



# The promises of New Plant Breeding Techniques: old wine in new bottles?

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## The promises of New Plant Breeding Techniques: old wine in new bottles?

The abbreviation NPBT (New Plant Breeding Techniques) refers to any of a heterogeneous set of multiple techniques for plant breeding. In this communication, we would like to focus specifically on the site-directed nuclease techniques (ZFNs, TALENs, CRISPR/Cas9), because they are considered as targeted mutagenesis: in that sense, it becomes possible to introduce targeted improvements into a given variety and to accelerate the effect of breeding in crop species.

These NPBT are presented as the solution to all the problems that agriculture in general and plant breeding in particular are facing today: for example, according to a booklet made by the University of Wageningen<sup>1</sup>, NPBT can be used to create “varieties with durable disease resistance against pathogens” or to remove “gluten from wheat for the benefit of coeliac patients”. It also states that “further developments in NPBTs indicate that traits such as resilience against drought and salt stress, and consumer quality factors such as fruit taste, can also be effectively addressed using genome editing”. In brief, NPBT will allow breeders to create all desirable traits that customers are looking for: a healthy, tasty and sustainable food.

Beyond the policy, regulatory and commercial issues at stake, we would like in this communication to address an historical and societal issue: the promises of an evolution made to order has indeed a long history, which goes back, according to Helen Anne Curry<sup>2</sup>, to the application of X-Ray at the beginning of the 20<sup>th</sup> century, and continues with the colchicine during 1930's, and the radiation after World War II. And most of these promises were not kept, even though some techniques are still used by breeders.

Therefore, it is quite legitimate to ask whether these techniques are really new, not from a technical point of view of course, for which there is no doubt, but concerning the promises and the possibilities that are put forward by those who promote these techniques as a kind of panacea.

In other words, we would like to know if the targeted mutagenesis is really targeted, but also if it is necessarily beneficial and with no risks: is it possible to give a plant any trait we want or is it a more complex situation? Do these techniques really reduce or eliminate off-target mutations? How can we be sure that these techniques won't lead to the apparition of completely new, undesirable and potentially dangerous traits? Moreover, if these traits are inheritable, what could be the consequences on a long period, both for the plant, but also for biodiversity and the humanity, especially if most of these modifications are undetectable?

Plant Breeding, Targeted Mutagenesis, Technological Promises, Risk Assessment, Inheritable Traits

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<sup>1</sup> <http://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=16408>. Consulted on 19/01/2020

<sup>2</sup> H.A. Curry, *Evolution Made to Order: Plant Breeding and Technological Innovation in Twentieth-Century America*, University of Chicago Press, 2016.