STRATEGIC PLAN

TEXAS A&M UNIVERSITY

Animal Science

Contents

DEPARTMENT OF ANIMAL SCIENCE STRATEGIC PLAN

Strategic Plan

Mission of the Department of Animal Science

The mission of the Department of Animal Science is to improve lives through discovery, integration, dissemination and application of science-based knowledge of animals and animal products.

Areas of Excellence to Support the Mission of the Department of Animal Science

To more effectively fulfill the mission of the Department of Animal Science, Areas of Excellence have been identified and developed. The goal for the Areas of Excellence are to provide focused areas of scholarship within the Department of Animal Science for which we may be or become a national and international leader. The Areas of Excellence align with the missions of both the Department and College, as well as the strategic pillars of the University: (1) Transformational Education for all students, (2) Discovery and Innovation for the world, (3) Impact on the state, the nation and the world.

Department of Animal Science Areas of Excellence

- CATTLE ADAPTED TO TROPICAL AND SUBTROPICAL ENVIRONMENTS
- PREGNANCY AND DEVELOPMENTAL PROGRAMMING
- SAFETY, QUALITY, AND NUTRITION OF FOOD PRODUCTS
- STUDENT AND STAKEHOLDER ENGAGEMENT IN ANIMAL SCIENCE
- QUANTIFIABLE ANIMAL PERFORMANCE

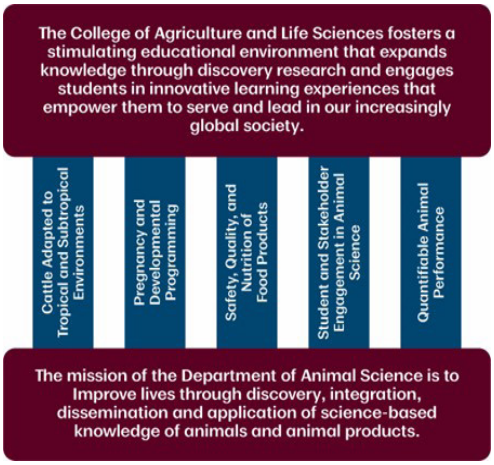

Figure X. *The mission of the Department of Animal Science provides a foundation from which the five departmental Areas of Excellence arise and by doing so, align and support the mission of the College of Agriculture and Life Sciences.*

TEXAS A&M UNIVERSITY
Animal Science

CATTLE ADAPTED TO TROPICAL AND SUBTROPICAL ENVIRONMENTS

Our goal is to be the world leader in beef production genetics, management, and products.

Approximately 70% of the increase in beef production required to meet the growing demand is expected from subtropical/tropical regions of the planet (FAO, 2009), including southern US, Mexico, Central/South American, Africa, Asia and Oceania. These regions contain ~70% of the world's cattle population, predominately *Bos indicus*-influenced breeds with diets based on forages and agricultural byproducts; however, most of these cattle are managed on strategies developed and recommended in *B. taurus* cattle. *Bos indicus* and *B. taurus* are two individual subspecies and differ in several body functions related to beef production, including reproductive physiology, nutritional requirements, social behavior, digestive system, and body composition. Hence, a fundamental step to meet the increasing global demand for protein while addressing environmental stewardship is to characterize these physiology, social and nutrient requirement differences. Such knowledge will lead to development and dissemination of management practices tailored to optimize production efficiency of *B. indicus*-influenced cattle reared in subtropical/tropical environments and will impact the state, nation and world.

Our **goal** is to be the world leader in beef production genetics, management, and products. Our **vision** is to provide unparalleled leadership, best practices, research, support, and training to beef industries worldwide, particularly those based in subtropical/tropical environments. This specialty will help us enhance beef production through excellence in developing and disseminating genetics, management, and product-related technologies to producers, students, industry professionals, and the public.

BUILDING BLOCKS OF OUR EFFORTS:

Research: Advancements in physiology and genetics will increase production through enhanced knowledge of reproductive efficiency, genetic improvement, nutritional management, and immunological function. Additionally, the impacts of these factors upon nutrition, palatability, yield, safety and consumption of beef are significant areas of investigation.

Teaching: Balanced undergraduate and graduate curriculum with emphasis on globalization. Programs including capstone, internships, study abroad, international travel, scientific collaboration and industry involvement will facilitate student development and employment opportunities. All providing opportunities for transformational education.

Extension: Two signature programs, the Beef Cattle Short Course and the International Beef Cattle Academy (ICBA), are housed within the Department of Animal Science and offer stakeholders unprecedented access to educational opportunities. The educational mission of the ICBA is to advance the knowledge of global beef production by exposing students to emerging technologies in cattle reproduction, nutrition, genetics, health, and welfare pertaining to all phases of beef production, as well as quality and safety of beef and its products. The 2017 Texas A&M Beef Cattle Short Course had an economic benefit of $2.2 million for ranches in attendance.

