Strategic Plan 2020 – 2025

Department of
Food Science & Technology

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TEXAS A&M UNIVERSITY
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Introduction

The 2020-2025 strategic plan for the Food Science & Technology Department (FSTC), formed in January 2020, builds on previous expertise following a division of the former Nutrition and Food Science Department. Goals and strategies have been developed to achieve significant progress toward the Department's aspiration to develop a world-class training, research, and outreach program that leads the nation in shaping the future direction of the food science profession, while innovatively meeting the current and emerging needs of stakeholders. The Department aims to be among the best food science programs in the world by developing unique high impact education and research programs that apply contemporary and novel technologies in food processing, food safety and quality, and sustainability.

The grand mission is to create new knowledge that leads to high quality, healthy, diverse, safe, and sustainable food systems to address current and future national and global needs. The Department will achieve this mission by investing in the people and tools needed to conduct interdisciplinary and collaborative research focused on the development and novel application of scientific and technological advances. The strategic plan has four key thematic areas of excellence including Global Sensory and Consumer Science, Global Food Safety and Quality, Functional Food Systems for Healthy Texas and Beyond, and Innovative Technology that together support our central theme, *Food Science for the Future*.

Our current strengths include specialized expertise in food science technologies, encompassing food chemistry, engineering, microbiology, and processing and unique access to a wide array of laboratories and pilot facilities. Our core teaching and research facilities include commercial-scale electron beam food processing, NASA space food preparation and processing, and grain processing and baking. We work closely with government, academic and industry scientists to be responsive to their needs. Our faculty research labs and departmental core facilities provide unparalleled undergraduate and graduate student training. Our graduates are making solid contributions in government, academia, and private industry.

Continued pursuit of a preeminent research portfolio will occur as a result of strategic investment in research infrastructure, increased faculty research effort, and continued emphasis on the Department of Food Science & Technology's research strengths. In addition, the Department will build out areas of research excellence and interdisciplinary collaborations while creating innovative programs that address the need for high quality and sustainable food supplies to ensure societal health and wellbeing. The Food Science & Technology Department's research portfolio will be characterized by continued growth of research opportunities for students, strategic engagement with industry, research expenditures, innovative technologies, scholarly outputs, and an enhanced student experience in the research enterprise. Our progress will be measured by benchmarks that demonstrate our commitment to excellence and our passion for creating *Food Science for the Future*.

Vision

The Food Science & Technology Department will be a global leader in shaping the direction of the food science profession and providing the science to feed the world.

Mission

We are committed to knowledge discovery and delivery of high-quality education to position the science of food within a sustainable framework, with emphasis on improving health and wellbeing.

Values

We are committed to our Aggie Core values:

Loyalty, integrity, excellence, leadership, respect, and selfless service.

In addition, we are committed to:

- **Openness and Inclusivity**: We embrace a worldview that recognizes and values the importance of both domestic and global perspectives.
- **Innovation and Knowledge:** We are committed to the pursuit of inquiry and discovery and to the creation and dissemination of knowledge.
- **Competence and Responsibility:** We are committed to excellence in research, education, and service to bring the practice benefits of our pursuits to state, nation, and global communities.

Area of Excellence 1 : Global Sensory and Consumer Science

The Global Sensory and Consumer Science Area of Excellence aims to uniquely leverage and meld the disciplines of sensory science, human behavior, and neuroscience to better understand and meet the needs of food consumers. To create this distinctive vision, this area of excellence will expand faculty expertise and extend existing teaching programs, including development of a new certificate program.

The Global Sensory and Consumer Science Area of Excellence is distinguished by:
- Development and establishment of a unique, premiere national and global program that combines sensory science, neuroscience, human behavior and marketing of foods
- Understanding consumer perception, behavior, and sensing of existing and new food concepts and products to improve consumer acceptance of product quality, nutritional value, and safety

Goal 1: Become a global leader in understanding linkages between food quality, value and healthfulness, and consumer perception, value, and behavior

Goal 2: Sustainable number of faculty with expertise in sensory science, human behavior, economic choice processing, neuroscience and sensing, brain signal transduction, and gut/brain axis

Goal 3: Sustainable education, research and outreach programs with foundations in sensory science, human behavior, and neuroscience

Objectives:
- 1.a. Use neuroscience, human behavior, and sensory techniques to understand drivers of consumer perception and outcomes
- 1.b. Acquire space for multidisciplinary sensory facility combined with the Human Behavior Laboratory
- 2.a. Expand expertise to strengthen applied and basic teaching and research program in sensory science, human behavior, neuroscience and sensing, brain signal transduction, and gut/brain axis
- 3.a. Expand and strengthen the undergraduate and graduate teaching programs and obtain higher national rankings

Area of Excellence 2 : Global Food Safety and Quality

The Global Food Safety and Quality Area of Excellence focuses on the responsivity of the U.S. food industry to remain globally competitive, developing advanced technologies and systems to ensure that current and next generation food scientists meet this grand challenge. The Food Science & Technology Department is strategically positioned to excel in this area, building upon strengths including deep expertise in food microbiology, food chemistry, food processing technologies, and vibrant training programs.

