Presentation on Innovation for Cool Earth Forum (ICEF) Annual Meeting, Tokyo, Japan, October 5, 2022

A PRESENTATION BY DR. UMA LELE

Pathways to reduce emissions from agriculture

At the Critical Decade to 2030 – Action-oriented Approach for Innovation and Deployment

Emissions from Agriculture in 2018

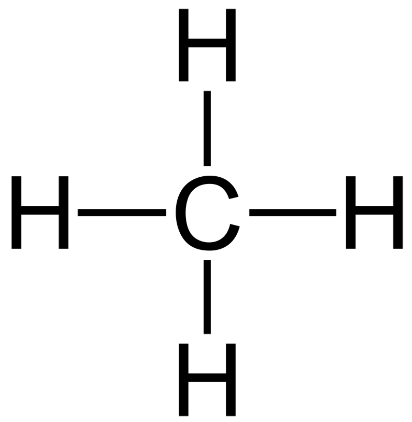
- Global emissions due to agriculture (within the farm gate and including related land use/land use change) were 9.3 billion tonnes of CO2 equivalent (CO2eq).
- Methane and nitrous oxide emissions from crop and livestock activities contributed 5.3 billion tonnes CO2eq in 2018, a 14 percent growth since 2000.
- Livestock production processes such as enteric fermentation and manure deposition on pastures dominated farm-gate emissions, together generating 3 billion tonnes CO2eq in 2018.
- Land use and land use change emissions were 4 billion tonnes CO2eq in 2018, caused mainly by deforestation (2.9 billion tonnes CO2eq) and drainage and burning of organic soils (1 billion tonnes CO2eq). They decreased globally by 20 percent since 2000.
- While emissions from deforestation decreased, those from drainage and fires of organic soils increased by nearly 35 percent since 2000.
- In Africa, both farm-gate and land use-related emissions increased over the entire 2000–2018 period, by 38 and 20 percent respectively.

Source: Emissions due to agriculture, Global, regional and country trends, 2000–2018

Global Methane Pledge

- At the Climate Conference in **Glasgow in 2021**, the EU and the US launched the Global Methane Pledge (GMP) – a collective goal of reducing man-made methane emissions by at least 30% from 2020 levels by 2030.Nov 22, 2021
- For achieving carbon neutrality, rapid reduction of non-CO2 GHGs such as methane (CH4) and nitrous oxide (N2O) are as essential as the reduction of CO2.
- The main sources of these gases are agricultural activities such as enteric fermentation, manure
- management, rice cultivation, and so on. Also, the reduction measures of these gases are more cost-effective than the reduction measures of CO2 emission

Why Reducing Methane Emissions is important?



- Methane currently accounts for around one-fifth of man-made global greenhouse gas emissions on a like-for-like basis.
- It has a shorter lifetime in the atmosphere than carbon dioxide (CO_2), but a greater near-term warming potential (by some accounts up to 80 times).
- Because of methane's shorter lifetime in the air, reducing new methane emissions could dramatically reduce the pace of warming.
- So curbing methane emissions can have incredible near-term impacts — both on climate warming and on the world's ability to meet net zero by 2050 or sooner
- Slowing today's unprecedented rate of warming can help avert our most acute climate risks, including crop loss, wildfires, extreme weather and rising sea levels.
- Atmospheric concentration of methane is increasing faster now than at any time since the 1980s.
- Now is the methane moment: Acting now to reduce methane emissions will have immediate benefits to the climate that reductions in carbon dioxide cannot provide on their own.

Scope of presentation

- Non-CO2 GHG reduction with a focus on methane and nitrous oxide emissions from agriculture and livestock
- (1) Challenges and opportunities for stakeholders (producer/consumer, public/private, etc.) in
- reducing non-CO2 GHGs in the agricultural field
- (2) Technology applications in non-CO2 reduction in agricultural field
- (3) Reduction potential of non-CO2 GHGs in primary industry countries (emerging countries)
- (4) Roles of emerging and developed countries and potential international cooperation

Livestock

An example of India. India has the world’s largest bovine population: 110 million buffaloes and 193 million cattle. It offers huge potential for sustainability

- Cattle is distributed across nearly 80 million small-scale dairy farms, with an average herd size of 1-3 female bovines, reflecting the small landholdings in the country. (Livestock Census, DAHD, 2019, FAOSTAT)
- India’s milk yields across crossbred and indigenous cows and buffaloes are some of the lowest in the world, ranging from only 20%-60% of frontier yields globally
- – 2.8 liters per day (LPD) for indigenous cows, 7.5 LPD for crossbreds, and 5.2 LPD for buffaloes against the average global yields of approximately 20 LPD.
- Nationally, 75% of milk production comes from descript bovines and 25% from non-descript bovines.

Steps needed to reduce livestock emissions: Ration Balancing Program (RBP) Approach helps to reduce methane emissions while increasing livestock productivity

RBP optimizes cattle feed using local inputs

It increases per cow and per buffalo productivity by **5%** to **15%** while reducing emissions by the same amount

Some **2.8 million** dairy animals are under Ration Balancing Program (RBP), i.e., but that is only 1 percent of the cattle population.

Genetic improvement is the largest driver of future productivity gains in the dairy sector.

- Continued focus on organizing small-scale dairy producers into dairy cooperative societies and dairy producer companies.
- Deploying additional Local Resource Persons (LRPs) to work directly with these organizations to expand uptake of RBP.
- Training of Milk Union and Dairy Producer Company leadership to better understand the financial returns to RBP.
- Importantly, Continue to upgrade the **overall genetic merit** of the national dairy herd.

Methane from Paddy Production

- Globally, the CH4 emissions from paddy rice fields are other source of methane.
- Southeast Asia emits approximately 10 Mg CH4 km−2 and it contributes 90% to the global rice CH4 emissions. Africa and South America contribute 3.5% and 4.7% to the global Paddy rice CH4 budget respectively.
- Rice is a vital crop grown on more than 167.25 million hectares of land globally. In Asia, China, India, Indonesia, Bangladesh, and Vietnam are the major dominant rice-producing countries. So, the areas of high rice production are equally the area of high CH4 emissions due to rice cultivation [14, 16].
- Emissions of CH4 from paddy soils are concentrated in irrigated areas; irrigated paddy soils account for 60% of the total rice harvesting area worldwide, but produce 78% of CH4 emissions in rice-producing areas [12].
- Population, income growth and urbanization have resulted in increased rice consumption;
- Diversification of consumption away from rice would reduce demand for rice as well as promoting diversification of crop production.

Reducing Methane in Paddy production

- Crop improvement strategies such as breeding high yielding and high stress tolerant rice varieties with reduced CH4 emissions the CH4 mitigation. Cultivation of high-yielding and more heat-tolerant rice cultivars are a promising approach to reduce CH4 emissions from paddy fields and slowing down global warming.
- These rice varieties should also be adaptable to changing climate e.g., the stress and water management conditions.
- CH4 can also be reduced from paddy fields through management practices like, the mid-season drainage, alternate wetting, drying irrigation and using alternative fertilizers to achieve sustainable rice production.

Additional Measures

- New crop varieties that better withstand climate shocks and improve yields,
- solar energy for product storage, and
- digital technologies that expand access to knowledge and services for rural producers.
- No till farming, agroforestry, and landscape management, will also support mitigation by sequestering carbon or reducing emissions.




Right Enabling Environment

Policies and institutions at the local, national, and international levels need to incentivize the development and adoption of new technologies and practices and ensure adequate finance is available. They must recognize potential trade-offs — in terms of yields and efficiency — between sustainable systems and existing or other modern farming practices and between

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THANK YOU

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