLISHMENTS

- Funded by the state of Kansas, the Global Food Systems Innovation Grants program was launched as part of the university's Global Food Systems Initiative, awarding $500,000 in its first year to faculty members involved in nine projects using multidisciplinary approaches to address some of the world's global food systems challenges while helping to create jobs and wealth for the state.
- The Launch a Business Program, in its second year providing courses, research and mentorship to new ventures in Kansas, expanded its assistance to 14 startup businesses, and the Kansas Business Climate Index was launched — all by K-State's Center for the Advancement of Entrepreneurship.
- Engagement with the military, soldiers, veterans and military families expanded through partnerships with the U.S. Army, Navy and Air Force through K-State Research and Extension, with the Institute for Health and Security of Military Families, and 4-H Military Partnerships.
- Six new distance education programs were established to serve online students, including two graduate certificates, a master's degree, two minors, a bachelor's degree and an undergraduate certificate.
- A record 584 students received K-State degrees via distance education, reinforcing the importance of distance education to growing numbers of students.
- The university joined the National Council for State Authorization Reciprocity Agreements, or SARA, a national initiative that establishes standards for postsecondary distance education courses and programs with the goal to make it easier for students to take online courses from institutions outside their home state.

For additional information, reference pages 26-29.

- Engagement with Australian partner governmental research institutions and universities continued to expand with a multimillion-dollar, international project funded by the Plant Biosecurity Cooperative Research Centre to explore unmanned aerial systems as an efficient method to detect pest insects and diseases in food crops before outbreaks occur.
- A new School for Applied and Interdisciplinary Studies was approved by the Kansas Board of Regents for K-State Olathe, and expanding corporate partnerships and innovative research at our Olathe campus was recognized at the first Ingenuity Central event.
- The Kansas State University Bulk Solids Innovation Center in Salina opened as a one-of-a-kind facility in North America studying the science of bulk solids material handling.
- The K-State Confucius Institute was launched in partnership with Jilin University, a leading national research university in China.
- The first corporate tenants for the new K-State Office Park in Manhattan were announced.
- Alumni engagement grew as the K-State Alumni Association retained the No. 1 ranking in the Big 12 for the 19th consecutive year for the percentage of graduates who are members, established Wabash CannonBall events in Houston and Denver, and enhanced programming for our international students and graduates.

LEADING THE WAY

Kansas State University is leading collaborations with area military institutions to provide services to military personnel and develop programs that can be shared nationwide.

Briana Nelson Goff, director of the Institute for the Health and Security of Military Families at K-State's College of Human Ecology, studies the effects of post-traumatic stress and other critical issues experienced by military service members. The institute provides research, outreach, training and clinical service programs to support the health and well-being of military personnel and their families.

Through a newly acquired partnership with the Walter Reed Foundation, Goff has helped the institute conduct four military and veteran couples retreats in the U.S. starting December 2015.

With continuing leadership and success, the institute will expand military outreach programs to other regions of the country.

Goff, also a professor in the School of Family Studies and Human Services, received the university's 2015 Excellence in Engagement award for her contributions to the university and community.

V. Faculty and Staff

Goal

Foster a work environment that encourages creativity, excellence and high morale in faculty and staff, responds to changing needs, embraces diversity, values communication and collaboration and is respectful, trusting, fair and collegial for all.

ACTIVITIES AND ACCOMPLISHMENTS

- The first university climate survey of faculty, staff and students was completed with 84 percent of the 7,411 participants reporting being comfortable or very comfortable with the university environment. Action planning began to address areas for improvement.
- Ten new endowed faculty funds were established in FY15 through private giving, bringing the total to 27 created over the past four years.
- The university completed the second year of a three-year compensation improvement plan to advance our goal for competitive compensation for faculty and staff, leading to an 8.9 percent increase in average salary for tenured/tenure-track faculty.
- The number of faculty in full-time positions, professor to instructor, increased by 45 between FY12 and FY15.
- More faculty engaged in international study abroad experiences, with a 50 percent growth in faculty-led proposals over the past four years and, for the first time, faculty-led experiences from every college.
- The university hosted its first Australian Fulbright scholars through its Oz-to-Oz program, including John Pluske, a distinguished Fulbright chair in agriculture and life sciences, and Lachlan Philpott, one of Australia's leading commercial playwrights.
- University human resource services were reorganized and consolidated within the new Division of Human Capital Services, with a new leadership team, a new website and new initiatives to improve services and our capacity to recruit and retain outstanding faculty and staff.

For additional information, reference pages 26-29.

- With broad involvement of university stakeholders, a compensation strategy was developed to provide a compass for future compensation/total rewards programs.
- A job analysis survey was completed by 85 percent of the university's unclassified professionals and university support staff to support the development of position descriptions and associated compensation structures.
- Major progress was made toward improving the efficiency and effectiveness of our recruitment and hiring processes, including the establishment of a talent acquisition team, the completion of a highly successful Kaizen initiative, the implementation of new hiring toolkits and the purchase of our first automated applicant tracking and hiring system.
- The university developed and began implementation of new policies that expand the professional titles available for use by non-tenure track faculty.
- The Center for Advocacy, Response and Education expanded its services, providing confidential advocacy to any K-State student, faculty or staff member impacted by sexual, domestic or dating violence, stalking or sexual harassment.
- The K-State Postdoctoral Association was established to support postdoctoral students engaged in research at K-State.
- The K-State Student Employee of the Year award was inaugurated to honor and recognize the important contributions made by student employees.

LEADING THE WAY

Kansas State University is home to many leading scholars, a number of whom are named endowed chairs. Endowed positions enable faculty like Roger McHaney and others to remain innovators in their field and recognize teaching excellence.

McHaney is the Daniel D. Burke chair for exceptional faculty, university distinguished teaching scholar and professor of management. His ongoing research includes studies on how social media is affecting business and higher education, distance learning techniques, online deception in business, business simulation applications and development of online training simulations. He's developing techniques to improve learning through distance education.

McHaney's work has led to international recognition, including multiple invited lectures around the world, publications in several of the nation's top business and education journals, as well as being named K-State's 2006-2007 Coffman Chair for University Distinguished Teaching Scholars.

VI. Facilities and Infrastructure

Goal

Provide facilities and infrastructure that meet our evolving needs at a competitive level with benchmark institutions and are an asset to recruit and retain quality students, faculty, researchers and staff.

ACTIVITIES AND ACCOMPLISHMENTS

- The university invested $73.3 million in academic facilities in FY15 with $207.1 million planned for investment in FY16.
- A collaborative campuswide planning effort with the city of Manhattan and broad stakeholder involvement is helping develop a North Campus Master Plan for anticipated growth and capital investment in the North Campus Corridor.
- Planning for the Seaton Complex revitalization for our College of Architecture, Planning & Design continued, given a boost by the vote of the college's Student Advisory Council to increase student fees for four years to raise additional funds for the project.
- The Purple Masque Theatre moved into the renovated West Stadium, providing a student-centered experimental theatre and learning environment for drama therapy, acting and directing, student showcases, play readings, Ebony Theatre productions and more.
- Progress continued on construction of the new $40 million wing to the engineering complex, which is set to open for spring 2016 classes, as well as the new College of Business Administration building to be completed summer 2016.
- Construction began on the new Berney Family Welcome Center in East Stadium, the new Jon Wefald residence hall, expanded dining center, expansion and renovation of the K-State Student Union, and the chilled water plant expansion project.
- Approximately 85,000 square feet of space being vacated due to new construction was strategically reallocated to better meet university needs through a formal, transparent planning process.

For additional information, reference pages 26-29.

- Classroom and lab space were enhanced through renovations in Cardwell Hall, Fiedler Library Student Success Center, Lafene Health Center, Mosier Hall, Throckmorton Hall, Trotter Hall, Waters Hall and on the Salina campus.
- The learning environment for performing arts students was significantly enhanced as our School of Music, Theatre, and Dance was named an All-Steinway School, a designation held by fewer than 200 schools in the world, and a reminder that the tools and equipment our students use are as important as our buildings.
- K-State Libraries completed two migrations with the move of its integrated library system to a new cloud-based system with enhanced online search tools and features and the transfer of 330,000 volumes from a University of Kansas storage facility to the K-State Libraries annex in Manhattan, providing patrons and researchers with quicker access to materials.

LEADING THE WAY

A modern theatre facility has taken the stage among West Stadium's original 1920s stonework.

The Purple Masque Theatre has moved from East Stadium, which it called home since 1974, to a specially renovated facility in West Stadium.

The new student-centered facility functions as an experimental theatre and learning environment. It is used for drama therapy, acting and directing, student showcases, play readings, workshops, Ebony Theatre performances and more.

Recent performances at the new theatre have included "No Exit," "American Tet" and an evening of the one-act plays "Laundry and Bourbon" and "Lonestar." The theatre is an incubator for new play development and contributes to the research, scholarly and creative activity of the School of Music, Theatre, and Dance.

The $6 million relocation of the Purple Masque Theatre has made room for the university's new Berney Family Welcome Center, which is under construction at East Stadium.

VII. Athletics

Goal

Strengthen the interconnectivity between intercollegiate athletics and the campus community, prepare our student-athletes for success in school, in sport and after graduation, and benefit our university, community and state.

ACTIVITIES AND ACCOMPLISHMENTS

- Five sports — football, men's golf, volleyball, men's cross country and women's cross country — led the Big 12 in Academic Progress Rating scores — and all programs remain well above this NCAA standard.
- Our student-athletes continue to lead on and off the field, with 22 All-American, 35 All-Big 12 and 125 Academic All-Big 12 selections.
- The Vanier Football Complex, the third phase of the Bill Snyder Family Stadium Master Plan, was completed, doubling space for student-athletes and coaches and providing an academic learning center; strength, conditioning, training and recovery areas; a team theater and meeting rooms; and improved north-end seating and fan amenities.
- The Ahearn Fund, K-State's national fund for student athlete excellence, reached 10,333 members, achieving record membership for the sixth year in a row and a more than 90 percent increase since 2010.
- Total athletics giving reached $34.5 million in FY15.
- With the elimination of direct university funding support as a source of revenue, a multiyear plan is underway to eliminate indirect funding for utility payments for athletics facilities by the end of FY16.
- Coach Bill Snyder was elected to the College Football Hall of Fame, recognizing his significant contributions to the sport and to our university.

For additional information, reference pages 26-29.

- The Staley School of Leadership Studies, in partnership with K-State Athletics, launched the Snyder Leadership Legacy Fellows program, which honors Coach Bill Snyder's leadership legacy by engaging students in a meaningful leadership development experience.
- The Pride of Wildcat Land, the Kansas State University Marching Band, received the prestigious 2015 Sudler Trophy, which is given every two years to recognize a marching band that excels in musical standards and has made important contributions to the advancement of performance standards over a number of years.

LEADING THE WAY

Wisdom from a hall of fame football coach is now the focus of a leadership development program for a select group of Kansas State University students.

The Snyder Leadership Legacy Fellows program, created by the university's Staley School of Leadership Studies in partnership with K-State Athletics, is based on head football coach Bill Snyder's 16 goals for success and is being used to develop students as effective leaders on campus, in their communities and beyond.

The inaugural class has 37 fellows, all in their final year of undergraduate studies at K-State, who were selected based on their demonstrated leadership skills and potential.

During the 2015-2016 school year, Snyder fellows are taking part in a variety of leadership development workshops, activities and events based on the coach's 16 goals.

Measuring our Progress

The vision of K-State 2025 requires an institutional commitment to planning and holding ourselves accountable at all levels.

Realizing the vision of K-State 2025 requires an institutional commitment to planning and holding ourselves accountable at all levels. With the launch of the visionary plan four years ago, we began building a sustainable framework to enable doing just that.

Beginning in fall 2012, we initiated an effort to align all college and major unit and associated departmental plans to the K-State 2025 visionary plan. Today, our academic colleges, major units and associated departments have defined their K-State 2025 goals, activities and measurable outcomes in completed plans available online. With the completion of these plans, K-State 2025 is supported not just by a university strategic plan, but also by nearly 100 plans that together define where we are going and how we get there.

Defining these plans, however, is not enough. We took steps in the past year to more closely align our internal budgeting processes and our fundraising goals with the K-State 2025 plans. With strategic plans now in place, we will look at new ways to communicate and report progress across the aligned plans.

Measuring and reporting progress is integral to holding ourselves accountable. Eight key metrics and seven comparison universities were chosen early in the planning process to measure our progress toward our visionary goal to become a Top 50 public research university by 2025. Three additional comparison universities were added more recently. These universities and the data for the most recent rankings from the Center for Measuring University Performance at Arizona State University are shown beginning on page 21.

Kansas State University has ranked between 80 and 85 in most categories compared with other public research universities based on a simple average. The university will need to continue making progress against a very competitive set of schools — all of which are working to increase their national rank and stature at the same time.

These national measures are important, but not the only measures of our success. Reflecting on the past four years, remarkable progress has been made. We have reached all-time highs in total research expenditures and freshman-to-sophomore retention rates. Our endowment pool has grown, we hired our first National Academy member, the number of doctorates awarded has increased, and our six-year graduation rate is seeing upward movement. We are providing students with a wider range of learning opportunities to be successful in their academic, professional and civic lives. We are taking a lead in helping solve challenges to our global food systems. We are investing in academic facilities and in our faculty and staff.

We will continue to measure our progress annually, consider unanticipated challenges and unexpected opportunities, adjust when needed, and be accountable to achieving our future for 2025.