PREGNANCY AND DEVELOPMENTAL PROGRAMMING

Our goal is to be the world leader in pregnancy and developmental programming of livestock.

Increased understanding of animal reproduction at molecular, cellular, and whole animal levels is critical for improving production efficiency in animal agriculture as well as enhancing human health. Independent of the species, if a pregnancy doesn't establish and successfully result in live offspring, the species is not sustainable. Additionally, a broader understanding of the impact of suboptimal environmental exposure during pregnancy or early postnatal life suggests that reproductive success is a lifelong measurement of that animal's performance, in addition to historically calculated pre- and early postnatal morbidity and mortality. Developmental programming touches every aspect of physiology and therefore impacts all aspects of livestock production, including: 1) reproductive outcomes; 2) immune function; 3) growth, metabolism, and efficiency; 3) stress response; 4) behavior; and more. This concept is not new; however, the mechanistic basis of this process has recently come to the forefront. Thus, pregnancy and developmental programming of both livestock and humans has taken on an increased level of importance. Nutrition, stress and environmental contaminants all play roles in programming the expression of genes in developing fetuses. Discovery and innovation in this Area of Excellence will allow for the generation of foundational knowledge and development of applied technologies and strategies that will positively impact the state, the nation, and the world.

Our **goal** is to be the world leader in pregnancy and developmental programming of livestock.
Our **vision** is to enhance reproductive efficiencies and outcomes via increased understanding of mechanisms supporting embryonic survival, relationships between intra-uterine nutrition, immune function, neonatal survival, and improved utilization of nutrients in livestock species and laboratory animals, as well as pre-and post- pubertal development and functionality.

BUILDING BLOCKS OF OUR EFFORTS:

Research: The Department of Animal Science is home to a critical mass of faculty with established records of collaboration and who have yielded significant extramural funding, publications, industry impacts, and global recognition. Their programs have been particularly effective at integration of scholarship in disciplines of agricultural sciences, biomedical sciences, veterinary sciences, engineering, bioinformatics, business, social sciences and the humanities.

Teaching: The opportunity for students to pursue graduate degrees in Physiology of Reproduction is an important recruiting tool. Faculty membership in the Interdisciplinary Faculty of Reproductive Biology (University Level) provides further opportunities for graduate students to engage with visitors to the seminar series as well as their peers from additional departments. Undergraduates have the opportunity to pursue training in reproductive biology courses with interactive laboratories as well as pursue laboratory research projects with faculty.

Extension: The dissemination of findings and translation of basic research into industry applications and protocols is a hallmark of this area. The involvement of research programs, as well as the level of engagement with stakeholders through events such as conferences and field days provide additional opportunities for stakeholder engagement.

SAFETY, QUALITY AND NUTRITION OF FOOD PRODUCTS

Our goal is to be the world leader in safety, quality and nutrition of food products.

Food product safety, quality, and nutrition are intrinsically linked and address a foundational need in society. Consumer attitudes toward consumption of food products (fresh or processed) are critical to marketing success and may be formed based on product safety, quality and nutritional value. Losing market shares would impact producers, processors, retailers, and the consumer. According to a 2016 study commissioned by the North American Meat Institute (http://meatfuelsamerica.guerrillaeconomics.net), companies in Texas that are directly involved in producing meat, poultry, and related products employ 146,464 people (1.87 million nationally) and an additional 354,960 jobs (3.54 million nationally) in related industries. Additionally, the manufacturer and sale of meat, poultry, and related products generated an estimated $87.39 billion in economic activity in Texas ($1.02 trillion nationally). The scope and utilization of research findings and outreach activities in this area are tremendous. Examples include but are not limited to: USDA's Nutrient Database updates, National Beef Quality Audit, Meat Science Lexicon development, establishment of a searchable validation database for food safety, determination of antimicrobial efficacy, and contributions to the Research Guidelines for Cookery, Sensory Evaluation, and Instrumental Tenderness Measurements of Meat. Efforts have also reduced food wastage due to spoilage, disease-related losses in animal production, and the burden on the human healthcare system caused by chronic and acute conditions.

Our **goal** is to be the world leader in Safety, Quality, and Nutrition of Food Products. Our **vision** is to provide leadership in research, support, and training in food safety, quality and nutrition as well as the relationship between these areas. This will help us enhance the quality of life for a global population through excellence in developing and disseminating information and technologies to students, industry professionals, and the public.

BUILDING BLOCKS OF OUR EFFORTS:

Research: Efforts span production through processing, distribution and preparation and includes the largest critical mass of meat science faculty in the U.S. who are renowned experts in the areas of sensory and flavor chemistry, fatty acid biochemistry, fresh meat quality, and food safety including antimicrobial applications and phage technology. This expertise is the basis for collaborations on a university, national, and global scale.

