

Category	: 8th Rice Genetics Symposium
Select Theme	: Genome and Gene editing: Novel tools and technologies
Endorsement email	:
Genome and Gene editing Novel tools and technologies Keyword 1	: CRISPR
Genome and Gene editing Novel tools and technologies Keyword 2	: site-directed mutagenesis
Genome and Gene editing Novel tools and technologies Keyword 3	: Plant transformation
Title of Entry	: Genome editing strategies for rice improvement
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Select only one type of presentation	: 15 minute oral presentation
Abstract	: The precision and ease of use of CRISPR nucleases, such as Cas9 and Cpf1, for plant genome editing has the potential to accelerate a wide range of applications for crop improvement. For upstream research on gene discovery and validation, rapid gene knock-outs can enable testing of single genes and multi-gene families for functional effects. Large chromosomal deletions can assist with positional cloning of QTLs by helping to narrow down the target region. Nuclease-deactivated Cas9 fusion proteins with transcriptional activators and repressors can be used to up and down-regulate gene expression. Even more promising, gene insertions and allele replacements can provide the opportunity for rapidly testing the effects of differing alleles at key loci in the same genetic background. The rice community is well positioned to take advantage of these new opportunities, as the wealth of cloned genes, diverse genetic donors, and sequence data present numerous testable hypotheses with clear implications for rice improvement. For example, data from the 3,000 Rice Genomes Project and High Density Rice Array (HDRA) studies can be used to define sequence variation at candidate genes underlying GWAS hits, which can then be rapidly validated using CRISPR editing techniques. Likewise, beneficial genes and QTLs originally identified from exotic germplasm, including landraces and wild relatives, can be rapidly transferred into elite breeding materials without causing negative linkage drag. Recently, Texas A&M AgriLife

Research has supported the development of a new Crop Genome Editing Lab on the College Station campus to support research and service activities for CRISPR-based genome editing in crop plants. The research team is testing various approaches to CRISPR delivery, including using ribonucleoprotein (RNP) CRISPR/Cas9 protein + gRNA complexes, to provide a non-transgenic approach to genome editing. The service team will perform genome editing across multiple crops to provide breeding and research groups with a rapid genome editing pipeline to test candidate genes in their programs, beginning with rice as a test system. Towards this end, a survey was performed to identify promising genes that can be used in a genome editing pipeline for rice improvement and several editing projects have been initiated.

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