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Short Communication

Circular Bioeconomy-The World Needs a Great Reset

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The World today emits 50 billion tons of carbon-di-oxide equivalents every year. This is 40 per cent more than the emissions in the year 2019. China emits largest (twice as that of the United States of America) followed by India as the third largest emitter. However, in terms of per capita emissions, we find these numbers small due to a large population base both in China and India. The average CO_2 emissions per capita in the USA are more than 18 tons per annum, while in China it is around 8 tons and 2.5 tons in India. Agriculture, production of fossil fuels and waste management are three big sources of methane emissions. Enteric fermentation in ruminants, microbial activity in water-logged paddy fields, burning of crop residues, forest-fires, decomposition of waste, and production of gas and oil leads to methane emissions. The warming potential of methane is much stronger than carbon-di-oxide (about 28 times) and that means despite contributing smaller to the total emissions, methane's contribution to warming is much more (7-8 times than emissions). However, life of methane in atmosphere is very less (12 years against centuries or thousands of years of CO_2), hence any effort to reduce methane emissions is worth. On a similar note, nitrous oxide emissions from agriculture are produced when nitrogen fertilizers are applied to the soils. It is true that nitrous oxide is naturally produced in soil but application of nitrogen fertilizers causes microbes to act more fiercely leading to emissions. Just like methane, nitrous oxide is also a potential gas to cause warming. Its warming potential is around 265 times that of CO_2. That means one ton of nitrous oxide would generate 265 times the amount of warming as one tonne of CO_2 and it stays in the atmosphere for around 121 years. On per capita basis, India may be among the lowest emitters but in actual terms methane and nitrous oxide emissions from India are on the dense side of the scale. The emissions are largest from the energy sector (74 per cent), followed by Agriculture, forestry and land use (18 per cent), industry (5 per cent), and waste (3 per cent). All of this because our wants are unlimited.

The emissions are result of the activities that tend to satisfy human wants, so these are anthropogenic in nature. To satisfy our wants, the natural resources have been extracted mercilessly as we considered them freely available, without paying any heed to their sustainable use. According to the estimates by OECD Environmental Outlook to 2030, the world has already extracted 49 billion tons of natural resources in the year 2022 by the month of July only and at this pace, it is expected that the extraction may reach 184 billion tons by 2050. Did we give a thought to the availability of food in absence of resources? Let me try to highlight it here. The population could be too big to feed itself by 2050, courtesy loss of resources. According to a report by OXFAM international, the earth may run out of food in around 27.5 years if food systems are not transformed. We are running short of fresh water, a greater part of which goes to agriculture. The pollution levels have already affected the life in water bodies- ponds, rivers, sea and oceans. The pace at which we are destroying rainforests the World over, they will all be lost within 75 years. In a nutshell, the beautiful, green and once upon a super-rich planet for life has turned almost lifeless. According to Ecological footprint Atlas, 2010, we are overusing earth at the rate of about 175 per cent. That means one earth is not enough to meet the demand for resources of the current population. We need 1.75 earth now and by 2032, that means in another ten years to satisfy our needs, we will need two earths. This is what we have done walking away from Nature in an imbalanced approach. And

as we discuss Sustainable Development Goals, we emphasize the need of transforming food systems and related policies. We are racing against time and agriculture must rapidly shift to technologies which are more climate friendly, our food systems must adapt to changing climate, and slash its carbon footprint or emissions of Greenhouse gases. Precisely, we all must work towards bringing nature at the centre of the economy. There is a need to encourage bioeconomic models.

The EU Commission defined the bioeconomy as "the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products and bioenergy. Its sectors and industries have strong innovation potential due to their use of a wide range of sciences, enabling and industrial technologies, along with local and tacit knowledge". Such a society that aims at giving it back to the nature or to restore nature or to keep the nature at the centre of the economy must learn recycle, reuse and reduce. The industry must also switch over to natural and organic production ways as good as possible, for example usage of cotton, jute, silk (lotus, bamboo, etc) by the textile industry instead of artificial fibres (polyester, nylon, rayon etc.). Manufacturing units must focus on biodegradable packaging, of food and other products. Agriculture crop residues may be used for manufacturing of composites which are very effective raw material for construction industry. However, there is no established study to suggest what itself could be the emissions from the activities which form part of a circular bio-economy. In other words, long to go before we figure out how effective the bio-economy is and how the processes which form the core of a bioeconomy have lesser carbon emissions. Such researchable issues may be worked on which will lead to adoption of sustainable eco-models.

Such an economic model of circular bioeconomy has already been established by Dr. Rajendra Prasad Central Agricultural University (RPCAU) in Sukhet village of Madhubani District in Bihar. The model was also praised by the Indian Prime Minister Mr. Narendra Modi in his 80th Mann ki Baat episode. The model has successfully established a self-sustaining village which is addressing three schemes of the Government of India- first Clean India Campaign, second- Ujjawala Yojana and third Doubling Farmers Income. About 100 farm families are associated with this approach in which kitchen garbage and animal dung is collected from the farm families (door to door) and is converted into vermicompost. Afterwards, from the sale of the vermicompost, every family is provided with LPG cylinders every two months. The capacity of every such production unit is 250 MT, and it can absorb five people. A rough estimate for the state of Bihar showed that two lakh such units are needed in the state which will generate employment for 10 lakhs people.

However, such a model will work in entirety with equal participation from all stakeholders. Hence policy and technological improvements are required. The European Union has taken a right step in this direction by formulating a bioeconomy strategy for a sustainable Europe. The Indian Government also believes that bioeconomy will be key to India's future growth for next 25 years. It is expected that Indian bioeconomy will touch USD 300 billion by 2030. In 2021, the size of Indian bioeconomy was USD 80 billion. The potential in Agricultural bioeconomy is huge if secondary agriculture is promoted. The committee on Doubling Farmers' Income has already devised suitable recommendations for secondary agriculture in India. It is the right time that states and the centre work in collaboration with the industry and the academia to promote circular bioeconomy.