OUR BENCHMARKS

- Total research and development expenditures
- Endowment pool
- Number of National Academy members
- Number of faculty awards
- Number of doctorates granted annually
- Freshman-to-sophomore retention rate
- Six-year graduation rate
- Percent of undergraduate students involved in research

OUR PEERS

Land-grant institutions without medical schools:

- Auburn University
- Clemson University
- Colorado State University
- Iowa State University
- Louisiana State University, Baton Rouge
- North Carolina State University, Raleigh
- Oklahoma State University, Main Campus
- Oregon State University
- University of Massachusetts, Amherst
- Washington State University

Benchmarks of Excellence

(Based on the most recent data available)

Institution	Total Research Development Expenditures[b]			
	FY 2010	FY 2011	FY 2012	FY 2013
Kansas State University	$160,679,000	$169,167,000	$176,141,000	$183,096,000
Auburn University	$145,115,000	$163,335,000	$133,013,000	$147,229,000
Clemson University	$174,693,000	$166,350,000	$142,096,000	$154,444,000
Colorado State University	$302,896,000	$330,784,000	$375,919,000	$313,238,000
Iowa State University	$250,120,000	$267,641,000	$260,995,000	$266,596,000
Louisiana State University, Baton Rouge	$289,872,000	$287,841,000	$285,395,000	$283,400,000
North Carolina State University, Raleigh	$360,795,000	$378,154,000	$404,225,000	$417,468,000
Oklahoma State University, Main Campus	$147,094,000	$162,786,000	$166,523,000	$134,500,000
Oregon State University	$216,595,000	$228,814,000	$240,507,000	$232,677,000
University of Massachusetts, Amherst	$169,143,000	$181,297,000	$194,775,000	$190,739,000
Washington State University	$304,352,000	$388,974,000	$335,930,000	$341,082,000

a. from IPEDS Data Center - most recent available comparative data

b. from NSF 2015 annual report - most recent available

c. from NACUBO annual report - most recent available

d. does not include DVM or other "first professional" degrees

e. from National Academies membership lists - accessed 7/20/2015 (http://www.nationalacademies.org/)

f. from ASU "Top American Research Institutions" 2014 provisional data - most current

Benchmarks of Excellence (Cont.)

(Based on the most recent data available)

Institution	Endowment Pool [c]				National Academy Members [e]				Faculty Awards [f]			
	FY 2011	FY 2012	FY 2013	FY 2014	2012	2013	2014	2015	2010	2011	2012	2013
Kansas State University	$337,460,000	$329,240,000	$364,675,000	$473,987,000	1	1	1	1	9	5	2	3
Auburn University	$471,851,000	$461,727,000	$522,145,000	$621,106,000	2	1	1	1	5	4	3	1
Clemson University	$473,748,000	$482,866,000	$528,697,000	$623,262,000	1	2	1	1	6	6	6	4
Colorado State University	$221,231,000	$225,362,000	$245,887,000	$284,495,000	5	5	5	8	7	4	5	8
Iowa State University	$612,283,000	$604,897,000	$673,515,000	$777,018,000	9	7	4	4	10	5	11	10
Louisiana State University, Baton Rouge	$672,790,000	$665,764,000	$721,198,000	$788,020,000	2	3	2	3	2	3	5	5
North Carolina State University, Raleigh	$617,632,000	$635,326,000	$769,404,000	$885,055,000	17	19	19	18	11	14	12	14
Oklahoma State University, Main Campus	$681,744,000	$675,030,000	$817,625,000	$904,893,000	3	3	3	2	3	5	4	3
Oregon State University	$411,964,000	$403,606,000	$443,826,000	$511,427,000	4	4	4	4	7	7	15	8
University of Massachusetts, Amherst	$529,262,000	$565,092,000	$664,240,000	$757,473,000	9	9	11	8	8	6	8	12
Washington State University	$722,717,000	$737,409,000	$777,628,000	$868,091,000	9	9	7	7	8	6	9	8

	Doctorates Granted [a, d]				Freshman-to-Sophomore Retention [a]				Six-year Graduation Rate by Cohort [a]			
	2010 – 2011	2011 – 2012	2012 – 2013	2013 – 2014	Fall 2010	Fall 2011	Fall 2012	Fall 2013	2005	2006	2007	2008
	162	162	158	166	81%	82%	81%	83%	56%	58%	60%	59%
	204	247	237	249	87%	89%	89%	91%	66%	68%	68%	71%
	192	220	187	216	89%	90%	92%	92%	80%	82%	83%	82%
	203	235	230	230	83%	83%	86%	85%	64%	63%	64%	65%
	358	394	349	347	86%	88%	87%	86%	68%	71%	68%	69%
	255	322	305	345	84%	84%	82%	85%	62%	65%	67%	67%
	395	446	488	494	88%	89%	83%	93%	72%	71%	74%	75%
	187	212	238	241	78%	80%	79%	81%	62%	62%	60%	61%
	172	206	204	186	83%	81%	84%	84%	61%	61%	61%	63%
	258	268	295	287	89%	89%	89%	90%	67%	70%	73%	75%
	197	203	268	260	82%	84%	80%	80%	67%	67%	65%	67%

Top Public Research Universities

Key Benchmark Rankings of Kansas State University and Peer Comparison Institutions*

Institution	Total Research Development Expenditures Control Rank **			Endowment Pool Control Rank **		
	2009	2010	2011	FY 2010	FY 2011	FY 2012
Kansas State University	75	71	71 ⬍⬍	76	75	78 ⬎
Auburn University	77	79	73	61	59	57
Clemson University	68	78	83	57	53	53
Colorado State University	42	44	43	97	95	95
Iowa State University	54	50	50	42	41	43
Louisiana State University, Baton Rouge	45	47	47	47	68	70
North Carolina State University, Raleigh	26	32	33	43	40	40
Oklahoma State University, Main Campus	87	75	72	45	57	58
Oregon State University	61	59	55	63	63	67
University of Massachusetts, Amherst	71	68	67	68	98	92
Washington State University	46	46	37	46	34	32

*Based on Arizona State University – Measuring University Performance: Top American Research Universities Annual 2013 report data.

At the time of publication of this annual report, the Top American Universities 2014 report was not yet available. This ranking chart will be updated with fourth year rankings at k-state.edu/2025 once 2014 report rankings information is released.

** Control rank refers to rank among all public research universities.

Are in the Top 25

Are in the Top 50

For additional information, reference pages 26-29.

	National Academy Members Control Rank **			Faculty Awards Control Rank **			Doctorates Granted July 1 to June 30 Control Rank **		
	2010	2011	2012	2010	2011	2012	2009 – 2010	2010 – 2011	2011 – 2012
	137	137	136 ▲	46	67	122 ▼	83	75	81 ▼
	79	78	99	77	87	101	61	63	53
	98	100	81	69	59	64	70	67	62
	57	57	58	60	87	73	60	64	57
	38	44	49	44	67	35	38	35	34
	79	78	81	126	105	73	39	51	41
	30	31	30	37	28	30	23	31	26
	65	63	65	99	67	84	58	69	65
	61	63	65	60	52	21	69	71	71
	38	38	46	53	59	54	43	50	48
	38	38	37	37	59	44	71	65	68

K-State 2025 Progress Report for 2014–2015

I. Research, Scholarly and Creative Activities, and Discovery

Goal: Create a culture of excellence that results in flourishing, sustainable and widely recognized research, scholarly and creative activities, and discovery in a variety of disciplines and endeavors that benefit society as a whole.

Activities and Accomplishments

- Total research expenditures, a K-State 2025 benchmark metric, increased to a record $184.9 million for FY14, growing 15 percent over five years.
- Researchers submitted a record 1,656 grant proposals, and received 962 awards totaling more than $137.6 million for FY15, the third highest total in university history.
- Communication, training and support for the K-State research community was enhanced through such initiatives as RSCAD Momentum, a new weekly newsletter; a Twitter feed; an expanded research website; and improved research training through the Collaborative Institutional Training Initiative, which provides high-quality, current and peer-reviewed research and ethics training.
- The Center for the Advancement of Digital Scholarship was established to increase the visibility and reach of K-State scholarship, provide copyright consultations and support the K-REx institutional repository, New Prairie Press, Open Access and Scholarly Communication initiatives.
- The university established a course-based methodology to improve the tracking of undergraduate participation in research and scholarly and creative activities and to recognize this research on student transcripts.
- Crossing Borders: An Interdisciplinary Journal of Undergraduate Scholarship, created to encourage multidisciplinary research and share the work of students with a wider community of scholars, was launched by New Prairie Press, an online imprint of K-State Libraries.
- K-State researchers are leading cutting-edge research into critical global food challenges through our four Feed the Future labs: Collaborative Research on Sorghum and Millet, Applied Wheat Genomics, Reduction of Post-Harvest Loss and Sustainable Intensification.
- Biosecurity Research Institute researchers continued their collaboration on National Bio and Agro-defense Facility-funded transition projects as construction of the new federal facility moved closer to becoming a reality with a formal groundbreaking in May 2015.
- The university's Sensory Analysis and Consumer Research Center ranked as the No. 1 program nationwide, just one example of our increasing number of research centers gaining national and international reputations for outstanding work.
- Fourteen patents for new biomedical technologies, livestock health improvement, safer pest control and more were awarded to our researchers in 2014, a 40 percent increase over our average of four to six patents a year.
- The university ranked 22nd in the nation for producing licensing revenue per active license among U.S. public research universities, and 28th in the nation for licenses and options to license per 100 disclosures according to the Association of University Technology Managers.
- Technology Acceleration Partners LLC, or TechAccel, was founded as a third-party startup company to establish partnerships with global agriculture and animal health industry leaders to address technology innovations for increasing food production, improving food quality and enhancing animal health.

Expected Outcomes by 2015

- Increased intellectual and financial capital to support RSCAD.
- More clusters/centers of collaborative RSCAD focus.
- Increased funding for investigator-based research, research centers and graduate training grants.
- Tuition waivers for all GRAs.
- Competitive compensation and support available to GRAs, GTAs and GAs.
- Enhanced and systematic approach for undergraduate research.
- Successful recruitment, retention, evaluation, compensation and rewards strategies in place to support RSCAD needs.
- Enhanced visibility and appreciation for RSCAD.

Expected Outcomes by 2020

- Intellectual and financial capital in place for expanded RSCAD efforts.
- Greater proportion of nationally and internationally recognized award-winning faculty in RSCAD programs.
- Nationally and internationally recognized research centers.
- Recognized for prominent and productive placement of our graduates.
- Increased participation by undergraduates in expanded opportunities in research.

Expected Outcomes by 2025

- Fifty nationally recognized Kansas State University researchers, a high proportion of whom are members of their National Academies.
- Extramural funding competitive with our benchmark institutions.
- Research and development expenditures competitive with benchmark institutions.
- Competitive amongst our peers in the percentage of undergraduates involved in research.

II. Undergraduate Educational Experience

Goal: Build a connected, diverse, empowered, engaged, participatory culture of learning and excellence that promotes undergraduate student success and prepares students for their professional, community, social and personal lives.

- The university achieved its highest freshman-to-sophomore retention rate in school history.
- The university remained the No. 1 choice among Kansas high school seniors and set records again for overall, multicultural and international student enrollments as well as freshman ACT average.
- Scholarship funding and financial assistance increased through our colleges, Global Campus and the university, including the allocation of nearly $4.5 million in institutional scholarships and need-based assistance over the past four years.
- The Kansas State University Open/Alternative Textbook Initiative, an effort to reduce textbook costs for students with investments in open source alternatives, received national attention in the report, "Open Textbooks: The Billion Dollar Solution," released by the Student Public Interest Research Groups.
- Investments in tutoring and academic advising include tools such as the new Advisor Center, which integrates the Education Advisory Board Student Success Collaborative advising platform with our student information system, providing our academic advisors for the first time with real-time analytics to help identify and assist students.
- The Office of Undergraduate Research & Creative Inquiry initiated a competitive grant program to support the expansion of undergraduate research.
- "A Walk in My Shoes: First-Generation College Students," a documentary produced in our College of Education in concert with K-State's First Scholars program, aired on public television and received comments from first lady Michelle Obama, a first-generation student herself.
- Enrollment in student success programs continued to grow, with record numbers participating in K-State First, which grew from 1,453 students in 2013-14 to 1,957 this past year and by 148 percent since 2011-12.
- Our Residential Connecting Across Topics, or CAT, communities produced a 98.8 percent fall-to-spring retention rate and tripled in size during the past year. The overall number of CAT communities doubled over two years, substantially expanding our integrated living/learning community system offerings to students.
- Kansas State University continues to be first nationally among public and state universities in the number of Rhodes, Marshall, Truman, Goldwater and Udall scholarship recipients since 1986.
- The number of students studying abroad grew by 41 percent during the last four years compared to about 10 percent nationally.
- The university tripled international exchange agreements with top 150 global universities and doubled the number of students doing semester exchanges at these universities and the number of incoming exchange students.

- Excellent, customized academic advising and services available to all students to support their success and degree completion.
- Engaged students benefiting from high-impact educational practices used by excellent faculty and staff across the university.
- Increased participation by undergraduates in expanded opportunities for meaningful research.
- Successful integration of undergraduate education and meaningful research is standard practice.
- Effective evaluation practices that recognize and reward teaching, advising and lifelong learning/professional development.
- Effective system in place that supports and promotes teaching excellence.
- Successful recruitment and retention strategies that address our entire student population.
- Improved six-year graduation rates and retention ratios.

- Integrated learning communities experienced by students, faculty and staff that promote student success within a culture of excellence.
- Excellent reputation for high quality teaching and advising that prepares students for their professional, community, social and personal lives.
- Superior and diverse faculty recognized for teaching excellence.
- All undergraduate students engaged in a diversity of experiences that expand their viewpoint.
- Increased undergraduate contributions in the creation of scholarship through research.
- Ongoing improvement of six-year graduation rates and retention ratios.

- An undergraduate educational experience recognized as one of the best among the nation's Top 50 public research universities.
- Faculty teaching and advising awards comparable to benchmark institutions.
- Freshman-to-sophomore retention ratios comparable to benchmark institutions.
- Six-year graduation rates comparable to benchmark institutions.

