



**AGRICULTURE
& LIFE SCIENCES**
TEXAS A&M UNIVERSITY

STRATEGIC PLAN 2015-2020



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Mission

The College of Agriculture and Life Sciences fosters a stimulating educational environment that expands knowledge through discovery research and engages students in innovative learning experiences that empower them to serve and lead in our increasingly global society.

Vision

- Provide preeminent programs and people that are responsive to a diverse and growing clientele and fulfill our land-grant mission of teaching, research, and service.
- Engage outstanding faculty, staff, and students from a multitude of backgrounds and cultures in a positive and stimulating work environment.
- Create inspired teaching programs that motivate, excite, and reward students and prepare them to contribute to an ever-changing and increasingly global society.
- Foster impactful research that will draw on faculty excellence and involve student training to both increase basic knowledge as well as apply those discoveries to meet the needs of society.



Context and Scope

The College of Agriculture and Life Sciences is rich in the heritage of the land-grant mission at Texas A&M University and as such has the responsibility to educate future leaders as well as to discover new knowledge and transfer that knowledge to the benefit of Texas and the global society. We represent a wide range of disciplines that include both fundamental and translational aspects of biological, environmental, and social sciences. We are both an integral part of Texas A&M University and close partners in our land-grant mission with Texas A&M AgriLife Research, Texas A&M AgriLife Extension, the Texas A&M Forest Service, and the Texas A&M Veterinary Medical Diagnostic Laboratory, which are agencies of The Texas A&M University System. This College strategic plan is part of the University plan and is paralleled by the separate strategic plans of our four partner agencies. Our College has undergraduate and graduate learning at its core, and uses experiences, research, and engagement to enhance this educational mission and increase our service to society. We share many research and engagement activities with our partner agencies while maintaining a variety of unique programs.

While our base and our heritage are agriculture, natural resources, and life sciences, the scope of disciplines in our college has greatly expanded well beyond the core of applied agriculture and food production to such topics as the understanding of all biological systems at the cellular and molecular levels, providing the basis for our global reach into the commerce and ecosystems domains, and the health, safety, and medical implications of our food and use of animal models for biomedical research, as well as the environmental impacts of producing agricultural products. Because of this evolving and expanding breadth, our College is now addressing such topics as energy production, global climate change, and human health. The human element of our efforts also makes us leaders in such areas as applied economics, tourism, and youth development. Our greatly expanded roles have extended both our reach and our sphere of responsibility.

Our Strategic Priorities ...

... Our Grand Challenges

- Feeding Our World
- Protecting Our Environment
- Improving Our Health
- Enriching Our Youth
- Growing Our Economy



Feeding Our World

Feeding our World is a grand challenge encompassing multiple facets of the College of Agriculture and Life Sciences at Texas A&M University. The challenge involves feeding nine billion people by the year 2050. The challenge to increase food production will rely on advances in technology and innovation. Government funding for agricultural research is flat or trending downward in comparison to other industries and especially other countries such as Brazil and China. Research is critical to address the challenge and will require integration of knowledge relevant to soil, water, plants, and animal sciences. Challenges also exist in distribution channels, resulting in unnecessary excesses and deficiencies of agricultural products. Policy restrictions as well as transportation, storage, and distribution issues currently exist. Post-harvest losses must be minimized as well. Food security will also be paramount to the initiative. While advancements in technology are adopted in the United States, barriers exist in other parts of the world. The challenge to increase production by 2050 coincides with limited increases worldwide in productive land, reduction in land availability, and a concomitant reduction in water usage. Water availability and quality will be of significant importance as will be climate change.

Texas is a geographically diverse state with Texas A&M AgriLife centers and activities strategically located to focus research and extension efforts to address diverse climatic, edaphic, geographic, and cultural conditions. Extension programming exists in 252 of our 254 counties providing an excellent infrastructure for technology transfer. Challenges include populations that are metropolitan, urban, and rural with different needs that can be addressed by the College and our partner agencies. International outreach occurs through the College of Agriculture and Life Sciences programs and the Borlaug Institute for International Agriculture.

