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S.NO.	TOPIC
1.	MANGROVE FOREST IN WORLD'S LARGEST DELTA
2.	NEED FOR CLIMATE-SMART AGRICULTURE IN INDIA

MANGROVE FOREST IN WORLD'S LARGEST DELTA

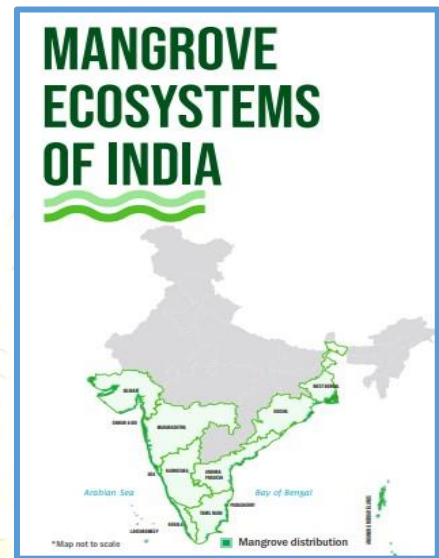
SOURCE: [INDIAN EXPRESS](#)

WHY IN NEWS?

Purbasha Rural Child Education Centre's unique approach to mangrove conservation draws attention. Innovative combination of community-led efforts, education, and sustainable development. As Global awareness of the crucial role mangroves play as blue carbon sinks. **Chargheri's mangroves highlighted** as a significant contributor to carbon sequestration.

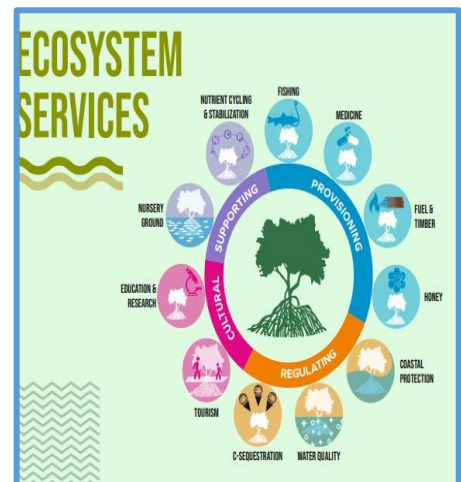
ABOUT MANGROVES:

- **Definition**
 - ✓ Mangroves are a salt-tolerant plant community found in tropical and sub-tropical intertidal regions globally. They thrive in areas with rainfall between 1,000 to 3,000 mm and temperatures ranging from 26-35°C.
- **Adaptations:**
 - ✓ Mangroves exhibit various adaptations in morphology, anatomy, and physiology to survive in hostile environments.
 - ✓ Adaptations include pneumatophores, buttress roots, stilt roots, vivipary, etc.
 - ✓ These adaptations are crucial for thriving in waterlogged soils and high salinity regimes, often affected by storms and tidal surges.
- **Threats and Challenges:**
 - ✓ Biotic pressures and natural calamities pose significant challenges to mangrove ecosystems.
 - ✓ Industrial expansion along coastlines and the discharge of domestic and industrial sewage contribute to pollution in mangrove areas.
 - ✓ Intensive conservation efforts are required to protect the sensitive mangrove ecosystem.



STATUS OF MANGROVE COVER:

- **Global Mangrove Status:**
 - ✓ 50% decline in world mangrove forests in the last 50 years due to coastal developments and climate change.
 - ✓ Mangroves act as a crucial defence during cyclones, absorbing CO₂ and preventing coastal erosion.
 - ✓ Sundarbans, covering 60% in Bangladesh and the rest in West Bengal, are the world's largest mangrove tracts.
- **Indian Mangrove Scenario:**
 - ✓ Mangroves cover an area of 4,628 sq km in India, representing nearly 3% of world's mangroves, housing 43-45 mangrove species. (Source: DTE)
 - ✓ Sundarbans facing challenges due to rising sea levels and changing salinity.





