BIRD's Climate Lens

COP 26 and Net Zero Target

Conference of the Parties (COP) to the UNFCCC was originally scheduled to take place in Glasgow, UK in November 2020 but was postponed due to the pandemic. The event was held in Glasgow from 31st October to 12th November 2021 with participation of nearly 200 nations. The "Glasgow Climate Pact" deal is seen as an effort to facilitate implementation of sustainable and low carbon oriented climate action. COP 26 was perceived as the best chance to limit temperature rise to 1.5 to 2°C. However a UN scientific assessment stated that all countries' present climate plans would increase the Earth's temperature by 2.7°C. As per the assessment by Climate Action Tracker (CAT), an independent organisation, if the targets were fully achieved, it could limit temperature rise by about +1.8°C.

Some of the key points of the deal and developments are as follows:

1. Recognising the emergency, countries re-affirmed the COP 21 goals to limit the global average temperature increase well below 2°C and pursuing efforts to limit it to 1.5 °C.

2. The deal called on all countries to gear up emissions cuts by submitting new and stronger action plans quickly - by 2022, three years earlier than agreed in Paris. Carbon dioxide emissions need to be reduced by 45% to reach net zero by mid-century.

3. Wealthy nations have not been able to provide a separate annual sum of $100 billion as promised by them. Hence the pact urged countries to pay up urgently through 2025.

4. Agreement included more on mitigation measures and how fossil fuels to be reduced to achieve net zero emissions by 2050.

5. Efforts to 'phase down' coal consumption and phase out inefficient fossil fuel subsidies. Countries, car makers commit to end fossil-fuel vehicles by 2040.

6. India, South Africa, Indonesia, Philippines join the Coal transition programme.

7. Large emission nations namely China and India opposed the mention of polluting fuels.

8. Glasgow Pact included efforts for doubling of finance for developing countries to adapt to climate change and building resilience.

9. Work programme to define global goal on adaptation, which will identify collective needs and solutions to the climate crisis already affecting many countries.

10. Enhanced Transparency Framework, for regular progress report submission by all countries, so as to promote transparent reporting of efforts.

11. Launching of a new "Glasgow dialogue" for funding arrangement to address climate change issues.

12. US$232 million pledged for Adaptation fund to finance adaptation projects in developing countries.

13. Announcement of US$413 million for the Least Development Countries (LDCs) that are vulnerable to climate change.

14. Egypt is selected for COP27 in 2022 and UAE chosen for holding COP28 in 2023.

India presented the way for an equitable and just solutions at the forum and voiced the concerns of the developing world successfully.

Setbacks of the COP 26 Meeting

1. Targets are voluntary with weak enforcement mechanism to check non-compliance, they are implementable on availability of adequate financial support.

2. Details on specific actions to be taken by countries is not provided which would enable measuring actual progress.

3. The summit only urges the developed country parties for climate finance. And do not have firm funding commitments from them.

4. World's top three largest emitters (China, USA, Europe with about 30% of the world's population), would take up 78% of the carbon budget.

5. China's peak emissions will be by 2030, before going down to net zero in 2060; it would take up 54% of the global carbon budget against a population share of only 19%.

6. The US, with 4.2% of the total population, would take up 14.2% of the budget and Europe, with 6.8%, would take up 9.5%.

7. Hence, focusing on net-zero timelines alone is not fair for all countries, if the initial carbon emissions vary greatly.

Road Map

- There is need to recalibrate the carbon emissions to be closer to countries population share.
- The aim to achieve net-zero should be at an earlier time-line and not depend on achieving it after reaching peak emissions.

Way-forward for India

- India's net-zero by 2070 account for 18.1% of the carbon space, which is a little higher than our population share of 17.7%. Hence, a modification in its trajectory as part of an agreed global package, in which other countries also take appropriate action is essential.
- India has made no commitments regarding phasingdown of coal-based power; however, our renewable energy goals by 2030 are likely to reduce the share of coal based power from 72% to about 50% by 2030.
- There is a need to implement closing of older, inefficient and polluting plants through suitable financing mode.
- India's net-zero by 2070 also requires phasing out petrol and diesel based transport and shifting to Electric Vehicles (EVs) that use electricity from renewables. In this direction restructuring of automotive sector for EV production is required.
- Expanding renewable capacity requires policy action for stabilizing supply from renewables.
- There is need to put in place, transmission infrastructure, creating efficient electricity markets and address the financial conditions of discoms.
- These aspects are not specified in the Nationally Determined Contributions (NDCs), therefore an implementable domestic policy needs to be prepared in the coming years.

35 ICAR's New Crop Varieties

Climate change can negatively impact yields by 4.5 to 9% as per the report of National Innovations in Climate Resilient Agriculture (NICRA). Hence climate resilience farming demand for new varieties needs to be met through R & D works and breeding programme. Special trait varieties that address or are tailor-made to suit climate change will increase the productivity as well as area of cultivation. In this connection, ICAR has developed 35 varieties with special traits. These varieties have been developed to address climate change and malnutrition challenges.

These varieties include drought tolerant variety of chickpea, wilt and sterility mosaic resistant pigeon pea, early maturing soybean, disease resistant rice and biofortified wheat, pearl millet, maize and chick pea, quinoa, buckwheat, winged bean and faba bean.