The Global Food Safety and Quality Area of Excellence specializes in:
- The availability of high quality, safe and sustainable food supplies that are of strategic importance nationally and globally
- Development of advanced technologies and educational programs to ensure adequate high quality, safe, and sustainable food supplies
- Ensuring the United States food industry remains globally competitive and responsive by adopting advanced food processing technologies, globalized supply chains, and novel distribution networks, while being adept at mining big data in support of food defense and traceability

Goal 1: Enhance the knowledge necessary to design, develop, and manufacture high quality foods, and safe food products that address evolving consumer trends

Goal 2: Enhance food safety, food quality, and sustainability through pre-harvest intervention strategies, and post-harvest processing, packaging, and use of novel ingredients and technologies

Goal 3: Enhance collaborative research and external outreach and engagement programs to improve food supply chains to mitigate food waste, strengthen food security during natural and man-made emergencies, detect fraud, and strengthen food defense by focusing on food authentication and traceability, and operational processes

Goal 4: Enhance internal and external collaborations to utilize big data analysis and predictive analytics to deliver targeted outreach programs to specific stakeholders

Goal 5: Enhance competitiveness of FSTC students for positions in the food industry, academia and regulatory agencies

Objectives:
- 1.a. Develop research program(s) that focus on plant-based proteins and alternate protein sources for human and companion animals
- 1.b. Develop research program(s) that focus on novel food processing technologies to enhance quality, nutrition, and convenience
- 2.a. Develop research programs that focus on smart food packaging systems
- 2.b. Strengthen research programs that focus on foodborne viruses
- 2.c. Strengthen research programs that focus on trans-kingdom interactions in food growing and processing environments
- 3.a. Develop research programs to focus on safety and traceability across the supply chain
- 4.a. Develop internal and external collaborative research programs to harness big data analysis and predictive analytics
- 4.b. Develop tailored degree programs focusing on multidisciplinary expertise
- 5.a. Increase student preparedness, and competitiveness for jobs in industry, government, and academia

Area of Excellence 3 : Functional Food Systems for Healthy Texas and Beyond

The Functional Food Systems for Healthy Texas and Beyond Area of Excellence develops food science innovations that sustainably leverage advanced and emerging scientific principles to create high quality, safe products. Through the creation of transformative knowledge and use of cutting-edge technologies including foodomics, the critical contributions of this area of excellence are to improve food quality while ensuring sustainable and secure foods for societal health and wellbeing.

The Functional Food Systems Area of Excellence focuses on:
- Facilitating discoveries that define fundamental and functional relationships between food composition and physical, chemical, and biological properties
- Creation of knowledge that leads to high quality and healthy food products that meet current and future consumer sensory, performance, and nutritional needs
- Innovations in analytical tools that precisely capture complex food quality attributes and their physiological effects

Goal 1: Improve food quality to ensure Texan and broader society health and wellbeing

Goal 2: Develop omics tools to ensure food security and efficiently mitigate food threats along the food value chain

Goal 3: Facilitate adoption of innovations and technologies to ensure sustainable and profitable food systems in Texas and globally

➡ **Objectives:**

1.a. Apply fundamental chemical and physical properties to develop high precision food property characterization tools

1.b. Develop innovative, precise, and sustainable methods for designing diverse foods that promote health & wellbeing

2.a. Develop tools for food traceability and to rapidly detect food toxins and contaminants through the food value chain

2.b. Develop innovative tools to characterize biological fate of whole food components

3.a. Develop outreach systems to promote wide adoption and use of novel food manufacturing technologies that minimize waste and promote health

Area of Excellence 4 : Innovative Technologies

The Innovative Technologies Area of Excellence reflects food industry priorities including food supply chain resilience, cleaner technologies, and improved food quality and safety efficiencies. Innovative food technologies harness the power to meet the ever-growing demands for food in a world of billions of people. Responsive to changing needs, this area of excellence is at the leading edge of emergent technology development and application.

The Innovative Technologies Area of Excellence builds:

- Resilience of the food supply chain through artificial intelligence, machine learning, and sensors
- Cleaner technologies that are economically and environmentally advantageous (plant-based foods, nanotechnology)
- Emerging technologies to improve quality and safety of foods at a low cost while reducing carbon footprint, food waste and loss

Goal 1: Sustainable number of faculty with expertise in innovative technologies for future foods

Goal 2: Sustainable education, research and outreach programs through strategic use and development of the FSTC pilot plant

Goal 3: Become leading department in innovative technologies for future foods

➡ **Objectives:**

1.a Become a leader in applications of big data, sensors development, nanotechnology and plant-based foods that ensure supply of safe affordable food

2.a Strengthen teaching, research, and outreach capabilities in innovative technologies