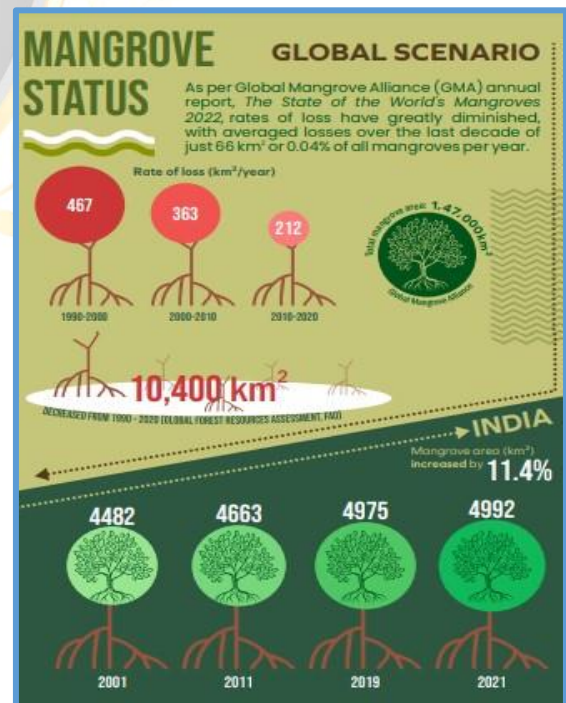
- ✓ Climate change impacts the effectiveness of mangrove **planting along the coast.**
- **Forest Survey of India Assessments:**
 - ✓ The **Forest Survey of India (FSI)** has been assessing mangrove cover **using remote sensing data since 1987.**
 - ✓ Assessments were **conducted at different scales: 1:1 million scale (1987), 1:250,000 scale (1989-1999), and 1:50,000 scale (2001 onwards).**
 - ✓ The assessments focus on mangrove cover and **exclude tidal creeks and water bodies within mangrove forests.**
- **Carbon Sequestration:**
 - ✓ **Mangroves are vital carbon sinks;** above-ground and below-ground biomass calculations are essential.
 - ✓ Plastic waste **accumulation threatens mangrove roots,** affecting their sustainability.

Global Forest Resource Assessment, 2020 (FRA 2020):

- **113 countries have Mangrove forests** covering an estimated 14.79 million hectares.
- **largest Mangrove area is reported in Asia (5.55 million hectares),** followed by **Africa (3.24 million hectares), North and Central America (2.57 million hectares)** and South America (2.13 million hectares).
- **More than 40 percent** of the total area of Mangroves was reported to be **in just four countries: Indonesia (19 percent of the total), Brazil (9 percent), Nigeria (7 percent) and Mexico (6 percent)**

SIGNIFICANCE OF MANGROVE FORESTS:

- **Medicinal and Ecological Importance**
 - ✓ **Traditional Medicine:** Mangroves (e.g., **Acanthus, Avicennia**) used in traditional medicine for **diseases like leprosy, malaria.**
 - ✓ **Bioactive Compounds:** Isolated compounds (e.g., **benzoxazoline-2-one, stigmasterol**) show therapeutic potential.
- **Mangroves in Wetland Ecosystems:**
 - ✓ **Sea Level Rise Impact:** Alters **productivity and nutrient flows** in mangrove ecosystems.
 - ✓ **Vegetative Production:** **Affects organic sedimentation and litter fall rates.**
 - ✓ **Species Response:** Investigation needed based on **hydrology, productivity, nutrient fluxes, sedimentation patterns, and oceanography.**
- **Role of Mangroves in Wetland Ecosystems**
 - ✓ **Structural Framework:** Mangroves as systems with **distinct functions and stability.**
 - ✓ **Management Principles:** Proper utilization through **sound management principles.**
 - ✓ **Long-Term Viability:** Achievable by considering **ecological, economic, and socio-cultural functions.**
 - ✓ **Quantifying Role:** Requires **interdisciplinary cooperation and integration** of research findings.
- **Destruction and Need for Conservation**
 - ✓ **Global Decline:** Over **80% of global mangrove forests devastated** due to human activities.

