

Sustainable Agriculture Practices in the state

Introduction :

In agriculture, sustainability is a complex idea with many facets, including the economic (a sustainable farm should be a profitable business that contributes to a robust economy), the social (it should deal fairly with its workers and have a mutually beneficial relationship with the surrounding community), and the environmental.

Environmental sustainability in agriculture means good stewardship of the natural systems and resources that farms rely on. Among other things, this involves:

- Building and maintaining healthy soil
- Managing water wisely
- Minimizing air, water, and climate pollution
- Promoting biodiversity
- **Sustainable agriculture practices**
- Over decades of science and practice, several key sustainable farming practices have emerged—for example:
 - **Rotating crops and embracing diversity.** Planting a variety of crops can have many benefits, including healthier soil and improved pest control. Crop diversity practices include intercropping (growing a mix of crops in the same area) and complex multi-year crop rotations.
 - **Planting cover crops.** Cover crops, like clover or hairy vetch, are planted during off-season times when soils might otherwise be left bare. These crops protect and build soil health by preventing erosion, replenishing soil nutrients, and keeping weeds in check, reducing the need for herbicides.
 - **Reducing or eliminating tillage.** Traditional plowing (tillage) prepares fields for planting and prevents weed problems, but can cause a lot of soil loss. No-till or reduced till methods, which involve inserting seeds directly into undisturbed soil, can reduce erosion and improve soil health.
 - **Applying integrated pest management (IPM).** A range of methods, including mechanical and biological controls, can be applied systematically to keep pest populations under control while minimizing use of chemical pesticides.
 - **Integrating livestock and crops.** Industrial agriculture tends to keep plant and animal production separate, with animals living far from the areas where their feed is produced, and crops growing far away from abundant manure fertilizers. A growing body of evidence shows that a smart integration of crop and animal production can be a recipe for more efficient, profitable farms.
 - **Adopting agroforestry practices.** By mixing trees or shrubs into their operations, farmers can provide shade and shelter to protect plants, animals, and water resources, while also potentially offering additional income.

- **Managing whole systems and landscapes.** Sustainable farms treat uncultivated or less intensively cultivated areas, such as riparian buffers or prairie strips, as integral to the farm—valued for their role in controlling erosion, reducing nutrient runoff, and supporting pollinators and other biodiversity.

Initiatives by Haryana Government :

Haryana emits nearly 2% of national greenhouse gases (GHG). Agriculture sector contributes about 82% & 91% of CH₄ & N₂O emissions of the state. Majority of CH₄ emissions occur from enteric fermentation of livestock (62%) followed by rice cultivation (14%) & biomass burning (6%). While majority of the N₂O emissions occur from application of synthetic nitrogenous fertilizer (62%) followed by indirect N₂O emissions (20%) & nitrogen from crop residue left (5%).

The State Government has been making efforts to address the impact of climate change in Haryana through formulation of suitable policies and introduction of schemes tackling the related issues through measures involving both adaptation and mitigation aspects.

NABARD is supporting projects many of which can be classified under climate finance. NABARD's thematic areas of forestry, agriculture, animal husbandry, land development, minor irrigation, etc., have projects / components with emission reduction potential. Apart from these, areas like farm mechanisation, Self Help Groups, Storage & Market Yards, etc. have some linkages with climate change adaptation.

Incidentally, NABARD's three flagship programmes namely - Rural Infrastructure Development Fund (RIDF), Integrated Watershed Management, Umbrella Programme on Natural Resource Management (UPNRM) have supported projects with emission reduction potential in the state.

It is established that short periods of exposure of wheat crops to temperatures of 28 °C to 32°C results in a significant decrease in yield by 20% or more. Unpredictable moisture deficits during crop growth are a major constraint for productivity, for example, Sclerotinia stem rot may become a serious threat to the successful cultivation of Indian mustard.

The environmental conditions that induce heat stress on dairy animals may exacerbate and may lead to decline in milk productivity and may impair reproductive functions and efficiency of livestock species.

Areas of concern

Water resources: Lack of Proper Water Database and Hydrological Information System, Gap between demand and supply of water, Pollution, Flood management, waterlogging and soil salinity, overexploitation of groundwater, Diminishing water bodies.

Agri-waste (stubble burning): According to a study based on satellite data acquired from National Remote Sensing Centre, Hyderabad, covering the districts with large-scale rice stubble burning (Ambala, Fatehabad, Jind, Kaithal, Karnal, Kurukshetra, Panipat, Sirsa, Sonapat and Yamunanagar), paddy stubble was burnt over an area of 207.7 thousand hectares in 2017, 202.3 thousand hectares in 2016, 163 thousand hectares in 2015, 168.9 thousand hectares in 2014 and 208.3 thousand hectares in 2013.

