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Methane from Rice: A Case for BRRI's NDC Evaluation

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In Bangladesh, we have around 12 million hectares of land under rice cultivation. This includes the coverage from Aus, Transplanted Aman, Deep Water Rice (DWR) and Boro. The amount of cultivable land under Boro and transplanted Aman is equal: 5 million hectares each, while in terms of total production, Boro, or exclusively irrigated rice, ranks the highest. Traditionally, Aus and Aman ecotypes are rainfed. But nowadays, for on-time crop establishment and frequent droughts, farmers irrigate their rainfed crops too.

The Boro rice (either HYV or hybrid) is exclusively an irrigated crop grown under continuously flooded conditions. The continuously flooded conditions favour more methane emission. The Boro rice shares 75% of the total paddy field emission. In contrast, transplanted Aman, DWR and transplanted Aus (recently, most of the HYV Aus are grown as transplanted crops) rice are also emitting a modest amount. However, the rice grown under exclusively upland conditions (broadcast) is Aus rice covering a small area, which emits a very insignificant amount of methane. So, the irrigation-dependent rice culture, irrespective of ecotype, is responsible for the lion's share of methane emissions from the crop sub-sector of the agriculture sector.

This annual methane emission is on an increasing linear trend. BRRI has a record of gradual increases in methane emissions from rice fields for Bangladesh. It was 0.8445 million tonnes (Mt) in 2020 and increased to 0.8624 Mt in 2023. These values are less than the previous assessments at BRRI and elsewhere. As per the previous BRRI estimation done in the mid-2010s, the emission was 1.56 Mt. In contrast, the FAO and CIMMYT estimations were 1.20 Mt and 1.39 Mt, respectively. The assessment of methane from the agricultural sector is a new area of research for a country like ours. So, the inconsistencies among the various assessments are quite expected, which have an impact on the accuracy of reporting and climate action. These inconsistencies arise from methodological differences, emission factor variations, data limitations, and spatial and time-based variability in agricultural practices.

The extent of methane emission from rice crops depends on flooding duration, rice varieties, rice area coverage and ecotype. The long-duration varieties remain submerged for a longer time compared to the short-duration ones and emit more methane. The traditional varieties emit more methane than the HYV ones.

As per the Paris Agreement, the government has to declare its GHG emission level (Nationally Determined Contribution: NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) through the Ministry of Environment, Forestry and Climate Change (MoEFCC). Accordingly, the Department of Environment (DoE), an institute under the MoEFCC, declared the national methane emission value from rice fields was 0.609 Mt in their last NDC. This value was an assessment based on the IPCC default value. The recent values are better than the previous ones, as the assessment done is based on real-time data. But there were also limitations, as the data was collected from some limited areas, which is not enough to represent the whole country. Anyway, we have no other alternative but to use this data right now. However, surely, the scientists will find some revised methodologies to determine the actual amount of methane emitted from the rice paddy in the near future.

Most of the previous assessments are IPCC default data-based (Tier 1). The recent approach should be country-specific (Tier-2) and, if possible, field-specific (Tier-3), collecting the data from field trials, remote sensing and precise emission factor calibration. So, it will take several years to generate the emission data closer to reality. However, BRRI and the allied institutes are working on it. To ensure perfectness and to get recognition, the BRRI should exchange its data, sources and methodologies with the other organisations and publish them jointly.

Through several initiatives in Bangladesh, the International Fund for Agricultural Development (IFAD) is working on methane mitigation. It now plans to expand these efforts via the 'Reducing Agricultural Methane Programme (RAMP)', which would empower Bangladesh to quantify methane emissions more precisely.

The rice sector in Bangladesh is playing a dual role: ensuring food security while contributing to global warming through major emissions from the rice field. The growing trend in emissions, as per BRRI estimation, pinpointed the urgent requirement of climate-smart strategies like AWD and short-duration HYVs. A diversified cropping pattern can also reduce methane emissions in a rice-rice cropping system significantly. Therefore, the appropriate policies and innovations are earnestly needed to address the issue of methane emissions from rice fields.

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