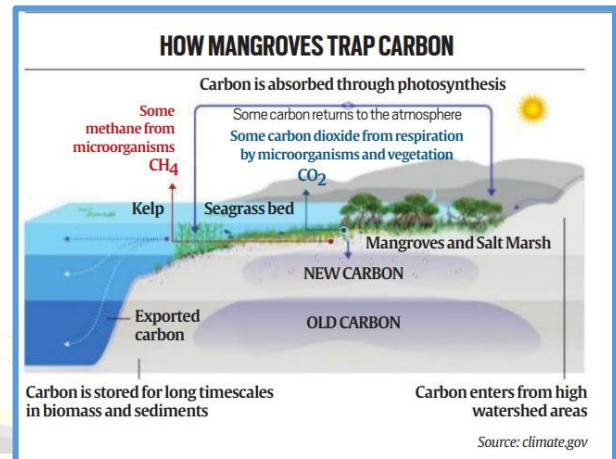




- ✓ **Consequences:** Increased flooding, coastal erosion, loss of biodiversity, livelihoods, and ecological imbalance.
- ✓ **Economic Importance:** Vital for fisheries, providing fuel, building materials, and other economically valuable resources.
- ✓ **Conservation Urgency:** Recognition of ecological, economic, and social values essential for sustainable mangrove management.

Recent Challenges in Mangrove Conservation

- **Global Recognition of Blue Carbon:**
 - ✓ Despite global awareness of mangroves as **blue carbon sinks**, Chargheri's mangroves confront new challenges.
 - ✓ Recognition of their **role in carbon sequestration faces ongoing scrutiny and adaptation.**
- **Scientific Contribution and Research Findings:**
 - ✓ Recent challenges **impact research on Blue Carbon Stock in Chargheri**, affecting the scientific understanding of mangrove ecosystems.
 - ✓ The role of mangroves in climate change mitigation **encounters contemporary challenges** and calls for continued exploration.



Concerns in Community Empowerment and Women's Role

- **Community Empowerment and Women's Role:**
 - ✓ Ongoing efforts in **empowering local communities, particularly women, in climate resilience encounter emerging challenges.**
 - ✓ The **Mangrove Army's unique initiative** involving mothers faces evolving concerns and requires continuous adaptation.
- **Sundarbans' Vulnerability to Climate Change:**
 - ✓ Sundarbans, especially Chargheri, grapples with **recent back-to-back cyclones (e.g., Amphan, Yaas).**
 - ✓ Urgency intensifies for **community-driven climate resilience** in vulnerable regions amid evolving climate challenges.

Emerging Issues with Tiger Widows' Participation

- **Tiger Widows' Participation:**
 - ✓ The participation of **tiger widows in mangrove afforestation events encounters recent challenges.**
 - ✓ **Holistic conservation approach faces evolving socio-economic concerns** within the community.
- **Education as a Conservation Tool:**
 - ✓ Integration of education into the **conservation model faces emerging challenges**, emphasizing the role of Purbasha Primary School.
 - ✓ Educational efforts as a key tool for **instilling environmental responsibility** encounter evolving challenges and dynamics.

CONSERVATIONS OF MANGROVES:

- **Human Impact on Mangrove Ecosystems:**



- ✓ Increasing human population in coastal areas and escalating demands for land, timber, fodder, and fuel-wood pose constant threats to Mangrove ecosystems.
- ✓ Effective conservation strategies are crucial to mitigate these pressures and ensure the sustainability of Mangrove habitats.
- **Rich Biodiversity in Mangrove Ecosystems:**
 - ✓ Mangroves, classified under Champion & Seth Classification (1968), fall into Type Group-4 Littoral & Swamp Forests, encompassing various subtypes.
 - ✓ Notable species within Indian Mangrove ecosystems include *Avicennia officinalis*, *Rhizophora mucronata*, *Sonneratia alba*, *Bruguiera cylindrica*, and others.
- **Government Action on Mangrove Conservation:**
 - ✓ Acknowledging the importance of Mangroves, the Government of India established a **National Mangroves Committee in 1976**.
 - ✓ The committee's role is to advise the government on conservation and development matters related to Mangroves.
- **Survey and Conservation Scheme:**
 - ✓ Emphasizing the urgency, the committee recommended a survey to assess the extent of Mangrove areas in the country.
 - ✓ Subsequently, the government devised a conservation and protection scheme for Mangroves, underscoring the need for proactive measures.