Teaching: Our students have access to more meat science and food safety courses than at any other U.S. university, as well as certificates in Meat Science and Food Safety. They also have significant opportunities to participate in judging teams, internships and research projects.

Extension: Our specialists possess the overarching expertise and ability to reach stakeholders at all levels of the conversion of animal products to consumer acceptable, safe, and nutritious food. These programs incorporate research innovation and transformational education to impact their audiences, which include individuals from across the state, nation and the world. Most of the extension programs such as Beef 706, Beef 101, Pork 101, Camp Brisket and Barbecue Camp are in high demand and are frequently sold out– sometimes in just minutes.

STUDENT AND STAKEHOLDER ENGAGEMENT IN ANIMAL SCIENCE

Our goal is to serve as a global leader in practices of student and stakeholder engagement in animal science.

The Department of Animal Science is one of the largest of its kind, with approximately 1,250 undergraduate students 130 graduate students, and more than 60 faculty members. The quality of education, including knowledge and skill development is significantly influenced by student and stakeholder engagement and is not limited to a classroom environment. Efforts in this Area of Excellence are based in aligning the student educational experience with industry needs, as well as enhancing public perception and understanding of animal science. We are committed to providing transformational education for all students. Examples include but are not limited to: completion of a data-driven undergraduate curriculum revision, increased independent graduate student research and teaching opportunities, development and expansion of online learning programs, study abroad experiences in Europe, Oceania, and South America, competing or coaching competitive teams, participation in government and/or industry-supported internships, as well as efforts in interdisciplinary and multi-investigator driven research, teaching and Extension projects. In addition to producer and consumer-focused engagement experiences, such as the Beef Cattle Short Course, ICBA, and Camps Brisket and Barbecue, there is also an annual focus on youth programs including: livestock and judging camps (700 future students), judging contests (3,000 future students), as well as stock shows including skillathons and science fairs (700 future students). Alignment of opportunities with industry and public priorities is facilitated via feedback from an External Advisory Council, former students, industry leaders, and program participants.

Our **goal** is to serve as a global leader in practices of student and stakeholder engagement in animal science. Our **vision** is to enhance the educational experience, appreciation of animal agriculture, create industry advocates, and improve consumer understanding of animal science. This specialization will improve the knowledge, skills and competency of our students and stakeholders including producers, industry professionals, and the general public.

BUILDING BLOCKS OF OUR EFFORTS:

Research: The Department is well suited to increase focus on discovery and innovation in the areas of pedagogy, student and stakeholder perceptions, high impact learning programs, and international collaborations. This will enable our Department to impact not only our students, but also individuals across the state, nation, and world.

Teaching: Opportunities for transformational education provided through both traditional and novel mechanisms to current students as well as individuals outside the discipline. Educational opportunities are also provided by varied training programs at the undergraduate and graduate levels including pursuits of traditional degrees as well as certificates of specialization.

Extension: Large-scale and highly-successful programs focused on youth experiences, producer education, equine and livestock education/advocacy, stock shows exhibits, professional development and public perceptions are hallmarks of the Department. These exist at the state, national and international levels.

QUANTIFIABLE ANIMAL PERFORMANCE

Our goal is to serve as a world leader in quantifiable animal performance.

Animals are biological transformers of low-quality feedstuffs (e.g., forages and grain byproducts) into high-quality foods (e.g., meats and milk) for human consumption, as well as raw materials such as wool and leather for clothing and accessories. In addition, some livestock (e.g., horses) are used for transportation and/or recreation. Thus, animal agriculture plays an important role in improving human nutrition, growth, development, and health, as well as economic and social developments worldwide. Discovery and innovation in quantifiable animal performance are critical for assessment of animal production and value. Recognizing that this area both influences and is influenced by a variety of social and environmental factors, it is necessary to develop models for evaluation of relationships and impacts. Potential applications include: (i) preclinical detection and mitigation of disease, (ii) monitoring and management of animal and animal handler welfare, (iii) precision nutrition, (iv) productivity and efficiency of feed use, (v) antimicrobial replacements, (vi) rates of carbon dioxide and methane emissions per unit of output, (vii) early detection of metabolic diseases and lameness, (viii) muscular endurance and athletic capability, (ix) detection of onset of parturition and estrus, (x) optimized feed delivery in confinement situations, (xi) evaluation of forage quality and monitoring of stocking rate in grazing animals, (xii) support of individual-animal management systems, and (xiii) development of biosurveillance networks to mitigate potential emerging-disease threats.

Our **goal** is to serve as a world leader in quantifiable animal performance. Our **vision** is to create and utilize novel models and critical metrics for evaluation and assessment of animal performance across species and disciplines. This specialty will enhance livestock and equine industries through developing and disseminating information and strategies for optimization of animal performance to producers, students, industry professionals, and the public.

