

Research Development Fund – Fall FY16 (Cover Page)
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Proposal Title: High-throughput DNA Sample Preparation and Genotyping for Translational Agricultural Genomics

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Key Participating units: AgriLife Research and TAMU: SCSC, ENTO, PLPA, HORT, ESSM, and more TBA

Anticipated Request Amount (\$): \$1.5 million

Executive summary: Advances in high-throughput genotyping, physical mapping and next-generation sequencing (NGS) have ushered forth sweeping changes in genome assembly, integrative genetics, research and breeding of agriculturally important species. At institutions where graduate student usage of cutting-edge technologies and science is promoted and expected, the graduate student research is profoundly expedited and enhanced; the superior competitiveness and professional success of those subsequent graduates perpetuates the reputation of those institutions as the “global leaders”. The species important to TAMUS vary widely in terms of their global levels of genomic research sophistication, e.g., rice, wheat, maize, sorghum, turf and forage grasses, cotton, potato, tomato, pepper, pecan, watermelon, et cetera, yet all are now or soon will be highly amenable to various types of DNA-sequence-based genetic dissection, integrative transcriptomics and breeding. We propose investments to simplify use of DNA technologies, economize and facilitate both high quality DNA extraction and genotyping, by any of a number of complementary methods. We propose to upgrade the pre-existing user-based AgriGenomics Laboratory, which is already focused on centralized high-throughput DNA extraction and simplex genotyping for the plant community, but also facilitating external interfaces for low- to high-plex genotyping. By providing the technologies, equipment, cost and time savings, this investment will expedite the crucial assimilation of SNP-based methods by students, PIs and Departments. This investment will uniquely augment current campus capacities, including the AgriGenomics Laboratory, which is used by a number of crop research and breeding groups for extractions and simplex genotyping, the off-campus AgriLife Research Genomics and Bioinformatics Service, which provides NGS applications, and the TIGSS Core facility in the Vet. Med. Research building.

The vision for the high-throughput DNA sample preparation and SNP genotyping core facility is to take advantage of cutting-edge automated platforms to provide rapid and low-cost services for DNA extraction and molecular marker genotyping. The DNA sample preparation workflow will use a robotic platform that provides high-quality DNA that can feed directly into the AgriLife Genomics lab for next-generation sequencing as well as into the simplex SNP genotyping platform. The SNP platforms will also be highly automated (based on platforms such as LGC SNPline and Douglas Array Tape) to provide high-quality genotyping data for research and breeding programs. The core facility will promote use by Texas A&M researchers and AgriLife Research breeding groups and will lead to significant upscaling of genotyping, thereby leading to more competitive proposals for external funding. In conjunction with current high-throughput phenotyping efforts, this core facility will transform plant breeding within the Texas A&M University System and lead to greater efficiencies for genetic research across many departments on campus. We think this facility would likely attract use by other institutions, e.g., local USDA-ARS, and perhaps facilitate similar capabilities at TAMUS for additional types of organisms.