State/UT-wise Mangrove cover In India (2021):

- ☛ Mangrove cover in the country is 4,992 sq km, 0.15% of total area.
- ☛ **Very Dense Mangrove:** 1,475 sq km (29.55%);
- ☛ **Moderately Dense:** 1,481 sq km (29.67%);
- ☛ **Open Mangroves:** 2,036 sq km (40.78%).
- ☛ Net increase of 17 sq km compared to 2019; Odisha gained 8 sq km, Maharashtra gained 4 sq km.
- ☛ Odisha's increase due to natural growth and plantation near rivers and estuaries.
- ☛ **Kendrapara, Jagatsinghpur, and Balasore in Odisha show significant growth.**
- ☛ Maharashtra's increase is from natural growth.
- ☛ South 24 Parganas district in West Bengal also saw growth.

Initiative for conservation of Mangroves	Description
MISHTI (Mangrove Initiative for Shoreline Habitats & Tangible Incomes)	✓ Aimed at promoting mangrove conservation and providing tangible economic benefits to shoreline communities.
Sustainable Aquaculture In Mangrove Ecosystem (SAIME)	✓ Focuses on sustainable aquaculture practices within mangrove ecosystems, ensuring the balance between conservation and economic activities.



➤ **Key Mangrove Species in India**

- ✓ **Diverse Mangrove Species in India:**
- ✓ Important Mangrove species in India encompass ***Avicennia officinalis*, *Rhizophora mucronata*, *Sonneratia alba*, and others.**
- ✓ These species play a **vital role in maintaining the ecological balance** of Mangrove ecosystems.

➤ **Conservation Focus and Management Regimes**

- ✓ Essential Management for Conservation:
- ✓ **Appropriate management regimes** are essential for the **effective conservation of Mangroves.**
- ✓ **Balancing the ecological needs with human demands** requires strategic planning and sustainable practices.

CONSERVATION MEASURES

Despite increasing developmental pressures, mangroves have been successfully managed in India in the last two decades. Between 2001 to 2021, Indian mangrove cover witnessed an increase of 510 km². There has been a net increase of 17 km² in the mangrove cover of the country as compared to 2018 assessment. This has been possible not only because of legislative protection regulating anthropogenic activities but also as a result of mangrove afforestation leading to natural colonization.

Ministry of Environment, Forest and Climate Change (MoEF&CC) has introduced legislative protection for conservation of Indian mangroves which include the following:

- Coastal Regulation Zone (CRZ) Notification issued under **The Environment (Protection) Act, 1986** protects coastal ecosystems including mangroves as ecologically sensitive areas (ESA)
- **The Indian Forest Conservation Act, 1980**
- **The Wildlife (Protection) Act, 1972**

WAY FORWARD:

➤ **Collaborations and Future Plans:**

- ✓ Collaborations with **institutes for educational tours** and upcoming events, such as **mangrove planting with tiger widows**, face evolving dynamics.
- ✓ **Anticipation and interest in future plans** highlight the need for adaptability in the face of contemporary challenges.

➤ **Sustainable Development Focus:**

- ✓ The **emphasis on sustainable development intertwining conservation** and community well-being encounters evolving challenges.
- ✓ **Balancing ecological threats with long-term socio-economic sustainability** necessitates continuous adaptation.

➤ **Inspiration for Climate Action:**

- ✓ The initiative serves as an inspiration amid recent challenges in mangrove conservation.
- ✓ **A beacon of hope showcasing local communities'** resilience and effective climate change mitigation efforts amidst evolving circumstances.

➤ **Drone Surveillance and AI Monitoring:**

- ✓ Implement drone technology **with advanced cameras and AI algorithms** for effective mangrove health monitoring.
- ✓ **Enhance surveillance capabilities to detect and address illegal activities** like encroachment and logging promptly.

➤ **IUCN's Conservation Mandate:**

- ✓ Since 1975, IUCN has been **dedicated to conserving critical coastal marine habitats**, including mangroves.

PROTECTED MANGROVE AREAS

national parks
wildlife sanctuaries
community reserves
reserves & protected forests

Pristine mangroves are being preserved in majority of the 129 declared Marine Protected Areas



- ✓ Over 30 resolutions and recommendations have been **adopted to promote the protection, conservation, and sustainable management of mangroves globally.**
- **Global Mangrove Alliance:**
 - ✓ A commitment to reverse the **loss of mangrove habitats worldwide.**
 - ✓ Aims to **increase the global area of mangrove habitat by 20% over the current extent by 2030.**
 - ✓ Collaborative efforts to secure commitments from governments and the private sector to halt and reverse mangrove loss.





