

CROP DIVERSIFICATION AND MICRO IRRIGATION

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The Indian Council of Agricultural Research (ICAR), Ministry of Agriculture & Farmers' Welfare has studied the prevailing cropping pattern and hydrological realities in different regions of India. ICAR study using Central Ground Water Board (CGWB) data and monthly gridded GRACE satellite data indicated the mismatch between the water demand of existed cropping patterns and water availability in groundwater depleted states particularly in Punjab, Haryana, Andhra Pradesh, Telangana, Maharashtra, Karnataka, and Tamil Nadu, encompassing the arid and semi-arid climates of the Country. ICAR has also prepared 'Atlas of cropping systems in India' and also identified alternative cropping systems as sustainable alternatives to cereal-dominated systems considering the prevailing agro-climatic conditions, resource availability including water availability and market opportunities.

Further, ICAR has prepared the agro-ecological and district specific crop plan for 14 major crops namely rice, wheat, maize, pearl millet, sorghum, pigeon pea, chickpea, soybean, mustard, groundnut, cotton, sugarcane, potato and onion by combining the Relative Spread Index (RSI), Relative Yield Index (RYI), Sustainable Yield Index (SYI) and Soil-climate suitability index (SCSI).

Rice, sugarcane, cotton and jute are among the major water-intensive crops grown in India and together occupy about 62.7 million hectares, representing nearly one-third of the country's gross cropped area. Recognizing the need to align cropping patterns with local water availability, ICAR assessed the cultivation of major water-intensive crops in relation to rainfall and water availability. The assessment identified that about 2.89 million hectares of rice are cultivated in 68 districts receiving less than 650 mm annual rainfall, accounting for about 5.67% of the total rice area (51 million hectares). Similarly, about 0.721 million hectares of sugarcane are cultivated in 91 districts receiving less than 700 mm annual rainfall, representing about 10.76% of the total sugarcane cultivated area (6.7 million hectares). These assessments provide the scientific basis for promoting location-specific crop diversification, particularly in water-scarce regions experiencing recurring water stress and declining groundwater levels, while balancing water security, farmer livelihoods and agricultural productivity.

The Government is promoting crop diversification from water-intensive crops to relatively low water-requiring crops such as pulses, oilseeds, millets and horticultural crops, taking into account local water availability, soil characteristics, agro-climatic suitability and sustainable use of natural resources. Under the Pilot Project on Crop Diversification, ICAR has implemented location-specific crop diversification interventions in 47 identified districts based on these criteria. To support diversified cropping systems, ICAR has also standardized and promoted optimum irrigation scheduling and drip fertigation for different crops to enhance water-use efficiency and productivity. Further, during 2023–24 to 2025–26, ICAR organized 457 training programmes, benefiting 8,749 farmers and 4,592 extension functionaries, to promote scientific crop diversification and sustainable crop management practices.

The Government is implementing several schemes and programmes to promote sustainable agriculture, micro-irrigation, soil health management and efficient utilisation of natural resources. The Prime Minister Dhan-Dhaanya Krishi Yojana (PM-DDKY) promotes sustainable agriculture in 100 aspirational agricultural districts through convergence of interventions such as crop diversification, irrigation development, post-harvest infrastructure, natural and organic farming, Integrated Pest Management (IPM) and Integrated Nutrient Management (INM). The Per Drop More Crop (PDMC) component of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) promotes efficient use of irrigation water through adoption of drip and sprinkler irrigation systems. The Soil Health Card Programme promotes soil test-based balanced and integrated nutrient management by providing farmers with crop-specific fertilizer recommendations for improving soil fertility and nutrient use efficiency. Further, the Watershed Development Component of PMKSY (WDC-PMKSY 2.0) promotes integrated watershed management through soil and water conservation, rainwater harvesting, groundwater recharge, restoration of degraded lands and sustainable management of natural resources.

In addition, ICAR promotes soil health management through soil test-based balanced and Integrated Nutrient Management (INM), Soil Test Crop Response (STCR)-based general fertilizer recommendations, and micronutrient mapping with location-specific nutrient recommendations. The Council has developed rapid and efficient soil testing kits and digital decision-support tools to facilitate timely soil fertility assessment and site-specific nutrient management. These technologies are disseminated through Krishi Vigyan Kendras (KVKs), frontline demonstrations and farmer capacity-building programmes to promote balanced fertilization, improve nutrient use efficiency and sustain soil health.

The Government is promoting long-term water security and climate-resilient agriculture through research, technology development and field demonstrations led by the Indian Council of Agricultural Research (ICAR). The initiatives include rainwater harvesting, creation of farm ponds and other surface water storage structures, groundwater recharge, conjunctive use of surface and groundwater, multiple use of harvested water, in-situ moisture conservation, conservation agriculture, in-situ moisture conservation, protective irrigation, micro-irrigation, and AI-, sensor- and weather-based irrigation scheduling, and advisory systems to improve water-use efficiency and climate resilience, and crop diversification from water-intensive crops to pulses, oilseeds, maize and agroforestry. ICAR also promotes micro-irrigation, Direct Seeded Rice (DSR), System of Rice Intensification (SRI), Alternate Wetting and Drying (AWD), raised-bed planting, laser land levelling, mulching, sprinkler and drip irrigation, and climate-resilient, water-efficient crop varieties through farmer training, frontline demonstrations, through Krishi Vigyan Kendras (KVKs) and State extension agencies.

The Government is strengthening the resilience of Indian agriculture to climate variability through research, technology development and field-level interventions complemented by flagship Government schemes. Under the National Innovations in Climate Resilient Agriculture (NICRA), ICAR promotes climate-resilient crop varieties tolerant to drought, flood, salinity and heat stress, Climate Resilient Villages (CRVs) in 151 vulnerable districts, District Agriculture Contingency Plans prepared for 651 districts, along with weather-based agro-advisories and farmer capacity building through Krishi Vigyan Kendras (KVKs). These initiatives are supported through Government schemes such as the National Mission for Sustainable Agriculture (NMSA), Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) – Per Drop More Crop (PDMC), Watershed Development Component of PMKSY (WDC-PMKSY 2.0) and the Prime Minister Dhan-Dhaanya Krishi Yojana (PM-DDKY), which improve resilience to climate variability and support environmentally sustainable agricultural practices.

This information was given by Minister of State for Agriculture and Farmers Welfare, Shri Bhagirath Choudhary in a written reply in Lok Sabha today.

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