Environmental Challenges of Modern Agriculture

Emissions from Indian agriculture have increased at an average annual growth rate of 1.2 per cent between 1990 and 2010.

FOR A LONG time, the anthropogenic emissions of greenhouse gases (GHGs) were attributed mainly to the energy sector, which is an intensive user of fuels such as diesel and petroleum. However, sector-specific research as well as the study of carbon footprints have highlighted the emission contributions of other economic activities such as agriculture, land use, land use change and forestry, industry, transport, commercial & residential buildings and waste and wastewater. Among these, the combined share of agriculture and forestry accounts for the highest share of 31 per cent in global GHGs (Intergovernmental Panel on Climate Change). Emissions from these two sectors arise from livestock, soil management, paddy cultivation, stubble burning, deforestation, land clearing, and fires.

In India, the balance sheet of emissions provides insights into the emission profile. Sector-wise distributions show the dominance of the energy sector with a share of 58 per cent, followed by industry (22%), agriculture (17%), and the waste sector (3%). However, the share of agricultural emissions is more than 21 per cent when one accounts for indirect emissions due to the consumption of inputs such as fertilisers, electricity and fuel such as diesel.

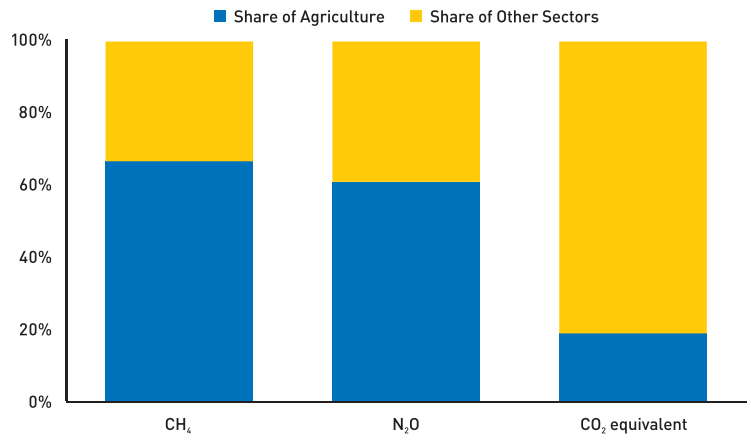
Emissions are measured in a common unit called carbon dioxide (CO_2) equivalents to facilitate comparison across sectors and activities that have varying intensities of different types of emissions. While the magnitude of methane (CH_4) and nitrous oxide (N_2O) may be low in total emissions compared with CO_2 emissions, they have significantly high global warming potential (GWP). The GWP of CH_4 and N_2O is 25 and 298 times that of CO_2, respectively.

The agriculture sector attains primacy due to its emissions of both CH_4 as well as N_2O. Although the CO_2 intensity of agriculture is relatively low, the sector is a key emitter that accounts for more than half the anthropogenic CH_4 and N_2O emissions (Figure E.1). Emissions from Indian agriculture have increased at an average annual growth rate of 1.2 per cent between 1990 and 2010.

Increase in demand for agricultural output is a natural consequence of a growing population. However, this comes at an environmental cost. For instance, the green revolution helped increase output by bringing a larger area under cultivation through irrigation and increasing production yields through the use of fertilisers. Both, electricity for irrigation and fertilisers are emission-intensive inputs, but self-sufficiency in food has come to be associated with such inputs, which have an adverse effect on the environment.

In short, the agriculture sector affects emissions and is also affected by emissions that lead to climate change. The relationship is complex due to the multiple agents involved. The transformation of agriculture into a climate-resilient system is the need of the hour. A system such as this would meet the food requirements while supporting the rural workforce. Additionally it will help stabilise national economic growth with adequate input requirements for downstream industries such as food processing and textiles as stated in the National Mission for Sustainable Agriculture, 2010. The benefits of low carbon agricultural practices have a direct impact on the environment including reducing GHG emissions, saving water and improving soil conditions.

Figure E.1: Share of Agricultural Emissions in India, 2007



Source: Ministry of Environment and Forests, 2010.