

TOWARDS CLIMATE RESILIENT AGRICULTURE THROUGH ADAPTATION AND MITIGATION STRATEGIES

Enabling farmers to cope with climate variability through
land, water, crop and livestock management
in vulnerable districts of India



National Initiative on Climate Resilient Agriculture
Central Research Institute for Dryland Agriculture
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The project aims to enhance resilience of Indian agriculture to climate change and climate variability through strategic research and technology demonstration. Strategic research on adaptation to progressive climate change covers crops, livestock, fisheries and natural resource management. Technology demonstration focuses on participatory evaluation of location specific interventions in vulnerable districts of India to enable farmers cope with current climate variability.

Climate change and Indian Agriculture



Climate change impacts on agriculture are being witnessed all over the world, but countries like India are more vulnerable in view of the huge population dependent on agriculture, excessive pressure on natural resources and poor coping mechanisms. The warming trend in India over the past 100 years has indicated an increase of 0.60°C. The projected impacts are likely to further aggravate field fluctuations of many crops thus impacting food security. There are already evidences of negative impacts on yield of wheat and paddy in parts of India due to increased temperature, water stress and reduction in number of rainy days.

Significant negative impacts have been projected with medium-term (2010-2039) climate change, eg. yield reduction by 4.5 to 9%, depending on the magnitude and

distribution of warming. Since agriculture makes up roughly 15% of India's GDP, a 4.5 to 9.0% negative impact on production implies cost of climate change to be roughly at 1.5% of GDP per year. Enhancing agricultural productivity, therefore, is critical for ensuring food and nutritional security for all, particularly the resource poor small and marginal farmers who would be affected most. In the absence of planned adaptation, the consequences of long-term climate change could be severe on the livelihood security of the poor.

Adaptation to climate vulnerability

Planned adaptation is essential to increase the resilience of agricultural production to climate change. Several improved agricultural practices evolved over time for diverse agro-ecological regions in India have potential to enhance climate change adaptation, if deployed prudently. Management practices that increase agricultural production under adverse climatic conditions also tend to support climate change adaptation because they increase resilience and reduce yield variability under variable climate and extreme events. Some practices that help adapt to climate change in Indian agriculture are soil organic carbon build up, *in-situ* moisture conservation, residue incorporation instead of burning, water harvesting and recycling for supplemental irrigation, growing drought and flood tolerant varieties, water saving technologies, location specific agronomic and nutrient management, improved livestock feed and feeding methods. Institutional interventions promote collective action and build resilience among communities. Capacity building by extensive participatory demonstrations of location specific agricultural practices helps farmers gain access to knowledge and provides confidence to cope with adverse weather conditions. In this project, an effort is made to marshal all available farm technologies that have adaptation potential and demonstrate them in farmers' fields in most vulnerable districts of the country through a participatory approach.





Village level interventions towards climate resilient agriculture

1 Building resilience in soil

Soil health is the key property that determines the resilience of crop production under changing climate. A number of interventions are made to build soil carbon, control soil loss due to erosion and enhance water holding capacity of soils, all of which build resilience in soil. Mandatory soil testing is done in all villages to ensure balanced use of chemical fertilizers. Improved methods of fertilizer application, matching with crop requirement to reduce nitrous oxide emission.

2 Adapted cultivars and cropping systems

Farmers in the villages traditionally grow local varieties of different crops resulting in poor crop productivity due to heat, droughts or floods. Hence, improved, early duration drought, heat and flood tolerant varieties are introduced for achieving optimum yields despite climatic stresses. This varietal shift was carefully promoted by encouraging village level seed production and linking farmers decision-making to weather based agro advisories and contingency planning.

3 Rainwater harvesting and recycling

Rainwater harvesting and recycling through farm ponds, restoration of old rainwater harvesting structures in dryland/rainfed areas, percolation ponds for recharging of open wells, bore wells and injection wells for recharging ground water are taken up for enhancing farm level water storage.

4 Water saving technologies

Since climate variability manifests in terms of deficit or excess water, major emphasis was laid on introduction of water saving technologies like direct seeded rice, zero tillage and other resource conservation practices, which also reduce GHG emissions besides saving of water.

5 Farm machinery (custom hiring) centers

Community managed custom hiring centers are setup in each village to access farm machinery for timely sowing/planting. This is an important intervention to deal with variable climate like delay in monsoon, inadequate rains needing replanting of crops.