NEED FOR CLIMATE-SMART AGRICULTURE IN INDIA

SOURCE: [THE HINDU](#)

WHY IN NEWS?

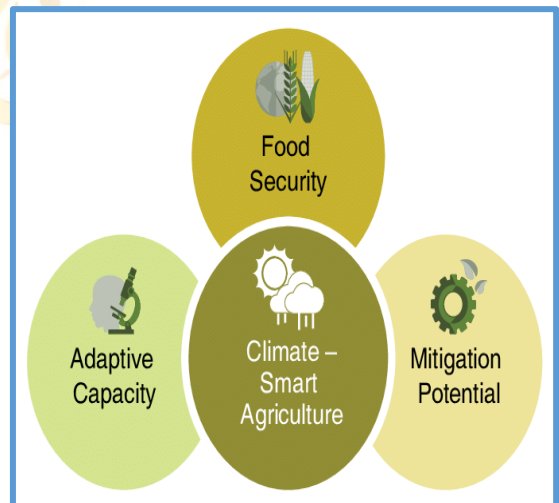
- With climate change becoming an **urgent global concern**, the intersection of climate change and **agriculture is gaining prominence in the news.**
- Escalating challenges related to **food security due to climate-induced factors** such as extreme weather events, **droughts, and changing agricultural landscapes have sparked increased attention.**
- The **concept of Climate-Smart Agriculture (CSA)** is making headlines globally as a **comprehensive approach to address the impacts of climate change on agriculture and ensure sustainable food production.**

RECENT SCENARIO OF GLOBAL CLIMATE CHANGE ON AGRICULTURE:

- **Global Food Demand:**
 - ✓ Growing population and dietary changes drive increased food demand.
 - ✓ About 8.9% (690 million) of the global population faces hunger.
- **Future Food Challenge:**
 - ✓ Need to produce 70% more food by 2050 for an estimated 9 billion people.
- **Climate Change and Environmental Impact:**
 - ✓ Meeting increased food demand worsened by climate change.
 - ✓ Agriculture generates 19–29% of total greenhouse gas emissions.
- **Climate Change's Effect on Indian Agriculture:**
 - ✓ Climate change causes a decline in major crop yields in India.
 - ✓ Predicted decline in major crop yields between 2010 and 2039, with potential losses up to 35% (rice), 20% (wheat), 50% (sorghum), 13% (barley), and 60% (maize).

WHAT IS CLIMATE SMART AGRICULTURE (CSA):

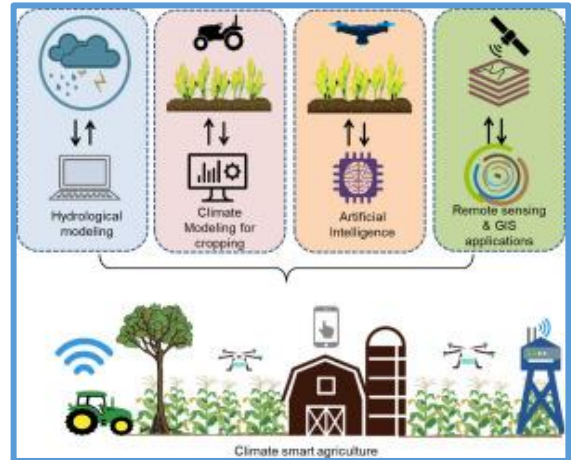
- **Definition of CSA:**
 - ✓ The term "Climate-Smart Agriculture" (CSA) refers to a **suite of agricultural practices collectively designed to address food security challenges** amid the impacts of climate change.
 - ✓ **Integration of Climate Change:** CSA is distinguished by its **systematic integration of climate change considerations** into the planning and execution of **sustainable agricultural practices.**
- **Objectives of CSA:**
 - ✓ **Increase Productivity and Incomes:**
 - Aims to sustainably enhance agricultural productivity and incomes.
 - ✓ **Adaptation to Climate Change:**
 - Focuses on building resilience and adapting to the impacts of climate change.
 - ✓ **Greenhouse Gas Emission Reduction:**
 - Seeks to reduce or remove greenhouse gas emissions, where feasible.
 - ✓ **Alignment with Global Goals:**
 - Supports internationally agreed goals such as the Sustainable Development Goals (SDGs) and the Paris Agreement.





