Indian agriculture: The route post-CoP 26

Strategies and pathways that can make Indian agriculture resilient and sustainable in a changing climate

DownToEarth

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India's pledge of *Panchamrit* (five-fold strategy) to fight climate change, announced during the 26th Conference of the Parties (CoP26) at Glasgow, Scotland, has caught global attention. The country's new commitments include reaching 500 giga watt (GW) of non-fossil fuel energy capacity by 2030; producing 50 per cent of energy requirements via renewable energy sources by 2030; a reduction of 1 billion tonnes of carbon by 2030; reducing the carbon emission intensity of the GDP by 45 per cent by 2030; and most importantly, achieving the target of net-zero emissions by 2070.

A basket of agreements was signed by groups of countries during the Glasgow Summit. Here, we focus our discussions on agriculture and food systems and how India should prepare and act to fight the challenge of climate change in light of CoP26.

India and 26 other countries signed the Sustainable Agriculture Policy Action Agenda at the summit to set a course of action to protect food systems and prevent loss of biodiversity against climate change. The countries laid down their commitments with a pledge "to use land sustainably and put protection and restoration of nature at the heart of all".

At the present inflection point, when the agricultural sector in these countries, and for that matter across the planet, is threatened by the adversities brought by climate change, this initiative seems to be a good way to reinvigorate efforts to promote and practice sustainable agriculture technologies.

While Indian agriculture is adversely impacted by the vicissitudes of climate change, the sector also is a significant contributor to greenhouse gas (GHG) emissions. As per the Third Biennial Update Report submitted by the Government of India in early 2021 to the United Nations Framework Convention on Climate Change (UNFCCC), the agriculture sector contributes 14 per cent of the total GHG emissions (energy 75.01 per cent; industrial process and product use 8 per cent; and waste 2.7 per cent, as per 2016 data).

Within the sector, 54.6 per cent of GHG emissions were due to enteric fermentation, followed by 17.5 per cent from rice cultivation, 19.1 per cent from fertiliser applied to agricultural soils, 6.7 per cent from manure management, and 2.2 per cent due to field burning of agricultural residues. Therefore, effective mitigation measures and appropriate adaptation technologies must be taken to reduce GHG emissions from the agriculture sector.

India's approach has been a balancing act between growth and sustainability in its climate change policies and it is leading the developing nations to place agriculture in the ongoing negotiations. The National Mission on Sustainable Agriculture, as part of National Action Plan on Climate Change for more than a decade now, has focused to make Indian agriculture sustainable, considering likely risks arising from climate variability.

The Indian Council of Agricultural Research and International Agricultural Research Centres of the CGIAR system (a France-headquartered public agricultural innovation network), including International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), have developed climate smart agricultural technologies and approaches to assist the agricultural sector to be less vulnerable to the adverse impacts of climate change.

We present a list of strategies/pathways that could be prioritised in the policy agenda to make Indian agriculture resilient and sustainable in a changing climate.

1. Diversification:

Diversifying from existing cropping systems, predominated by rice and wheat in many unsustainable landscapes, to more nutritious and environment-friendly crops have often been suggested to address challenges of climate change and malnutrition. However, such a transition must protect the income base of the farmers.

Research findings have already shown the potential benefits of crop diversification, including to sorghum and millet, and particularly in those tracts where rice yields are low. Such diversification would not only increase the nutritional value of the food system, but also holds potential to reduce inputs and GHG emissions.

Agroforestry, for example, brings synergies between trees and crops or forages (such as trees on field bunds, inline agroforestry, and high-density fruit orchards) to help diversify existing farming systems and achieve medium to long term sustainability.

Diversification to crops like pulses, oilseeds, vegetables, and fruits, adapted to specific agro-ecologies, must also be planned, and implemented by the states with suitable incentives to farmers during the changeover. However, diversifying to new portfolio of crops will require strengthening of existing value chains.

For crop diversification (from major staples to nutritious and climate-resilient crops) to succeed, healthy and diversified diets need to be promoted and incorporated in the menu of Indian consumers.

An increasing consumer interest on safe and nutritious foods is already observed during the pandemic, and this positive trend for healthy foods is expected to further rise. Reduction of food waste must also be internalised by large section of consumers, through campaigns by government and civil society, that lessen GHG emissions from this neglected part of the food system.

2. Agro-ecological approaches:

Methane from rice-paddies, nitrous-oxide emissions, or nitrogen leaching from inefficient use of chemical fertiliser are a key downside of resource-intensive approaches to production. Agro-ecological approaches offer a solution to these problems. The natural farming practices are the commonest example, which have since been tried and scaled up in parts of India that bring synergy towards ecosystem services and biodiversity conservation.

Managing crop-residue burning remains a huge challenge. The activity affects air quality in immediate vicinity and in urban centres. This practice is propelled by a monoculture farming system and the legacy of, perhaps, perverse policy incentives.

Conservation agriculture offers solutions to such pernicious problems with good agronomy and soil management such as no-till farming, crop rotation, *in-situ* crop harvest residue management / mulching, zero-till planters such as the Happy Seeder, among others. These practices could be very useful in significantly reducing GHG emissions.

Excessive use of pesticides and fertilisers pollutes the environment. The scientifically prescribed ratio of macro nutrients (nitrogen-phosphorous-potassium or N-P-K) is already skewed in many states, because of excessive subsidy in favour of urea vis-à-vis the balance approach to plant nutrition considering macro- and micro-nutrients.