2.b Acquire demonstration or pilot plant equipment

3.a Improve the Department's reputation for excellence in innovative technologies for future foods in teaching, research, and service

Departmental Effectiveness & Infrastructure

Overview

The Food Science & Technology Department is poised to strategically advance and become a leader in applied contemporary and novel technologies in food processing, food safety and quality, and sustainability. We are committed to establishing and maintaining state-of-the-art facilities and equipment to support collaborative research as we aim to address grand challenges. The newly formed department is comprised of faculty, staff, and students that are currently dispersed across the TAMU campus. Lacking centralized space and facilities directly impacts our goals to expand the importance and impact of our research, recruit exceptional faculty, enhance collaborations and innovations, and increase undergraduate student enrollment while providing high impact training experiences for our students. Securing critical resources and personnel are central to achieving our departmental goals.

In addition to the immediate need for a central physical location for the Food Science & Technology Department, there is a critical need to develop an expedited plan to facilitate the migration of food scientist faculty members to the new department. Migration of faculty would serve to lessen current threats to the survival of the new department based on legacy attachments of faculty to their discipline-specific affiliations across campus. Specifically, a consolidated faculty presence and investment of time is essential for coalescing around specific themes (areas of excellence) and building the Department's reputation domestically and globally; recruiting and building world-class graduate programs (especially in Ph.D. food science training); raising the Department's ranking and competitiveness for large grants because migrated faculty productivity would then be attributed to the Department; attracting major food industry support due to increasing solidity and productivity of a unified Department with a positive reputation and growing influence and impact. Finally, a united faculty will allow for streamlined research and collaborative projects, educational and mentoring activities, and Departmental administration.

Addressing the critical needs outlined above will accelerate the success of the Food Science & Technology Department as we look to lead in the future of food. We have highlighted below critical needs in each of the areas of excellence to address existing resource and personnel needs and have set the following strategic priorities to competitively position the Department and capitalize on existing strengths:

Invest in infrastructure for increased research and scholarly productivity
- Establish physical infrastructure to house the Department in a central location
- Invest in laboratory equipment for research and high impact learning experiences
- Leverage available facilities on campus including core teaching and research facilities:
  - Commercial-scale electron beam food processing: The Food Science and Technology Department's National Center for Electron Beam Research is the nation's only International Atomic Energy Agency (IAEA) recognized International Collaborating Centre for electron beam technology applications in food, health and the environment.
  - Pilot-scale high acid/hot fill processing/bottling line
  - NASA space food preparation and processing
  - Modern grain processing and baking, and teaching and demonstration laboratories
  - Food data science lab that includes advanced analytical instruments for high sensitivity molecular characterization of complex food components and their biological metabolites, as well as BSL-2 certified molecular microbiology.

These state-of-the-art resources position Texas A&M University's Food Science and Technology Department to be a global leader in addressing emerging research and high impact teaching needs.

Attract and retain high quality research faculty
- Recruit and retain the best in the field
- Increase external funding for collaborative and interdisciplinary research

Environmental Scan

Anchored in our core purpose and values, we have developed our strategic plan to meet the demands of the future through a core ideology and envisioned future that will evolve. We are dedicated to being a global leader for *Food Science for the Future*, a role that requires our department to understand and adapt to what the future will hold as we achieve our goals. In our environmental scan, we identify assumptions about the future and factors, both internal and external, that will influence outcomes. In this way, we have prepared ourselves for adaptive management practices in response to critical uncertainties including relevant and unforeseen issues.

Internal Environment
Summary
The new Food Science and Technology Department includes approximately 95 undergraduate and 30 graduate students (fall 2019 enrollment), eight faculty members (4 Professors, 2 Associate Professors, one Instructional Associate Professor and one Lecturer), and an emeritus professor. Department staff include an administrative assistant and a program coordinator currently shared between FSTC and Nutrition departments. The other staff members who currently provide business, information technology, and academic advisor services are being centralized at the College level. The quality of education, including knowledge and skill development, is significantly influenced by student and stakeholder engagement and is not limited to the classroom environment. During the last 15 years, with the exception of only 3-4 students whose employment status is unknown, the majority of Food Science Master's program graduates have been employed by the food industry (40%) or have continued on to a doctoral program (32%). The majority of Food Science Ph.D. graduates are employed in the food industry (67%). The student profile for degrees awarded 2018-2019 (all levels) was 30 females and 7 males, approximately 50% were students of minority ethnicities.

Organization
Within the Department, the lack of a centralized facility hampers efficiency at multiple levels, creating barriers to the successful cultivation of positive outcomes for student support, faculty collaboration, and collegiality. Addressing limitations in infrastructure would support the development of a more efficient and collaborative environment to retain faculty who may leave to join competitors and deter the current over-reliance on faculty in other departments for program-critical activities.

