Crop Plant Genomics for Food Security

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Securing food supply on a global scale currently faces a complex set of unprecedented problems, including rising demand due to population increases and social mobility, global climate change, energy costs, and resource limitations. Responding effectively to these challenges has become a major focus for scientists and policy makers world-wide.

Nearly all nutrition for humans and our domesticated animals is derived from only 6 plant species: rice, wheat, maize, barley, soybean and potato. Each of these crops has been domesticated from a very limited range of wild ancestral species; therefore each of these major crops has a relatively narrow genetic diversity from which novel traits can be identified for crop improvement. In view of the unprecedented demand for greater yields within a sustainable production system, a commensurate increase in innovation is needed to secure crop improvement.

In my presentation I will describe how advances in genomics and biotechnology are shaping modern crop improvement. I will focus on the advances made in understanding the functions of plant genes and how this knowledge is being applied to improve plant yield and pest tolerance. The large and complex polyploid genomes of many crops are formidable barriers to genome analysis; I will show how the application of next generation sequencing technology has broken these barriers and facilitated the sequencing of multiple variants to exploit new sources of genetic variation.

Finally, I will develop a scenario for the large-scale application of genomics for crop improvement, focussing on wheat, one of the most important crops in the world.