The climate resilient varieties include salt tolerant, drought resilient, pest resilient, early maturing, bio-fortification etc.will diversify nation's crop production while ensuring food security.

These 35 varieties will not only provide the much needed resilience for the farmers facing frequent and intense climate change events to curb both biotic and abiotic stress but also are crucial to sustain crop production, food security and nutritional security through climate resilient smart agriculture.

Zero Budget Natural farming : the healthy way!

The advent of Green Revolution in the country since the 60's has made a considerable stride in improving productivity and production making the country selfreliant in food production. However, use of chemicals in agriculture adversely impact soil health and reduces productive life of soil and more essentially puts plant health at risk.

The chemical intensive - agriculture practices contaminate groundwater and related ecosystems, leading to biodiversity loss in the farmland. Hence the overuse of chemicals such as during the Green Revolution, brought about increased food production at the cost of degradation of soil health. In particular the States that were active in Green revolution are seen to be worst affected - as far as soil and water quality is concerned.

Green revolution has made the country self-sufficient in food grain front however with the following flip side..

1. Productive soil resources has undergone many detrimental effects
2. Overuse of fertilisers and pesticides
3. Deterioration of our productive eco-systems
4. Indirectly influencing human health adversely

5. Need for reducing cost and sustainable climate resilient production system

What is Natural Farming

Natural farming is an ecological farming approach where the laws of nature are applied to agricultural practices. It works by reviving the beneficial soil organisms, which contribute to fertility and good nutrition of the plants. No external fertilisers and pesticides are added to the soil. It is basically a low cost farming approach, completely moulding with local biodiversity.

In Harmony with Nature

Zero Budget Natural Farming (ZBNF) is a method of chemical - free agriculture that aims to solve the growing problem of chemical farming. It is introduced in India by Padmashri Subash Palekar. It incorporates best practices from various agro-ecological approaches for climate change adaptation. Some of them are regenerative agriculture, conservation agriculture, Silvipasture, Tree inter-cropping, multi-strata agroforestry, farm-land restoration, SRI, nutrient management and farmland irrigation practices.

Principles of ZBNF: Adhering to no chemical usage, the following are in brief the principles of ZBNF:

1. Use of indigenous cow for cow-dung and urine
2. Use of botanical extracts
3. Adoption of indigenous seeds
4. Ensure minimal tillage
5. Ensure that all inputs are made within the village

The four pillars of ZBNF are : (1) Beejamrut (2) Jeevamrut (3) Mulching and (4) Whapsa. While there are three main Asthras used in ZBNF that help in pest management. These are Agniasthra, Brahmasthra and Neemasthra. All the ingradients for these preparations are locally available.

The Government has taken several initiatives to promote natural farming such as ICAR is undertaking scientific evaluation at multilocational testing and development of standard protocol. NITI Ayog is supporting through holding of consultations to discuss various aspects to implement it nationally. Several States such as Andhra Pradesh, Tamil Nadu, Maharashtra, Rajasthan, Uttrakhand, Kerala, Karnataka and Haryana are encouraging ZBNF.

Climate smart agriculture - Vulnerabilities and Adaptation strategies

Introduction

- As per FAO estimate, by the year 2050 world population will increase by 1/3rd and food required for food security by 60%.
- Agriculture has become a high-risk profession and climate change is impacting the productivity adversely.
- Hence reorienting agriculture through use of conventional knowledge - blending it with climatesmart practices with ground level climate actionoriented efforts are key parameters to increase production.

Climate resilient and climate smart agriculture (CSA)

The concept of CSA was developed in 2009 by FAO intending to benefit primarily smallholder marginal and vulnerable rural community. It integrates the three dimensions of sustainable development - economy, society and environment - by jointly addressing food security and climate challenges.

Climate Resilient Agriculture is 'agriculture that reduces poverty and hunger in the face of climate change, improving the resources it depends on for the future, whereas Climate-Smart Agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support the development and ensure food security in a changing climate. Thus climate-smart approach increases the resilience of agriculture to combat climate change.

CSA Concept

Climate Smart Agriculture approach highlights the following (FAO, 2013):

CSA leads to enhanced biodiversity, maintain and enhance groundwater avilability, improved soil- health that can retain nutrient and moisture with multiple seasonal in-situ water storage. It results in benefits such as increased yields, income and resilience in agriculture, reduce local pollution, emission reduction, poverty

reduction to achieve sustainable agricultural development that explicitly aims at three objectives.

Objectives of CSA : The CSA aim to achieve three main objectives

A. Sustainably increasing agricultural productivity, to support equitable increase in farm incomes, food security and development;

B. Adapting and building the resilience of agricultural and food security systems to climate change; and

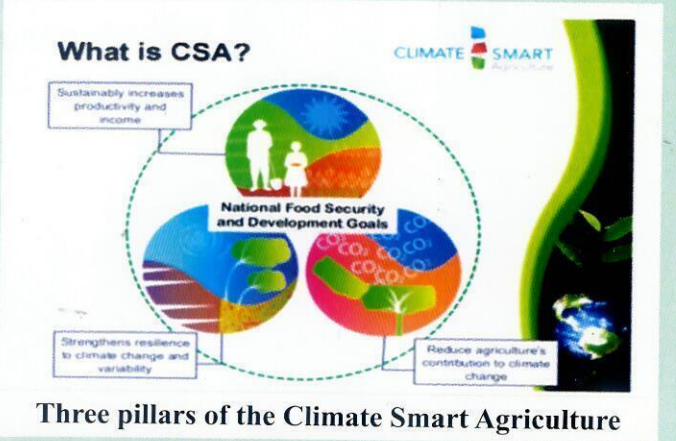
C. Reducing greenhouse gas emissions from agriculture (including crops, livestock and fisheries).

