Aproaches for mitigation of greenhouse gas emission from agricultural fields

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Percentage of atmospheric methane emitted form rice paddy is estimated at 60Tg/yr (20 - 100Tg/yr) which is near 10% of total global methane emission of 535Tg/yr (410 - 660Tg) (IPCC(1995), and which is near 30% of anthropogenic CH_4 emission.

Thus, mitigation of CH_4 emission is required to be speed up. CH_4 in paddy soil is emanated by the activities of anaerobic bacteria which is called methane producer through reduction of CO_2 or decomposition of acetic acid, and it is transported to atmosphere through soil or paddy water surface. It is effective to control methane emission from rice paddy that period is prolonged on intermittent irrigation drainage; composted rice straw is incorporated as fertilizer instead of flesh one, or other. However, empirical approach of these kinds of experiments had not been sufficient because such a kind of experiment required significant times and efforts. In this study, we conducted demonstrative experiments to verify the effects of water management method differences in order to reduce CH_4 emission from rice paddy at 9 experimental sites in 8 prefectures.

In this, we used new gas analyzer which can measure CH_4, CO_2 and N_2O at once developed by National Institute for Agro-Environmental Sciences (NIAES), Japan. In this report, we show the preliminary results in first year of this study. 'Nakaboshi' (mid-season-drainage) is one of cultivation methods in rice paddy that surface water in paddy field is once drained for about 10 days and the field is maintained like upland field to give adequate stress to rice plant for better harvest qualities and yields. Our targeted evaluation was dependencies of nakaboshi periods lengths and Nakaboshi periods to CH_4 emission reduction amounts for total cultivation periods within harvest yield maintained.

The longer length of Nakaboshi period was prolonged, the lesser emission amounts of CH_4 decreased even after when Nakaboshi period lasted, as a whole. In some soil types, for example in Kagoshima, exceptional phenomena of that significant high emission were observed at a later stage of cultivation season (around the end of August). Adjusting of Nakaboshi periods did not make effective performance in such soil types. In some cases, emission increase of N_2O was found during Nakaboshi period which was closed to the condition of upland field.