



New Gene Editing Technique

Why in News

The proposal for Indian regulators to consider a **new gene editing technique** has been pending with the [Genetic Engineering Appraisal Committee](#) for almost two years.

Gene Editing

- Genome editing (also called [gene editing](#)) is a **group of technologies that give scientists the ability to change an organism's Deoxy-Ribonucleic Acid (DNA)**.
- These technologies **allow genetic material to be added, removed, or altered** at particular locations in the genome.



Key Points

- **About:**
 - The [Indian Agricultural Research Institute \(IARI\)](#) has now moved to newer technologies such as **Site Directed Nuclease (SDN) 1 and 2**.
 - New technique aims to bring **precision and efficiency into the breeding process** using gene editing tools such as [CRISPR \(Clustered Regularly Interspaced Short Palindromic Repeats\)](#), whose developers won the [Nobel Prize for Chemistry in 2020](#).
 - **SDN genome editing** involves the **use of different DNA-cutting enzymes** (nucleases) that are directed to cut the DNA at a **predetermined location** by a range of different DNA binding systems.
 - After the cut is made, the **cell's own DNA repair mechanism recognizes the break and repairs the damage**, using one of two pathways that are naturally present in cells.

- It **involves the use of gene editing tools to directly tweak (improve\change)** the plant's own genes instead.
- It would allow plants to be genetically modified **without the need for conventional transgenic technology.**
- **Current Application:**
 - A research coalition under the [Indian Council of Agricultural Research \(ICAR\)](#), which includes the **IARI**, is using these techniques to **develop rice varieties which are drought-tolerant, salinity-tolerant and high-yielding.** They could potentially be ready for commercial cultivation within three years.
 - The IARI has previously worked on golden rice, a traditional GM variety which inserted genes from other organisms into the rice plant, but ended trials over five years ago due to agronomic issues.
- **Significance of New Techniques:**
 - **Safe:**
 - In this case, you are **just tweaking a gene that is already there in the plant**, without bringing in any gene from outside.
 - When a protein comes from an outside organism, then you need to test for safety. But in this case, this protein is right there in the plant, and is being changed a little bit, just as nature does through [mutation.](#)
 - **Fast:**
 - It is **much faster and far more precise than natural mutation** or conventional breeding methods which involve trial and error and multiple breeding cycles. It is potentially a new [Green Revolution.](#)
- **Status of New Techniques Globally:**
 - The **U.S, Canada, Australia and Japan are among the countries which have already approved the SDN 1 and 2 technologies** as not akin to GM, so such varieties of rice can be exported without any problem.
 - The **European Food Safety Authority** has also submitted its opinion that **these technologies do not need the same level of safety assessment** as conventional gene mutation, though the [European Union](#) is yet to accept the recommendation.
- **Related Laws in India:**
 - In India, several rules, guidelines, and policies backed by the “Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells, 1989” notified under the [Environment Protection Act, 1986](#), regulate genetically modified organisms.
 - Apart from it, the **National Ethical Guidelines for Biomedical and Health Research involving human participants, 2017**, by the [Indian Council of Medical Research \(ICMR\)](#), and the Biomedical and Health Research Regulation Bill implies regulation of the gene-editing process.
 - This is especially so in the usage of its language “modification, deletion or removal of parts of heritable material”.
 - However, there is no explicit mention of the term gene editing.

Genetic Engineering Appraisal Committee

- It functions under the Ministry of Environment, Forest and Climate Change (MoEF&CC).
- It is **responsible for the appraisal of activities involving large-scale use of hazardous microorganisms and recombinants** in research and industrial production from the environmental angle.
- The committee is **also responsible for the appraisal of proposals relating to the release of genetically engineered** organisms and products into the environment including experimental field trials.
- GEAC is **chaired by the Special Secretary/Additional Secretary of MoEF&CC** and co-chaired by a representative from the Department of Biotechnology (DBT).

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