BUILDING BLOCKS OF OUR EFFORTS:

Research: Providing subject matter expertise within quantifiable animal performance will improve efficiency and value associated with animals, animal products, and the animal science industry. Application of developed models and metrics will generate data to help inform both public and industry perception and policy regarding the previously mentioned applications.

Teaching: Knowledge and application of empirical and quantitative skills is a University-level learning outcome and is addressed in both undergraduate and graduate courses within the Department. Further, the revised curriculum includes both capstone and internship requirements providing undergraduates increased opportunities for industry engagement. Departmental mini-grants for graduate research projects provide additional opportunities for graduate students to independence in research project design.

Extension: The translation and dissemination of outcomes within areas of quantifiable animal performance impacts stakeholders within our state, nation and the world. Application of findings offers potential for increased efficiency of management and production, as well as improved, data-driven communication with consumers.

Planning Process Used to Develop Areas of Excellence

Multiple factors were taken into consideration in selection and refinement of the Department of Animal Science, Areas of Excellence. It was determined that an Area of Excellence:

- Should consider all three legs of the Land-Grant System (i.e., teaching, research, and Extension)
- Should go beyond the boundaries of a state or even a country.
- Should change lives, promote awareness and be able to endure.
- Should encompass faculty from two or more disciplines.
- May represent something that our Department is doing well, but should focus on what we need to be great at in 10 to 15 years from now.
- May be species specific, but multi-species considerations would be more desirable.
- Should improve lives of Texans and beyond through animal agriculture.

It was further determined that Areas of Excellence will include appreciation for:

- Basic research
- Applied research
- Scholarship of teaching and learning
- Extension
- Global relevance
- Societal and/or political implications
- COALS/AgriLife and University Strategic Planning Pillars

COALS/AgriLife Strategic Planning Pillars

- **Profitable/innovative agriculture and nutrition**
- **Precision agriculture and nutrition**
- **Policy associated with agriculture and nutrition**

University Strategic Planning Pillars

- **Transformational education for all students**
- **Discovery and innovation for the world**
- **Impact on the state, the nation, and the world**

Departmental process for creation and refinement of Areas of Excellence:

- Department Advisory Council suggestions
- Pre-departmental retreat faculty surveys
- Departmental retreat with facilitator
- Post-departmental retreat faculty surveys
- Faculty Advisory Committee review of data and generation of summary areas
- Faculty meetings to review proposed Areas of Excellence
- Finalization of Areas of Excellence and Presentation to the Dean of the College
- Submission of Areas of Excellence content by individual faculty

Resources to Reach Excellence

Serving as a world leader in each of the designated Areas of Excellence requires access to a world leading infrastructure. Progress is presently hindered by either a lack of facilities and/or a loss of utility of existing facilities due to age, size and deferred maintenance. The breadth and experience of current personnel is a strength of the department. However, potential faculty retirements, reduction in staff and graduate student numbers, increasing stakeholder demands, and the need for specific expertise not presently within the department pose future challenges to achieving departmental goals. Finally, an organized and clearly communicated plan for efficient utilization of resources, including financial, physical and intellectual is also critical and will serve as a foundation for continued success and development of departmental efforts.

Facilities

- Appropriate classroom and laboratory activity space at all facilities, with IT capabilities
- Maintenance and improvements to Kleberg Center to include:
  - Molecular biology core laboratory to include IVF, transgenics, and gene editing
  - Sensory and flavor chemistry laboratory update
  - General laboratory repair, including removal of non-operational fume hoods
- A replacement for the Rosenthal Meat Science Center to include:
  - BL2 or BL3 processing facility and updated micro labs
  - Dedicated teaching space for industry programs to run throughout the semester
  - Food chemistry, processing, and packaging research and teaching space
- A replacement for Pearce Pavilion to include:
  - Arena and livestock housing space capable of hosting extension and youth programs
  - Departmental Welcome Center for visitors
- Improvement/expansion/replacements at ASTREC-PFL to include:
  - Dedicated Beef Cattle teaching barn complete with classroom and laboratory
  - Large animal respiratory chambers and nutrition/feed evaluation equipment
  - Small ruminant individual feeding barn
  - Large scale facilities for sensory technology data acquisition and storage
- Freeman Arena:
  - Specified Equine Quarantine Area
  - Security – tack room and pasture lighting

Personnel

- Faculty with expertise in epigenetics/epigenomics, molecular genetics, functional genomics
- Faculty with expertise in transgenics, ovarian biology
- Faculty with expertise bioinformatics, big-data, modeling
- Faculty with expertise in further processing, value-added, packaging, consumer acceptance, risk modeling
- Faculty with expertise in fermentation biology, food microbiology
- Faculty with expertise in beef cattle forage, plant animal interface
- Extension specialists in beef cattle, animal welfare, youth programs
- Undergraduate recruiter, judging team coordinator