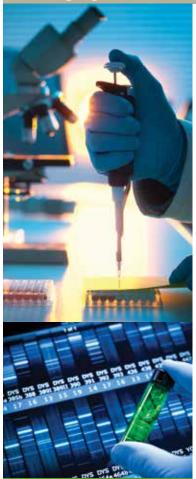## *Empowering Genomics and Bioinformatics Technologies: Changing the Face of Agriculture*

Texas A&M AgriLife Research has brought together a team of extraordinary genomics, bioinformatics, molecular, and computational scientists to meet the next-generation sequencing and bioinformatics needs of Texas A&M AgriLife, The Texas A&M University System, and the broader scientific community. The Genomics and Bioinformatics Service has built a rapidly growing collaborative network spanning the entire Texas A&M System, along with an increasing number of agriculture and life sciences companies in the private sector. The Genomics and Bioinformatics Service supports more than 400 researchers drawn from over 20 departments, six colleges, and multiple agencies across the Texas A&M System and the Texas A&M Health Science Center, generating hundreds of terabytes of sequencing data per year. It was involved in 190 grant submissions over the past two and a half years, resulting in tens of millions of dollars in new funding for scientists across the Texas A&M System. Its services include next-generation sequencing (Illumina HiSeq2500, MiSeq, GAII, Roche 454), genotyping and transcription analysis (Illumina iScan), bioinformatics and statistics analysis, grant support, and custom methods development. It also aids in experimental design and provides genomics technology and bioinformatics training and consulting services.

Genomics across Texas A&M AgriLife

Plant Genomics. AgriLife Research crop improvement programs use high-throughput genomic and phenotyping technologies to identify gene quantitative trait loci and molecular mechanisms and markers related to yield, biotic and abiotic stress tolerance, and pest resistance. Using the latest in high-throughput sequencing technology, AgriLife Research scientists can generate thousands of highly reproducible DNA markers that can be funneled into our world-class plant-breeding programs. Ongoing research includes the following:

- Novel marker-assisted breeding programs in
    - » sorghum,
    - » wheat,
    - » sugarcane,
    - » corn,
    - » cotton,
    - » rice,
    - » peanut,
    - » citrus, and
    - » many other economically important crops.
- Identification of genes and associated phenotypes that combine to form complex traits related to host-pathogen interaction, drought stress, and many other economically significant traits. We combine genomic, functional genomic, transgenic, molecular, and biochemical approaches to identify these genes and phenotypes.
- Development of model plant research programs that can be directly applied to commercially relevant crops such as cotton.

The agency prides itself on its continued reinvestment in diverse crop improvement programs that aid in the development of its genomics research infrastructure for gene discovery and marker-assisted breeding.

Animal Genomics. Using some of the most advanced tools and facilities available today, AgriLife researchers are world leaders in animal research, making significant advancements in animal agriculture and animal health. Ongoing research includes the following:

- The first-ever sequencing and analysis of the complete genomes of the quarter horse, Bos indicus (Brahman) cattle, scarlet macaw, gulf shrimp, and honeybee.
- Reproduction, animal health, and nutrition research being conducted in the following livestock species: cattle, equine, poultry, sheep, and goat.
- Evaluation of vaccine types across genotypes to find causal determinants that explain differential responses to pathogen attacks.
- Invention of a prescriptive production tool for beef producers, applying genomics to production management.

The above are only a few of the many examples of extraordinary genomics research being conducted across the Texas A&M System. We also have one of the nation's best entomology programs, and our researchers are using next-generation sequencing to study the decline of honeybee populations through advancements in forensic science. Other research areas include the following:

- Metagenomics in both humans and animals.
- Pathogen genomics across a range of species and hosts.
- Diagnostic testing, vaccine development, biomarker discoveries, and groundbreaking basic research with applications from cancer prevention and treatment to a fundamental understanding of molecular biology.
- The nation's largest snake venom genomics and proteomics profiling program.

About Texas A&M AgriLife Research
A member of The Texas A&M University System
Established in 1888, Texas A&M AgriLife Research is the state's premier research and technology development agency in agriculture, natural resources, and the life sciences. Headquartered in College Station, AgriLife Research has a statewide presence, with scientists and research staff on other Texas A&M University System campuses and at the 13 regional Texas A&M AgriLife Research and Extension Centers. The agency conducts basic and applied research to improve the productivity, efficiency, and profitability of agriculture, with a parallel focus on conserving natural resources and protecting the environment. AgriLife Research has 550 doctoral-level scientists, many of whom are internationally recognized for their work. They conduct hundreds of projects spanning many scientific disciplines, from genetics and genomics to air and water quality. The annual economic gains from investments in Texas's public agricultural research are estimated at more than $1 billion. Through collaborations with other institutions and agencies, commodity groups, and private industry, AgriLife Research is helping to strengthen the state's position in the global marketplace by meeting modern challenges through innovative solutions.

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