nature genetics

Where genome editing is needed

The journal endorses the principle of transparency in the production of genome-edited crops and livestock as a precondition for the registration of a breed or cultivar, with no further need for regulation or distinction of these goods from the products of traditional breeding.

Rapid, precise and appropriate breeding strategies are needed for the future of agriculture, not only to keep pace with the constantly evolving ecology of food and fodder production but also to meet increasing demand for more nutritious harvests (*Nat. Genet.* **47**, 561, 2015). In much of the world, most people subsist upon staple food crops that cannot keep up with the demands of the expanding human population and the drier and warmer field conditions imposed by climate change. Perversely, in the developed world, wealthy consumers often select their food by its provenance, largely by what has been omitted during its production or influenced by a tale of its scarcity and low-yielding origins. Genetic research has a part to play in meeting the needs for food security, calories, nutrition and diversity, but, if it is to succeed, the story of how we achieve precision breeding of genome-edited crops and animals needs to be compelling and transparent.

The technological revolution in genomics-based agriculture, if responsibly promoted, has the potential to meet and exceed our needs, equally for science and society. On 109, Sanwen Huang and colleagues propose a practical model for regulating the introduction of new genome-edited crops that would make it possible to achieve some of these goals while building popular support for sustainable agriculture based on biological science. We fully endorse this proposal.

As a technology, genome editing applied in agriculture represents a more efficient and precise method for genetic manipulation but does not fundamentally differ from classic breeding in terms of outcomes. Thus, the wisdom of 'product-based' versus 'technology-based' regulation as advocated by Huang and colleagues becomes apparent. A distinction must be established, particularly in the public sphere, between 'genetically modified organisms' (GMOs) generated through the transgenic introduction of foreign DNA sequences and 'genome-edited crops' (GECs) generated through precise editing of an organism's native genome. Transparency and accuracy on the part of scientists and researchers will help to dispel negative or stigmatizing perceptions of GECs and hopefully pave the way for sensible policies for their regulation and use.

Central to the responsible application of genome editing to agriculture is the registration of GECs, which is directly comparable to the requirement that traditionally bred varieties be registered. No further regulation exists for varieties obtained by classical methods, so GECs likewise should not be subject to government oversight. Instead, Huang and colleague suggest that registration be accompanied by accurate reporting of quality control standards to ensure full characterization of the genetic changes introduced into the plant. Additionally, a description of the steps taken in production to minimize the potential for escape from the field or laboratory should be disclosed. Such an approach would be advantageous not only to researchers but also to the public. The potential benefits of GECs should not be impeded as a result of misinformation, so disclosure and education are the best ways to promote sound policies.

Scientists will be more trusted if we deploy technology where it is most needed. It is therefore our view that the use of genome editing and genomic breeding in crop plants and livestock will lead to better agriculture as well as the expertise needed to adapt these technologies for human somatic cell therapies. Consequently, the journal is keen to attract basic and applied research uses of genome editing technology in plants, animals, and human stem cells and somatic cells. ■