Infrastructure
The organizational need to secure space and equipment is also a critical infrastructure need. With the proper resources and reliable, centralized access to those resources, the Department can adequately train and teach skills essential for knowledge transfer of technology and maintain a world-class curriculum.

Budget
A limited internal budget is an ongoing challenge that is collectively addressed through creation of a diversified research and development portfolio that is supported by a strong institutional ranking, faculty publications, and sponsored research awards to projects engaging multiple units and disciplines. In addition,

positioning the Department to be competitive for external funding sources will result in securing the funds needed to recruit and retain talented graduate students.

Human resources

Human resource considerations are varied and include faculty issues such as the degree to which faculty members are open to change and whether or not retired faculty are promptly or never replaced with new hires. Societal trends have the tendency to drive enrollment based on preferences, for example, technology to develop insect-based foods, "all natural" foods, and precision nutrition, etc. Finally, funding for adequate technician support, which is critical to our research mission, is necessary to maintain laboratory functions.

External Microenvironment

As a new department, we have considered the following external microenvironmental factors, all of which shape our current strategic thinking as we position to excel in our thematic areas of excellence. Future reports will include comparative analyses that summarize our relative position among peer institutions for important ranking and recognition factors including research and publications, total donated funds, established and key resources, and working strategic partnerships.

Competitors

Peer institutions can leverage multi-year competitive funding, lower tuition and fees, higher faculty to student ratios, higher student stipends, and better graduate employment rates to recruit and retain exceptional student talent.

Industry

Within the industry, rapid shifts in consumer trends and industrial technologies demand evolving expertise and innovations (green technologies, packaging, shelf-stable) that are responsive to critical food insecurity issues worldwide.

Consumers

Knowledge discovery using technological advances, including nanotechnology and real-time data, is required to meet consumer needs for healthy, affordable food, and precise nutritional information.

Market

Use of artificial intelligence and machine learning facilitate reliable and intelligent supply chains that adapt quickly to events with minimal disruption. Improved marketing and regulations have the power to lessen consumer food and technology neophobia through improved marketing and regulations about the safety of new foods and technologies.

External Macroenvironment

Summary

Our Food Science and Technology faculty have extensive international research engagement and expertise. Faculty work closely with multiple partners on various continents to address global challenges related to sustainable food systems, food quality and human health, food safety, postharvest loss and food waste, and food diversity, among others. We have established strengths as a global leader in electron beam food processing and space food processing. In addition, our work operating a Latin American Food Safety Program

is a highly collaborative effort with Latin American universities and agricultural commodities exported to the U.S., efforts that are advancing food safety practices in the global market.

Demographics
The need for enrollment growth and program expansion in higher education is prompted by economic and demographic trends that show increased demand for educational pathways for a very diverse population of students including non-traditional and professional students. Training these populations requires programmatic shifts in how and when courses are delivered and culture shifts to create positive learning environments for all learners.

Economic & Political
The current global pandemic exemplifies the need to consider mega-issues and our commitment to remain flexible as we implement our strategic plan to meet global food security needs. The COVID-19 pandemic has negatively impacted the U.S. economy and will continue to affect funding levels, student enrollment, and our pursuit of excellence under ongoing restrictions. The political climate and legislative changes also affect funding levels, requiring a diverse portfolio of revenue generation and judicious allocation of funds into the Department.

Cultural
Shifts in the cultural composition and preferences of the U.S. population are driving demand for specific foods and, therefore, changes in manufacturing technologies. Further, specific technologies are required to serve immunocompromised populations.

Technological
A massive shift to online learning driven by the global pandemic has highlighted the need for faculty professional development in online pedagogy and course delivery to train the future workforce. Technological advances in food processing require food scientists with unique expertise in computer sciences and big data analysis.

Industry Engagement & Student Preparedness

Industry engagement and student preparedness increase the breadth and scope of our research mission and we will pursue advancements in these areas to improve lives through transformative student experiences and collaborative industry relationships to build resilient and sustainable food systems. Aligned with the TAMU strategic plans to elevate graduate and professional education and support student engagement in transformational learning experiences, we are committed to realizing the outreach, engagement, and student experience objectives further described in each area of excellence.

The Department conducted surveys of former students and of industry partners to inform strategic planning, prioritization of implementation steps, and identification of potential partnerships. Both alumni and industry partners highlighted the importance of building the Department's capacity to prepare students for professional careers by offering applied experiences, such as site visits, mentoring, and internships, and the development of interpersonal and intrapersonal skills, including communication, collaboration, conflict resolution, adaptability, and critical thinking. The importance of these "soft skills" and a broader understanding of the variability in professions within the food science discipline were given more emphasis in survey responses than purely technical knowledge and skills. Respondents also provided valuable information about industry trends (big data,

artificial intelligence) and potentially valuable curricula modifications (regulatory topics, advanced safety). The results of these surveys have shaped the goals, objectives, and tactics presented in this strategic plan.

