CLIMATE RESILIENT AGRICULTURE - GS III MAINS

Q. Critically examine the major impacts of climate change on Indian agriculture and throw a light on how the practice of Climate Resilient Agriculture addresses the above impact. (15 marks, 250 words)

News: *50k villages in 310 districts: Govt prepares plan for climate-resilient farming*

What's in the news?

- Recently, the Union government is planning to unveil a framework to promote climate-resilient agriculture in 50,000 villages located in climatically-vulnerable districts.

Climate Resilient Agriculture:

- It involves integrating adaptation, mitigation, and other practices in agriculture to enhance the system's ability to respond to climate-related disturbances by resisting damage and recovering swiftly.
- It requires the prudent and improved management of natural resources such as land, water, soil, and genetic resources through the adoption of best practices.

Major Impacts of Climate Change on Indian Agriculture:

1. Changes in Rainfall Patterns:

- In 2019, India experienced delayed and deficient monsoon rains, leading to reduced crop yields in many regions.

2. Increased Temperature:

- In recent years, heatwaves in India have affected crop yields, particularly for heat-sensitive crops like wheat and rice.

3. Shifting Pest and Disease Patterns:

- Increased incidence of pests like the pink bollworm has affected cotton production in India, and locust swarms from the Somalia region have increased due to erratic rain.

4. Water Scarcity:

- Changes in precipitation patterns and melting glaciers can lead to water scarcity, especially during critical crop growth stages.

5. Changes in Cropping Patterns:

- As temperature and rainfall patterns shift, farmers may need to adapt their cropping patterns to ensure productivity.

6. Increased Extreme Weather Events:

- Climate change has been linked to an increase in extreme weather events, such as cyclones, storms, and hailstorms.
- For example, the recent Cyclone Biparjoy caused significant damage in affected areas.

Challenges in Adopting Climate Resilient Agriculture:

1. Multidimensional Intervention:

- Collaboration between teams with diverse backgrounds and methods is necessary due to the involvement of various stakeholders, leading to human resource and policy challenges.

2. Skill Issues:

- There is a significant knowledge and training gap due to weak extension services, which limit the connection between research and farmers.

3. Structural Issues:

- Agriculture faces structural challenges such as over-dependence on rainfall, inadequate seed supply, fragmented land holdings, and insufficient post-harvest infrastructure.

4. Delayed Benefits:

- Certain agricultural practices take time to yield results, requiring sustained motivation and support for farmers.

5. Policy Issues:

- Policies like Minimum Support Price (MSP) and subsidized fertilizers often lead to monocultures, excessive water extraction, soil health degradation, and the destruction of natural pollinators.

Strategies and Technologies for Climate Change Adaptation:

1. Gene Editing:

- Researchers have developed CRISPR-edited rice varieties that are resistant to bacterial blight, a significant disease impacting rice production in Asia.

2. Tolerant Crops:

- Drought-tolerant maize varieties in sub-Saharan Africa, can produce 20-30% higher yields under drought conditions compared to conventional varieties.

3. Water Management:

- In Israel, advanced drip irrigation systems have reduced water usage by up to 50% while increasing crop yields.

4. Agro-Advisory:

- In India, the Indian Council of Agricultural Research (ICAR) offers agro-advisory services through mobile applications like mKisan, which sends real-time advisories to millions of farmers.

5. Soil Organic Carbon:

- In Brazil, the adoption of no-till farming has improved soil organic carbon content and boosted soybean yields by up to 30%.

6. State Interventions:

- Andhra Pradesh, Himachal Pradesh, and Sikkim, among other states, have initiated extensive programs to adopt and promote organic farming practices.
- Notably, Sikkim has achieved the status of being an entirely organic state.

7. Role of Research Institutes:

- The Indian Council of Agricultural Research (ICAR), in collaboration with its network of research institutes, state agricultural universities, and various departments, has been implementing agriculture contingency plans across approximately 650 districts in India to enhance climate change preparedness over the past seven years.
- These successful models are being extended to SAARC countries to help them adapt to climate change impacts such as floods, cyclones, droughts, heat waves, and seawater intrusion.
- Additionally, ICAR has established climate-resilient villages in 151 districts across India, which state governments are replicating to build carbon-positive villages and enhance overall resilience to climate change.

WAY FORWARD:

- Adapt appropriate mitigation technologies like cultivating tolerant breeds to combat climate stress.
- Manage water and nutrients efficiently to enhance productivity and resource use.
- Provide timely agro-advisories for effective crop monitoring.
- Implement conservation agricultural practices to increase soil organic carbon and create a favorable environment for plant growth, including manure management.
- Prioritize the reduction of greenhouse gas emissions from both agricultural and non-agricultural sources, with neem-coated urea as a key policy intervention.
- Conduct structured training to build stakeholder confidence and raise awareness about climate change events.
- Bridge the gap between current management practices and essential agro-advisories. Develop flagship farmer-oriented programs to improve skills in agriculture and related sectors.
- Promote collaboration among farmers, research institutions, funding agencies, governments, NGOs, and the private sector to strengthen climate-resilient agriculture (CRA).