Building Blocks Of Our Efforts

- **Breeding/Genetics of Plants and Animal.** Genetic advancements in plants and food animals will increase production through improved efficiencies, environmental tolerance, and disease/pest resistance.
- **Food Technology and Safety.** Post-harvest technologies can increase food supplies by reducing spoilage/waste while preventing contamination and enhancing utility, nutritional value, and marketability of foods.
- **Water/Land Resource Management.** Availability of water and land for food production along with the impact of this production and urban development are all factors that will affect food supplies.
- **Development of Nutritious Foods/Feeds and Education.** Food supplies need to consider nutrient availability and balance as well as the consumer's knowledge about them.
- **International Development.** Providing subject matter expertise abroad will help improve production and value-chain development and development policies, and hosting international students and scholars will help create the next generation of hunger fighters.





Protecting Our Environment

We are moving into a new era where improved management of existing landscapes (agricultural and natural) is critical to protect our environment. Forefront issues are soil degradation and loss, nutrient pollution from fertilizers and animal waste, and water consumption, as well as their effects on ecosystem services, invasive species, and biodiversity. Many of the same issues exist in urban environments, too, where air and water pollution and runoff from impervious surfaces impact stream health and water supplies. We will develop strategies to project the rate and magnitude of global change and its ensuing impacts and develop tactics to adapt, or, even better, mitigate the effects of global change.

At very broad scales, global change may alter species distributions, cause more frequent weather-related disturbance events, shift rainfall patterns that drive water supplies and stream hydrographs, and accelerate sea level rise that will lead to issues with saltwater intrusion and coastal flooding. Changes in seasonal precipitation patterns, annual rainfall amounts, and rising temperatures may significantly impact agriculture and the humans depending on it. How changes in climate and climatic stability will affect crop and animal productivity (food security) and ecosystem services (e.g., nutrient cycling, climate mitigation, pollination) will be topics of increasing importance when designing sustainable solutions to support the future world population.

Land use change, which includes conversion of natural lands to cropland, urban, and peri-urban regions, can have a detrimental effect on ecosystem services, biodiversity, and the movement of species, and can contribute to increases of CO₂ release into the atmosphere. Habitat loss and ecosystem degradation and fragmentation affect carbon, water and nutrient cycling; biodiversity; and extinction of species.

Building Blocks Of Our Efforts

- *Water. Adequate clean, fresh water will be a major factor in competition between human health, food production, energy, and nature*
- *Urbanization & Land Use Change. Land use change (which includes conversion of natural lands to cropland, urban, and peri-urban regions) can have a detrimental effect on ecosystem services, biodiversity, movement of species, and CO₂ release into the atmosphere.*
- *Invasive Species/Biodiversity. Biodiversity is essential for ecological community resistance to invasive species, enhances resilience to disturbance, and directly and indirectly offers a wide range of ecosystem service benefits to humankind.*
- *Cultural Attitudes and Behaviors. Human orientations toward nature and resource use influence organizational policies that impact the health of ecosystems.*





Improving Our Health

Improving our health through research that benefits humans, animals, plants, and the environment is one of the critical Grand Challenges for strategic emphasis for years to come. The College of Agriculture and Life Sciences is dedicated to improving health of humans, animals, and plants by designing fruits, vegetables and animal products that prevent chronic diseases, determining causes and new treatments/drugs for diseases, and helping understand disease prevention strategies like recreation and body weight control. Our students will be among the leading research scientists and technicians, registered dietitians/nutritionists, physicians, pharmacists, and biotechnology engineers of the future. We have a leadership role in improving health by providing students and researchers with state-of-the-art equipment and facilities to investigate such areas as genomics and structure-based drug design combined with computer bioinformatics to find the molecular basis of disease and the right intervention to target a specific disease or to optimize metabolism/body weight. Other research is aimed at finding nontoxic “smart drugs” that can be carried by nanoparticles directly to disease sites in the body. Programs aimed at nutrition and metabolism enable health outcome optimization through personalized assessments and interventions. Importantly, programs in recreation and nutrition focus on optimizing health and preventing the most common and debilitating diseases currently facing Americans. Health promotion starts with healthy habits and our programs are proactive in improving learning and success in children. With obesity and diabetes reaching epidemic levels, our scientists are unraveling the mysteries of factors that increase risks of metabolic syndrome including obesity, diabetes, and cardiovascular diseases.

