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Greenhouse Gas Emissions from Paddy Ecosystems: Critical Windows of Water and Gas Diffusivity (GREPEC)

Period
2 ½ years

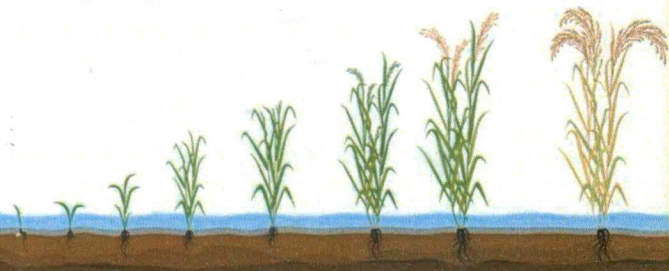
Starting Date
1st March, 2021

Funding Source
Asia-Pacific Network (APN)

Countries
Sri Lanka, India, Japan, Vietnam, USA,
New Zealand, Denmark

Countries where experimental work
carried out
Sri Lanka, India, Japan

Leading Institute
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Remarks

This study investigated the applicability of Alternate Wetting and Draining (AWD) against conventional completely flooded (CF) water management in paddy ecosystems in relation to greenhouse gas (CH_4 and N_2O) emissions, water usage and crop yield in wet and dry seasons.

The total water saving under AWD ranged between 27-35 % as compared to CF.

Reduction of seasonal CH_4 emission under AWD was 32% and 43% in wet and dry seasons, respectively as compared to CF.

Compared to CF, seasonal N_2O emissions increased under AWD by 7% and 23% in wet and dry seasons, respectively.

No statistically significant difference in yield was observed between the AWD and CF.

The diurnal variation of CH_4 seemed to follow the daily temperature variation with higher emissions from morning to afternoon and low emissions at night.

Ebullition accounted for 60% of the total emission at the heading stage because of increase in CH_4 production and reduction of the capacity of aerenchyma in rice plants.

Application of rice straw increased both CH_4 emissions via rice plant and ebullition during panicle formation and ripening stages.

Further studies focusing on different rice varieties, geographical contrasts, climatic factors, straw management and soil management need to be conducted to obtain more generalized conclusions.

Policy Recommendations

Encourage local farmers to adapt to the AWD as an emerging method

- to reduce fresh water consumption
- to reduce seasonal CH_4 emission without compromising the yield.

Improve residue management

- Application of rice straws to paddy fields needs to be done with caution as they provide additional carbon sources and may potentially enhance CH_4 emissions.

Develop fertilizer and manure management plan

- Optimize fertilizer type, application frequency for right timing of uptake with respect to crop needs.

Policy meeting at Ministry of Environment

