

## **Use of Genomics to Drive Genetic Improvements in Perennial Legumes**

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Plant genomics research increases our knowledge of genes and regulatory networks involved in growth, development, and adaptation to a changing environment. Advances in genomics research can enable targeted breeding or engineering of plants with desirable traits that are able to thrive under adverse environmental conditions. Research areas in need of further exploration to drive genetic improvements in perennial legumes include: collaborative efforts to advance our understanding of germplasm diversity and population structure, evaluate existing genetic variation for target traits, integrate DNA sequencing technologies, identify genetic polymorphism in relevant backgrounds, develop SNP markers suitable for high-throughput genotyping, enhance marker density of genetic linkage maps, progress with multi-location phenotyping networks, expand the use of suitable breeding methodologies, tag relevant genes with molecular markers to combine multiple mechanisms for yield and adaptation to biotic and abiotic stress, utilize information from different model and crop species through comparative mapping and bioinformatics approaches, and integrate information into databases to facilitate the use of “breeder-friendly” tools. The anticipated outcome from collaborative research activities can increase our understanding of the genetic mechanisms underlying complex value-added traits, accelerate gene discovery and functional analyses, enable simultaneous improvement for multiple traits, facilitate implementation of efficient breeding methodologies to maximize genetic gain, and accelerate development of cultivars that increase production efficiency with reduced inputs. We have the opportunity to move forward in the perennial legume research community with a multidisciplinary approach, combining expertise and resources to more efficiently develop enhanced perennial legume cultivars that address the current and changing needs of consumers and producers for food, feed, and biofuels.