Our aim is to engage industry and students in synergistic ways through new initiatives including:

High impact, industry supported research and connected internship opportunities

Formal training opportunities to support student development through hands-on learning and research projects in partnership with industry. These high impact learning environments accelerate student comprehension of evolving issues and solutions to critical problems while also connecting their classroom learning to application.

Formalized Mentorship Program

Students will work directly with professionals in their field of study who are willing to advise their academic and professional journey. Emphasis on proper mentorship practices and professional development skills, including resume and interview skills, will be incorporated.

Industry site visits, Industry on campus day

Policies and procedures will be developed to facilitate student visits to industry sites within Texas and beyond (Study Abroad Texas Program). Early exposure to potential career pathways in industry will serve to contextualize opportunities for students and facilitate networking. Likewise, invitations for industry to visit campus to highlight current and future job openings, meet and recruit students for internships and early job placement opportunities, will create further direct access for both students and our industry partners.

Industry Advisory Board

Creation of this advisory board is central to our vision and mission to be a global leader in research, education and service as we aim to provide science to feed the world. The advisory board will provide non-binding strategic advice for industry-relevant research and student initiatives, as well as helping to connect our scientists with funding opportunities through networking with industry associations, etc. In return, our scientists and students will be more connected to our industry partners, promoting effective identification of industry needs and communications of research-based information to stakeholders.

A strong relationship between the food industry, state and federal agencies and the Food Science Department will create benefits for all involved by offering advancements and problem-solving to the industry, and experience and connections to our students that will be valuable during their academic and professional careers. In addition to developing strategic relationships that build department-industry-student connections, we will further create a transformative student experience by achieving the following:

- Elevation of current, revised undergraduate and graduate curricula with high impact learning experiences including direct experiences with industry, hands-on use of advance laboratory

instrumentation and techniques, improved access to practical co-curricular learning experiences in leadership and personal development

- Professional development opportunities to hone skills that complement students' degrees including team science approaches and teaching opportunities
- Build capacity to teach the next generation of students, enhancing the student experience online and opportunities to train students domestically and globally using online tools and training

Appendix
2020-2025 Strategic Plan Tactics & Benchmarks

⟶ **Introduction:**

The envisioned future for the newly formed Food Science & Technology Department is a vivid picture of outcome-oriented goals that represent what will constitute its future success. The Department is dedicated to enhancing and creating robust research, teaching, and outreach programs to address consumer and industry needs and challenges at the human-health nexus locally, nationally, and globally.

Each defined goal will move the Department toward the realization of its vision that includes four key thematic areas of excellence: Global Sensory and Consumer Science, Global Food Safety and Quality, Functional Food Systems for Healthy Texas and Beyond, and Innovative Technology that together support its central theme, *Food Science for the Future*. The goals outlined are not listed in priority order and every goal will need to be accomplished to fully achieve the vision. Detailed below, each goal is accompanied by a set of objectives, which represent central issues affecting the Department's ability to achieve its goals, tactics detailing actions that will be taken to achieve the stated objectives, and benchmarks against which to measure progress as the strategic plan is executed.

Area of Excellence 1 : Global Sensory and Consumer Science

Goal 1: Become a global leader in understanding linkages between food quality, value and healthfulness and consumer perception, value, and behavior

Goal 2: Sustainable number of faculty with expertise in sensory science, human behavior, economic choice processing, neuroscience and sensing, brain signal transduction, and gut/brain axis

Goal 3: Sustainable education, research and outreach programs with foundations in sensory science, human behavior, and neuroscience

Area of Excellence 1 Objectives	Tactics	Benchmarks
Objective 1.1.a. Use neuroscience, human behavior, and sensory techniques to understand drivers of consumer perception and outcomes	• Identify and recruit current faculty with expertise in each area that are willing to work across departments and colleges • Identify and establish novel research directions in consumer perception related to neuroscience, human behavior, and sensory techniques that do not currently exist within the Department, College and University • Engage external advisors to provide insight, training, and future internships and other opportunities for students	1.1. Key faculty recruited and working together within one year 1.2. Research proposals submitted within two years 1.3. One to three federally funded integrated projects by year five 1.4. External Advisory Board consisting of CEOs of global companies established within one year