The three pillars of CSA: To achieve the objectives, the three pillars are as follows

Productivity: CSA aims to sustainably increase agricultural productivity and incomes from crops, livestock, and fisheries, without having a negative impact on the environment. This, in turn, will raise food, nutritional and livelihood security with sustainable intensification.

Adaptation: CSA aims to reduce the exposure of farmers and rural community to short-term risks, while also strengthening their resilience by building their capacity to adapt and prosper in a wake of climate change and to face climate change shocks and long-term stresses.

Mitigation: CSA should help to reduce and/or remove greenhouse gas (GHG) emissions wherever and whenever possible.



Three pillars of the Climate Smart Agriculture

Key features of CSA

Addresses climate change : CSA integrates climate change into the planning and development of sustainable agricultural systems and thus address climate change impact by increasing resilience and preparedness.

Integrates multiple goals and manages trade-offs : CSA outcomes are increased productivity, enhanced resilience, and reduced emissions. However it may not be possible to achieve all these three outcomes, thus during implementing CSA, trade-offs are essential part of the approach. Hence participatory approaches to identify synergies and weigh the costs and benefits of different options play a key role to integrate multiple goals.

Maintains ecosystems services : Ecosystems provide farmers with essential services, encompassing clean air, water, food and materials. It is imperative that CSA interventions do not contribute to their degradation. Thus, CSA adopts a landscape approach that builds upon the principles of sustainable agriculture but goes beyond the narrow sectoral approaches that result in uncoordinated and competing land uses, to integrated planning and management (FAO 2012b: FAO 2013a).

Multiple entry points at different levels : It has multiple entry points, ranging from the development of technologies and practices to the elaboration of climate change models and scenarios, information technologies, insurance schemes, value chains and the strengthening of institutional and political enabling environments. CSA goes beyond technologies at the farm level and includes the integration of multiple interventions at the food system, landscape, value chain, or policy level.

Context-specific : CSA is context-specific and therefore climate-smart in one-place may not be climate-smart in another, hence no interventions are climate-smart everywhere or every time. Interventions must take into account how different elements interact at the landscape level, within or among ecosystems, and as a part of different institutional arrangements and political realities.

Engages women and marginalized groups : CSA approaches involve the poorest and most vulnerable groups like women and marginalized groups which live on marginal lands. They are most vulnerable to climate events like drought and floods thus, most likely to be affected by climate change. Gender is the central aspect of CSA as women typically have less access and legal right to the land or to other productive and economic hence their adaptive capacity and awareness can help them to overcome the risk induced by climate change.

CSA strives to involve all local, regional, and national stakeholders in decision-making using the process of CSA-PRA in order to identify the most appropriate interventions as also helping to form the partnerships and alliances needed to enable sustainable development.

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CSA Plan development : Understanding of following issues is required for the development of CSA plan.

Climate - Smart Agriculture plan with four major components

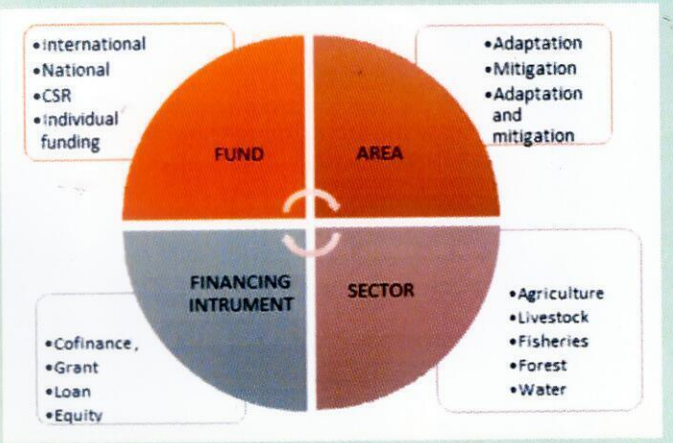
- **Situation Analysis :** It involves creating the basic understanding contextual reality of the program to be implemented. Content of the situation analysis is usually based on existing global and national data sources, as well as expert input and surveys.

- **Targeting and prioritizing :** This approach narrows an extensive list of possible practices, services, and policies down to a range of best-bet options that can be scaled out, and which may serve to attract investment and funding.

- **Program support :** Program Support creates the products to help different actors to implement CSA interventions on the ground. It concentrates on developing tangible materials and plans to inform, train, and roll-out intended interventions such as training curricula, extension materials, business models, implementation plans etc.

Monitoring evaluation and learning : CSA plan's monitoring, evaluation, and learning (ME&L) component develops strategies and tools to track progress of implementation, evaluate impact, as well as facilitate learning to improve CSA planning and implementation.