III. Graduate Scholarly Experience

Goal: Advance a culture of excellence that attracts highly talented, diverse graduate students and produces graduates recognized as outstanding in their respective professions.

- The number of doctorate degrees awarded, a K-State 2025 benchmark metric, increased for the second consecutive year from 166 to 190 and by 17 percent overall since 2011-12.
- Funding support to graduate students was enhanced through efforts of the colleges and the Graduate School, including the new Presidential Doctoral Scholarship Program to assist with recruitment of outstanding doctoral applicants in interdisciplinary studies; the Marie R. Bonebrake Graduate Award; and the Arts, Humanities and Social Sciences Small Grant Program to support direct research costs for graduate students in their final year.
- Three new graduate certificate programs were established to meet the needs of today's professionals: Leadership Dynamics for Adult Learners; Social Justice Education; and Dialogue, Deliberation and Public Engagement.
- The Graduate School made changes to further advance graduate programs, increase efficiencies and improve communication, including modifications to our online application and admissions system, dashboards to provide real-time data to graduate programs and departments, an enhanced website, and two associate deans — focusing on enrollment management and student services and on academics and research.
- Career development activities for graduate students were expanded with 27 professional development workshops and the initiation of a Dissertation Writing Retreat.
- An inaugural graduate student alumni reunion reconnected these alumni with the Graduate School, academic departments and the university.

- Competitive compensation and support available for GRAs, GTAs and GAs.
- Tuition waivers for all GRAs.
- Engaged graduate students integrated in university life with enhanced visibility and appreciation.
- Outstanding mentoring for our graduate students.
- Expectation of excellence for the graduate scholarly experience.
- Increased capacity to secure funding for graduate research and teaching.
- Broader spectrum and greater overall number of courses offered at the graduate level and especially at the Ph.D. level.
- Expanded partnerships with industry and government to provide high-level learning and experiential training opportunities for graduate students.

- Increased participation by our graduate students in unique high-level learning and experiential training.
- Expanded reputation for outstanding graduates with the critical skill sets needed to excel in their careers in a global environment.
- Increased funding for graduate research and teaching.
- Increased number of nationally and internationally recognized award-winninggraduate faculty.
- Increased number of doctorates awarded.

- National and international reputation for outstanding graduates with demonstrable career success.
- World-class reputation as a preferred destination for outstanding graduate students.
- Stable funding for graduate research and teaching competitive with benchmark institutions.
- Doctorates awarded comparable to benchmark institutions.

IV. Engagement, Extension, Outreach, and Service

Goal: Be a national leader and model for a re-invented and transformed public research land-grant university integrating research, education and engagement.

Activities and Accomplishments

- Funded by the state of Kansas, the Global Food Systems Innovation Grants program was launched as part of the university's Global Food Systems Initiative, awarding $500,000 in its first year to faculty members involved in nine projects using multidisciplinary approaches to address some of the world's global food systems challenges while helping to create jobs and wealth for the state.
- The Launch a Business Program, in its second year providing courses, research and mentorship to new ventures in Kansas, expanded its assistance to 14 startup businesses, and the Kansas Business Climate Index was launched — all by K-State's Center for the Advancement of Entrepreneurship.
- Engagement with the military, soldiers, veterans and military families expanded through partnerships with the U.S. Army, Navy and Air Force through K-State Research and Extension, with the Institute for Health and Security of Military Families, and 4-H Military Partnerships.
- Six new distance education programs were established to serve online students, including two graduate certificates, a master's degree, two minors, a bachelor's degree and an undergraduate certificate.
- A record 584 students received K-State degrees via distance education, reinforcing the importance of distance education to growing numbers of students.
- The university joined the National Council for State Authorization Reciprocity Agreements, or SARA, a national initiative that establishes standards for postsecondary distance education courses and programs with the goal to make it easier for students to take online courses from institutions outside their home state.
- Engagement with Australian partner governmental research institutions and universities continued to expand with a multimillion-dollar, international project funded by the Plant Biosecurity Cooperative Research Centre to explore unmanned aerial systems as an efficient method to detect pest insects and diseases in food crops before outbreaks occur.
- A new School for Applied and Interdisciplinary Studies was approved by the Kansas Board of Regents for K-State Olathe, and expanding corporate partnerships and innovative research at our Olathe campus was recognized at the first Ingenuity Central event.
- The Kansas State University Bulk Solids Innovation Center in Salina opened as a one-of-a-kind facility in North America studying the science of bulk solids material handling.
- The K-State Confucius Institute was launched in partnership with Jilin University, a leading national research university in China.
- The first corporate tenants for the new K-State Office Park in Manhattan were announced.
- Alumni engagement grew as the K-State Alumni Association retained the No. 1 ranking in the Big 12 for the 19th consecutive year for the percentage of graduates who are members, established Wabash CannonBall events in Houston and Denver, and enhanced programming for our international students and graduates.

Expected Outcomes by 2015

- Enhanced integration between academics and student service learning.
- Increased participation by undergraduates in expanded opportunities for meaningful engagement experiences.
- Increased recognition of our services as a source of expertise, information and tools for disciplines worldwide.
- Increased numbers and diversity of faculty and staff participating inengagement.
- Increased extramural funding for engagement initiatives at the local, state, national and international level.
- Recognition as leaders in engagement within our state and nation.
- Enhanced visibility and appreciation for engagement and its interconnectedness with research and education within our university.

Expected Outcomes by 2020

- Exposure on a national level as a leader/partner engaged in significant social, political, health, economic and environmental issues.
- All undergraduate students engaged in at least one engagement/service learning project.
- Increased number of graduate students involved in engagement.
- Increased appreciation by K-State graduates for lifelong involvement in engagement and service.
- Increased capacity to respond to emergencies worldwide.
- Preferred destination for faculty, staff and students who value engagement as integral to their academic and personal lives.

Expected Outcomes by 2025

- Nationally recognized as a leader in and model for a re-invented and transformed land-grant university integrating research, education and engagement.
- Nationally and internationally recognized as a leader in engagement on a global scale.
- Recognized as a leader in engagement, reaching both rural and urban communities.

V. Faculty and Staff

Goal: Foster a work environment that encourages creativity, excellence and high morale in faculty and staff, responds to changing needs, embraces diversity, values communication and collaboration and is respectful, trusting, fair and collegial for all.

Activities and Accomplishments

- The first university climate survey of faculty, staff and students was completed with 84 percent of the 7,411 participants reporting being comfortable or very comfortable with the university environment. Action planning began to address areas for improvement.
- Ten new endowed faculty funds were established in FY15 through private giving, bringing the total to 27 created over the past four years.
- The university completed the second year of a three-year compensation improvement plan to advance our goal for competitive compensation for faculty and staff, leading to an 8.9 percent increase in average salary for tenured/tenure-track faculty.
- The number of faculty in full-time positions, professor to instructor, increased by 45 between FY12 and FY15.
- More faculty engaged in international study abroad experiences, with a 50 percent growth in faculty-led proposals over the past four years and, for the first time, faculty-led experiences from every college.
- The university hosted its first Australian Fulbright scholars through its Oz-to-Oz program, including John Pluske, a distinguished Fulbright chair in agriculture and life sciences, and Lachlan Philpott, one of Australia's leading commercial playwrights.
- University human resource services were reorganized and consolidated within the new Division of Human Capital Services, with a new leadership team, a new website and new initiatives to improve services and our capacity to recruit and retain outstanding faculty and staff.
- With broad involvement of university stakeholders, a compensation strategy was developed to provide a compass for future compensation/total rewards programs.
- A job analysis survey was completed by 85 percent of the university's unclassified professionals and university support staff to support the development of position descriptions and associated compensation structures.
- Major progress was made toward improving the efficiency and effectiveness of our recruitment and hiring processes, including the establishment of a talent acquisition team, the completion of a highly successful Kaizen initiative, the implementation of new hiring toolkits and the purchase of our first automated applicant tracking and hiring system.
- The university developed and began implementation of new policies that expand the professional titles available for use by non-tenure track faculty.
- The Center for Advocacy, Response and Education expanded its services, providing confidential advocacy to any K-State student, faculty or staff member impacted by sexual, domestic or dating violence, stalking or sexual harassment.
- The K-State Postdoctoral Association was established to support postdoctoral students engaged in research at K-State.
- The K-State Student Employee of the Year award was inaugurated to honor and recognize the important contributions made by student employees.

Expected Outcomes by 2015

- Total compensation competitive with aspirant university and regional employers for faculty and staff in high-priority areas.
- Efficient, effective and integrated university human resources processes and services that place employees in the right positions with the right skill sets at the right time.
- Careerlong learning recognized by the university and its employees as a shared value and responsibility.
- Effective evaluation processes that results in accountable faculty and staff with a clear understanding of their job expectations and how they contribute to the university's mission.

Expected Outcomes by 2020

- Total compensation competitive with aspirant university and regional employers for all employees.
- Faculty and staff current with developments in their fields and the skills needed to achieve excellence in performing their jobs.
- Successful recruitment and retention of a talented and high-performing diverse workforce.

Expected Outcomes by 2025

- Talented, high-performing, diverse workforce recognized for excellence.
- Award-winning faculty and researchers.
- Stable funding available for recruitment and retention of top-level faculty and staff.
- Optimal number of faculty and staff comparable with benchmark institutions.

VI. Facilities and Infrastructure

Goal: Provide facilities and infrastructure that meet our evolving needs at a competitive level with benchmark institutions and are an asset to recruit and retain quality students, faculty, researchers and staff.

- The university invested $73.3 million in academic facilities in FY15 with $207.1 million planned for investment in FY16.
- A collaborative campuswide planning effort with the city of Manhattan and broad stakeholder involvement is helping develop a North Campus Master Plan for anticipated growth and capital investment in the North Campus Corridor.
- Planning for the Seaton Complex revitalization for our College of Architecture, Planning & Design continued, given a boost by the vote of the college's Student Advisory Council to increase student fees for four years to raise additional funds for the project.
- The Purple Masque Theatre moved into the renovated West Stadium, providing a student-centered experimental theatre and learning environment for drama therapy, acting and directing, student showcases, play readings, Ebony Theatre productions and more.
- Progress continued on construction of the new $40 million wing to the engineering complex, which is set to open for spring 2016 classes, as well as the new College of Business Administration building to be completed summer 2016.
- Construction began on the new Berney Family Welcome Center in East Stadium, the new Jon Wefald residence hall, expanded dining center, expansion and renovation of the K-State Student Union, and the chilled water plant expansion project.
- Approximately 85,000 square feet of space being vacated due to new construction was strategically reallocated to better meet university needs through a formal, transparent planning process.
- Classroom and lab space were enhanced through renovations in Cardwell Hall, Fiedler Library Student Success Center, Lafene Health Center, Mosier Hall, Throckmorton Hall, Trotter Hall, Waters Hall and on the Salina campus.
- The learning environment for performing arts students was significantly enhanced as our School of Music, Theatre, and Dance was named an All-Steinway School, a designation held by fewer than 200 schools in the world, and a reminder that the tools and equipment our students use are as important as our buildings.
- K-State Libraries completed two migrations with the move of its integrated library system to a new cloud-based system with enhanced online search tools and features and the transfer of 330,000 volumes from a University of Kansas storage facility to the K-State Libraries annex in Manhattan, providing patrons and researchers with quicker access to materials.

- Responsive, timely and strategic facilities services aligned with campus operational needs as well as future planning and implementation.
- Adequate temporary space to house programs and staff impacted by renovations of existing facilities.
- Robust and reliable information technology ensuring business continuity and consistent with the achievement of the highest-quality levels of support for research, instruction, student services and administration.

- Adequate office space for all K-State employees equipped to support their work and productivity.
- Efficient, reliable and cost-effective central and building utilities with the capacity for expansion as needed to support campus needs and guarantee the safety, comfort and integrity of our research, animal and human environments.
- Enhanced campus community experience and collaborative learning and working environments promoted by facilities that support multidisciplinary work and integrated interaction between students, faculty, researchers, staff and administrators.

- High-quality, technology-enabled, flexible and adaptable classroom space appropriate to the evolving needs of the learning environment and readily available to faculty and students.
- High-quality research laboratories and specialty spaces that enhance research and scholarly activities.
- Well-maintained buildings, utilities, information technology infrastructure and grounds consistent with the expectations and image of a highly ranked land-grant research and teaching institution.
- An excellent campus community experience supported by facilities and landscapes that enhance social interaction, learning and collaboration.
- Signature facilities that promote collaborative learning and working environments; multidisciplinary work; and integrated interaction among students, faculty, researchers, staff and administrators.

VII. Athletics

Goal: Strengthen the interconnectivity between intercollegiate athletics and the campus community, prepare our student-athletes for success in school, in sport and after graduation, and benefit our university, community and state.

- Five sports — football, men's golf, volleyball, men's cross country and women's cross country — led the Big 12 in Academic Progress Rating scores — and all programs remain well above this NCAA standard.
- Our student-athletes continue to lead on and off the field, with 22 All-American, 35 All-Big 12 and 125 Academic All-Big 12 selections.
- The Vanier Football Complex, the third phase of the Bill Snyder Family Stadium Master Plan, was completed, doubling space for student-athletes and coaches and providing an academic learning center; strength, conditioning, training and recovery areas; a team theater and meeting rooms; and improved north-end seating and fan amenities.
- The Ahearn Fund, K-State's national fund for student athlete excellence, reached 10,333 members, achieving record membership for the sixth year in a row and a more than 90 percent increase since 2010.
- Total athletics giving reached $34.5 million in FY15.
- With the elimination of direct university funding support as a source of revenue, a multiyear plan is underway to eliminate indirect funding for utility payments for athletics facilities by the end of FY16.
- Coach Bill Snyder was elected to the College Football Hall of Fame, recognizing his significant contributions to the sport and to our university.
- The Staley School of Leadership Studies, in partnership with K-State Athletics, launched the Snyder Leadership Legacy Fellows program, which honors Coach Bill Snyder's leadership legacy by engaging students in a meaningful leadership development experience.
- The Pride of Wildcat Land, the Kansas State University Marching Band, received the prestigious 2015 Sudler Trophy, which is given every two years to recognize a marching band that excels in musical standards and has made important contributions to the advancement of performance standards over a number of years.

