Science & Technology · GS - III

How can biotechnology help to improve the living standards of farmers?

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
15	~250 words

Answer Hint

Improved crop varieties; pest resistance; climate resilience; biofertilisers; biopesticides; livestock improvement; post-harvest technology; farmer income; biosafety

Model Answer

Introduction

Biotechnology applies biological systems and organisms to develop products and processes that can improve agricultural productivity, reduce losses and strengthen farmers' livelihoods.

Ways Biotechnology Can Improve Farmers' Living Standards

1. Higher Crop Productivity

Marker-assisted selection, genomic tools and tissue culture can accelerate the development and multiplication of improved crop varieties with desirable characteristics.

2. Pest and Disease Resistance

Biotechnology can help develop crops resistant to particular pests and diseases, potentially reducing crop losses and pesticide expenditure. Benefits depend on the crop, pest pressure and resistance-management practices.

3. Climate Resilience

Research can support varieties with improved tolerance to drought, salinity, heat and other stresses, helping farmers adapt to changing climatic conditions.

4. Biofertilisers and Biopesticides

Beneficial microorganisms and biological pest-control products can improve nutrient availability and reduce dependence on some chemical inputs when appropriately used.

5. Livestock and Dairy Development

Biotechnological tools can assist animal disease diagnosis, vaccine development, breeding and reproductive management, improving livestock health and productivity.

6. Tissue Culture and Horticulture

Disease-free planting material, especially for crops such as banana and potato, can improve crop uniformity, quality and farm returns.

7. Post-Harvest Management

Biotechnology can contribute to improved food preservation, processing and detection of pathogens, helping reduce losses and improve market value.

8. Income Diversification

Improved crop varieties, horticultural crops and value-added biological products can create new income opportunities.

Challenges and Safeguards

High seed costs, intellectual-property concerns, unequal access to technology, limited extension services and uncertain markets may prevent small farmers from benefiting. Genetically modified crops and other technologies require appropriate biosafety assessment, regulation and transparent public engagement.

Conclusion

Biotechnology can improve farm productivity, resilience and incomes, but its benefits must be accessible, scientifically evaluated and supported by affordable inputs, extension services and reliable markets.

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