Building Blocks Of Our Efforts

- *One Health: A Systems Biology Approach. One Health is an overarching concept of the complex links between animal, human, and ecosystem health that are both beneficial and problematic, and are governed by the broad array of intricate and interconnected pathways of communication among genes, molecules, cells, and organisms.*
- *Foods for Health. Food is part of a complex system of processes, from consumer choice to biochemical mechanisms that underlie functions of nutrients in plant- and animal-source foods to enhance human health and disease prevention.*
- *Ingestive Behavior and Metabolism Consumption, digestion, and use of food are governed by a wide range of physical, physiological, psychological, and social factors, and are regulated by many biochemical processes.*
- *Wellness through Parks and the Natural Environment. Parks, gardens, greenways, natural areas, and recreation in general all contribute to individual and community health by impacting people’s well-being, ability to concentrate, outlook on life, and stress levels.*
- *Population Growth and Reproductive Rights. The education and empowerment of women can mitigate some of the population growth and thereby reduce demands projected on our global food supply and natural resource as well as the related human suffering.*





Enriching Our Youth

Providing the support, opportunities, programs, and services to assist youth to grow into fully productive citizens presents significant challenges to families, our education system, youth serving organizations, and a variety of government organizations at every level. Complicating this is the observation that the demographics and cultural diversity of Texas is rapidly and significantly increasing.

With the increasing population in Texas, there is increased demand on all levels of the education system. Expectations of standardized testing in secondary schools and maintaining both affordability and access to higher education are challenging institutions to provide the support, content, and preparations for students entering the workforce or continuing their education. Additionally, more students are entering college with college credits completed in order to minimize costs and to position themselves for better acceptance into a particular institution. Their youth, maturity level, and previous exposure to formal college classes may give these students different learning needs. Our College will continue to provide innovative educational programs and opportunities to meet the needs of today's ever-changing youth.

Communities across the United States and Texas are searching for the best ways to facilitate positive pathways for youth to decrease negative behaviors such as drug use, engagement of unprotected or early sexual activity, involvement in gangs, and low school performance or dropping out of school. Our College, the AgriLife agencies, and other organizations are developing knowledge and programs to help youth develop the positive attitudes, skills, and behaviors that will enable them to successfully navigate life and transition to adulthood.

Constructive use of out-of-school time has been shown to increase positive social behaviors, prevent risk behaviors, and provide settings for social support from peers, parents, and other caring adults. In addition, quality out-of-school time activities enable youth to achieve higher academic levels, demonstrate greater optimism about their future, and become active productive citizens. Organizations like our College that provide positive influence through intentional activities continue to need support in program design, program management, fundraising strategies, staff training, and program evaluation. Our promotion and facilitation of organizational capacity for quality youth development opportunities will increase the probability that youth will make a successful transition to adulthood (i.e. being economically self-sufficient, form meaningful relationships with others, and being good citizens). Additionally, providers of youth programs and services too often have inadequately addressed cultural context and behaviors, such as value orientation, ethnic identity, social capital supports (e.g., caring adult role models), language and acculturation, religious beliefs and practices, and family structure.





Building Blocks Of Our Efforts

- *Promote Health and Wellness of Youth. Patterns of behavior, lifestyle choices, and community environment all affect the current and future health status and general well-being of youth.*
- *Facilitate Academic Achievement, College Readiness, and Career Development. Readiness is a continuum that begins with a child's culture and attitude of long term goals and then the preparation and supports to achieve them.*
- *Build and Sustain Collaborative Partnerships to Support Youth Development. Joint efforts can help promote a comprehensive approach to youth development that views each young person from a holistic perspective, recognizing the unique role that each sector plays in ensuring the development of youth into healthy productive members of society.*
- *Training for Faculty/Staff. To effectively create youth development programs and have a positive influence on their delivery, it is imperative that faculty and staff understand technology, risk management, issues affecting youth, mentoring, and professionalism.*



Growing Our Economy

The earth's population is expected to grow by 28 percent from 7 to 9 billion people by 2050. This population growth is further expected to be accompanied by a rising level of purchasing power and standard of living for many of the developing nations' populations. This suggests there will be substantial growth in per capita demand for existing products, and the creation and evolution of new markets for products and services. It is, therefore, projected that the 9 billion people will consume at the present day rate of 12 billion people, a 70% increase over today's needs.

However, this population growth and market expansion will occur against a backdrop of an ever-increasing, interconnected global dynamic where economies shift quickly and decisions are made electronically. The political and cultural winds of emerging and unstable nations create additional limitations and constraints, sometimes at odds with those of more affluent and powerful countries. The expanding populations and increasing rates of consumption will place even greater demands on the natural resources of land and water needed to supply the market and economic expansion. The workforce needed for this expanded production and consumption marketplace will require new developments in education, healthcare, public services, and civil infrastructure. Rural development and sustainability, which are already a focus of concern, will face more pressure and will likely increase in importance as new opportunities in foreign, developing countries as rural enterprises evolve there.