- Outstanding academic and athletic success by our student-athletes.
- Enhanced learning environments and relationships promoted by facilities and integrated activities that support interaction between students, student-athletes and the campus community.
- Enhanced integration between academics and athletics.
- Increased support for academics through athletics.
- Exposure on a national and global level withunique branding that highlights the academic/athletic success of our student-athletes.

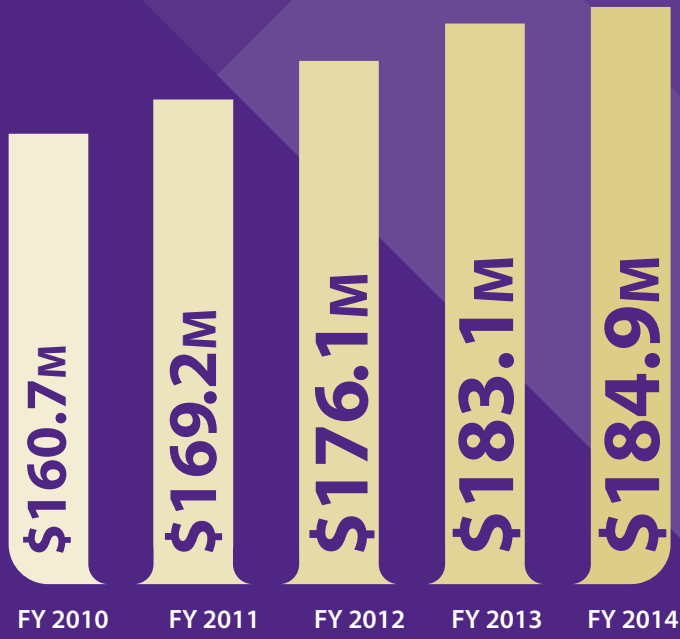
- A world class student-athlete experience.
- Outstanding student athletes prepared to excel in their chosen careers and community and personal lives.
- Increased funding for total endowment.

- National reputation for a world class student-athlete experience.
- Recognized leader in integrating academics and athletics.
- World class facilities at all levels.
- Sustained funding for student athlete scholarships.

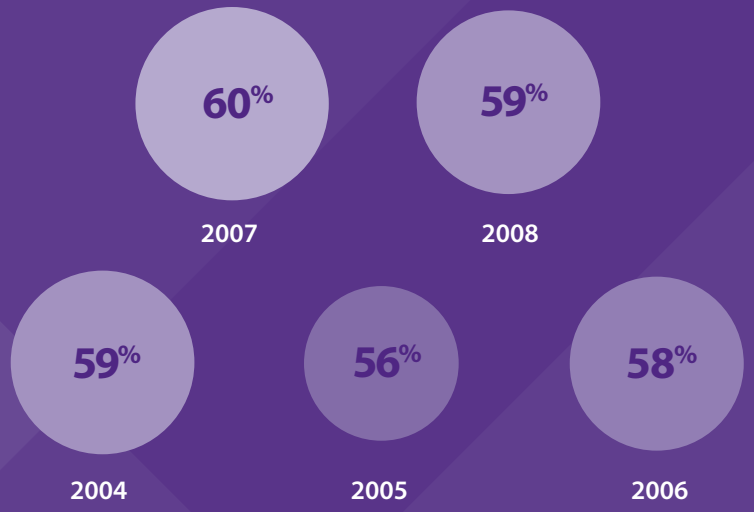
K-State 2025: Snapshots of Success

Freshman-to-Sophomore Retention

Total Research Expenditures

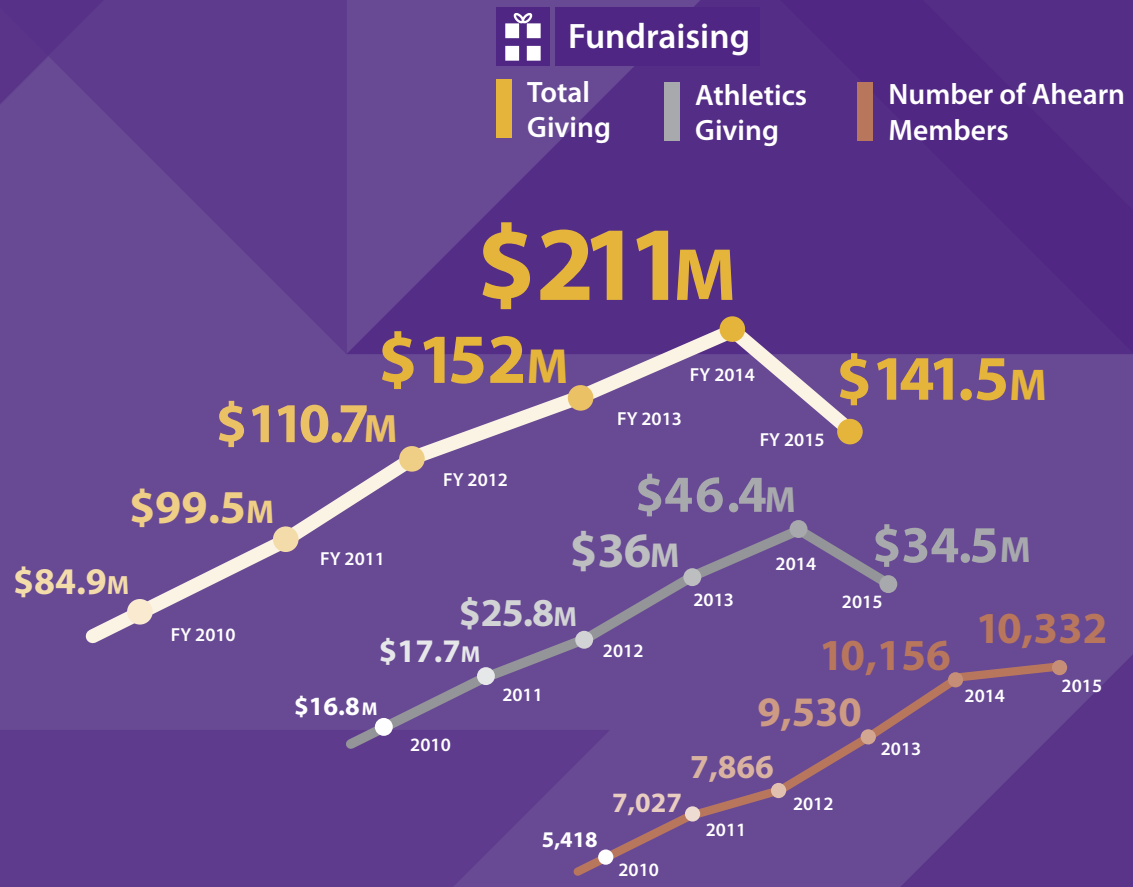


6-yr Graduation Rate by Cohort

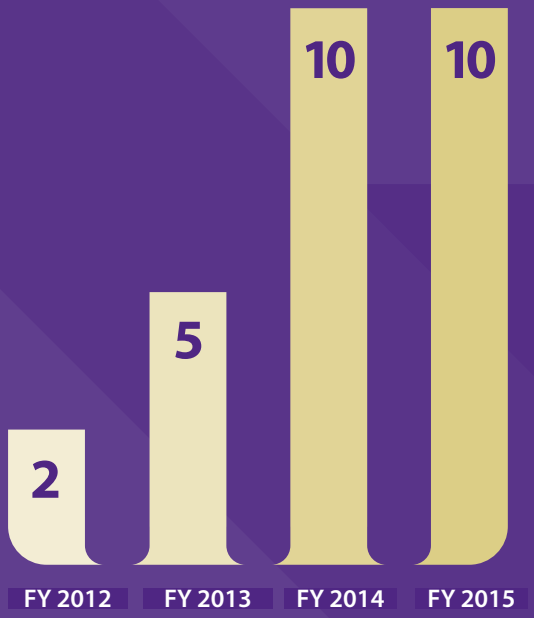


Doctorates Conferred

Fundraising



New Endowed Faculty Funds



Increased Endowment

Benefits K-State 2025 areas:

- Chairs
- Professorships
- Undergraduate and Graduate Scholarships


INNOVATION
INSPIRATION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Perspectives

Fall 2015

KANSAS STATE UNIVERSITY

Message from President Kirk Schulz and Vice President for Research Karen Burg

In academia, we're always cautious about definitively claiming something, but after more than 150 years of experience working on the topic, we at Kansas State University can reasonably state that we are one of the world's leaders in food research.

We have a proud heritage in food research and education. Kansas State University was the first operational land-grant institution under the Morrill Act in 1863. As a land-grant, our focus has been on teaching practical agriculture, science and engineering to improve lives since our inception. This entire issue is devoted to food research and a sampling of the food-related projects and ideas at Kansas State University that are focused on addressing some major food-related challenges in the world's future.

The current world population is more than 7.3 billion people. By 2050, that population is projected to be at least 9.6 billion, with most of the growth in developing regions such as China, India and Africa. By 2030, the global middle class will grow from 2 billion people to at least 4.9 billion. Most of this growth also will be in China, India and Africa. This population segment will demand a safe, higher-quality diet focused on animal protein and cereal grains.

Projections indicate humans will need to produce between 70 to 100 percent more food to meet demand. That means in the next 35 years, the world will need to produce more food than ever before in human history. Because agriculture in developed nations is already largely efficient, and we can't add to the agricultural lands that make up 40 to 50 percent of the Earth's surface, the challenge is huge. Innovation must happen in growth areas such as China and Africa.

In 2014, we introduced the Global Food Systems Initiative, the university's first presidential initiative. Initiative activities use our skills, expertise and world-class research facilities in the food system to accelerate research and solutions for our private and public food industry partners, as well as the producers who are responsible for the largest percentage of the world's food supply: farmers in developing nations with small acreages, also known as smallholder farmers. Faculty and staff in all of the university's colleges are contributing to this initiative with projects that focus on food sustainability, food bio- and agro-defense, and food accessibility and nutrition.

In addition to our heritage, what other evidence supports Kansas State University's status as a global food leader?

For starters, the U.S. Agency for International Development has invested more than $100 million in our capabilities to establish four new Feed the Future Innovation Labs at Kansas State University. These federal labs focus on reducing global hunger by helping smallholder farmers grow better crops, use improved methods for defending food crops against disease and insect pests, and establish more efficient methods of distributing the harvests — all while helping them turn a profit.

We also encourage you to read stories about our work in improving wheat genetics (Page 13), using fewer natural resources (Page 26) and reintroducing grocery stores into rural communities to feed those at home (Page 14).

The Global Food Systems Initiative will help us continue to serve as a food research leader by eliminating some food production hurdles, and it will help us maintain our trajectory toward becoming a Top 50 public research university by 2025.