Funding opportunities for CSA



Mapping of funding opportunities for the CSA

Impact of climate-smart agriculture in India

- Zero tillage and line sowing in wheat and rice instead of broadcasting of seed increased wheat and rice production by 10 to 15 % in Karnal, Haryana

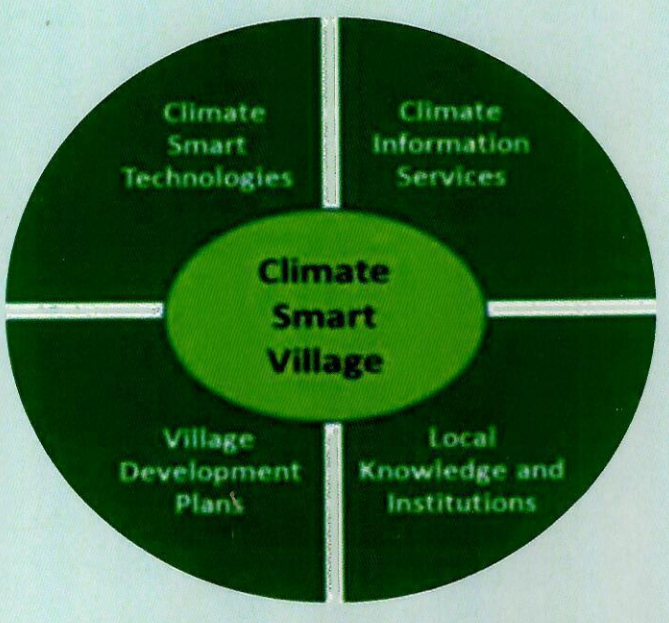
- Direct Seeded Rice (DSR) which involved sowing of rice directly compared to the traditional methods of nursery and transplanting the seedling to field with standing water - reduces water use by 25 % and methane emissions by 40 %

- Zero tillage cuts the diesel used by 80% per hectare - thus reduce emission

- Bed planting of maize and wheat which cuts water use by 30 to 35 %

- Zero tillage residue management and diversification bring down fertilizer-use

- **Concept of Climate Change Village :** Climatesmart village model is an approach where local organization, farmers and policymakers collaborate to select the most appropriate technologies and interventions based on global knowledge to local action. This local action promotes adaptation to build resilience to climate stress. It helps to enhance productivity income and enable climate mitigation to ensure food, nutrition and livelihood security while managing the climate change risks. The major components of the climatesmart village are



Four component of climate-smart village

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Under the National Innovations in Climate Resilient Agriculture (NICRA) project of ICAR, CSA are under practice across the country in 100 villages with the vision to implement it in all respects in all these villages with following climate-resilient practices

(a) No burning of crop residues mandatory greening of wastelands with the tree cover

(b) Water-saving paddy cultivation practices direc tseeding AWD etc.

(c) Mandatory groundwater recharge structure

(d) Use of energy-efficient pump for water lifting

(e) Green and brown manuring to the extent feasible

(f) Utilizing of complete surface water harvesting potential

(g) Fertilizer use only based on soil testing

(h) Nitrogen application based on better product

(I) Mandatory vaccination of livestock for seasonal disease'

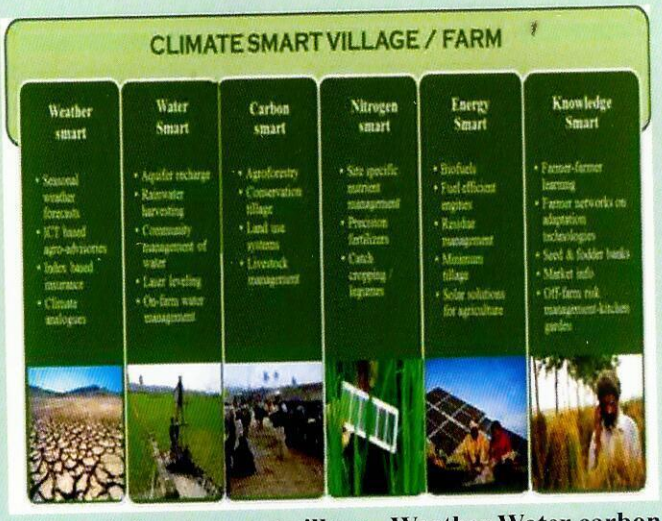
(j) Livestock feeding housing and manure management that emit the least manure.

(k) All farmers to learn access to an agro adviser through mobile

(l) Appropriate weather insurance package identified

Key Intervention of climate-smart village : There are 6 pillars which are called climate-smart village pillars under which different interventions are proposed

- Weather smart
- Nitrogen Smart/soil smart
- Water smart
- Carbon Smart
- Energy Smart
- Knowledge Smart



Pillars of climate-smart village - Weather Water carbon nitrogen/soil energy and knowledge

Climate-smart agriculture (CSA) practices and technologies

There are range of climate-smart agriculture (CSA) practices and technologies within seven entry points for CSA which help to transit and reorient the agriculture to resilience to climate change as given below

- Soil Management and Nutrition Management
- Crop Management
- Water Management
- Forestry
- Fisheries & Aquaculture
- Energy Management
- Livestock Management

Overview of categories of CSA technologies and practices and their benefits

Technologies and practices	Benefits
Soil Management and nutrition management	
• Zero tillage minimum tillage or conservation • Erosion control such as reducing the degree and length of slop through progressive and bench terracing • Protection soil cover from mulch crop residues or cover crop	These practices maintain and improve soil health which is key for sustainable and productive agriculture. It also increases organic carbon • Maintain productivity of the soil • Require fever chemical inputs