During 2016 kharif season 12862 active crop fire locations were identified as compared to 12417 points during current (2017) kharif season. Thus there is a marginal decrease of about 3.4% in the crop residue fire locations as compared to last year. District wise highest crop fire locations have been observed in Fatehabad, Sirsa, Karnal and Kaithal districts during both the years. At district level significant decrease was observed for Yamunanagar and Faridabad districts. Major paddy stubble burning was observed in Karnal, Kurukshetra, Kaithal, Fatehabad and Sirsa districts during all the previous five years.

Sustainable Agriculture Practices in the State

1. Mitigation strategies for the State

(A) Mitigation involves human interventions to reduce the emissions of greenhouse gases by sources or enhance their removal from the atmosphere by “sinks”. A “sink” refers to forests, vegetation or soils that can reabsorb CO₂.

The State Government has constituted State Level Steering Committee for recommending and endorsing projects under NAFCC.

One project titled “**Scaling Climate Smart Agriculture (CSA) through Mainstreaming Climate Smart Villages (CSVs) in Haryana**” has been accorded approval for grant support of Rs.22.09 crore to the executing agency viz Agriculture Deptt, Govt of Haryana. The project is spread over 250 villages in ten districts (Yamunanagar, Ambala, Kurukshetra, Karnal, Jind, Kaithal, Panipat, Sonapat, Sirsa and Fatehabad). The project was earlier piloted in 27 villages of District Karnal jointly by the International Maize and Wheat Improvement Center (CIMMYT), National Innovations in Climate Resilient Agriculture (NICRA) Project under Indian Council of Agricultural Research (ICAR) and the Department of Agriculture & Farmers Welfare, Government of Haryana. The climate smart villages in this pilot project successfully adopted a portfolio of interventions for managing water, weather, nutrient, carbon, energy and knowledge.

Factors that have been affecting different aspects of crop production for such farmers, as per the Haryana State Action Plan (HSAPCC) in the 10 selected districts include crop season shifting, temperature alterations, increased requirement of water for irrigation by agricultural crops and consequent over exploitation of groundwater resources, declining soil organic carbon, multiple plant nutrient deficiencies, development of herbicide resistance, crop residue burning etc. There is also evidence of large yield gaps, more particularly, ‘management yield gaps’ (crop loss due to poor management in farmers fields) in crops such as wheat, paddy and maize.

The scaled up project proposes adoption of sustainable agricultural practices in model fields on community lands: e.g. zero tillage, raised bed planting, direct seeded rice, alternate wetting & drying in rice, crop residue management/mulching; crop diversification (horticulture, bee keeping, mushroom cultivation etc), site specific nutrient management, precision water management (laser leveling/micro irrigation), seed/fodder banks powered with value added weather forecasts; skill development; ICT based advisories and capacity building & knowledge sharing.

Another project titled “**Climate Resilience Building of farmers through Crop Residue Management**” in Punjab, Haryana, Rajasthan and Uttar Pradesh has been accorded approval for grant support of Rs.120.66 crore. The project grant support in

Haryana is Rs.22.535crore and Rs.3.045 crore to the executing agencies namely Dept. of Agriculture, GoH and NABARD respectively. The project is spread in ten major paddy growing districts of Haryana (Ambala, Fatehabad, Kurukshetra, Karnal, Jind, Kaithal, Panipat, Sonapat, Sirsa and Yamunanagar), accounting 80% of the paddy cultivated area. As a part of the project Haryana RO is organizing the “Awareness and Capacity Building of Farmers” component of the project

NABARD Haryana RO organized a workshop on Crop Residue Management in collaboration with GIZ. The event included a field visit to a project sanctioned by Haryana RO. The project covered an area spread over 400 hectares and involved demonstration of operating various machinery as a substitute for stubble burning.

The RO has earlier collaborated with National Dairy Research Institute (NDRI) for conducting a workshop on “Climate Resilient Livestock Management Systems” with grant support. The focus of the workshop was livestock sector with an objective to promote breeding of indigenous livestock like Hariana, Tharparkar, Murrah, Sahiwal etc.

(B)Haryana State Action Plan on Climate Change (SAPCC)

The Haryana State Action plan on Climate Change (SAPCC) has been prepared in consonance with the National Action Plan on Climate Change (NAPCC). The sector-wise proposed activities and investment have been identified in the SAPCC as under:

(Rs. Crore)	
Sector / Mission	Proposed Investment
Forest (Greening India Mission)	6,060.00
Agriculture (Sustainable Agriculture Mission)	111.50
Energy (Enhanced Energy Efficiency Mission Jawaharlal Nehru National Solar Mission)	45,325.90
Water (National Water Mission)	4,497.00
Rural Development	2,224.20
Health	10.85
Total	58,229.45
Strategic Knowledge (Capacity Building (@1%))	560.05
Grand Total	58,789.50

(C) Although the State of Haryana has very little scope for extending area under the regular Forests, the department is laying great emphasis on promoting Farm-forestry, Agro-forestry and afforestation of wasteland for increasing the Tree Cover. Poplar tree plantations dominate the Tree Cover in agricultural fields of Panchkula, Ambala and Yamunanagar districts. Eucalyptus, Shisham, Kikar, Jal and Jand tree plantations in Agricultural fields of central and south Haryana also account for a major portion of Forest & Tree Cover in the State.