President Kirk Schulz

Vice President for Research Karen Burg

contents

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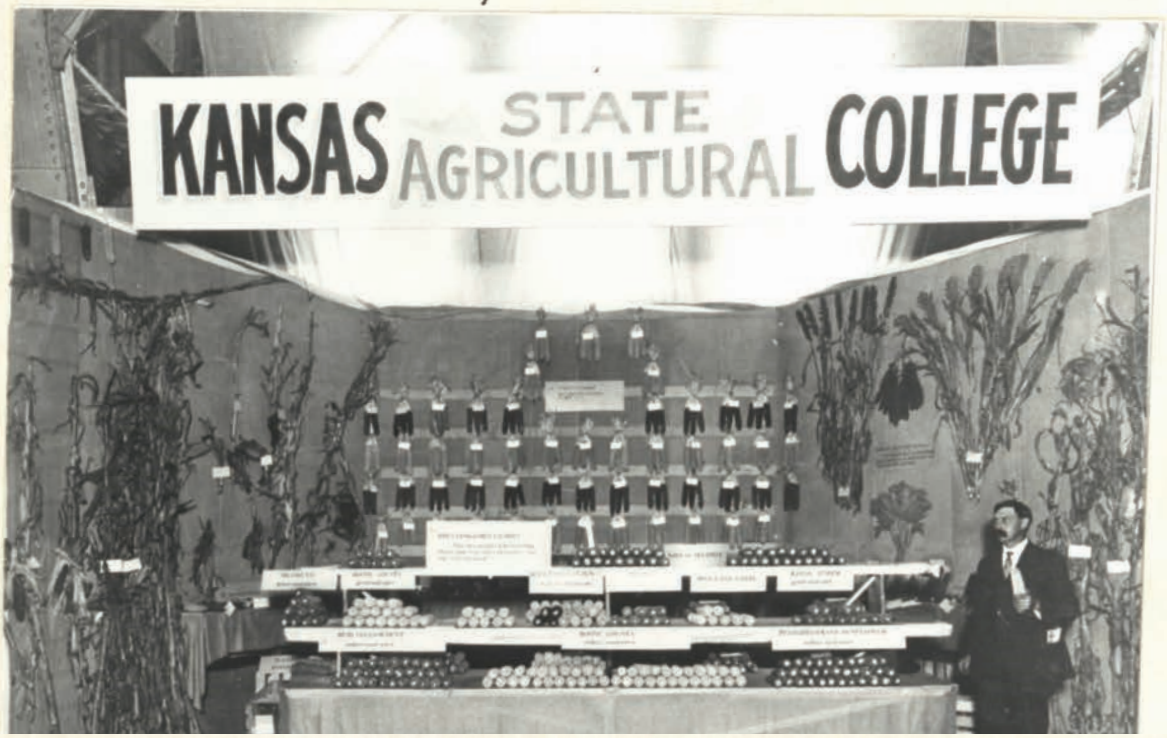
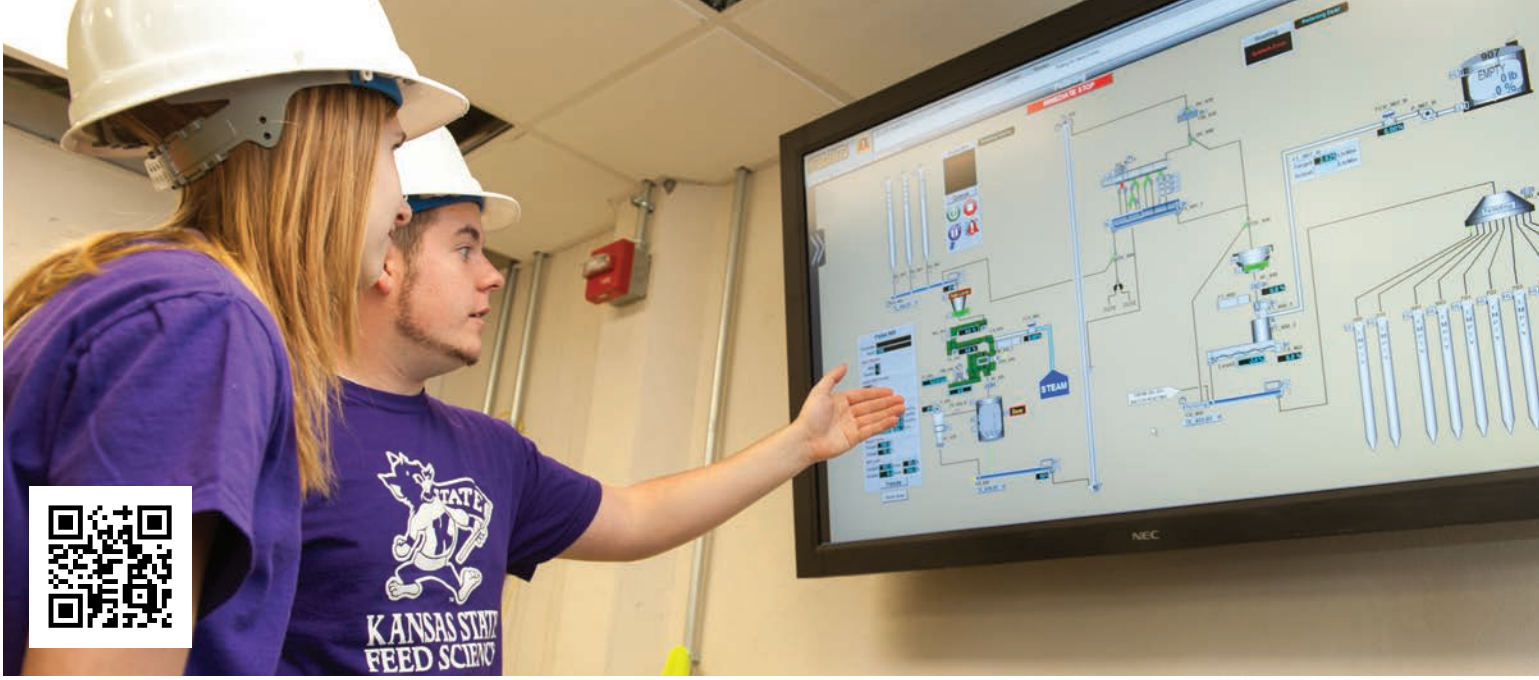


Since its inception in 1863, Kansas State University has been developing a reputation for being home to numerous world-class food-focused research facilities and faculty experts, as well as a training ground for the next generation of researchers.

Harvesting Soy Beans w/ binder 9/29/1924



ACCELERATING EXPERIENCE IN FOOD RESEARCH, EDUCATION

Global Food Systems Initiative gains momentum

The Global Food Systems Initiative, announced by Kansas State University President Kirk Schulz in January 2014, builds on the university's legacy of leadership in food production, food safety and food security. Through a concentrated universitywide research effort, Kansas State University is developing and commercializing new food technologies and innovations, building talent-based networks with the public and private sectors, and training the next generation of researchers for the state's workforce.

"The initiative is aimed at transforming lives toward a world where people no longer face the agony of extreme poverty, malnutrition and hunger," said Dirk Maier, professor of grain science and IGP Institute senior postharvest engineer.

Manhattan is quickly becoming a powerhouse for global food research as the home to the Kansas Department of Agriculture, the U.S. Department of Agriculture's Center for Grain and Animal Health Research, the American Institute of Baking International and the current construction of the National Bio and Agro-defense Facility, or NBAF, all in or near the northern quadrant of the university's Manhattan campus.

"If we do this successfully, we can use the resources we already have on campus to meet our goals of educating others and helping industries improve their capabilities," said John Floros, dean of the College of Agriculture and director of K-State Research and Extension. "I want people to know that this is to help the public. We want to address industry problems of the global food system and make things better. This will provide an even bigger impact beyond our current goals."

The initiative covers the entirety of the food production cycle — from how food is grown, to how it is processed, transported, stored, packaged, marketed and consumed. It also involves every department at the university, including those that study family issues, nutrition, business, health, biology, the environment and more.

"This effort should lead toward Kansas State University becoming the place you go if you want to improve your food system capabilities or to learn more about the global food system," Floros said.

In spring 2015, the university awarded $500,000 in grants to faculty members for research related to the Global Food Systems Initiative. Funding was awarded to nine projects that are multidisciplinary approaches to addressing needs in the global food system and helping create jobs and wealth for the state.

"It is our job to address food system issues for Kansas producers. But when we address items for Kansas, the solution also can be applied globally," Floros said. "Ultimately, this will help Kansas today and tomorrow. This is what we have done since we began as a land-grant university, and this is what we will continue to do. Together, we will innovate the next breakthrough."

By Kelly Hannigan, senior in agricultural communications and journalism

Food for all

An update on the university's four Feed the Future Innovation Labs

In just over two years, Kansas State University has become a major player in implementing the U.S. Agency for International Development goal to reduce hunger and improve food security in the most impoverished nations of the world.

In two years, USAID has committed more than $100 million to Kansas State University under its Feed the Future initiative, creating four innovation labs.

Kansas State University is responsible for managing the funds, most of which are distributed to partner universities to conduct research in nations where hunger is prevalent. The university benefits by acquiring new resources and employees, and is at the forefront of research that can be applied in Kansas and around the U.S.

The following is a look at how the projects have helped so far.

Applied Wheat Genomics

Kansas State University's Feed the Future Innovation Lab for Applied Wheat Genomics was funded in 2013 for $5 million. The project's main goal is to develop heat-tolerant, high-yielding and farmer-accepted wheat varieties for South Asia, where approximately 20 percent of the world's wheat is grown.

University wheat geneticist Jesse Poland, the lab's director, said the project has made significant progress in the past year, including establishing field trials in India and Pakistan; generating genetic profiles for more than 25,000 wheat varieties; and implementing high-throughput phenotyping to more accurately assess plant growth and performance.

Poland said that work in India and Pakistan is complimentary to ongoing work in the Kansas State University wheat breeding programs, adding that local breeding work supported by the Kansas Wheat Commission and Kansas Wheat Alliance is very synergistic and that the same tools and new breeding technologies are being applied.

"The project is off to a great start," he said. "It is an exciting time to apply leading genomics to accelerate the breeding process, particularly with the goal of increasing food security in the places that it is most needed."

Sorghum and Millet

Kansas State University's reputation as a leading center for international sorghum and millet research got a big boost in 2013 when USAID awarded the university $13.7 million for the Innovation Lab for Collaborative Research on Sorghum and Millet.

Since then, the university has worked aggressively to improve the productivity, disease resistance, agronomy and economic value of sorghum and millet in Ethiopia, Senegal and Niger.

In 2014, Kansas State University awarded $8.5 million in funding to U.S. universities and international partners to conduct research in the focus countries. Their projects will promote food security, household resilience and private sector growth in the region.

Of that money, 57 percent is dedicated to genetic enhancement of sorghum and millet; 23 percent toward value-added uses; and 20 percent to improve production systems. Forty-two percent of the money is for projects in Ethiopia.

According to Timothy Dalton, project director and professor of agricultural economics, scientists have conducted research on one year's growing cycle, and crops are now being planted for the second year.

"Our first year of research was a resounding success with field trials conducted in more than 30 sites in Africa, and food products evaluated by urban and rural consumers in West Africa and Ethiopia," Dalton said. "Much of the seed development work will be long-term and requires patience, but we expect to launch new pest management techniques, cropping practices and new food products in the near future."

Related projects in the past year include training scientists in the focus countries; developing research methods that appropriately integrate women into production agriculture and processing; and improving crop resistance to heat, drought, insects and disease.

Preventing Loss

In 2013, Kansas State University received $8.5 million to establish the Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss. As much as one-third to one-half of the world's

Photos provided by Kira Everhart-Valentin, Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet.


Gurbachan Singh & Sons
Wedding Villa
ENTRANCE

harvest is lost every year for a variety of reasons, from transportation to storage to consumer waste.

The project's work is focused on Bangladesh, Ethiopia, Ghana and Guatemala. Major crops being studied include wheat, maize, sesame and chickpea.

Surveys with smallholder farmers in those countries indicate the major causes of food loss are weather, termites, theft, rodents, and insects in fields and storage bins.

Kansas State University and Oklahoma State University faculty have traveled to the host countries to help lead projects that include international universities and U.S. government agencies. Some of the research planned in the next two years:

- Identifying insects causing food losses.
- Employing low-cost microchip-based sensors for measuring grain moisture.
- Drying techniques for stored grain, including greenhouse drying and solar drying.
- Proper storage techniques, including bags that help prevent infestations.
- Determining proper clothing when applying pesticides.
- Identifying farmers' trusted information sources.

Sustainable Intensification

At $50 million, the Feed the Future Innovation Lab for Sustainable Intensification is the university's biggest USAID award. The grant was received in fall 2014 for work in Cambodia, Bangladesh, Senegal, Burkina Faso, Tanzania and Ethiopia.

Sustainable intensification means producing more food and nutrition on the same land base while protecting the natural resources on which the food system depends.

Here's what Kansas State University has done since being awarded the funds:

- Renovated space in Waters Hall and hired four staff members on campus. The project also has hired three regional coordinators in Bangladesh, Senegal and Tanzania.
- Began a process to select a university to lead the Appropriate Scale Mechanization Consortium, which will identify the appropriate tools to help small landholders in the focus countries.
- Initiated the Geospatial and Farming Systems Consortium, which uses satellite images and advanced technology to map land that is targeted for research in the focus countries.
- Conducted meetings with partners in the host countries to identify their research and capacity-building needs.

Project director Vara Prasad, professor of crop ecophysiology, said the information gathered so far will help to select U.S. and international universities for research awards, which will be announced soon.

"We are closely working with all of our partner institutions and USAID to ensure that all the objectives during the first year are met," Prasad said. "The project is on track, and we are excited to complete the establishment phase and move into research and capacity-building. It is truly a collaborative effort, with multiple national and international organizations working toward common goals of improving food and nutritional security of smallholder farmers."

By Pat Melgares, Communications and Agricultural Education

Robert Fraley discusses mitigating global challenges in inaugural Henry C. Gardiner Lecture

In the next 35 years, farmers will have to produce more food than the world has produced in its history, a challenge some are calling the greatest we've ever faced. But however daunting it may seem, Robert Fraley is optimistic.

Fraley, executive vice president and chief technology officer for Monsanto Co. who was part of a team of scientists to first genetically modify plants, spoke at the inaugural Henry C. Gardiner Lecture at Kansas State University in January. Fraley addressed the challenges facing agriculture in the coming decades.

"What excites me is a world in which we are smart about our innovation and take a bold step forward and use science," Fraley told the more than 1,000 people attending at McCain Auditorium.

Farmers, who account for less than 1 percent of the population, are expected to feed more than 9 billion people by 2050 while facing limited resources and changing climate conditions. Despite the challenges, Fraley pointed out that the agricultural industry has already made advances in increasing production because of two major breakthrough areas: biology and information technology. It is advances in biology that help scientists breed crops. And increased accessibility of technology — especially for smallholder farmers — is improving the efficiency of agriculture, he said.

However, Fraley doesn't leave genetically modified organisms, or GMOs, out of the equation. Fraley said these organisms, designed to withstand factors like climate and pests, have been consumed for 20 years and that every major scientific body and regulatory agency in the world has concluded GMO products are safe.

The lecture series was established in honor of Henry C. Gardiner, a Kansas State University graduate who was a visionary leader in the U.S. cattle industry. The purpose of the lecture series is to bring leaders in global food systems from throughout the world to the university to present their views and provide a forum for open discussion.

"As the first lecture in the series, it was a spectacular success," said John Floros, dean of the College of Agriculture and director of K-State Research and Extension. "I hope to follow up next year with another speaker as compelling."

By Lindsey Elliott, Communications and Marketing

Scaling up

University and city developing the North Campus Corridor for research, education, training

Kansas State University and Manhattan, Kansas, are quickly establishing themselves as a nexus for food and bio-/agro-defense research and expertise.

The north section of the university's Manhattan campus houses the Biosecurity Research Institute, the colleges of Veterinary Medicine and Agriculture, the Grain Science Complex, the Kansas Department of Agriculture, and the upcoming National Bio and Agro-defense Facility, or NBAF — the U.S. Department of Homeland Security's foremost animal disease research facility — among several other world-class research facilities. Together, the region is a powerhouse for crop protection, animal health and food safety research.

Kansas State University and the city of Manhattan are working together to integrate the current and future development of facilities and infrastructure in this region of the campus through the North Campus Corridor Project. The corridor will serve as a hotspot of research, education and professional training. It networks the research facilities with the university's academic, intellectual property and athletic facilities as well as with future startup companies renting office and lab space in the corridor.

