

ICAR-Central Research Institute for Dryland Agriculture
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Date: 20.11.2019

Reply to Lok Sabha Unstarred Question No.1068 regarding “Climate Change”

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- (a) Whether the Government has conducted an impact assessment study related to climate change in agrarian societies of Maharashtra;**

N.A.

- (b) if so, the details thereof;**

N.A.

- (c) The findings of such study with reference to impact on agriculture based sectors;**

N.A.

- (d) The details of the recommendations made to mitigate the impact of climate change; and**

The Indian Council of Agricultural Research (ICAR), Ministry of Agriculture and Farmers Welfare, Government of India has conducted studies related to climate change under National Innovations in Climate Resilient Agriculture (NICRA) project. Under NICRA, studies are being conducted to develop heat and drought tolerant wheat, flood tolerant rice, drought tolerant pulses, water logging and high temperature tolerant tomato etc. Interventions viz. site specific rainwater harvesting structures (RWH) in drought affected areas; recycling of harvested water through supplemental irrigation to alleviate moisture stress during midseason dry spells; improved drainage in flood-prone areas; conservation tillage; artificial groundwater recharge and water saving micro-irrigation methods; drought and flood tolerant varieties; timely planting; community nurseries for delayed monsoon; water saving paddy cultivation methods (SRI, aerobic and direct seeding); green manuring; advancement of planting dates of *rabi* crops in areas with terminal heat stress; frost management in horticulture through fumigation; and popularization of location-specific & risk-reducing intercropping systems could mitigate the impact of climate change. Over 700 RWH structures were constructed/renovated/repared, while 80000 m³ additional rainwater storage capacity was created through farm ponds alone and the cropping intensity was increased by about 20%. *In-situ* moisture conservation through ridge and furrow and raised bed planting in soybean,

cotton, maize, pigeonpea, short duration pulses, vegetables, wheat, mustard, sugarcane, potato and vegetables resulted in higher benefit: cost ratios (2.6 to 4.7). Adoption of *in-situ* moisture conservation measures in crops was helpful to improve the soil moisture availability at the root zone (30-40 days) and eventually increased the productivity of crops by 15-20% in dry regions of the country in comparison to the traditional practices of farmers. Adopting improved varieties coupled with improved agronomic management can improve the rice yields by 6-17% in irrigated condition and by about 20-35% in rainfed condition, wheat yields by about 10% in 2010-2040 scenarios, maize yields by about 10% in 2050 and by 4% in 2080 scenario. Further, to cope with weather aberrations on real time basis, District Agricultural Contingency Plans are prepared for 650 districts in the country.

The three centres of All India Coordinated Research Project on Dryland Agriculture (AICRPDA) in Maharashtra i.e. Akola, Parbhani and Solapur have developed doable rainfed technologies for the domain districts of Akola, Buldana, Washim, Amaravati, Yeotmal, Parbhani, Nanded, Jalna, Aurangabad, Latur, Hingoli, Solapur, Ahmednagar, Eastern part of Pune, Sangli, Satara, Dhule and Nandurbar. Under National Innovations in Climate Resilient Agriculture (NICRA) project, the centres have developed real-time contingency plans (RTCP) to cope with delayed onset of monsoon and seasonal drought. The key real-time agronomic interventions include suitable crops and varieties for delayed onset of monsoon; repeated interculture to break soil crust and remove weeds, *in-situ* moisture conservation through opening conservation furrows at 10 to 15 m interval etc. to cope with early season drought; repeated interculture to break soil crust and remove weeds, *in-situ* moisture conservation through opening conservation furrows at 10 to 15 m interval, surface mulching with crop residues, foliar spray of 1% KNO₃ or 0.5% water soluble fertilizers, and providing protective irrigation, if available to cope with mid-season drought; harvesting crop at physiological maturity with some realizable yield or harvest for fodder, providing protective irrigation, if available to cope with terminal drought or prepare for *rabi* sowing in double cropped areas.

Since 1995, the four (04) Cooperating Centres of All India Coordinated Research Project on Agrometeorology (AICRPAM) located at Solapur, Parbhani, Akola and Dapoli are engaged in research, extension and training activities in the state of Maharashtra. The centres are preparing and issuing agromet advisory services (AAS) for selected villages under NICRA project as well as part of the Gramin Krishi Mausam Seva (GKMS) issuing agromet advisory services through DAMUs and AMFUs. The economic impact assessment of the AAS has also been done by the centres. Farmers awareness programs are being conducted regarding climate change and associated aspects for the farmers of the state.

