

## **The future is sustainable for biotech cereal crop improvement**

Ian Godwin

*Centre for Crop Science, Queensland Alliance for Agriculture and Food Innovation, The University of Queensland, Brisbane, QLD 4072, Australia*

\*e-mail: i.godwin@uq.edu.au

### **Abstract**

As we approach the joint challenges of rapidly growing human population, increasing human affluence and quality food demand, and the impact of rising temperatures and climate instability, the science of crop improvement requires all the tools available to deal with the demands sustainably. Cereals are the most important staples in the human diet, and are key to the production of intensive animal based agriculture. The big five cereals (rice, wheat, corn, barley and sorghum) provide in excess of half of the world's calorific intake. Cereal cultivation takes up a significant proportion of arable land, meaning any improvements in sustainability can have global impact. Many of the world's most resource-poor communities could be regarded as over-reliant on these few species of the grass family. Genetic modification and gene editing are key tools for improving the productivity, resource-use efficiency and product quality of cereals. My group has been using GM and CRISPR/Cas9 gene editing to improve the utilization of crops such as sorghum and barley for humans and intensive feeding industries like poultry and pork. Improving the protein content and digestibility of sorghum has shown to have major benefits to human nutrition and the nutrition of meat poultry. In addition, we have been able to show that some simple manipulations have the potential to reduce greenhouse emissions in cattle. Altering plant development for root and tillering traits have also shown that we can design cereals to suit the soil and climatic variation in production areas, to minimize some of the threats associated with increasingly sporadic rainfall events in Australia, the world's driest continent. I will present some of our outcomes and highlight the environmental benefits of these GM and GE cereals.

**Key words: sorghum, barley, cereal protein, plant developmental genes, abiotic stress tolerance**