CRIDA : HYDERABAD

Answer to the question for the Lok Sabha - D.No. 989 regarding 'Adverse impact of climate change on agricultural production'

a) Whether the government has conducted / sponsored any study to assess the impact of climate change on Agricultural yields in the country, including Himalayan region;

- Extensive field and simulation studies were carried out in agriculture and allied sectors by the 23 network centers consisting ICAR Institutes such as Indian Agricultural Research Institute at New Delhi, Central Research Institute for Dryland Agriculture at Hyderabad, CMFRI, Cochin, IIHR, Bangalore etc. and State Agricultural Universities, located in different parts of the country. The climate change impact assessment was carried out using the crop simulation models particularly INFO-CROP by incorporating the projected climates of 2020, 2050 and 2080. Most of the results were obtained through incorporating the future projections by Had CM3 model. From these projections, variability in temperature and rainfall pattern was observed in future periods with significant impact on crop yields.

- The Indian Network for Climate Change Assessment (INCCA) of the Ministry of Environment & Forests, has studied the climate change impact assessment in the Himalayan region

b) if so the details of findings thereof;

The following points have emerged from the ICAR-NPCC network project

Rice

Irrigated rice yields are projected to reduce by -4% in 2020, 7% in 2050 and by -10% in 2080 scenarios. On the other hand, rainfed rice yields in India are projected reduced by -6%in 2020 scenario, but in 2050 and 2080 scenarios they are projected to decrease only marginally (<2.5%). Adopting improved varieties and input management can improve the yields by 6-17% in irrigated condition and by about 20-35% in rainfed condition.

Wheat

Climate change is projected to reduce the timely sown irrigated wheat production by about 6% in 2020 scenario from existing levels, however, late and very late sown wheat yields are projected to decrease by about 18% in 2020, 23% in 2050 and 25% in 2080 scenarios if no adaptation is followed. However, adaptation by sowing improved varieties coupled with improved agronomic management can improve the yields by about 10% in 2020 (2010-2040) scenario.

Maize

Climate change is projected to reduce the irrigated kharif maize yields by up to 18% in 2020 scenario, if no adaptation is followed. However, adapting to climate change by adoption of technologies such as improved varieties and agronomical management can improve the yields by about 21% in 2020 scenario. Climate change in 2050 and 2080 scenarios is projected to reduce the irrigated kharif maize yields by 18 to 23% and the adaptation is projected to improve the yields by about 10% in 2050 and by 4% in 2080 scenario.

Sorghum

Rainfed sorghum yields, on all India scale, are projected to marginally (2.5%) decline in 2020 scenario while it is projected to decline by about 8% in 2050 scenario. Adaptation strategies such as improved and tolerant variety managed under improved input efficiency with additional nitrogen fertilizer can enhance the irrigated maize net production by about 21% in 2020, 10% in 2050 and 4% in 2080 scenarios.

Soybean

Likely increase in kharif soybean yield in the range of 8-13% under different future climate scenarios (2030 and 2080) is predicted.

Groundnut

Kharif groundnut yields are projected to increase by 4-7% in 2020 and 2050 scenarios where as in 2080 scenario the yield is likely to decline by 5%.

Chickpea

Future climates are likely to benefit Chickpea by an average increase in productivity ranging from 23 to 54%. However, a large spatial variability for magnitude of change in the productivity is projected.

Potato

Climate change may likely to benefit potato in Punjab, Haryana and western and central UP by of 3.46 to 7.11% increase in production in A1b 2030 scenario, but in West Bengal and southern plateau region, potato production may likely to decline by 4 - 16% by 2030.

Apple

In Himachal Pradesh, consequent to warming and reduction in chilling temperatures, Apple cultivation has shifted to higher elevations.

Controlled environmental studies

whereas controlled environmental studies under elevated CO2 upto 550 ppm indicated a positive response to pulse crops like chickpea, soybean, Greengram and vegetables like onion and tomato and non-edible oil seeds like castor.

Points from the INCAA study on Himalayan region on CC Impacts

- **Rainfall:** The analysis indicated that the annual rainfall in the Himalayan region may vary between 1268±225.2 mm to 1604±175.2 mm respectively. The projected precipitation show a net increase in 2030's with respect to the simulated rainfall of 1970's in the Himalayan region by 60 to 206 mm. The increase in annual rainfall in 2030's with respect to 1970's ranges from 5 to 13%. All seasons in the Himalayan region indicate an increase in rainfall, with the monsoon months of June, July, August and September showing the maximum increase in rainfall by 12 mm.
- **Temperature:** The annual temperature is projected to increase from 0.9±0.6 °C to 2.6±0.7°C in 2030's. The net increase in temperature is ranging from 1.7°C to 2.2 °C with respect to the 1970's.

- **Agriculture:** Apple production in the Himachal region has decreased between 1982 and 2005 as the increase in maximum temperature has led to a reduction in total chilling hours in the region—a decline of more than 9.1 units per year in last 23 years has taken place. This reduction was more during the months of November and February. With increasing temperatures, it is anticipated that there may be an all-round decrease in apple production in the Himalayan region, and the line of production may shift to higher altitudes.

c) whether the Government has implemented schemes to address the adverse impact of climate change on agriculture;

Yes. The various schemes are listed below.

National Action Plan on Climate Change: It consists of 8 national missions.

- Jawaharlal Nehru National Solar Mission
- National Mission for Enhanced Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for Sustainable Agriculture
- National Mission for Sustaining the Himalayan Ecosystem
- National Mission for a Green India
- National Mission on Strategic Knowledge for Climate Change

Other National and Sub-National Initiatives are:

- National Clean Energy Fund
- State Action Plan on Climate Change
- NABARD: Progressing Adaptation Actions
- Auto Fuel Vision and Policy 2025
- Indian Network for Climate Change Assessment
- Expert Group on Low Carbon Strategies for Inclusive Growth
- Bilateral Cooperation on Environment and Clean Technology