Since soil health card scheme of the government has penetrated throughout the country, site-specific, need-based nutrient management would be advisable to sustainably conserve the soil ecosystem.

Organic farming that involves crop cultivation in natural ways can be practised with supportive policy incentives, without compromising the profitability and income of farmers. Use of botanicals, green-manure and biological pest control is nature-friendly and can lead to reduction of GHG emissions to a considerable extent. The organic movement, albeit slowly, is catching up in some parts of India.

Nature-positive and regenerative agriculture practices mentioned above hold potential to reduce GHG emissions. Since the government is driving for such technologies and practices at some pace and scale, their scientific validation and demonstration (to avert notions that they might compromise on food security) can bring wide adoption by interested farmers.

3. Water-use efficiency:

Diminishing natural resources, including water, is the most visible manifestation of climate change in India. Water used for Indian agriculture accounts for about 80 per cent of total freshwater resources and, therefore, efficiency savings would always be desirable for additional food production for a burgeoning population. Promotion of micro-irrigation practices (sprinkler and drip) through several schemes and programmes by the government has been localised in few states as of now that should proliferate to larger crop areas.

We need to move from a supply-based to demand-based system to reach the huge micro-irrigation potential. Several new production methods and techniques along with specific agronomic practices have been suggested by agricultural scientists and experts. For example, system of rice intensification (SRI), alternate wetting and drying (AWD), direct seeded rice (DSR) and furrow irrigation, have often been prescribed for efficient use of irrigation water in a traditionally perceived water-guzzling crop like paddy with no yield disadvantages.

Subsidy-based approaches to irrigate farmlands has led to negative environmental consequences in many parts of India. Punjab is a case in point, where over-exploitation of ground water due to subsidies on power (in fact, it is free) has already led to an alarming situation.

“More crop-per drop” has been the mantra of current public policies around irrigation water. Suitable policies with incentives mechanism could lead more farmers to adopt technologies that aim to “irrigate the crop and not the land”.

In-situ soil and moisture conservation with involvement of the community has successfully been addressed through the watershed management approach. The impacts of the interventions demonstrated successfully by institutes like ICRISAT have shown recharging of groundwater that has enabled farmers to grow more crops per year and enhancement of productivity of a diverse portfolio of crops.

Convergence of schematic interventions through the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Pradhan Mantri Krishi Sinchai Yojana (PMKSY), among others, for groundwater recharging, revival of traditional water bodies and creation of water harvesting structures would go a long way in conservation and usage of water for agricultural use. Efficient use of water in agriculture will lessen an impending ecological threat from current unsustainable practices.

4. Renewable energy usage:

India’s ambitious renewable energy target (500 GW by 2030) must include the potential agriculture sector upfront. At present, Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) scheme of the government aims to improve irrigation access and raise farmers’ income through solar-powered irrigation. However, with highly subsidised or free electricity to irrigate agricultural lands, farmers have not largely switched over to solar-powered irrigation and harness the potential.

Setting up of solar power plants on farmlands, wherever possible, and solarising existing grid-connected pumps, could earn additional income to farmers, besides making them net energy producers. Government policies must reorient to reduce agriculture’s power subsidy bills and divert the money towards sustainable farm sector investments like solar power that could address challenges arising from the “water-energy-food” nexus. Reducing energy usage from fossil fuel sources and moving towards renewables, will reduce carbon footprints in the agriculture sector and enhance livelihoods of smallholders.

5. Digital agriculture: Increasing use of mobile telephones (and smartphones) in rural India offers a unique opportunity to leverage information symmetry and connectivity to the advantage of farmers. The new ICT (Information and Communications Technology) and data ecosystems carry the potential to raise farm productivity and income by supporting the delivery of information and services, market integration and management of risks, mainly arising from weather extremes.

Proven support systems, like weather advisories and market intelligence, hold promise to make farming more profitable and sustainable. For example, Meghdoot, a pan-India application for accessing agromet information, has been popular amongst its users. Similarly, new agri-tech start-ups and farm enterprises, including those led by farmer collectives like food processor organisations / food processor corporations, are increasingly using digital tools to bring efficiency in agricultural marketing and manage risks. Public policies must keep these emerging trends in mind.

6. Research and innovation investments: To offset the impact of climate change on food and agriculture by developing climate resilient varieties and other suitable technologies, increased resource allocation to agricultural research and innovation has often been prescribed. The rise of carbon dioxide levels and temperature in the atmosphere have direct correlation on crop productivity, grain quality, pest and disease incidence, as well as on the cropping system.

Research and analyses on the contributions of various allied sectors of agriculture on ghg emissions will also be helpful for effective policy planning. For example, animal agriculture contributes the highest carbon emissions within agriculture sector in India and therefore, life cycle assessment (LCA) studies need to be done for products or services in the livestock sector for robust measurement systems as tools for national GHG inventory and monitoring emission reduction targets.

Inadequate and sub-optimal investments may not yield desired results and, therefore, the government must commit enhanced outlay for agricultural research and innovation, including improvement of infrastructure, and capacities of both scientists and extension personnel.

Climate change affects the poor and the smallholders, who earn their livelihoods from agriculture, disproportionately. Technologies and adaptation strategies must, therefore, reduce their vulnerabilities. India, in its mitigation and adaptation efforts, must formulate and implement policies that make Indian agriculture climate resilient and sustainable. Post-cop26, India's ambitious commitments should reflect in its tangible and concrete actions.

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