(D) Crop Cluster Development Programme (CCDP)

Govt. of Haryana has introduced CCDP in “Baagwani Villages” based on development of backward and forward integration by creating on farm infrastructure required for organized marketing of fresh fruits and vegetables (FFV) for FPOs/ FPCs and will provide complete

supply chain right from production; value addition till it reaches the market. Under this project, Horticulture deptt has identified 140 potential horticulture clusters covering 340 Baagwani Villages across the state.

Adaptation strategies for the State

Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change.

Agriculture sector could benefit from research in molecular breeding for heat stress tolerance during grain filling period in wheat, development of water efficient aerobic rice, improving abiotic (drought and salinity) stress tolerance in Indian mustard, molecular Breeding of chickpea for drought prone environments and enhancing soil health. Extension work and advisory for fruits and vegetables in horticulture, strengthening of pest monitoring system needs to be undertaken.

Under livestock, strengthening extension to provide advisory on Adaptation practices by capacity building of farmers, Dairy, feed and fodder development, preventive health measures, strengthening disease investigation system and risk management is being undertaken.

Under fisheries, improving fisheries management, reducing post-harvest losses, increasing waste recycling, maximizing yield and quality and reducing spoilage are undergoing in the state.

A Comprehensive water database modelling and analysis of the data for climate change impact on water resources and development of real time water quality monitoring system have been identified as important interventions apart from rehabilitation of irrigation infrastructure and flood control measures for efficient management of water resources. Capacity building, groundwater management, rainwater harvesting, water logging and salinity control, construction of dams in upper catchments, crop diversification, use of water saving technologies, R&D etc. also need to be stepped up.

Alternative farming method in Karnal

Zero-till agriculture, an alternative farming method, which helps prevent soil depletion as well as uses water efficiently, is being used successfully by some farmers in Haryana.

To deal with the crisis, the farmers were encouraged by the scientists to take up zero till agriculture, which forced them to stop deep tilling and puddling in paddy. They no longer removed and burnt the crop residue. Farms were to be laser levelled, through which farms are near flat with a slight grade for drainage. Unlevelled farms require extra water storage in paddy fields to accomplish puddling. Laser levelling is known to reduce water use by 25.57 per cent while at the same time increasing yields by 10.82 per cent.

For placing the seeds and fertiliser in the farm where crop residue are left, farmers used the seed fertilizer drill by Happy Seeder. They skipped over paddy transplantation and instead, direct seeded the rice. This method would also reduce the need for pesticides over the next 2-3 years once the mulch and permanent crop cover is established.

Extension through mass media

To strengthen the extension services by using print and electronic media and information technological support.

a) Publication

b) Advertising and Publicity

100 % Seed Treatment for Rabi &Kharif Crops

The 100% cost of the seed treatment of certified seed were borne on share basis i.e. 50% under the State Plan Scheme 50% share under RKVY for the year 2017-18.

Award to the outstanding Farmer district/village

Many farmers, villages and districts played a significant role in the adoption of innovative practices and making special contribution in improving the crop productivity. Such farmers villages and districts need to motivated by rewarding their contribution so that others may also follow in their footsteps.

Other Changes

Many farmers have played a significant role in the adoption. Expenditure of some activity may be carried out in this component. Govt. of Haryana has laid major thrust for the promotion of Water Saving Technologies under “On Farm Water Management” programme. The department is providing assistance to farmers for laying of Under Ground Pipe Line (UGPL) System, Sprinkler Irrigation System and Drip Irrigation system in cotton and sugarcane crops. These water saving devices have been found most suitable for different favourable agro-climatic conditions e.g. Sprinkler Irrigation System has been found well suited for sandy soils having undulating topography. Whereas, UGPL has been found most viable in central flat region of the State. However, Drip Irrigation System in cotton and sugarcane crops was taken up on pilot basis for the first time during 2010-11.

Based on ecology and cropping pattern, the State can be divided into 3 agro-Eco regions. The area falling under Zone I and II are ideal for crop diversification with wheat, rice, pulses, cotton and sugarcane as well as for raising dairy cows, buffaloes and poultry. These Zones have better irrigation facilities and good overall infrastructure. For crop diversification, main issues are water intensive crops, to improve soil health, conserve natural resources & lack of post harvesting technologies. Haryana Government has amended the APMC Act making enabling provision for contract farming, promoted Basmati rice area, summer moong cultivation, cotton & guar cultivation, promoted horticultural crops under NHM & Mushroom cultivation in the State.

In order to improve the genetic merit of livestock, State Govt. has paid special attention towards conservation, multiplication and improvement of indigenous germplasm such as Murrah breed of buffaloes and Haryana & Sahiwal breeds of cows.