• Soil compact management • Restoration of degradation soil • Fallowing • Integrated soil fertility management using inorganic and organic fertilizer management of nitrogen fertilizer using mulching compost manure or green manure in place of inorganic fertilizers.	• Support important ecosystem functions such as nutrient cycling contributing to enhancing productivity • Increase resilience to climate change • Integrated nutrient management like green manure can contribute to adaptation • Reduce cost to farmers
Crop Management	
• Crop diversification • Crop rotation • Itercropping with leguminous plants • Increasing the use of efficient crop varieties • Integrated pest management, weed management • Breeding and using crop varieties with increased resistance Rice intensification and improved cultivation practices • Mulch or crop cover cropping • Landscape-level pollination management • Nutrition Management	• Improves pollination management across the landscape-level ecosystem • Resilience increases • Planning of nitrogen-fixing crops can contribute to adaptation and reduce the cost to farmers. • Nutrition Improves • Improves Pest and weed management and increase resilience to climate resilience • Manage the Risk • Soil moisture improves
Water Management	
• Water harvesting, conservation method • Groundwater development • Recharging structures • Construction or enhancement of dams • Irrigation Morden technology accurate scheduling • Water budgeting • Drainage and flood management • Restoring of riparian habitat creation of river • Improved hydrological monitoring and weather forecasting capacity	• Irrigation improvements can • Reduce GHG emissions • Contribute to increase crops and grans grassland productivity and • Support adaptation • Water Management improves • Risk reduces • Resilience increases • Production increases
Livestock Management	
• Climate-resilient shed with the solar lighting system • Fodder banks • Manure Management(such as recycling and bio-digestion composting, and improved storage), • Cultivation of climate resilient fodder • Use of solar energy in the dairy process • Resilient Animal breeding (such as for heat-tolerant and locally-adapted breeds)	• Reduces Risk of climate change • Helps in Diversification of in come from live stock management • Increases adaptation • Incorporating livestock manure can support adaptation • Reduces the cost to farmers • Reduces emission and help in mitigation • Improves pasture and grass - land management • Rotational grazing can boost resilient

• Grazing management on posture lands such as rotational grazing adjusting stocking densities to feed available and altering plants species • Feed management such as improved feed quality as per feed availability and altering species a forage legume • Low-cost fodder grasses species and forage legume • Low-cost fodder conservation techniques such as bailing and silage • Disease surveillance and control and Vaccines • Weather warning systems and weather-indexed insurance • Solar operated temperature control systems	• Local breed conservation • Improves the health of livestock
Energy Management	
• Wind and geothermal energy (such as windmills) • Solar power (such as photo - voltaic panels) • Energy-efficient cookstoves • Equipment for bio-oil extraction and purification • Fermentation and distillation facilities for ethanol production • Solar-, wind- or bioenergy-operated water pumps • Renewable energy-powered vehicles • Heat generation and recovery systems (such as heat pumps, geothermal energy, insulation) • Dedicated energy crops	• Energy technologies can improve energy efficiency, increase the use and produc - tion of renewable energy, and broaden access to modern energy services • Developing and using local energy sources can increase incomes and expand the diversity of energy sources, increasing resilience to climate change
Integrated system	
• Agroforestry • Crop-livestock-tree systems • Rice-fish systems • Land fragmentation (riparian areas and forest land within • The agricultural landscape) • Integrated food-energy systems (IFES)	• Integrated soil-crop-water management improves the soil's capacity to retain nutri - ents, improving productivity. • More integrated systems often have important biophy - sical and socio-economic benefits when compared to conventional systems (e.g., without the integration of trees, etc.) • IFES reduce energy poverty next to providing food and nutrition
Conservation and management of genetic resource	
• Use of genetically diverse varieties and breeds ? • Using grazing animals to manage landscapes and wildlife habitats • In situ conservation of wild relatives (for example	• Diversity on farms can contribute to risk management, • Help in adaptation • Increases resilience

protecting important species by designating sites as genetic reserves) • Ex situ conservation (for example, conserving species in gene banks)	

Outputs and outcome of adaptation interventions

The Significant outputs and outcome of adaptation interventions recommended under World Bank-GEF funded project 'Strategies to Enhance Adaptive Capacity to Climate Change (a consortia mode project of CRRI, Cuttack; CMFRI, Mumbai; OUAT, Bhubaneswar; TCS-Innovation lab and IARI) are summarized below:

S&T Innovations	Intervention	Impact	Income enhancement
Improved, heat and drought tolerant crop varieties	Varietal demonstrations of wheat, mustard, soybean, gram, maize, multi-cut fodder sorghum, green gram	52 to 64% increase in Seed replacement rate Average 15-25% yield enhancement	Average 35-65% additional income
Improved crop management	Recommended seed rate, sowing method, dose and scheduling fertilizer and irrigation	Yield increase by 12- 15%; coupled with 25% & 30% reduction in CO_2 emission / ha & water saving respectively	` ~10000/ha
Improved crop management and nursery of horticultural crops	Shade net house (56 nos.) of 9X6 m size, pheromone traps (1500 nos.), raised bed sowing of vegetable crop Papaya orchard (100 nos.)	Improved seed of vegetables and horticulture plants etc. Household availability of fruits for nutritional supplement	Net profit Rs. 30,000/ha /season
Water Saving Technologies	Laser levelling (3 ha), Underground pipeline (3 km), sprinkler/ rain gun (10 units), drip (22 units) Open-well deepening (>100 open wells), de-silting and renovation of community ponds (6 nos.)	~ 40% water saving, ~25% irrigation-time saving and ~25% reduction in CO_2 gas emission. 10 ha area increased under irrigation Water Users Groups	Through increased yields and area under irrigation; reduced cost of irrigation
Livestock/ animal husbandry interventions	De-worming, vaccination, medicine, green fodder, nutrient Supplement, mange feed and water	12-15% increase in milk yield & 20-25% reduction in calf mortality	Rs. 8000/ lactation period/ house hold
Value addition of farm produce	Dhalia making - Machine (14 nos.); chilli powder machine - (3 nos.); dhaal making machines (5 nos.)	Benefit for groups in income enhancement, self-employment for women (chilli powder making with own brand)	Rs.3000 – 4000/ quintal
Secondary skill development for income enhancement	Tailoring training and machines (24 nos.)	Women economic empowerment	Rs. 3000/month/ Household
Seed village	Mobile seed processing units(one) Seed village (11 nos.) Community seed banks (22bins)	Increased income to seed –selling farmers	Rs.70,00-80,000/ ha.
Village resource centres	Information sharing, dissemination and custom hiring machinery per centre Power spray (5 nos.), seed- cum- fertilizer drill (4 nos.), Rotavator (1) Zero-till seed drill (4)Audio system (1)	Availability and appli- cation of agricultural machinery, improved cultivation, drudgery reduction; dissemination of information	Confounded in the enhanced income of all other activities
Knowledge and weather-based farm advisory	*mKRISHI* - two- way mobile communication services over 36000 voice alerts, 46000 weather forecasts mKRISHI regular and IVR services (>2000 nos.)	Informed decision making, Early Warning System	Crop and resource savings confounded in all activities

Examples of CSA under NICRA project

Silage making technology for livestock (in Kalaburgi, Karnataka) : This climate resilient technology made availability of green fodder at the time of drought period especially in summer. Supply of required nutrients to animal improved the milk production, there by animals withstand severe drought and sickness during nonavailability of green fodder.

Impact : There was an increase in milk production (9.56 litres /day/ animal) with silage intervention whencompared to without silage (6.30 litres/ day). Similarly in 2017-18, 5 farmers adopted this technology and achieved increase in milk production 10.21litres/day when compared to 7.85 litres /day.

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KVK Hamirpur, conducted different demonstrations on natural resource management, crop production, livestock and fisheries, fodder production in the adopted villages.

Particular	Interventions	Technology Demonstrated	Benefits
1. Natural Resource Management	Mulching	Plastic mulching in cucurbits (Bitter gourd, bottle gourd and cucumber)	Increase in yield, reduced number of irrigations, reduced number of weeding and hoeing
	Tetra Vermbed	Vermi-compost preparation	Increase in yield by 20 per cent ofthe crops like vegetables, maize and wheat
2. Crop production	Short duration (Zaid crop)	Toria	Increase in yield by 1.5 q/ha
	High yield variety	Maize resistance to lodging	Increase in yield by 2q/ha
	High yield variety	Wheat, early sown variety to exploit residual moisture	Increase in yield by 1.5q/ha and reduced in number of irrigations
	Drought tolerant	Brown sarson (KBS3)	Increase in yield by 1.5 q/ha andreduced number of irrigations
	Crop Diversification	Cabbage and cauliflower	Increase in yield by 30q/ha
	Moisture conservation through bio mass mulching	Elephant foot yam	Increase in yield by 150q/ha
	Pheromone e-trap for fruit fly	Management of fruit fly in cucumber	Increase in the yield 30 /ha
3. Livestock and fisheries	Artificial insemination Breed upgradation Deworming in livestock Mineral mixture Preventive vaccination		
4. Fodder production	Azolla Silage Goatry feed		

NABARD launches JIVA to promote natural farming under its existing watershed, wadi programmes

NABARD launched an agroecology-based programme JIVA that will promote natural farming under its existing watershed and wadi programmes in 11 states. "JIVA is a culmination of several projects under the watershed programme and will be implemented on existing completed watersheds and wadis in eleven states covering five agro-ecological zones, which are in fragile and rain-fed areas," NABARD Chairman G R Chintala said in the virtual launching event.

He said JIVA aims to ensure using the principles of agroecology long-term sustainability and transform the pre-existing social and natural capital, and nudge the farming community towards natural farming as commercial farming cannot work in these regions.

"We will invest Rs 50,000 per hectare under this programme. The JIVA programme will be implemented on a **pilot basis in 25 projects across 11 states** covering five agroecological zones." He further highlighted as follows:

The best practices will be implemented on 200 hectares in each project, these 200 hectares will be a learning and proselytising platform to the village

For JIVA, NABARD will collaborate with national and multilateral agencies as this is a knowledge and skillintensive programme.

NABARD will initially collaborate with the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia, for simple soil water monitoring technology and ICAR for research support for scientific validation of natural farming practices.