The North Campus Corridor is as much about research as it is about training students who will be the next generation workforce and helping grow the state's economy, said Ruth Dyer, senior vice provost for academic affairs and chair of the North Campus Corridor Task Force.

"We're looking at the future needs of the university and the region and how we can address those needs with the North Campus Corridor," Dyer said. "The collaboration between the university and the city has been instrumental in creating a plan that will maximize the opportunities in the North Campus Corridor."

In part, the traditional research park model is changing, said Dyer, who recently attended a national meeting for land-grant universities. At the meeting, representatives from several universities with research parks discussed the challenges of static infrastructure as well as the parks' distance from campus.

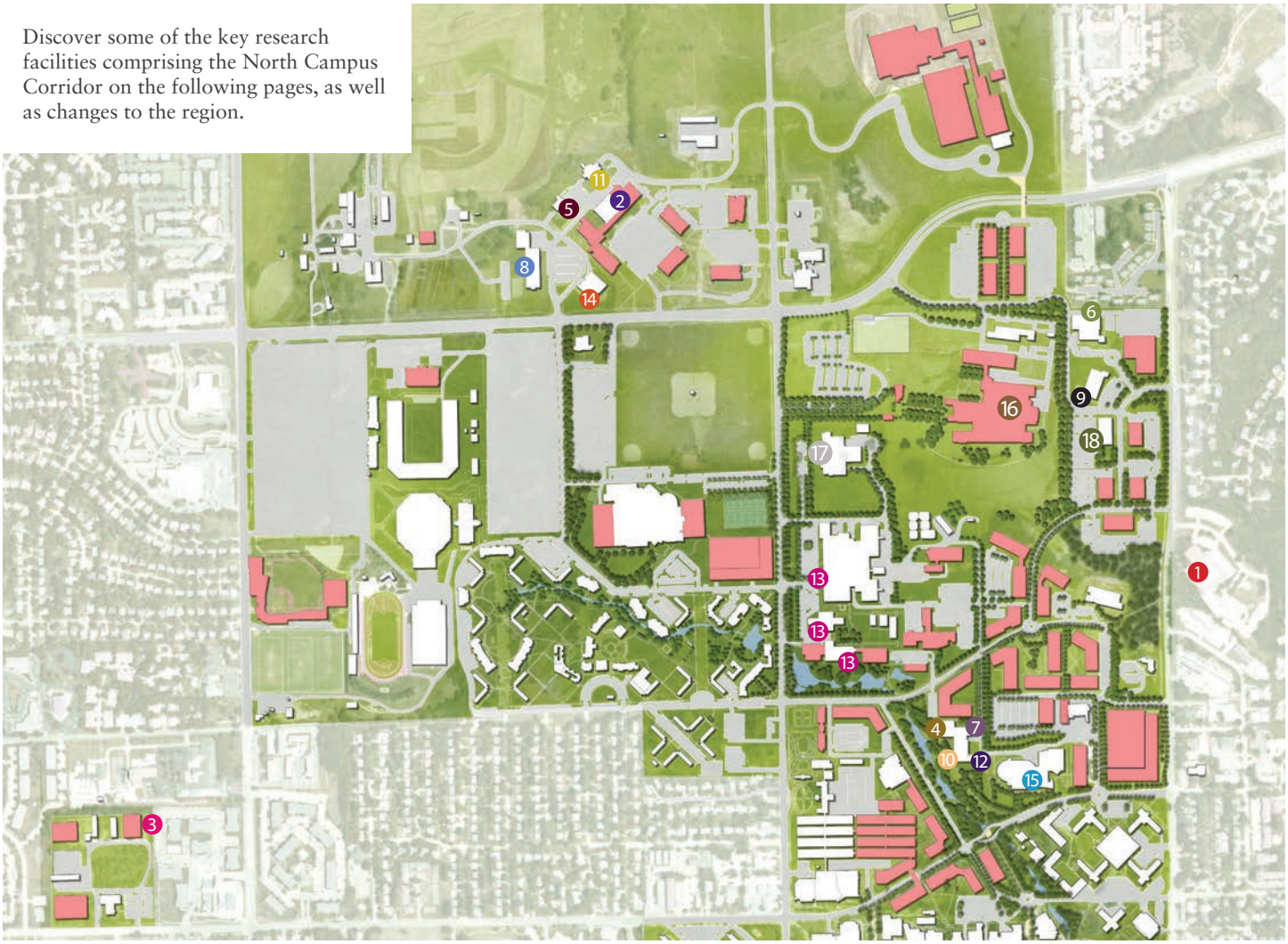
"We are pursuing a slightly different model than what has been used in the past at other universities," Dyer said. "What is being designed here is a concept that facilitates shared resources, space and knowledge across multiple colleges, disciplines, facilities and partners. It also provides rental space and labs for some of the startups and entrepreneurs that NBAF will attract and space for students to intern with companies."

One of the more unique components of the North Campus Corridor is there is more than 1,700 acres of agricultural land adjacent to the northern edge of the corridor. While this land is not what may be considered as traditional lab space, the land serves as the research space for plant sciences and livestock.

"These acres of agricultural land are the research space for many faculty members in the colleges of Agriculture and Veterinary Medicine," Dyer said. "The university sees this land as a treasure and and a piece of who we are as a land-grant institution."

A bird's-eye view of the North Campus Corridor with descriptions of the facilities is on page 10.

Discover some of the key research facilities comprising the North Campus Corridor on the following pages, as well as changes to the region.



The North Campus Corridor is a nexus of research, innovation and education for Kansas State University and the city of Manhattan. Upcoming facilities are in colored in coral while existing facilities are colored in white.

1 AIB International

AIB International is a nonprofit founded by the North American wholesale and retail baking industries as a technology transfer center for bakers and food processors.

2 Bioprocessing and Industrial Value Added Program

The lab specializes in the development of biomaterials processing technology and using agricultural-based materials to produce higher-value products for economic development. It is part of the 16-acre Grain Science and Industry Complex.

3 Center for Grain and Animal Health Research

The U.S. Department of Agriculture's Agricultural Research Service Center for Grain and Animal Health Research is the only USDA research laboratory in Kansas. Located near the Kansas State University Manhattan campus, the center conducts research and develops innovative technologies to solve soil erosion, the production and storage of grain, and arthropod-vector animal diseases. The center is comprised of five research units.

4 Dairy Processing Plant

This plant is part of the Food Science Institute and is equipped to produce a variety of dairy products as well as for pasteurization, homogenization, churning, condensing and ultrafiltration of dairy foods. The dairy facility can be used for the manufacture of new products and study new ingredient functionality.

5 Hal Ross Flour Mill

The mill is a leading pilot scale flour mill used for teaching, research and industry training. It contains the same full-scale equipment and control systems used in the commercial flour milling industry. It is part of the 16-acre Grain Science and Industry Complex.

6 Manhattan/K-State Innovation Center

The Kansas State University Institute for Commercialization, or KSU-IC, and the Kansas State University Research Foundation, or KSURF, work together to help university researchers take their ideas and inventions and make them profitable. The foundation handles researcher disclosures and the patent process, and the institute works with companies to license the new technology.

7 Kansas Valued Added Foods Lab at Call Hall

This lab offers food-related businesses, processors and entrepreneurs numerous services, including assisting in new food production; conducting shelf life tests; reviewing product labels; and generating nutritional information. The lab is part of the Food Science Institute.

8 Kansas Wheat Innovation Center

The center was built by the Kansas Wheat Commission on land owned by the university. The center houses Heartland Plant Innovations and the university's Wheat Genetics Resource Center — initiatives focused on developing new technologies for wheat farmers.

9 Mary and Carl Ice Hall

The hall is laboratory space for several of the College of Human Ecology's larger-scale research projects. These projects include the Programs for Workplace Solutions, the Personal Financial Planning Clinic and the Sensory Analysis Center — an internationally recognized research institute skilled in consulting, project management, method development, educational sensory and consumer research — among others.

10 Meat Science Facility at Call Hall

With a mission of meat science research and teaching, the facility provides educational and technical support for meat processors and entrepreneurs in areas such as product safety, meat processing regulations and quality control techniques. The lab is part of the Food Science Institute.

11 O.H. Kruse Feed Technology Innovation Center

The newly constructed feed technology innovation center is a world-class facility focused on addressing the needs of the livestock feed industry. Areas of focus include the science of feed processing, pet food development and grain handling. It is part of the 16-acre Grain Science and Industry Complex.

12 Thermal Processing Lab at Call Hall

The lab's focus is educating food processors, evaluating larger-scale food formulations, and providing training experience with processing equipment. The lab also works with processors to develop new products, test thermal processes and scale up operations to market test-size batches.

13 Veterinary Medicine Complex

The complex includes the Kansas State Veterinary Diagnostic Laboratory, the Veterinary Health Center and the Center of Excellence for Emerging and Zoonotic Animal Diseases, or CEEZAD, a U.S. Department of Homeland Security laboratory headquartered at Kansas State University, develops innovative countermeasures against high-priority foreign, emerging and zoonotic diseases that threaten human and animal health.

14 Grain Science Center/IGP Institute

The IGP Institute serves and supports Kansas and U.S. farmers in promoting the export and use of their wheat, corn, soybeans and grain sorghum with customers around the world through outreach, research and education. The building also houses several leading grain science research laboratories.

15 Weber Hall

The university's animal sciences and industry department is one of the largest in the U.S. It focuses on food and animal product safety, quality, security, production and management.

16 National Bio and Agro-defense Facility

The National Bio and Agro-defense Facility, or NBAF, is the U.S. Department of Homeland Security's foremost animal disease research facility. The $1.25 billion facility is a biosafety level-4 laboratory that will research emerging, high-consequence livestock diseases. NBAF is expected to be fully operational by 2022 or 2023.

17 Biosecurity Research Institute

The Biosercurity Research Institute, or BRI, at Pat Roberts Hall is a biosafety level-3 and biosafety level-3 agriculture facility that focuses on high-consequence animal, plant and foodborne pathogens that threaten agriculture and human health. The BRI also offers BSL-3 laboratory training and is equipped with large animal holding pens.

18 Kansas Department of Agriculture

The Kansas Department of Agriculture, or KDA, is the nation's first state department of agriculture and is dedicated to providing support for agriculture in Kansas, including farmers, ranchers, food establishments and agribusiness.

Unyielding

Researcher explores plant genomes to breed improved wheat varieties

The wheat that forms the basis of a tasty pasta dish today was domesticated nearly 10,000 years ago from wild grass. Eventually, these early cultivars, or breeding lines, spread to diverse regions around the world. These early wheat cultivars are helping researchers at Kansas State University develop new wheat varieties that are tolerant to changing climatic conditions.

Eduard Akhunov, associate professor of plant pathology at the university, has been investigating wheat genetic diversity for six years. Akhunov collaborates with a team of researchers from around the world in the search for specific wheat lines that are adapted to harsh environments.

"We analyze wheat lines that have been bred for many years around the world," Akhunov said. "People grew them in specific environments because they are very well adapted. This creates a unique opportunity to find new, useful genes that enable these wheat lines to grow in heat- or drought-prone conditions, or in the presence of pathogens."

For example, in 2013, Akhunov and his colleagues identified a gene that gives wheat resistance to a deadly race of Ug99, a wheat stem rust pathogen. Akhunov said that the goal is to find specific wheat lines that have these useful properties. Once they are pinpointed, researchers can begin crossing these lines with modern cultivars that currently grow in Kansas or in other regions.

Akhunov finds these genes by studying the sequences of multiple wheat genomes received from germplasm repositories around the world. This sequence-based approach leads to useful information without having to interbreed these wheat lines with local Kansas cultivars. For some traits — like drought and heat tolerance — it is impossible to simply bring in the wheat varieties from other parts of the world, plant them in Kansas, and deduce if these lines will be useful for breeding.

"If you bring wheat from the Middle East and try to grow it here, you would get a very poor product because it isn't adapted to the Kansas environment," Akhunov said. "Even if you plant a Kansas cultivar in Nebraska or Texas, it will develop completely differently. Instead, we study genetic diversity using technology that allows us to sequence all genes in the wheat genome."

The samples Akhunov studies all have a known geographic origin and are connected to the location's historic climate data. Researchers take isolated DNA from these samples and compare them against each other.

"When you compare genomic sequences, you're actually looking at genetic mutations in the genetic code that are enriched in the regions that show extreme climatic conditions," Akhunov said.

For example, if a group of lines grows successfully in a heat-stressed environment, the researchers can look at the mutations within that genome. If mutations are found frequently in these adapted lines, it could be deduced that these mutations make the wheat lines better adapted to this heat-stressed environment.

Akhunov said they create a catalog of mutations for a large number of wheat lines across the world. The project currently involves approximately hundreds of wheat lines from around the world and millions of mutations. To analyze these vast amounts of data, Akhunov uses the university's Beocat computer cluster.

"All our work is done on campus," he said. "In addition to computing resources, we're also lucky to have the Integrated Genome Facility just down the hall that has equipment for DNA sequencing. Just being able to process and analyze this data is a great success. The amount of DNA in a wheat genome is nearly six times greater than in the human genome. It takes a lot of time to analyze."

In spite of the seemingly never-ending job of data analysis, Akhunov and his team are continuing to expand their work. The next step is utilizing a technology that Akhunov, fellow Kansas State University researchers and industry developed that allows them to analyze genetic variations from grass species that are related to wheat. They collaborate on this project with the university's Wheat Genetic Resource Center.

"Species of certain grasses are related closely to wheat," he said. "We can crossbreed them with wheat and bring this exotic diversity into breeding programs. Many useful genes, including drought- and disease-resistance genes, are found in these grasses, so this could be an effective way of controlling wheat-killing diseases or yield losses."