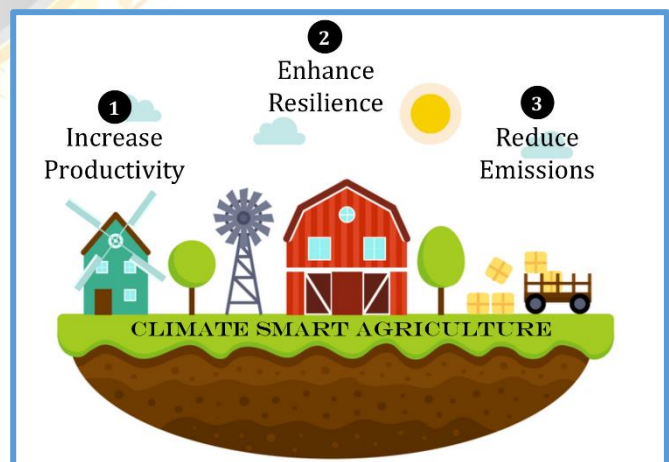
CHARACTERISTICS OF CSA:

- **Holistic Approach:**
 - ✓ Unlike traditional agriculture, CSA takes a holistic approach, **acknowledging and incorporating climate change dynamics** into the development of sustainable agricultural systems.
- **Three Primary Pillars:**
 - ✓ CSA is **built on three interconnected pillars: increased productivity, enhanced resilience, and reduced emissions.**
 - ✓ However, **achieving an optimal balance among these pillars involves inherent trade-offs.**
- **Ecosystem Services Preservation:**
 - ✓ CSA recognizes and emphasizes the **preservation of ecosystem services.**
 - ✓ This includes **ensuring the sustainability of services provided by ecosystems, such as clean water, materials, food, and sunlight, to the agricultural sector.**
- **Adaptability and Flexibility:**
 - ✓ CSA is **not confined to specific practices, technologies, or methodologies.**
 - ✓ It is a flexible concept that can be adapted to various contexts, with **multiple entry points ranging from technological development to climate change modeling and scenario planning.**
- **Conceptual Framework:**
 - ✓ CSA goes beyond being a **set of rigid practices**; it serves as a **conceptual framework.**
 - ✓ It **encompasses diverse elements such as technology development, climate change models, information technology, insurance schemes, value chains, and the strengthening of institutional and political environments.**



NEED FOR CLIMATE-SMART AGRICULTURE:

- **Impact of Climate Change:**
 - ✓ Climate change worsens degradation in **already-degraded environments**, negatively affecting food production and systems.
- **Indian Crop Yield Decline:**
 - ✓ Anticipated **nine percent decline in major crop yields** across India from **2010 to 2039** due to climate change effects.
- **Embracing Climate-Smart Agriculture (CSA):**
 - ✓ Heightened necessity to adopt Climate-Smart Agriculture **to counteract the adverse effects of climate change on agricultural systems.**
 - ✓ Urgent transformation required in **agriculture, covering crops, livestock, fisheries, and forestry, to effectively respond to climate change.**
- **Sustainable Productivity and Incomes:**
 - ✓ Climate-smart agriculture **aligns with sustainable agriculture and rural development goals, aiming to increase agricultural productivity and incomes sustainably.**
- **Contribution to Global Goals:**





- ✓ Attaining Climate-Smart Agriculture objectives contributes to achieving the Millennium Development Goals (MDGs), focusing on reducing hunger and enhancing environmental management.