- (e) **The steps taken by the Government to ensure the implementation of such recommendations to protect agricultural sectors in the country?**

Since 2011, the real-time contingency plan (RTCP) interventions are being demonstrated by the three centres of AICRPDA in 6 villages in 3 districts of Maharashtra with two pronged approach i.e. drought preparedness and real-time implementation of land, water, crop, soil, nutrient and energy (farm implements) management practices to cope with weather aberrations. During 2011 to 2018, under delayed onset of monsoon conditions, varieties of major rainfed crops were assessed for their suitability and best performing varieties were identified. On an average, these varieties gave about 15-35% higher yields compared to local/farmers' varieties. Early season drought conditions were addressed through *in-situ* moisture conservation and mulching which helped in adaptation of crops and realizing improved yields by 16-30% compared to no contingency measures. RTCP measures of foliar sprays of thiourea and KNO₃ in mitigating midseason drought/dry spells gave 10-20% higher yield in different crops compared to no spray. The effect of terminal drought on different crops was mitigated mostly by providing supplemental irrigation from harvested rainwater in ponds, and foliar sprays. Supplemental irrigation improved yields by 25% in cotton and 55% in soybean at different locations. The three centres of AICRPDA in Maharashtra i.e. Akola, Parbhani and Solapur are also providing technical backstopping for the implementation of Project on Climate Resilient Agriculture (PoCRA), Govt. of Maharashtra.

Activities being taken up in Technology Demonstration Component of NICRA in the state of Maharashtra to minimise the impact of Climate change and variability

Extensive farmer participatory demonstrations of location-specific climate resilient technologies were initiated on farmers' fields to address the issues related to heavy rains and floods and to enhance the adaptive capacity of communities, in the districts which are frequently prone to heavy rains and floods as part of Technology Demonstration Component (TDC) of National Innovations in Climate Resilient Agriculture (NICRA). The NICRA programme is operational in 8 locations in Maharashtra.

KVKs involved in the technology demonstration component of NICRA and the technologies demonstrated to minimise the impact of climate change in the State of Maharashtra

S. No.	District involved in NICRA	Climatic vulnerability addressed	Climate Resilient technologies demonstrated
1	Ahmednagar	Drought	<ul style="list-style-type: none"> • Desilting of water storage tanks in the village • Broad bed planting and conservation furrow • Application of bio-organic slurry

			<ul style="list-style-type: none"> • Water evaporation retardant in farm pond • Short duration cultivars of soybean, onion, Bengal gram • Resilient intercropping system • Silage making and use during the lean season • Backyard poultry • Custom hiring centres of farm implements
2	Amravati (Durgapur)	Drought	<ul style="list-style-type: none"> • Water harvesting and efficient use of harvested water • Location specific, crop specific In-situ water harvesting practices • Recharging of borewells • Short duration cultivars of soybean, chick pea • Cropping intensification with the harvested water during the rabi season • Resilient intercropping systems • Silage making and use during the lean season • Custom hiring centres of farm implements • Seed bank
3	Aurangabad	Drought	<ul style="list-style-type: none"> • Insitu water harvesting • Water harvesting and efficient use of harvested water • Recharging of borewells • Short duration cultivars of soybean, jowar, chick pea • Critical irrigation during the kharif season for protecting crops against long dry spells • Cropping intensification with the harvested water during the rabi season • Resilient intercropping systems • Silage making and use during the lean season • Custom hiring centres of farm implements

4	Buldana	Drought	<ul style="list-style-type: none"> • Location specific, crop specific Insitu water harvesting practices • Water harvesting and efficient use of harvested water by efficient methods of irrigation • Short duration cultivars of redgram, soybean, chick pea • Cropping intensification with the harvested water during the rabi season • Crop diversification • Enhancing the green fodder production • Seed bank • Custom hiring centre
5	Jalna	Drought	<ul style="list-style-type: none"> • Insitu water harvesting • Water harvesting and efficient use of harvested water • Short duration cultivars of soybean, jowar, chick pea • Critical irrigation during the kharif season for protecting crops against long dry spells • Cropping intensification with the harvested water during the rabi season • Crop diversification • Enhancing the green fodder production • Custom hiring centre
6	Nandurbar	Drought	<ul style="list-style-type: none"> • Water harvesting and efficient use of harvested water • In-situ water harvesting • Improved irrigation methods • Short duration cultivars of maize, chickpea, green gram, cotton • Resilient intercropping system • Improved green fodder • Backyard poultry • Custom hiring centres of farm implements
7	Pune	Drought	<ul style="list-style-type: none"> • Water harvesting and efficient use of harvested water • In-situ water harvesting

			<ul style="list-style-type: none"> • Laser land levelling • Short duration cultivars of bajra, sorghum, sunflower • Silage making and use during the lean season • Backyard poultry • Custom hiring centres of farm implements
8	Ratnagiri	High and intense rainfall	<ul style="list-style-type: none"> • Konkan jalkund/ Vijay bandhara • Polythene mulching • Improved cultivars of cowpea, rice • Supplementary nutrition to milch animals to minimize the impact of extremes of temperature • Backyard poultry • Silage and enhancing green fodder availability • Custom hiring centre

Several training programs are being conducted to build capacities of farmers on various aspects of climate change and resilient technologies and to minimise crop losses.

S. No.	Name of the KVK	Number of trainings programmes taken up during 2011- 2018	Number of Participants
1	Ahmednagar	46	1820
2	Amravati	142	5349
3	Aurangabad	184	4930
4	Baramati_Pune	45	937
5	Buldhana	37	1218
7	Jalna	303	1016
8	Nandurbar	164	2886
9	Ratnagiri	115	608
	Total	1113	21897