VICTORY COUNTDOWN SERIES - DAY 9

"The debate over genetically modified crops is not just scientific, but social and ethical." (Substantiate this statement by discussing the major concerns related to GM crops in India.)

Genetically Modified (GM) crops are developed by altering an organism's genetic material to introduce desirable traits such as pest resistance, higher yield, or tolerance to environmental stress. While GM technology is often projected as a scientific solution to India's food security challenges, the debate surrounding GM crops in India extends far beyond laboratories and yield statistics. It deeply involves **social, ethical, environmental, economic, and governance-related concerns,** making the issue not merely scientific but profoundly societal.

Scientific Concerns and Uncertainties

From a scientific perspective, critics argue that the long-term ecological and health impacts of GM crops are not fully understood. Concerns include the possibility of gene flow from GM crops to wild or non-GM varieties, leading to loss of biodiversity. The emergence of pest resistance and super weeds, observed in regions cultivating Bt crops, raises questions about sustainability. Moreover, the absence of conclusive long-term studies on human health impacts fuels public skepticism, especially in a country where food safety regulation enforcement remains uneven.

Environmental and Ecological Concerns

India is one of the world's mega-biodiversity regions, with rich indigenous crop varieties developed over centuries. Large-scale GM crop cultivation threatens this diversity through monoculture practices, increased chemical dependence, and disruption of soil micro-organisms. Environmentalists caution that GM crops may undermine agro-ecological balance, affecting pollinators such as bees and contaminating traditional seed systems that millions of farmers depend on.

Social and Farmer-Centric Issues

Social concerns dominate the GM debate in India, particularly regarding farmer livelihoods. The experience with Bt cotton, India's only commercially approved GM crop, reveals mixed outcomes. While yields initially increased, rising input costs, pest resistance, and seed dependency have placed financial stress on small and marginal farmers. The ethical issue of corporate control over seeds, often protected by intellectual property rights, raises fears of farmers losing seed sovereignty and becoming dependent on multinational corporations.

Ethical and Cultural Dimensions

Food in India is not merely a commodity but a cultural and ethical matter. Ethical questions arise over tampering with natural life forms, informed consumer consent, and labeling of GM foods. Public resistance also stems from the perception that GM crops are introduced without adequate democratic consultation, ignoring indigenous knowledge systems and traditional farming practices. The precautionary principle, therefore, gains ethical significance in policymaking.

Governance, Regulation, and Public Trust

India's regulatory framework for GM crops, involving bodies such as the Genetic Engineering Appraisal Committee (GEAC), is often criticised for lack of transparency and public engagement. Conflicting scientific reports, court interventions, and policy reversals have weakened public trust. The debate over GM mustard exemplifies how regulatory decisions are contested not only on scientific grounds but also on democratic accountability and federal consent.

The debate over genetically modified crops in India clearly transcends scientific innovation and enters the realm of social justice, environmental ethics, farmer welfare, and democratic governance. While GM technology offers potential solutions to agricultural challenges, its adoption must be guided by transparency, rigorous regulation, ethical responsibility, and public participation. In a diverse agrarian society like India, sustainable food security cannot be achieved through technology alone, but through policies that respect ecological limits and social equity.

VICTORY COUNTDOWN SERIES - DAY 10

"The strength of a nation's backbone depends on how well it adapts to changing times."

(Examine how Indian agriculture must transform to remain the backbone of the economy in the modern era.)

Agriculture has long been described as the backbone of the Indian economy, providing livelihood, food security, and social stability. Even today, despite rapid industrialisation and growth of the service sector, agriculture continues to play a critical role in India's economic and social framework. However, in the 21st century, the relevance of agriculture can no longer be measured merely by its share in GDP. Instead, its importance must be understood in terms of employment generation, food and nutritional security, climate resilience, sustainability, and technological adaptation. Thus, while agriculture remains the backbone of the nation, it must evolve to meet modern challenges and future needs.

Continuing Significance of Agriculture in India

Agriculture remains central to India's socio-economic structure. As per recent estimates, the sector employs around 42–45% of India's workforce, even though its contribution to GDP is about 18%. This reflects agriculture's vital role in sustaining rural livelihoods. India is also one of the world's largest producers of rice, wheat, pulses, milk, fruits, and vegetables, ensuring food availability for its population of over 1.4 billion. Moreover, agriculture supports allied sectors such as food processing, textiles, trade, and transportation, reinforcing its backbone status in the broader economy.

Emerging Challenges in the Modern Context

Modern Indian agriculture faces multiple structural challenges. Climate change has increased the frequency of droughts, floods, and heatwaves, directly affecting crop productivity. According to official assessments, nearly 55% of India's net sown area is rain-fed, making it highly vulnerable to climate variability. Declining soil fertility, groundwater depletion, fragmented landholdings, and rising input costs further strain farm sustainability. Additionally, income disparity between agricultural and non-agricultural sectors continues to widen, raising concerns about rural distress and farmer welfare.

Need for Technological and Structural Transformation

To remain relevant in the modern era, agriculture must undergo a technology-driven transformation. Initiatives such as digital agriculture, precision farming, artificial intelligence-based advisories, and climate-resilient crop varieties are increasingly important. Government programmes like PM-KISAN, PM Fasal Bima Yojana, Soil Health Card Scheme,

and Agri-Infrastructure Fund aim to improve income stability, risk management, and post-harvest infrastructure. The expansion of Farmer Producer Organisations (FPOs) also helps small farmers gain market access and bargaining power in a competitive economy.

Sustainability and Food Security Imperatives

Modern agriculture must prioritise sustainability alongside productivity. Excessive chemical use, monocropping, and water-intensive farming threaten long-term food security. India's commitment to sustainable agriculture, aligned with the UN Sustainable Development Goals, emphasises natural farming, micro-irrigation, crop diversification, and renewable energy use in agriculture. Ensuring nutritional security through millets, pulses, and diversified food systems is equally critical in addressing malnutrition and public health concerns.

Agriculture continues to be the backbone of the Indian nation, not merely because of its economic contribution, but due to its role in employment, food security, and social stability. However, in a rapidly changing world marked by climate stress, technological disruption, and economic transition, agriculture must evolve to remain resilient and inclusive. The future of Indian agriculture lies in sustainable practices, technological innovation, farmer-centric policies, and institutional reforms. Only then can agriculture effectively support India's aspiration for equitable growth and long-term national development.