After the pilot, scale up of the programme to other states across NRM (natural resource management) projects is also planned.

Under the JIVA programme, we expect outcomes in resilience to climate change, sustainability and food and nutrition security."

NITI Aayog Vice-Chairman Rajiv Kumar, who was present on the occasion, said climate change is real and it is no longer enough to think about it. "We need to start acting on it. We need to take measures to put carbon back into the soil. I don't know of any other technology so far that can do it, except for natural farming.

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"As 86 per cent of our land holdings are held by small and marginal farmers, we need to find a replacement to the biochemical revolution to make our farming nutritional and globally competitive," he added. (excerpts from the Times of India, 09.02.2022)

BRIC THESIS and commitment to cooperate on climate change issues

In 2003 the economist of Goldman Sachs, a financial Consultancy Company, Jim O'Neil proposed the thesis or idea of BRIC based on the claim that the economic growth of the four countries-Brazil, Russia, India and China would dominate by the year 2050 which is now shifted to the year 2030.

BRIC-group was established in 2006 (BRICS: Brazil, Russia, India, China and South Africa which joined in 2011) and its first summit was held in 2009 at Yeketerinburg, Russia. The BRICS represent the five rising economies of the world. BRICS represent 41% of the world's population, 24% of global GDP and has 16% share in global trade. On 9th September 2021 India Chaired the 13th Summit on online mode, and came out with the New Delhi Declaration, on the values and future aims of BRICS and its ongoing activities, it outlines all priority areas of BRICS.

On the global issues and challenges, the summit discussed the climate change affecting lives of the people of the of the member country. The leaders reiterated their commitment to implement UNFCCC, its Kyoto Protocol and Paris Agreement. Consensus on the principles of UNFCCC including 'Common But Differentiated Responsibilities and Respective Capabilities' in light of different national circumstances was also made. The summit also called for timely achievement of all SDGs, including SDG-12 which identifies sustainable consumption and production patterns as a vital element of sustainable development. The summit is of significance as it articulates global response to pressing issues. The summit provides platform to raise concerns of the members at global level. The BRICS is effective on non-controversial issues such as fund-arrangements for infrastructure development through its New Development Bank, Climate change, peace (counter terrorism measures, inclusive of humanitarian assistance to Afghanistan), reforms of global institutions and bilateral cooperation among member states.

India likely to become the largest market for batteries and Solar Panel

India and the US launched the climate action and finance mobilization dialogue, it will bring-in investment and technology in clean energy projects. The dialogue was held in New Delhi with the Environment Minister of our nation and the US envoy for climate holding an hour long bilateral meeting. Issues and concerns on the need to achieve - by all parties to the Paris Agreement to a net zero emissions target by 2050 was deliberated. No country can address climate change alone, hence all countries to do their part. India's leadership on renewable energy was focus of discussion. We have already achieved 100 GW of renewable energy capacity against the proactive target of 450 GW by 2030. The dialogue focus was on capital for deploying 450 GW of renewable energy. The US Envoy also stated that it is cheaper to build a solar farm in India than anywhere else in the world. The Environment Minister stated during the launch of Climate action and Finance Mobilisation Dialogue (CAFMD) under India-US Climate Clean

Energy Agenda 2030 that India is becoming an attractive destination for clean energy investment. Further the dialogue will strengthen the India-US bilateral cooperation and also work to mobilise and deliver climate finance primarily as grants and concessional finance for climate action, which is in accordance with the Paris agreement

Shoonya campaign for zero-pollution delivery vehicles

A campaign was launched by NITI Aayog and Rocky Mountain Institute (RMI) - India for accelerating the adoption of Electric Vehicle (EV) to promote zeropollution delivery vehicles by working with consumers and Industry in September 2021. RMI is an independent non profit organization founded in 1982.

The campaign has brought out the Online Tracking Platform that will share data such as vehicle kilometres electrified, carbon savings, criteria pollutant savings and other benefits from clean delivery vehicles. There is need to reduce emissions, particularly in the Urban freight vehicles sphere, which account for 10% of freight transportation-related CO2 emissions in the country. These emissions are expected to grow by 114% by 2030.

Electric Vehicles emit no pipe emissions and thus can

contribute to an improved air quality. On their manufacture also they emit 15-40% less CO2 compared to their internal combustion engine counterparts, at the same time have lower operational cost. Shifting over to EVs will help the country to reduce oil dependency while solving the challenge of energy scarcity.

However there is much need on technological front for production of electronics that is crucial requirement of the EV industry. These electronics include batteries, semiconductors, controllers etc. Battery is the single most important component of EVs. We do not have any known reserves of lithium and cobalt which are essentially required for production of battery. We are dependent on countries like Japan and China for the import of lithium-ion batteries.

In the infrastructural front there is need for clarity on AC versus DC charging stations, grid stability, range anxiety-that the batteries will soon run out of power, are some of the limiting factors for the growth of the EV industry. Hence presently the intra-city transport is targeted for EV promotion. Innovative models would make it possible for promoting inter-city travel/transport that may include portable charging infrastructure and services. Skills available for servicing EV may also have to be looked into so as to make it easy for consumers to switch over to EV.