Akhunov's wheat genetics projects are funded by the Kansas Wheat Commission, the U.S. Department of Agriculture, the National Science Foundation and the university. All support contributes to the project's overall goal of learning how plants adapt to their environments.

"When we understand the mechanisms, we can learn to predict if a wheat variety will be able to adapt or not," Akhunov said. "There will always be screening involved, but it will become a more precise science."

By Megan Saunders, Communications and Marketing


"People have to eat, and the grocery store is the cornerstone of a community," said Pam Budenbender, store owner. "Statistically, when rural grocery stores fail or close, the town dies."

Talk of the town

Rural Grocery Initiative feeds small communities

When the sole grocery store in Onaga, Kansas, burned down in 2010, the town lost more than a community hub. The 800 residents also lost their local source of food: The nearest grocery store was a 50-mile round trip.

Pam Budenbender and her husband, Paul, took action. They gathered funds, partnered with food distributors and built Onaga Country Market, an invaluable source of fresh food for the local community.

"People have to eat, and the grocery store is the cornerstone of a community," said Pam Budenbender, store owner. "Statistically, when rural grocery stores fail or close, the town dies."

People like Budenbender — along with Kansas State University's Rural Grocery Initiative — are keeping small towns alive by investing in rural grocery stores.

The Rural Grocery Initiative, part of the university's Center for Engagement and Community Development, aims to create new models for rural business development and sustainability.

"These small food businesses are anchor institutions," said David Procter, director of the Center for Engagement and Community Development. "They are important sources of jobs and local taxes as well as the primary place for healthy food in the community."

Since 2007, the initiative has worked with rural communities — those with populations less than 2,500 people — to help current grocery stores stay open or to help build new stores. The initiative has helped launch or sustain multiple stores in the Kansas towns of Plains, Morland, Minneola and Protection.

The initiative also has aided rural communities in more than 25 states as they improve access to healthy foods.

"We're now talking about grocery stores in terms of their connection to farmers markets and local growers," Procter said. "The initiative has changed from a focus strictly on grocery stores to the bigger issue of getting more healthy food into small towns."

The Rural Grocery Initiative continues to support small communities through several new resources and research projects.

- The Rural Grocery Store Summit is a biennial meeting where store owners can network and discuss issues, challenges and solutions. The 2014 summit included Kansas rural grocery store owners like Budenbender as well as owners from more than 15 states.
- The initiative provides a rural grocery toolkit, which is a resource for current grocery store owners as well as people considering establishing a grocery store. The toolkit contains a variety of links with information on assessing the market, funding, legal licensing and regulations.
- Several U.S. Department of Agriculture, or USDA, grants are helping the Rural Grocery Initiative identify the challenges that store owners face as well as identify different ownership models, including cooperative stores, community-owned stores, nonprofit stores or sole proprietorships.
- A collaborative $500,000 USDA grant focuses on two interventions — a nutrition education program and a new food labeling system — to help customers fill their shopping carts with healthier foods. The food labeling system adds nutritional value, or NuVal, scores to shelf labels. The NuVal scores range from one to 100, with more nutritional food containing labels closer to 100.

  "We want to increase the purchase of healthy food by customers," Procter said. "Ultimately, we hope that the grocery store will purchase more healthy foods, which can improve the overall health profile of the store and the community."

  The grant also involves the university's agricultural economics and human nutrition departments as well as K-State Research and Extension and the University of Minnesota Extension Service.

By Jennifer Tidball, Communications and Marketing

Photo provided by Justin Kastner, Frontier program.

Experiential learning takes students to a new Frontier

Ensuring a safe and healthy food supply for the world's growing population requires preparing highly skilled leaders ready to meet this challenge.

That need is the focus of Kansas State University's Frontier program, which provides multidisciplinary training and experiential learning to students interested in becoming scholarly, thoughtful global food systems leaders. Program alumni have gone on to work in government — including the U.S. Food and Drug Administration and Kansas Department of Agriculture — and in agri-industry at companies such as Cargill.

"From Los Angeles to Boston, the Frontier program increased my multidisciplinary breadth over facets encompassing the food industry and beyond by providing a unique educational atmosphere. This atmosphere developed my scholarly and occupational identities through experiential learning, networking with other students, and skill-development workshops. I discovered the vastness of the food industry through experiential learning."

— Megan Kulas, Frontier alumna who now works at the U.S. Food and Drug Administration

Now, with a Global Foods System Innovation Grant from the university, the Frontier program will focus on a Kansas pipeline of global food systems leaders with the education and outreach project "Experiential, Multidisciplinary Career-Development Investment for Kansas."

"This project will innovatively cultivate multidisciplinary breadth in current and future Kansas-based members of the global food systems workforce," said Justin Kastner, program director and an associate professor of food safety and security at Kansas State University. "Global food system employers want skilled graduates and career-development pipelines and job preparation — and that's what we're doing at the Frontier program."

Kastner and Jason Ackelson, a political scientist and an adjunct faculty member in diagnostic medicine and pathobiology at Kansas State University, created the Frontier program in 2004. Ackelson is the program's co-director.

Frontier's successful field trips and experiential learning components will be part of the new Kansas initiative. To date, more than 200 students have gone on Frontier field trips to meet with governmental and nongovernmental policy-making and policy-analysis groups in Washington, D.C., and to explore key ports of food entry across the nation. Also to be offered will be weeklong courses on a wide and multidisciplinary range of topics relevant to global food systems.

By Beth Bohn, Communications and Marketing

Beefing up the beef transport system

Electrical and computer engineering, psychological sciences, agricultural economics and veterinary epidemiology. These may not be the first disciplines you think of when it comes to solving issues in the beef industry, but a team of Kansas State University researchers believes the complex beef transportation system can be improved by using tools from their fields.

"The beef cattle industry and the transportation system are interdependent infrastructures," said Faryad Darabi Sahneh, research assistant professor of electrical and computer engineering. "When you add in the element of human behavior and decision-making, predicting what can happen becomes a very complex issue. This is why it's important to have a multidisciplinary approach to help cover all the angles.

Sahneh, along with Caterina Scoglio, professor of electrical and computer engineering; Gary Brase, professor of psychological sciences; Ted Schroeder, distinguished professor of agricultural economics; and Mike Sanderson, professor of diagnostic medicine and pathobiology, have been awarded a $60,000 Global Food Systems Innovation Grant to develop computational models to help mitigate potential threats to the beef transport system.

The researchers are collecting data on the movement of cattle and trucks and plan to use this information to create models that will predict potential vulnerabilities and ways to protect against them. One of the threats that will be evaluated is the possibility of an epidemic.

"An infected animal being transported to another area can spread the disease to other cattle without the producers knowing. And there are other ways of spreading disease, too," Scoglio said. "If a truck is going to pick up feed and the truck driver gets some mud containing a pathogen on his or her boots, clothing or truck wheels, the driver can unknowingly transport the pathogens to other locations and spread the disease."

The transportation of cattle from ranchers to feedlots to slaughterhouses has made the industry more efficient, but also has left the industry vulnerable. The researchers hope to find ways to reduce the infrastructures' susceptibilities, especially because of the effects it could have on the state.

"Agriculture and the cattle industry are a huge part of the Kansas economy, so if something negative happens to it, that's going to be bad for the entire state," Brase said. "It will hurt more than just the producers; it will raise the prices of beef at the grocery story and have an overall effect on the state economy."

It also will take more than just a model, Scoglio said. It will involve understanding the industry and the attitudes of producers and empowering them to make informed decisions. It's a job that will take more than just one expert.

"Kansas State University is a unique place for this kind of research," Brase said. "As a land-grant university, there's a lot of emphasis on actually getting your hands on real-world problems. We are always looking for ways to translate research into practical issues."

By Lindsey Elliott, Communications and Marketing




Budding opportunities

University tapping public, private industry to help meet increasing food demands

Kansas State University's Global Food Systems Initiative is leveraging the university's more than 150-year food and agriculture heritage, expertise and world-class research facilities to help meet the challenge of sustainably feeding a growing population that will reach 9.6 billion people by 2050 and double the global food demand.

The initiative, introduced by Kansas State University President Kirk Schulz in January 2014, creates future opportunities for the university and the state by building on the university's land-grant heritage in crop production and protection, animal health, food safety and food security, and leveraging that research and expertise to industry partners and entrepreneurs. These partners can quickly move new food-based technologies that address emerging food challenges to the marketplace.

"The great thing about the agricultural industry is that it has been around for centuries and a lot of the companies that are ingrained in the global food system itself have excellent pathways to the market," said Ken Williams, director of licensing at the Kansas State University Institute for Commercialization. "They have brand loyalty and they have a lot of different things that allow them to be successful. Trying to replicate that on your own as an entrepreneur can be tough; it's not impossible, but it can be tough."

Two initiatives in particular are helping develop public partnerships.

Launch a Business

Launch a Business is a program that provides entrepreneurs with access to university faculty and to alumni mentors who are operating successful businesses.

Chad Jackson, director of the Center for the Advancement of Entrepreneurship at the university's College of Business Administration, said that the program has doubled the number of entrepreneurs it is accepting into its five-week summer course, including 10 spots for those focusing on advancements in food and agriculture.

"In its first year, our program had a broad reach of entrepreneurs, and we'll continue that," Jackson said. "But the exciting thing is when you start to develop expertise for specific industries, the effect you can have goes up a notch."

Partnership with General Mills

Food giant General Mills Inc. recently formed a research agreement with Kansas State University to develop wheat varieties with improved nutritional

Estimated Total Spending by the Global Middle Class, 2030

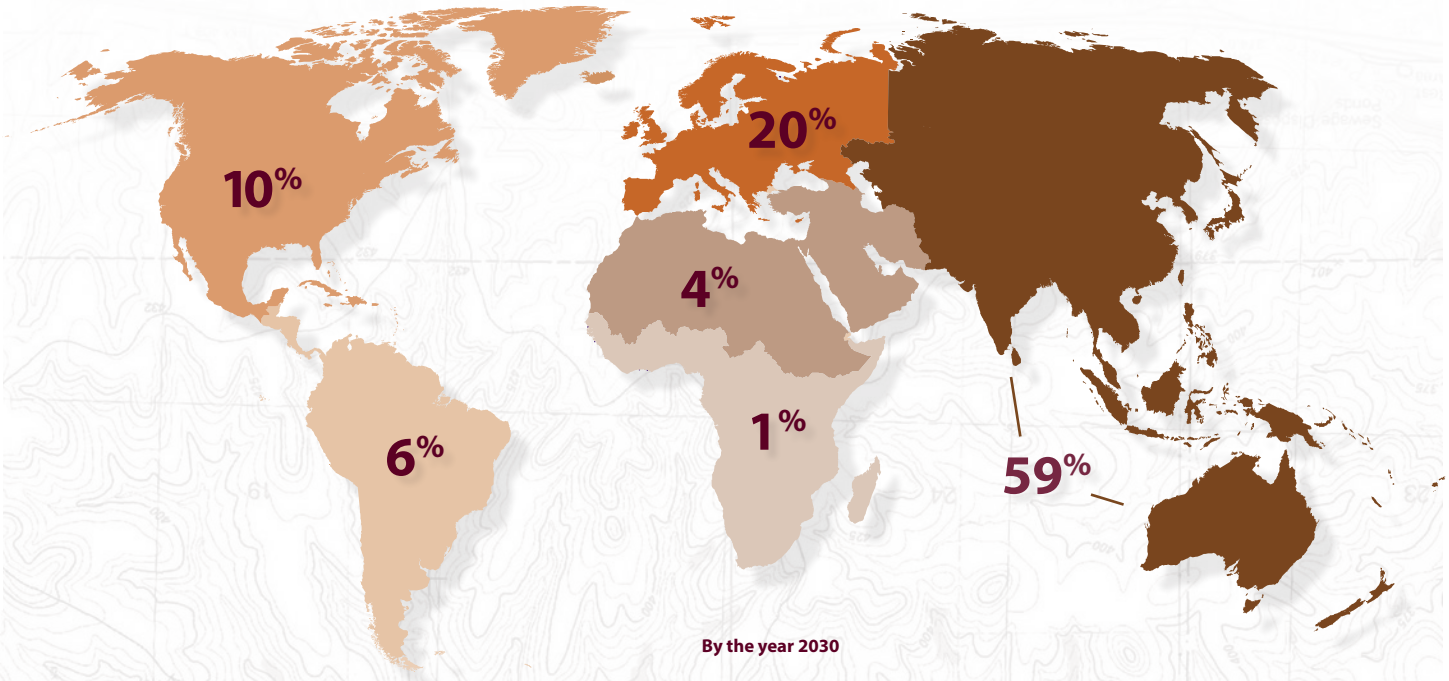
The percentages on the adjacent map indicate the estimated increase of each region's share of the world's food spending in 2030. It equates to $56 trillion in purchasing power.

Source: Organization for Economic Co-operation and Development Centre (2010).

milling and baking qualities. The project directs more than $400,000 toward wheat development projects at the university.

"The expectation is that Kansas wheat farmers will benefit directly from this research," said Jesse Poland, assistant professor of plant pathology and director of the Feed the Future Innovation Lab for Applied Wheat Genomics. "Through these projects, we are focused on developing and delivering wheat varieties with superior quality that may be grown in high-value, contract acres."

By Kelly Hannigan, senior in agricultural communications and journalism



By the year 2030

FOOD TECHNOLOGIES REQUIRE CONSUMER ACCEPTANCE

RESEARCHERS STUDY RNA INTERFERENCE IN PLANTS AND ANIMALS TO IMPROVE FOOD EFFICIENCY WHILE UNLOCKING PUBLIC PERCEPTION

The unpredictability of Mother Nature often requires crops to deal with changing weather patterns, such as excessive moisture one month and drought the next. Scientists develop new varieties that can adapt well to a particular weather extreme, but creating a variety that acclimates to all becomes a greater challenge.