Area of Excellence 1 Objectives	Tactics	Benchmarks
Objective 1.1.b. Acquire space for multidisciplinary sensory facility combined with the Human Behavior Laboratory	• Develop a plan for Administration and industry for costs associated with building or converting existing space near the Human Behavior Laboratory • Identify internal and external sources of support • Contact and solicit industry and external donations during years one through three • Identify location for combined sensory and laboratory space	1.5. Plan for acquiring space results in an increase of internal and external support and donations within one year 1.6. Combined sensory and laboratory space established within one year and renovations for these facilities scheduled for year two
Objective 1.2.a. Expand expertise to strengthen applied and basic teaching and research program in sensory science, human behavior, neuroscience and sensing, brain signal transduction, and gut/brain axis	• Hire faculty member with expertise in flavor chemistry • Hire faculty member with expertise in applied sensory science • Hire a cluster of 4 faculty members with expertise in economic choice processing/behavioral economics/neuroeconomics, gut/brain axis and signal transduction • Integrate applied sciences with expanded basic sciences including neuroscience and sensing, gut/brain axis, and human signal transduction • Develop competitive graduate research programs	1.7. Sustainable number of faculty hired and retained including flavor chemist and applied sensory scientist within one year and four faculty within a cluster for economic choice processing expertise, neuroscience, gut/brain axis and signal transduction expertise by year four 1.8. Submission of at least three federal grants that integrate applied and basic science by year five 1.9. Increase graduate student enrollment to at least ten by year four with at least six Ph.D. and four M.S. students
Objective 1.3.a. Expand and strengthen the undergraduate and graduate teaching programs and obtain higher national rankings	• Split the existing stacked sensory science course into undergraduate and graduate courses • Add the undergraduate sensory science course to the undergraduate curriculum in Food Science • Identify existing courses at the University in marketing, human behavior and neuroscience and add these to the core requirements for a certificate program • Develop advanced sensory science course that includes flavor chemistry • Add and develop graduate courses in neuroscience and human behavior during years three to five • Develop a sensory certificate for undergraduate and graduate students	1.10. Existing sensory course (NFSC/ANSC 687/487) split and taught separately in year one 1.11. Undergraduate sensory course added to the core curriculum in year one 1.12. Existing courses in other departments identified and students enrolled by year two 1.13. Advanced sensory science course that includes flavor chemistry, developed in year 3 and taught in year four 1.14. Graduate courses added to the curriculum and taught at least once by year five 1.15. Certificate program initiated in year three for undergraduate and year five for graduate programs 1.16. Higher national rankings based on IFT rankings

Area of Excellence 2 : Global Food Safety and Quality

Goal 1:   Enhance the knowledge necessary to design, develop, and manufacture high quality foods and food products that address evolving consumer trends

Goal 2:   Enhance food safety, food quality, and sustainability through pre-harvest intervention strategies, and post-harvest processing, packaging, and use of novel ingredients and technologies

Goal 3:   Enhance collaborative research and external outreach and engagement programs to improve food supply chains to mitigate food waste, strengthen food security during natural and man-made emergencies, detect fraud, and strengthen food defense by focusing on food authentication and traceability, and operational processes.

Goal 4:   Enhance internal and external collaborations to utilize big data analysis and predictive analytics to deliver targeted outreach programs to specific stakeholders

Goal 5:   Enhance competitiveness of FSTC students for positions in the food industry, academia and regulatory agencies

Area of Excellence 2 Objectives	Tactics	Benchmarks
Objective 2.1.a. Develop research program(s) that focus on plant-based proteins and alternate protein sources for human and companion animals	• Hire faculty with plant-based protein formulations expertise • Develop new plant-based protein foods course(s) • Develop industry collaborations in plant-based proteins	2.1. At least one faculty member hired with research focusing on plant-based proteins within two years 2.2. Original research publications increasing by two-fold each year 2.3. Two-fold increase in industry-TAMU collaborative proposals submitted for funding
Objective 2.1.b. Develop research program(s) that focus on novel food processing technologies to enhance quality, nutrition, and convenience	• Hire faculty with novel food processing technologies expertise • Develop new food processing undergraduate/graduate course(s)	2.4. At least 1 faculty member hired with expertise in novel food processing within two years 2.5. Original research publications increasing two-fold each year 2.6. External grant funding showing a positive trend 2.7. Increasing enrollment in new courses

Area of Excellence 2 Objectives	Tactics	Benchmarks
Objective 2.2.a. Develop research programs that focus on smart food packaging systems	• Hire faculty member with smart food packaging expertise • Develop collaborations with packaging industry • Secure corporate donations of packaging equipment for pilot plant • Conduct a survey of peer institutions to identify strategic collaborative opportunities • Develop new food packaging undergraduate/graduate course(s)	2.8. At least 1 faculty member hired with expertise in food packaging systems within two years 2.9. Original research publications increasing two-fold each year 2.10. Graduate students specifically applying to FSTC for packaging research programs 2.11. Industry-TAMU / peer institution collaborative proposals submitted for funding 2.12. Packaging equipment donation from private industry to meet research and teaching needs 2.13. Grow extramural research funding 2.14. Increasing enrollment in new courses
Objective 2.2.b. Strengthen research programs that focus on foodborne viruses	• Hire faculty with molecular food virology expertise • Develop food virology undergraduate/graduate course • Secure laboratory space to facilitate food virology research	2.15. At least 1 faculty member hired with expertise in food virology 2.16. Original research publications increasing two-fold each year 2.17. Graduate students specifically applying to FSTC for food virology research 2.18. Food virology course development and approval 2.19. Increasing enrollment in food virology course 2.20. Grow extramural research funding
Objective 2.2.c. Strengthen research programs that focus on trans-kingdom interactions in food growing and processing environments	• Hire faculty with trans-kingdom interactions expertise to lead study of this topic and to collaborate with the food production/processing areas	2.21. At least 1 faculty member hired with expertise in trans-kingdom interactions 2.22. Original research publications increasing two-fold each year 2.23. Grow extramural research funding
Objective 2.3.a. Develop research programs to focus on safety and traceability across the supply chain	• Initiate formal collaborations with College of Business (COB) and College of Engineering (COE) • Include faculty from COB and COE in Ph.D. advisory committees • Meet with food supply chain practitioners to understand their problems and how we can help solve them • Encourage Ph.D. students to enroll in appropriate COB and COE courses	2.24. Original research publications increasing two-fold each year 2.25. Increase in collaborative grant proposals with COB and COE 2.26. Increase in faculty from COB and COB on FSTC student committees