Among the myriad of products and services and manufacturing systems, our College is uniquely positioned to lead in the innovation and implementation for food-, energy-, tourism- and health-related industries. We will provide leadership to grow our economy through the innovation we create and the education we provide to students and our stakeholders throughout their lives. Our agricultural breadth and depth of expertise and facilities make us world leaders and intellectual innovators in adapting to new challenges and needs. This intellectual capacity has allowed us to branch out in novel applications of our agricultural roots. Biofuels and renewable energy have been a natural application of our plant and biotechnological science and engineering expertise. Likewise, our fundamental knowledge of biological systems positions us as leaders in disease prevention, detection, and treatment as well as in regards to the impacts of disease on commerce and communities. We are also positioned as world leaders in this area as tourism is one of the leading economic drivers in communities and nations around the world, including in the United States.





Building Blocks Of Our Efforts

- *The Economic Landscape - Global Dynamics, Sustainability, Human Capital. Economic growth will be affected by the ever-changing geopolitical environment, and must be consistent with the health of the natural, cultural, and social environments.*
- *Outputs - Food, Resources, Health, Experiences (tourism, recreation, and education). Production increases, product development, and product improvements all create economic growth in the presence of expanding or new marketplaces that are fair and well-functioning.*
- *Domestic and International Commerce-Trade, Finance, Investment, Regulation, Logistics, Transportation. Texas' economy is linked to the rest of the country and world through trade and investment which rely on the efficiency of capital markets and regulation of markets and food systems.*



Foster excellence in our work and ability to work together

Addressing these Grand Challenges will require an environment that is supportive, multidisciplinary and intellectually fertile. To provide this we will:

Elevate our Faculty

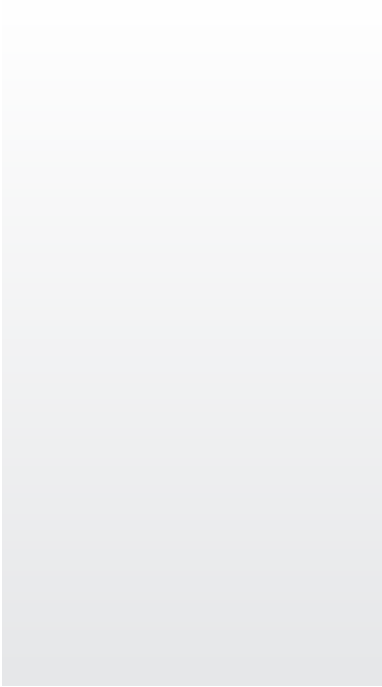
Faculty members are most successful when provided a supportive environment in which to function. They need one that has the resources needed for their teaching and entrepreneurial research programs and the facilities and equipment infrastructure to keep them at the forefront of their disciplines. Resources and programmatic support will be directed by strategic priorities and evidence of success. Their professional improvement and career advancement also depend on support, and we will provide opportunities for growth through faculty development leave, international collaborations, intergovernmental personnel act assignments, and other experiences that will expand their horizons and bring prestige to our institution. We will provide and seek recognition for their excellence in terms of awards and other honors to help their professional advancement and brings further recognition to the College.

Enrich our students and their educational experience

Students come to our College for an education but also for the start/continuation of their professional development. We are known for and will continue to produce graduates who are leaders in many fields. We are charged with not only providing all of the kinds and amounts of necessary information but also the critical thinking and problem solving skills with which to use that information. We will continue to emphasize their educational enhancement through our high impact learning programs that expand the minds and awareness of students beyond the classroom learning. These programs teach them about other lands and cultures and about how to use their information to solve research or business problems, and give them transformative experiences that change their lives. Part of this education for many is learning about the value of those who are or think differently than them. That is underscored through the high impact experiences and why they transform these students. Respecting these differences will be critical to them in their careers and their lives.