6 Crop contingency plans

To cope with climate variability, ICAR/CRIDA has developed district level contingency plans for more than 400 rural districts in country. Operationalization of these plans during aberrant monsoon years through the district/block level extension staff helps farmers cope with climate variability.

7 Livestock and fishery interventions

Use of community lands for fodder production during droughts/floods, improved fodder/feed storage methods, feed supplements, micronutrient use to enhance adaptation to heat stress, preventive vaccination, improved shelters for reducing heat/cold stress in livestock, management of fish ponds/tanks during water scarcity and excess water are some key interventions in livestock/fishery sector.





8 Weather based agro advisories

Automatic weather stations at KVK experimental farms and mini-weather observatories in project villages are established to record real time weather parameters such as rainfall, temperature and wind speed etc. both to issue customized agro advisories and improve weather literacy among farmers.

9 Institutional interventions

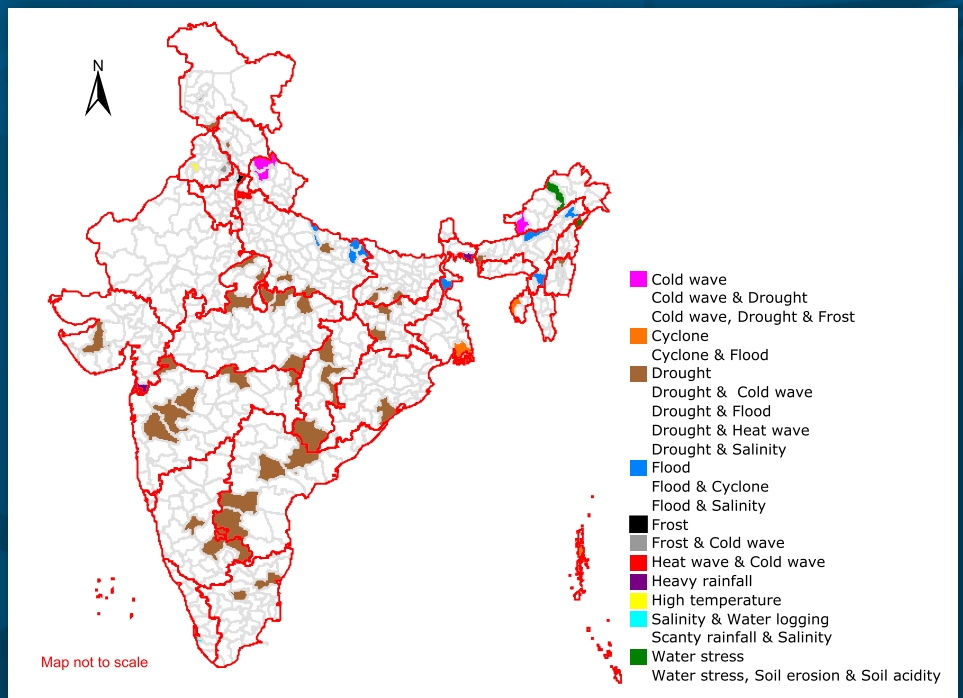
Institutional interventions either by strengthening the existing ones or initiating new ones relating to seed bank, fodder bank, commodity groups, custom hiring centre, collective marketing, introduction of weather index based insurance and climate literacy through a village level weather station are introduced to ensure effective adoption of all other interventions and promote community ownership of the entire programme.

10 Village Climate Risk Management Committee (VCRMC)

A village committee representing all categories of farmers including women and the land less is formed with the approval of Gram Sabha to take all decisions regarding interventions, promote farmers participation and convergence with ongoing Government schemes relevant to climate change adaptation. VCRMC participates in all discussions leading to finalizing interventions, selection of target farmers and area, and liaison with gram panchyat and local elected representatives and maintain all financial transactions under the project.

Project sites

The project is implemented in one representative gram panchayat in each of the 100 districts selected based on major climatic vulnerability viz. drought, floods, heat wave, cold wave, frost and cyclones. The project is implemented by Krishi Vigyan Kendras (KVKs) at district level, regionally coordinated by the Zonal Project Directorates (ZPDs) with overall planning, monitoring and coordination by CRIDA, Hyderabad.



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