Viewpoint: Here’s why we have to harness gene editing to promote global food security

There is an urgent need to develop crop varieties which tolerate adverse growth conditions while requiring fewer inputs. Plant breeding is critical to global food security and, while it has benefited from modern technologies, it remains constrained by a lack of valuable genetic diversity, linkage drag, and an effective way to combine multiple favorable alleles for complex traits.

CRISPR/Cas technology has transformed genome editing across biological systems and promises to transform agriculture with its high precision, ease of design, multiplexing ability and low cost.

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The linking of crop domestication with a century and half of targeted breeding has led to modern cultivars which display a blend of desirable traits. Domestication traits include larger fruit or seeds, loss of natural seed dispersal, altered photoperiod sensitivity and vernalization responses, and improved grain threshability.

Overall, the genetic gain of a breeding program is a function of heritability and population size, and is largely determined by the capacity to phenotypically evaluate a large number of plants in a high?throughput manner (Breseghello and Coelho, 2013). The rapid development and integration of CRISPR (clustered regularly interspaced short palindromic repeats)/Cas (CRISPR associated proteins)?based gene editing into plant science has created an alternative avenue for crop improvement, and has the potential to increase speed and precision in plant breeding programs.

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