Expand our access and impact

The need for higher education is growing faster than we can create classroom space for it. Lifestyles, student needs, and remote locations are all changing when, where, and how students learn. High demand core courses and lower demand specialized courses all can benefit from the increased curricular efficiencies of sharing courses and faculty expertise between institutions. For all these reasons, technology-mediated and on-line learning will be tools of which we make more and better use. These modes of teaching will also expand our reach to new audiences in other locations through outreach programs and continuing/professional education, and will allow our faculty and students to interact with those at other institutions to enhance their Texas A&M education.



Enhance our work and scholarly environment

Our work and scholarly environment will be based on understanding and respecting different perspectives and capturing the value they bring to a discussion, situation or a solution. Having respect for another's perspective is not just professional, it adds dimension and allows one to grow from it. It also can add to the applicability of your solution or help to avoid an unforeseen pitfall. Fostering the presence of a diverse environment assures these multiple perspectives will be present to enrich our thinking and impact. Most complex problems or situations, like the Grand Challenges, will require a complex solution that draws from many viewpoints including those based on culture, subject matter, institutional hierarchical level, geographic location, ethnicity, gender, etc. Fostering a climate of respect and appreciation for differing perspectives will be a key part of our Grand Challenge solutions.

Establish a culture of multidisciplinary thinking and acting

Faculty Awareness and Engagement

Faculty Networking

Faculty may be well-versed in the faculty, staff, programmatic, and facility resources in their own disciplines, but not what is available in others. They need to be aware of potential collaborators as well as opportunities in terms of funders, funding programs, and requests for proposals. Faculty members also need to be aware of what efforts/projects are already ongoing at TAMU and how they might contribute to such projects with their own expertise or by merging complimentary programs. This indicates that communication is critical in terms of a faculty expertise database, inventory of programs/projects, and regular update on opportunities.

Faculty Expertise

Effective and competitive projects require expertise in key areas and a critical mass of that expertise in terms of numbers of people. It is essential that gaps in our expertise relative to the Grand Challenge initiatives be identified and filled as new hires and redirections of existing faculty occur. This may often require departments to work together or that interdisciplinary organizations such as institutes and centers be the home for such expertise.

Faculty Recognition/Success (mentoring, culture, education, service/outreach)

Addressing the large and complex Grand Challenges will require an interdisciplinary team approach that will cause people to work across departmental lines. Working on large teams may also be contrary to the advancement of a tenure-track new assistant professor as such large projects usually do not have a rate of output evidence to make a successful tenure case. Because of these and other related issues, our College will need to foster a culture in which interdisciplinary efforts and teamwork are valued and rewarded in the same way that more disciplinary/departmental-centric achievements are. We will also need to appropriately support and mentor faculty involved in these types of large or interdisciplinary projects.





Communications

The integrative teams needed to address the Grand Challenges will need to be formed, often involving faculty that either do not yet know each other or are from different departments. They may be from other colleges or institutions and will likely have different spheres of influence and opportunity. All of this is to say that communication will be critical to getting them together and making sure they can function and access all the opportunities available to them. Networking activities as well as updates of funding possibilities and ongoing activities are just two internal benefits but communicating our impact and potential to the outside world will be needed too.

Support for Interdisciplinary Initiatives

Seed Funding

New ideas and new relationships between disciplines often don't develop by themselves and need some seed funding to stimulate interaction or to generate some trial runs of results. This funding can come in many forms such as travel grants to meet with potential funders, graduate student funding, or operating funds.

Proposal Development

Interdisciplinary projects tend to be large and complex and, therefore, writing proposals for such efforts is likewise time-consuming and complex. Having proposal development assistance/support is critical to attracting faculty to team initiatives. Faculty members are already fully occupied with their individual, disciplinary proposals to navigate the complexities and magnitude of additional, larger, group proposals.

Research Infrastructure

Interdisciplinary solutions to the Grand Challenges will depend on a base of strong disciplinary programs. These depend on a well-equipped, staffed, and maintained infrastructure. In partnership with the University and AgriLife agencies, the College needs to assure access to core research and teaching facilities with the latest technologies and with appropriate levels of financial underwriting. There also needs to be solid support at the departmental level for the faculty member's disciplinary activities.

External Partners

Just like the Grand Challenges are too large to be solved by one discipline alone, they are too large and complex to be solved or funded by one institution alone. Our efforts will require collaborations and funding from internal partners such as the AgriLife agencies as well as external partners such as governments, corporations, other universities, foundations, municipalities, and non-profit organizations. Many of these may be new to us as partners and will therefore need special attention as we learn each other's customs, processes, and expectations.

