

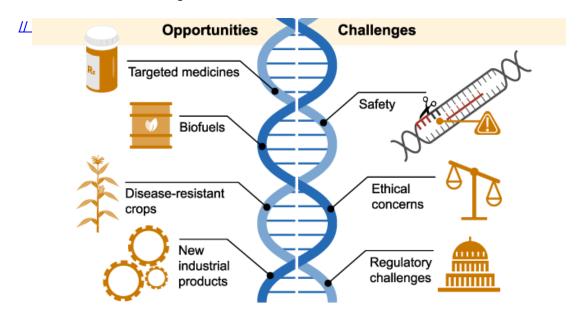
New Gene Editing Technique

Why in News

The proposal for Indian regulators to consider a **new gene editing technique** has been pending with the <u>Genetic Engineering Appraisal Committee</u> for almost two years.

Gene Editing

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



Key Points

About:

- The <u>Indian Agricultural Research Institute (IARI)</u> has now moved to newer technologies such as <u>Site Directed Nuclease (SDN) 1 and 2</u>.
- New technique aims to bring precision and efficiency into the breeding process using gene editing tools such as <u>CRISPR (Clustered Regularly Interspaced Short</u> <u>Palindromic Repeats)</u>, whose developers won the <u>Nobel Prize for Chemistry in 2020.</u>
- 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 <u>Indian Council of Agricultural Research (ICAR)</u>, which
 includes the <u>IARI</u>, is using these techniques to <u>develop rice varieties</u> 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 <u>Green Revolution</u>.

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 <u>European Union</u> 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 <u>Environment Protection Act, 1986</u>, regulate genetically modified organisms.
- Apart from it, the National Ethical Guidelines for Biomedical and Health Research involving human participants, 2017, by the <u>Indian Council of Medical Research</u> (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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