Consider the numerous metabolic disorders or even viruses that plague living things. Because antibiotics only help combat bacterial infections, livestock and humans typically rely on a strong immune system to feel better.

A technology developed in the last two decades called ribonucleic acid interference, or RNAi, could help overcome these and many other challenges. Scientists from multiple disciplines at Kansas State University are working together to determine how to use RNAi to more efficiently produce food from plants and livestock.

Barry Bradford is an associate professor of animal sciences and industry and primary investigator on the project. He said as an example in animals, the complex process would first require identifying a protein encoded by a gene that is causing a problem, with the goal to suppress that protein in a certain organ, such as the liver.

Fatty liver syndrome in cattle could be one such problem addressed by RNAi. It occurs when a cow breaks down too much fat for the liver to process and the leftover fat in the liver becomes toxic.

Computer software determines what RNA molecule to build that will bind to the problem protein and eventually silence it. Bradford said the computer algorithms are precise and provide a sequence that will only knock down one of the 25,000 or more proteins produced in an organism.

A nanoparticle is formed when a protective shell is built around and bound to the double-stranded RNA. Scientists would then place the nanoparticle in the animal's bloodstream, where it would go to the targeted organ and complete its task of silencing the protein.

Bradford, who has been working on RNAi as a Fulbright senior scholar in Australia, said the process is not any more invasive than giving the animal a traditional drug and is more targeted. It also does not involve genetic modification.

"A benefit would be you don't have to worry about a drug their body has to get rid of," Bradford said. "You have a nanoparticle, but RNA is always in the body in billions of copies. You are introducing a different code to a natural compound already in the body."

Because the technology is new and is still being developed, consumers might have questions and concerns. Scientific feasibility alone does not mean the technology will work, which is why Glynn Tonsor, associate professor of agricultural economics at Kansas State University, is on the study to analyze the consumer aspect.

"There is benchmark science at the front of this, but we also have to understand if the public is going to accept this technology," Tonsor said.

Tonsor plans to analyze consumer perceptions of RNAi in the form of meat products that might come from it. For example, he wants to know if a consumer would purchase a steak or ground beef from an animal that experienced RNAi.

The RNAi project was funded through the university's Global Food Systems initiative and includes nine faculty from the College of Agriculture, College of Veterinary Medicine and College of Arts & Sciences.

By Katie Allen, K-State Research and Extension

Early detection

Researchers develop detection test for subclinical mastitis in dairy cows

Each day Mike Scheffel's 608 Holstein cattle produce about 24,000 gallons of milk. Scheffel, manager of Kansas State University's Dairy Unit, has been working on dairies since age 12. Throughout the years, he's seen one of the constant challenges facing dairy producers: mastitis in the dairy cows.

"Every dairy deals with mastitis," said Scheffel, who also is a research assistant in animal sciences and industry. "That's the nature of the operation. We've been very fortunate here and have preventative steps to recognize the early symptoms, but it's a problem that's always present at a dairy."

Mastitis is a disease that inflames and eventually scars the udder tissue of dairy cows. This reduces a cow's milk production and alters the milk composition. Mastitis costs the U.S. dairy industry more than $2 billion annually. Fast and early detection could help dairy producers reduce transmission to other cows in the dairy operation.

Kansas State University researchers Deryl Troyer, professor of anatomy and physiology, and Stefan Bossmann, professor of chemistry, developed a test that can positively identify mastitis in dairy cattle earlier and for less cost than current technologies on the market.

"The classical mastitis tests estimate the numbers, not the activity, of neutrophil cells, which are the dominant cells that travel to the inflamed udder during mastitis," Troyer said. "Many times early and emerging cases of mastitis are not caught by the tests because they count the numbers rather than the activity. These are often the most important cases to catch."

The test uses the duo's nanoplatform technology that can quickly detect cancer cells and tumors before physical symptoms ever appear. Several enzymes that cause inflammation in human cancers also cause inflammation in the udder of the dairy cows.

"We looked at about 30 enzymes and identified three that are highly indicative of mastitis," Bossmann said. "These three enzymes and this nanoplatform make it possible to detect preclinical mastitis cases that have high enzymatic activity but a low somatic cell count. These cases were previously undetectable, so there was not a test on the market for this combination."

To test for mastitis, a sample of pasteurized milk is put into a buffer solution containing the enzyme-detecting nanoplatform. The nanoplatform consists of iron nanoparticles coated with amino acids and a fluorescent dye. The amino acids and dye interact with enzymes in the milk. The sample is incubated for up to 30 minutes and then examined for three enzymes that cause mastitis.

Recent tests in the Troyer and Bossmann laboratories have detected subclinical mastitis in less than five minutes.

Researchers say their mastitis test could be used today by large-scale dairies and eventually by robotic dairy facilities.

Additional collaborators include Scheffel; Gregg Hanzlicek, assistant professor of diagnostic medicine and pathobiology and program director for the Kansas State University Veterinary Diagnostic Laboratory; Luis Mendonca, assistant professor of animal sciences and industry; Tej Shrestha, senior scientist of anatomy and physiology; Madumali Kalubowilage, chemistry doctoral student, Sri Lanka; Thilani Samarakoon, former postdoctoral researcher; and Samie Milligan, Heart of America Dairy Herd Improvement Association.

Kansas ranks 16th in the U.S. for milk production. It produces nearly 3 billion pounds of milk annually. Dairy is a more than $5.4 million industry in Kansas.

By Greg Tammen, Communications and Marketing

Good to the LAST DRIP

Researchers are evaluating irrigation technologies to help farmers

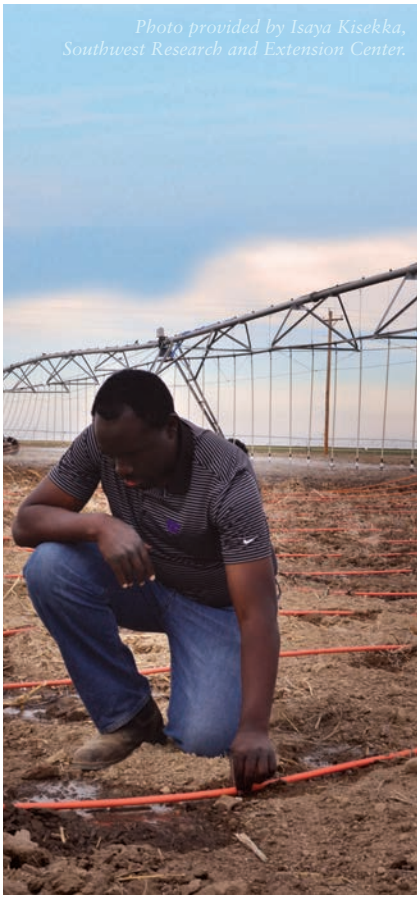


Photo provided by Isaya Kisekka, Southwest Research and Extension Center.

Kansas State University researchers are evaluating different irrigation technologies to help farmers determine the best method for irrigating their cropland under water-limited conditions.

Isaya Kisekka, assistant professor of irrigation and agricultural water management, and her colleagues at the university's Southwest Research and Extension Center in Garden City, Kansas, are researching mobile drip irrigation, or MDI.

Initial work on mobile drip irrigation technology can be traced back to the early 1980s, but it has not gained much in popularity. Continued drought and groundwater depletion along with technological advances in drip line emitters, water filtration and planting equipment — such as tractors with GPS and autosteer for planting crops in circles, which is critical to using mobile drip irrigation — might increase acceptance of the irrigation method among producers.

"Lately there has been a renewed interest in MDI," Kisekka said. "The combination of declining groundwater levels coupled with frequent droughts has many farmers concerned in the south and central High Plains."

The researchers, in collaboration with private industry, the Kansas Water Office and Kansas State University's Global Food System Initiative, are looking at the viability of mobile drip irrigation in comparison to another commonly used technology called low elevation

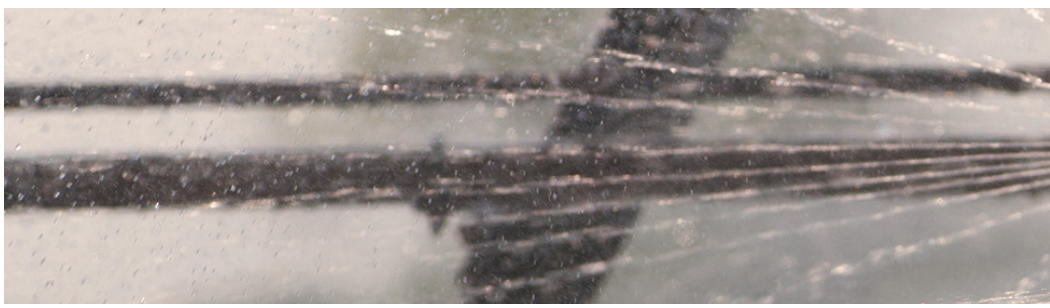


Photo provided by Isaya Kisekka, Southwest Research and Extension Center.

spray application, or LESA. Both may help farmers save money and conserve water.

"We hope that technologies such as MDI will slow the transition from irrigated agriculture to dryland farming, which would have a significant socio-economic influence on many rural communities and the state as a whole," Kisekka said. "The new version of the technology involves accessories that let the spray and drip line be connected to the same drop hoses, which allows the flexibility to use sprays for enhancing germination and for herbicide incorporation."

Mobile drip irrigation combines the mobility and economic benefits of center pivot irrigation — a large sprinkler system on wheels — and the water conservation benefits of drip irrigation. Low elevation spray application uses a center pivot system with spray nozzles a few feet from the ground.

According to Kisekka, sprays are needed to ensure germination in dry years and for incorporating herbicides and fertilizers. In addition, the drip irrigation can reduce evaporative losses to center sprinklers and is relatively inexpensive to retrofit an old sprinkler system to mobile drip irrigation.

The researchers planted corn in May at the university's Southwest Research and Extension Center. They will be collecting data to compare mobile drip irrigation to low elevation spray application in summer 2015. They will compare yields, water productivity, biomass, evaporation losses and application efficiency, and do an economic analysis.

"The lack of data on the MDI technology is the reason we are conducting this research," Kisekka said. "We can scientifically quantify yield benefits, if any, and potential water saving of this technology compared to LESA."

In addition to Kisekka, the team of researchers includes Jonathan Aguilar, assistant professor and extension water specialist; John Holman, associate professor and cropping systems agronomist; Randall Currie, associate professor of weed science; Bill Golden, research assistant professor of agricultural economics; and Sarah Zukoff, assistant professor of entomology.

By Stephanie Jacques, Communications and Marketing

Photo provided by Dan Donnert, K-State Research and Extension.

Have your cake and eat it, too

Novel starch makes processed foods healthier

The old saying is confusing, because why would anyone who has cake elect not to eat it? Some have argued that the order should be reversed to clarify the relationship: After you eat your cake, you can no longer have it, because it's gone.

But regardless of order, afterward, the real problem begins: Your blood sugar rises rapidly because of the easily digestible starches that cake and other processed foods contain. These starches contribute to obesity, diabetes and colon cancer.

Kansas State University researchers have found a way to make processed foods healthier by producing resistant starch, or starch that can't be digested by the stomach and small intestine.

> If people are going to make the less healthy decision, why not make those things healthier?

"We are trying to understand the structure of starch and how it's related to digestibility, and then use technology to manipulate the structure and change digestibility," said Yong-Cheng Shi, professor of grain science and industry.

Postdoctoral researcher Michael Sweedman said the starches have many applications in foods like white bread and cookies and "anything where you want functional fiber in products, but you don't want the textural properties that come with more traditional forms of fiber."

A patent is pending on the process that creates resistant starches. Commercial food ingredient companies are interested in licensing the technology, which requires no nonfood chemical additives and meets niche dietary requirements, such as vegan, vegetarian, kosher and halal.

"We are carefully controlling crystallization conditions," Shi said.

Water, enzymes, and heating and cooling are all that's required to manipulate the starches, and the process is high-yielding. Increasing the proportion of resistant starches results in foods with a lower glycemic index. An additional benefit is that because resistant starch escapes digestion in the small intestine, it is fermented in large intestine.

"The colon is like a large fermentation tank," Sweedman said, "and bacteria need to be fed."

When we eat high glycemic index food, it is digested and absorbed in the bloodstream before it gets to the large intestine, and bacteria don't get the food they need. That means bad bacteria proliferate.

"Fermentable material needs to get through," Sweedman said.

Human clinical trials demonstrated a positive glycemic response, and results raised questions about measuring the glycemic index that will ripple through the human nutrition community. An additional application for the product may be as a coating on pills that ensures ingredients survive long enough to be absorbed. Shi and Sweedman are also working on ways to scale up production to make it suitable for a commercial environment, which may entail another patent.

So should we be encouraged to eat the cake?

"People should eat better food, but the fact remains that many of us still choose for whatever reason — price, shelf life or just texture-flavor profile — processed foods over the more fresh traditionally healthy foods," Sweedman said. "If people are going to make the less healthy decision, why not make those things healthier? You can make those sweet, processed foods healthier for people, and you get the best of both worlds."

By Sarah Caldwell Hancock, Office of the Vice President for Research

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- As the nation's first operational land-grant university, Kansas State University has more than 150 years of expertise in animal health, plant science, food safety and food security.
- More than $192 million in active funding has been awarded to Kansas State University for research related to global food systems since 2012.
- Kansas State University is home to the four newest Feed the Future Innovation Labs from USAID.
- In 2014, Kansas State University helped produce 15 wheat varieties for Kansas' more than 9 million acres of wheat fields.
- Kansas State University is the only U.S. university invited to join the Plant Biosecurity Cooperative Research Center. The center is a consortium of several of Australia and New Zealand's leading governmental research institutions and universities. Kansas State University and Australia share similar agricultural systems and concerns about emerging diseases and insect pests.
- The U.S. National Research Council ranks Kansas State University's department of plant pathology and its program as No. 1 in the nation among 162 plant pathology departments.