Interdisciplinary Support

The interdisciplinary nature of Grand Challenge solutions will require support mechanisms and resources outside of the normal disciplinary departments. Departments are the functional units of the College's operations, but Grand Challenge financial, personnel, programming, and facility issues often transcend departments and therefore need a management system that recognizes and accounts for the many concerns and needs involved. Likewise, many of the administrative tasks for these interdisciplinary activities often are outside the authority of any one department, so mechanisms are needed to efficiently and effectively complete them.

The Planning Process Used To Develop This Strategic Plan

The year 2012 was the 150th anniversary of the Morrill Land-Grant Act, which led to the establishment of Texas A&M University. The College of Agriculture and Life Sciences has stayed and will stay true to its land-grant mission while working to address future societal problems. In a recommitment effort toward our land-grant mission, the College embarked on an exciting, interdisciplinary, faculty-driven initiative during the 2012/2013 academic year to chart our priorities for the future. The process began by answering a series of questions: What are the issues? What are our areas of expertise and strength? How do our strengths guide us? What problems might we encounter? What resources are needed? What are the next steps necessary to move forward? The end, the answers to these questions helped define and develop the College's five Grand Challenges: Feeding our World, Protecting our Environment, Improving our Health, Enriching our Youth, and Growing our Economy. These Grand Challenges represent large and complex problems that our society will face in the coming decades that can be best addressed through research, teaching, and service in academic fields found in the College.

Beyond answering these stimulating questions, the process for developing and refining these Grand Challenges involved the selection of speakers for the Blue Bell Lecture Series, the 2013 Texas A&M AgriLife Conference, faculty-led white paper development, the Grand Challenges Town Hall, and the 2013 AgriLife Administrative Retreat. Through a generous endowment from Blue Bell Creameries, the Blue Bell Lecture Series gave the College external perspectives from global leaders on how it can uniquely approach the Grand Challenges. At the 2013 Texas A&M AgriLife Conference, more than 100 attendees split into small groups for each Grand Challenge topic to define the issues and brainstorm areas of strength and opportunity, as well as any potential problems. This step led to the formation of five facilitated faculty groups who developed white paper plans on each Grand Challenge topic. The discussion from the 2013 Texas A&M AgriLife Conference session served as the starting point for the white papers, which were then refined by the smaller groups. The white paper plans were presented back to the larger faculty at the Grand Challenges Town Hall in May 2013. Once the white papers were presented, the Town Hall attendees participated in break-out groups to further discuss each topic and items highlighted in each white paper. The final step of the Grand Challenge development process was the 2013 AgriLife Administrative Retreat in June 2013. During this retreat, administrators addressed the Grand Challenges and their impact on the College, Texas A&M AgriLife Extension, and Texas A&M AgriLife Research.





Through this process, it became evident that, while each Grand Challenge has a different focus, a number of cross-cutting themes emerged: health, human capacity, food, water, and ecosystems. To refine these themes, as well as to bring together the five Grand Challenges, a unification committee was formed from representatives of each of the five faculty groups. Their result was a vision that the cross-cutting themes can serve as focal points to build programs that span the Grand Challenges so as to increase human empowerment and capacity. Water and ecosystems are the basis for food production which is essential for health and prosperity which all increase human capacity. These unifying, cross-cutting themes will add to the framework in which our Grand Challenge efforts are organized. Furthermore, the Grand Challenges were not seen as a change in the course or a new set of research foci for our disciplines, but rather led to the recognition that there is incredible potential at the interface of these disciplines to solve the Grand Challenges and we need strong disciplines to also have strong interdisciplinary efforts. From a strong base of funding and infrastructure comes a variety of disciplinary and interdisciplinary research activities that create and contribute to major initiatives to address the Grand Challenges.

In addition to cross-cutting themes, a sense of the supporting environment needed to achieve these complex solutions emerged out of the Grand Challenge planning process, as well. These included more effective faculty networking and teambuilding, more facilitation of major proposals/initiatives, better shared/core facilities, and a better system for fostering/supporting/recognizing interdisciplinary efforts as well as excellence in all its forms.

The Texas A&M University College of Agriculture and Life Sciences will continue to focus on its land-grant mission by developing new, innovative, and interdisciplinary ideas. By concentrating on developing solutions for its five Grand Challenge areas and fostering a supportive environment in which to work, the faculty and administration in the College will actively create opportunities today that will improve future generations.



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