Area of Excellence 2 Objectives	Tactics	Benchmarks
Objective 2.4.a. Develop internal and external collaborative research programs to harness big data analysis and predictive analytics	• Meet with food supply chain practitioners to understand their problems and how we can help solve them • Initiate formal collaborations and external and internal research groups to demonstrate the application and integration of data science, software tools, and systems models that have enabled advanced analytics for managing the global food system • Develop a Food Data lab focusing on application of big data streams	2.27. Increasing research collaborations with COB and COE resulting in an increase of grant proposals and research papers 2.28. Original research publications increasing two-fold each year 2.29. Increase in faculty from COB and COE on FSTC student committees
Objective 2.4.b. Develop tailored degree programs focusing on multidisciplinary expertise	• Develop Professional Science Masters (PSM) programs related to multidisciplinary topics of relevance to food science and technology • Develop a new certificate or minor focusing on Data Science for Food Scientists	2.30. First cohort of students to enroll in PSM within two years 2.31. Develop the certificate program(s) within two years
Objective 2.5.a. Increase student preparedness and competitiveness for jobs in industry, government, and academia	• Develop a formal process to include internship experiences in graduate and undergraduate degree plans • Form an external student professional development advisory group and identify a faculty member to foster development of the program; provide a token stipend to the faculty for this activity • Invite private industry/government to visit campus for strategic events and as opportunities arise; designate a room for external partner use (in Cater-Matill) when they are on campus	2.32. All graduate students securing industry and government internships before graduation 2.33. Ph.D. graduates obtaining positions in academia/private industry/government within three months of graduation 2.34. All B.S. students having at least one industry internship before graduation 2.35. B.S. students having job offers or graduate school admission before graduation

Area of Excellence 3 : Functional Food Systems for Healthy Texas and Beyond

Goal 1: Improve food quality to ensure Texan and broader society health and wellbeing

Goal 2: Develop omics tools to ensure food security and efficiently mitigate food threats along the food value chain

Goal 3: Facilitate adoption of innovations and technologies to ensure sustainable and profitable food systems in Texas and globally

Area of Excellence 3 Objectives	Tactics	Benchmarks
Objective 3.1a. Apply fundamental chemical and physical principles to develop high precision food property characterization tools	• Hire molecular food interactions / interfacial scientist or lipid chemist to anchor and catalyze development of collaborative and applied science in faculty cluster • Develop collaborative research and grant proposals with faculty in engineering, biochemistry and other complementary areas • Publish opinion-shaping, high-quality research in top tier journals in the field • Generate national visibility in advanced food characterization methods through competitive grants and high-quality research and publications	3.1. Molecular food interactions faculty member hired within two years 3.2. Improved federal grant funding for faculty cluster by 50% 3.3. Invited presentations, authorships, and editorial activities at (inter)national level by 50% of faculty in cluster 3.4. National awards by 30% of faculty in cluster
Objective 3.1.b. Develop innovative, precise, and sustainable methods for designing foods that promote health and wellbeing	• Hire food polymer / material science faculty member to provide expertise in complex food component function • Hire food informatics / metabolomics faculty to provide expertise in big data handling • Apply innovative tools (e.g., gene editing, nanotechnology) to improve food bioactive profile through strategic collaboration with geneticists, engineers, and others • Develop collaborative research and grant proposals with faculty in nutrition, genetics, plant sciences and other complementary areas • Develop collaborative projects with food industry to address emerging consumer needs through product innovation	3.5. Food polymer / material scientist faculty member hired within two years 3.6. Food informatics / metabolomics faculty member hired within two years 3.7. New discoveries in physical phenomenon governing food quality and biological effects 3.8. New tools to characterize food metabolites and handle complex food science data 3.9. Publications in high impact, top tier journals 3.10. At least two major collaborative grants with partners secured 3.11. Technology licenses developed from collaborative work 3.12. At least 10% of faculty research funded through industry collaborations
Objective 3.2.a. Develop tools for food traceability and rapid detection of food toxins and contaminants through the food value chain	• Develop high-throughput, non-destructive screening methods for food ingredients and commodities in collaboration with the Office of State Chemist, and Center of Excellence for Cross-Border Threat Screening (CBTS) • Collaborate with photonics research cluster at TAMU to explore applications of new imaging and spectroscopy tools to non-destructive food characterization	3.13. Access to non-traditional grant sources by faculty, including U.S. Food and Drug Administration, Department of Homeland Security, Department of Defense 3.14. Collaborative publications in high quality journals 3.15. New food screening tools available for public use

