Mains Practice Question

Q. Genetic engineering is a double-edged sword. The only solution is to accelerate the good side of these technologies. Discuss (250 words)

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Approach

- Introduce by briefly explaining what genetic engineering is.
- Mention the advantages and challenges associated with Genetic engineering.
- Provide a way forward to accelerate the good side of such technologies.
- Conclude suitably.

Introduction

- Genetic engineering is the process of using recombinant DNA (rDNA) technology to alter the genetic makeup of an organism. Traditionally, humans have manipulated genomes indirectly by controlling breeding and selecting offspring with desired traits.
- Genetic engineering involves the **direct manipulation of one or more genes.** Most often, a gene from another species is added to an organism's genome to give it a desired phenotype.
- Through genetic engineering, scientists are able to move desirable genes from one plant or animal to another or from a plant to an animal or vice versa. In essence, genetic engineering is a technology wherein a specific gene can be selected and implanted into the recipient organism.

Body

Advantages of Genetic Engineering

- **Genetically Modified (GM) Crops:** Genetic engineering made it possible to create crop varieties regarded as “more beneficial” terms of coming up with crops with the desired traits.
    - Examples of genetically-engineered plants (Bt Cotton) with more desirable traits are drought-resistant plants, disease-resistant crops, plants that grow faster, and plants fortified with more nutrients.
- **Treatment of Genetic Disorders and Other Diseases:** Through genetic engineering, genetic disorders may also be fixed by replacing the faulty gene with a functional gene.
    - Disease-carrying insects, such as mosquitoes, may be engineered into becoming sterile insects. This will help in curbing the spread of certain diseases, e.g. malaria and dengue fever.
- **Therapeutic Cloning:** It is a process whereby embryonic cells are cloned to obtain biological organs for transplantation.

Challenges of Genetic Engineering

While genetic engineering is beneficial in many ways, it is also implicated in certain eventualities deemed as “unpleasant” or disadvantageous.

- **Irreversible Changes:** Nature is an extremely complex interrelated chain. Some scientists believe that introducing genetically-modified genes may have an irreversible effect with consequences yet unknown.
    - GMO that can cause harmful genetic effects, and genes moving from one species to another that is not genetically engineered.
- **Health Issues Related with GMO Crops:** There are concerns over the inadvertent effects, such as the creation of food that can cause an allergic reaction.
- **Bioethics:** Genetic engineering borderlines on many moral and ethical issues. One of the major questions raised is if humans have the right to manipulate the laws and course of nature.

Way Forward

- As there have been no checks or balances, and it is too late to stop the global spread of these technologies.The only solution, now, is to accelerate the good side of these technologies and build defences.
- Representatives of academic and scientific bodies must look at **participation and informed consent** as the two most important tools. By shaping communication about genetic science around the core pillars of consent, transparency, accountability, sustainability and awareness, we can create a circle of trust.
- With Artificial Intelligence (AI) and genomic data, scientists will decipher the complex relationships between DNA and biological processes and find treatments for diseases.
- The scientific community can address people’s concerns, explain the benefits of genetic science and adopt suggestions from the public to make this area of science more accessible and acceptable.

Conclusion

Genetic engineering can revolutionise nutrition and public health. The scientific community needs to reach out to all stakeholders to allay any concerns. We must also remember that when it comes to genetic engineering, no matter how important the end goal may be, it is equally important that we achieve it with justifiable means.