The EV industry is in its nascent stage, however is developing at a rapid pace and with the present challenges, they present huge potential to reduce carbon footprints and provide a cost-effective system of transportation. Hence, one way to contribute towards this growth is to buy an electric vehicle.

Some Initiatives to promote the sector

National Electric Mobility Mission Plan (NEMMP):

aims to achieve national fuel security by promoting hybrid and electric vehicles in the country. NEMMP was launched in 2013.

Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme :

aims to encourage, and in some segments mandates the adoption of EVs, with a goal of reaching 30% EV penetration by 2030.

National Mission on Transformative Mobility and Battery Storage :

aims to recommend and drive the strategies for transformative mobility and phased manufacturing programmes for EVs, EV Components and Batteries.

Fiscal Incentives :

To spur the production and consumption of EVs and charging infrastructure - such as income tax rebates, exemption from customs duties, etc. have been introduced by the Government.

E-buses offer many value propositions to metro cities: they are more efficient, cleaner, quieter, and increasingly cost-competitive.??By 2030, if 4 out of 10 buses sold in the country are electric, India would emerge as the second largest e-bus market in the world after China. The increasing priority and support for e-buses from the central and State Governments and active response from industry is making it increasingly easy to adopt.

International Year of Millets : 2023

The United Nations General Assembly has declared 2023 as the 'International Year of the Millets'. Our Country has the largest biodiversity of millets in the world. We also have a vast and varied variety of millet products. Millets include three major and six minor crops as follows :

Major Millets : Sorghum, pearl, finger millets

Minor Millets : Barnyard, Proso, Foxtail, Kodo, Brown Top and Little Millet.

The Govenment of India through the revamped National Food Security Mission Operational Guidelines (NFSM) has given focus on 212 millet districts in 14 States. This Mission includes incentives to farmers for quality seed production and distribution. In addition developmental activities and projects are also being promoted through the mission covering field level demonstrations, trainings, primary processing clusters, research support etc, Further, launch of 67 value-added technologies, release of 77 high- yielding and 10 fortified varieties has also been undertaken by the GoI.

Millets are three to five times more nutritious than wheat and rice in terms of proteins, minerals and vitamins. They

require less water for production, hence they are most suitable for cultivation in dry lands of small and marginal farmers with use of farm yard manure. Hence millet farming holds the key to face the challenge of climate change, environmental degradation and malnutrition. Maximum area under millet cultivation is in States of Rajasthan, UP, Haryana, Maharashtra, Uttarakhand, Tamil Nadu, Telangana, Karnataka and Gujarat. Millets are cultivated in around 14 million hectares with annual production of 16 million tonnes. The exports of millets touched 26 million USD in 2020 from our country.

Several issues need to be addressed to promote the sector and gain from enhanced export and domestic markets. Better high yielding varieties, package of practices, farm gate processing, price support and value addition are key to increase millet production. Linking of small and marginal millet farmers to online marketing platforms like e-NAM requires promotion of FPOs with capacity building programmes for farmers, FPOs, processors, MSMEs and start ups for fabricating machinery to - improve the dehulling of millets in ways that keep the nutritional value of millet intact.

Commodity based FPOs such as the Millet based FPO in Dharmapuri district, Tamil Nadu is an example where technical assistance is provided to farmer-members for value addition of millets such as cookies, flour, sprouted flour, rice etc in the brand name of D. Millets. The FPO is also involved in providing inputs such as good quality seeds, low-cost machinery and procurement of millets for processing.

The good practices of millets in rural areas needs to be identified and indigenous food systems of tribal communities such as Dongria Komdha needs to be promoted by the State Governments. Hence millet farming policies need to be strengthened to empower the farmers in rain-fed areas to grow millets and rural women to engage in millet processing activities and micro-enterprises through skill development

Wladimir Peter Köppen

German meteorologist and climatologist who was born in Russia on 25 September 1846, is best known for his works in the field of Climatology and Meteorology for more than 70 years. He developed the world map of temperature belts. His achievements, practical and theoretical, profoundly influenced the development of atmospheric science. A major achievement in geographical climatology was reached in 1900 when Koppen introduced mathematical system of climatic classification. Each of five major climate types was assigned a mathematical value according to temperature and rainfall. Since then, many of the systems introduced by other scholars have been based on Köppen's work.

He identified in 1884 five major climatic groups, which correspond with the five main vegetation groups: A (tropical), B (dry), C (temperate), D (continental), and E (polar). These five classifications are in use even today:

- Tropical rainy climate
- Dry climate
- Warm temperature rainy climate
- Snowy and cold climate
- Polar climate

Koppen used the temperature and precipitation statistics in his classification of the climate. These two weather elements are easy to measure. Thus his most notable contribution to science - the development of the Koppen Climate Classification system, which is still commonly used today - even after 130 years. He also coined the name aerology for the science of measuring atmosphere, as early as in 1870s.

In 1927 he undertook the editorship of a five-volume Handbuch der Klimatologie ("Handbook of Climatology"). In gratitude for his services to Russian culture, Tsar Alexander II appointed him Academician, the highest academic rank in Russia he was also granted in 1858 a seaside estate called Karabakh on the south coast of Crimea as an appreciation of his in-depth work on Climate.

BANKERS INSTITUTE OF RURAL DEVELOPMENT
Sector H, LDA Colony, Kanpur Road, Lucknow-226012
Uttar Pradesh