Area of Excellence 3 Objectives	Tactics	Benchmarks
Objective 3.2.b. Develop innovative tools to characterize biological fate of whole food components	• Hire fermentation / food biotechnology faculty to lead food-microbiome interactions and food microbial biotransformation research • Develop collaborative projects and grant proposals with geneticists, biochemists and biostatisticians • Develop high sensitivity analytical tools for characterizing metabolites of complex food components • Develop nationally recognized research in food-microbiome interactions and metabolomics	3.16. Fermentation / food biotechnology faculty member hired within two years 3.17. Improved grant funding for faculty 3.18. Collaborative publications and grant writing with partners 3.19. Improved visibility of program
Objective 3.3.a. Develop outreach systems to promote wide adoption and use of novel food manufacturing technologies that minimize waste and promote health	• Hire an extension food scientist to facilitate adoption of technologies that promote safe, sustainable, and high-quality food systems for healthy Texans • Transfer enology program into Food Science and Technology Department • Utilize the new pilot facility to facilitate process and product innovations in collaboration with the food industry • Develop and execute regular professional development trainings for industry • Engage professional organizations (e.g., Institute of Food Technologists) through leadership and volunteer activities • Establish cutting edge food science outreach program that innovatively engages stakeholders • Develop departmental revenue stream through service and R&D activities with industry	3.20. Extension food scientist hired within two years 3.21. Two short course trainings provided to industry partners annually 3.22. Faculty appointed to leadership roles in professional organizations 3.23. Students actively engaged in professional organizations through leadership and synergistic activities 3.24. Industry internships and professional fellowships obtained by 30% of Food Science students annually

Area of Excellence 4 : Innovative Technologies

Goal 1: Sustainable number of faculty with expertise in innovative technologies for future foods
Goal 2: Sustainable education, research and outreach programs through strategic use and development of the FSTC pilot plant
Goal 3: Become leading department in innovative technologies for future foods

Area of Excellence 4 Objectives	Tactics	Benchmarks

Objective 4.1.a. Become a leader in applications of big data, sensors development, nanotechnology and plant-based foods that ensure supply of safe, affordable food	• Hire material scientist faculty for texture development of foods with enhanced sensory characteristics • Hire engineer faculty with AI and machine learning expertise (joint appointment with College of Engineering) • Hire engineer faculty to develop sensors using nanotechnology (joint appointment with College of Engineering) • Hire chemist or engineer faculty to develop sustainable clean technologies using plant or other natural materials to produce high quality foods (joint appointment with College of Engineering) • Evaluate current technology expertise and determine needs for further faculty hires • Generate intradisciplinary collaborations in support of innovative technologies	4.1. New faculty recruited and retained to fill technology knowledge gaps 4.2. New faculty hires collaborating with faculty from other areas of excellence and/or departments/colleges (e.g., food chemist works with engineer to test a flavor sensor; sensory faculty works with engineer to develop high quality plant-based meat replacement; food microbiologist works with big data analyst to test traceability of a pathogen in process line; sensory faculty works with materials scientist to develop food structure that maximizes flavor)
Objective 4.2.a. Strengthen teaching, research, and outreach capabilities in innovative technologies	• New faculty create innovative research programs • New faculty increase research funding • Expand courses including innovative technology • Identify undergraduate curriculum needs • Increase technology related activities	4.3. Individuals with relevant expertise hired 4.4. Competitive graduate research programs 4.5. Increased number of grants, peer-reviewed publications, and patents 4.6. New courses at graduate and undergraduate level developed by new faculty 4.7. Stronger curriculum with enhanced experiential learning
Objective 4.2.b. Acquire demonstration or pilot plant equipment.	• Proactive efforts to identify space for building or pilot plant • Develop plan to justify pursuit and acquisition of building / pilot plant facility efforts	4.8. Plan used to obtain donations from external groups 4.9. Improved external grants funding due to enhanced facility capabilities
Objective 4.3.a. Improve the Department's reputation for excellence in innovative technologies for future foods in teaching, research, and service	• Proactive efforts to recruit faculty and students • Proactive efforts to obtain funding to sustain programs • Marketing plan to promote uniqueness of technology programs	4.10. Enhanced teaching and research capabilities 4.11. Improved external grants funding from increased number of post-doctoral researchers 4.12. Improved departmental reputation 4.13. Increased enrollment due to improved departmental reputation 4.14. Increased departmental impact on food science issues worldwide