GOVERNMENT INITIATIVES:

<i>Government Initiatives on CSA</i>	<i>Key Points</i>
<i>National Innovation on Climate Resilient Agriculture (NICRA)</i>	<ul style="list-style-type: none"> ✓ Launched by ICAR in 2011 with an outlay of Rs.350 crores. ✓ Aims to enhance resilience in Indian agriculture against climatic variability through improved technologies.
<i>National Mission on Sustainable Agriculture (NMSA)</i>	<ul style="list-style-type: none"> ✓ Part of NAPCC, includes interventions like Soil Health Card, Paramparagat Krishi Vikas Yojana. ✓ Focuses on adopting sustainable development pathways and environment-friendly technologies.
<i>National Adaptation Fund for Climate Change (NAFCC)</i>	<ul style="list-style-type: none"> ✓ Established to support climate change adaptation in vulnerable states and Union Territories. ✓ Funds concrete adaptation activities, including those in the agriculture sector.
<i>Climate-Smart Village (CSV)</i>	<ul style="list-style-type: none"> ✓ An institutional approach to test and promote CSA at the local level. ✓ Involves a portfolio of interventions covering the full spectrum of farm activities.
<i>Pradhan Mantri Krishi Sinchayee Yojna (PMSKY)</i>	<ul style="list-style-type: none"> ✓ Launched to prioritize water conservation and management in agriculture. ✓ Aims for 'Har Khet Ko Paani' and 'More crop per drop' to improve water use efficiency.
<i>Pradhan Mantri Fasal Bima Yojna (PMFBY)</i>	<ul style="list-style-type: none"> ✓ Voluntary scheme since Kharif 2016 for States/UTs and farmers. ✓ Cumulatively enrolled 2,938.7 lakh farmer applications, insuring Rs. 10,49,342 crore till 2020-21.
<i>Soil Health Card Scheme</i>	<ul style="list-style-type: none"> ✓ Launched in 2015 to provide detailed soil nutrient status to farmers. ✓ Aims to improve productivity through judicious use of inputs; target to issue 10.48 crores of SHCs.
<i>National Water Mission (NWM)</i>	<ul style="list-style-type: none"> ✓ Aims for Integrated Water Resource Management and water use efficiency optimization by 20%. ✓ Addresses water conservation and minimizes wastage, including in agriculture.
<i>Paramparagat Krishi Vikas Yojna (PKVY)</i>	<ul style="list-style-type: none"> ✓ An extended component of SHM under NMSA, launched in 2015. ✓ Supports and promotes organic farming through a cluster approach, improving soil health.
<i>Biotech-KISAN</i>	<ul style="list-style-type: none"> ✓ Launched in 2017 for scientist-farmer partnerships in agriculture innovation. ✓ Establishes Biotech-KISAN Hubs across agro-climatic zones, benefiting farmers and developing entrepreneurship.



<i>Neem Coated Urea</i>	<ul style="list-style-type: none">✓ Urea fertilizer coated with neem to act as a slow releaser of nitrogen.✓ Reduces pest and disease infestation, minimizing chemical usage in farming and increasing crop yield.
<i>Sub-mission on Agro-forestry</i>	<ul style="list-style-type: none">✓ Launched in 2016-17 to plant trees on farm bunds.✓ Aims for sustainability in agriculture and optimum productivity by mitigating the impact of climate change.
<i>National Livestock Mission</i>	<ul style="list-style-type: none">✓ Initiated in 2014-15, focuses on livestock development.✓ Aims for sustainability, bio-security, conservation of animal bio-diversity, and farmers' livelihood protection.

WAY FORWARD:

- **Community Engagement:**
 - ✓ The **rise in community-supported agriculture efforts** and the **positive impact of CSA** on local communities, farmers, and biodiversity are capturing media interest.
- **Economic and Environmental Implications:**
 - ✓ The **economic autonomy gained by farmers through CSA adoption**, along with its positive environmental implications.
- **Role in Biodiversity Conservation:**
 - ✓ CSA's **contribution to biodiversity conservation** and its **ecosystem-based approach** are presented as key elements in **addressing habitat degradation and maintaining ecological balance.**
- **Global Collaborations and Targets:**
 - ✓ Global initiatives like the **Global Mangrove Alliance** and specific targets for increasing mangrove **habitat globally by 2030** are gaining attention as collaborative **efforts to combat climate change.**
- **Innovation and Capacity-Building:**
 - ✓ The innovative aspects of CSA, including the **use of technology like precision farming, drone monitoring, and AI**, are being covered in the news, along with the **need for capacity-building programs.**