

Genetic Technology (Precision Breeding) Bill



Department
for Environment
Food & Rural Affairs

Factsheet – Precision Bred Organisms

Introduction

The Genetic Technology (Precision Breeding) Bill describes a new category of organism that has been produced using modern biotechnology, for which the existing Genetically Modified Organisms (Deliberate Release) Regulations 2002 and the Environmental Protection Act 1990 will no longer apply. These organisms, known as Precision Bred Organisms, will be governed by a new regulatory framework and must adhere to a specific set of criteria in order to qualify for Precision Bred status. In this fact sheet we clarify the key differences between Genetically Modified Organisms (GMOs) and Precision Bred Organisms.

What is a Genetically Modified Organism (GMO)?

A GMO is an organism that contains the random, stable insertion of a functional gene or genes derived from a sexually incompatible donor species. 'Functional' genes are those which have an effect on the physical or behavioural characteristics of the organism. Because these genes are derived from a sexually incompatible donor, the changes seen could not have occurred naturally or through traditional breeding processes.

What is a Precision Bred Organism?

A Precision Bred Organism is a plant or animal containing specific, precise, and stable genetic changes made using a modern biotechnology, that could also have arisen naturally or occurred through the application of traditional breeding methods. A Precision Bred Organism must not contain functional genes derived from a sexually incompatible species. However, it may contain trace amounts of such genetic material so long as this is in line with what is in the existing gene pool of the organism.

How is a Precision Bred Organism similar to a traditionally bred organism?

A large, and growing, body of scientific evidence has shown that genetic material is not as stable as previously believed. Rather, it is mutable and varies, even between individuals of the same species. Traditional breeding methods contribute to this genetic diversity by introducing a range of genetic changes, which generally arise from the random mixing of genes between sexually compatible species. Breeders have utilised these methods for over 10,000 years to domesticate and improve useful plants and animals. Similar kinds of genetic changes can be generated using precision breeding, however the technologies used, such as gene editing, make them in a significantly more targeted manner.

How is a Precision Bred Organism similar to a naturally occurring organism?

Many plants and animals naturally have trace fragments of genetic material derived from sexually incompatible species. This often arises from infection with a bacteria or virus, which can introduce its own DNA to the plant or animal through a process known as natural transformation. Cultivated sweet potatoes contain these kinds of genetic fragments and have been consumed for decades with no adverse effects on human, animal, or environmental health. A Precision Bred Organism may contain similar

genetic changes so long as they are in line with genetic features already found in the existing gene pool.

Why does the Bill allow Precision Bred Organisms to contain genetic changes of this kind?

Genetic technologies have progressed significantly in recent years, allowing scientists to make alterations to the DNA of plants and animals which can be specific, precise, and targeted to a specific location. To facilitate these kinds of changes, some modern biotechnologies require the transient introduction of genes that subsequently allow the 'precision' change to occur. The gene or genes facilitating this change are then removed. In some cases, trace amounts of this DNA, which no longer performs a function or materially affects the organism, remains behind. As a result, only the specific 'Precision Bred' change, which could have arisen naturally or through traditional breeding, has any material effect on the organism (Figure 1).

Importantly, the measures in this Bill only apply to plants and animals which are to be released or marketed in England. This ensures that it is the genetic characteristics of the final organism that are being considered when a determination of 'Precision Bred' status is made. This is in line with current thinking, that it is the final characteristics of an organism that determines its risk rather than the process by which it is made.

Scientific advice from the operationally independent Advisory Committee on Releases to the Environment (ACRE) is that an organism which meets the criteria set out in the Bill would not pose a greater risk to health or the environment as a result of the method by which it is produced. This is corroborated by a wealth of scientific evidence, as well as through a long history of safe use with regards to releases of traditionally bred or naturally arising plants and animals. This extends to the inclusion of small fragments of non-functional DNA from sexually incompatible species.

By allowing genetic features which are similar to that which can arise naturally, we ensure that the definition of 'Precision Breeding' in the Bill captures and regulates relevant organisms in line with scientific evidence. This will enable breeders to utilise the full toolkit available to them, whilst retaining the highest levels of human, animal, and environmental safety. In so doing, we will be able to capture the huge benefits this technology may bring.

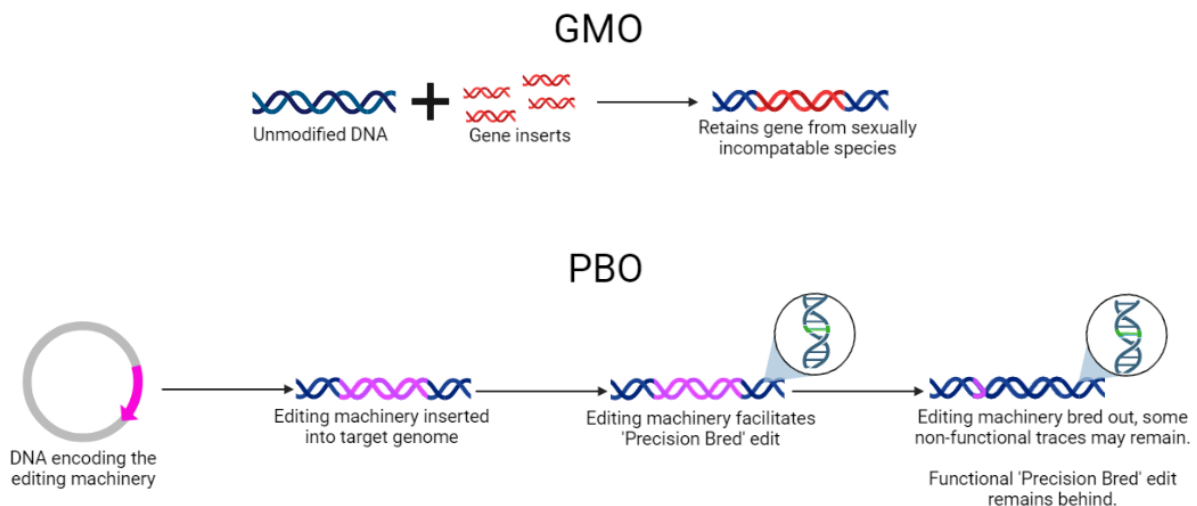


Figure 1: All GMOs contain a functional gene derived from a sexually incompatible species. Some Precision Bred Organisms require transient introduction of genes encoding editing machinery to facilitate the 'Precision Edit'. Any functional genes of this kind must be removed prior to release or market.