silicate fertilizers were decided to correspond to 200g m^{-2} of CS, which is conventional application rate in Japan. All of three silicate fertilizer treatments can supply same amount of 0.5 HCl soluble silicate.

Number of tiller was measured periodically during the growing season. Rice yield and yield components were determined at harvest time. Then concentration of nitrogen and silicate in rice plant was measured.

Results and Discussion: Number of tiller of organically managed rice was lower than that of rice with conventional culture. Brown rice yield of organically managed rice reduced. Compared with CON, silicate fertilizer (CS, SG, PSI) increased percentages of ripened grain and brown rice yield by 4 to 8%. Silicate fertilizer application did not increased nitrogen uptake, but concentration of silicate in rice plant in silicate fertilizer plots was higher than that in CON plots. These results suggest that increase of silicate uptake enhanced photosynthetic ability and rice ripening. From these results, it is suggested that silicate fertilizer application can increase rice yield in organic farming system.

Aquatic Biota in Winter Flooded Paddy Field with Organic Farming -Case Study in Field Science Center, Tohoku University, Japan-

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In Japan, more than a half of natural wetlands have been lost in the last century primarily due to land reclamation by drainge (Geographical Survey Institute, 2000). On the other hands, waterfowl, for example white-fronted goose (*Anser albifrons* Scopoli) migrating to Japan are increasing. Waterfowl habitat environments are getting worse and may increase risks of food shortage and disease infection.

Winter flooded rice fields have potential as alternative wetlands for waterfowl. Winter flooding is conducted worldwide, for example, in Sichuan province in China (Qiu, 1962), California in the United States (Day and Colwell, 1998), Ebro delta in Spain (Serra *et al.*, 2007), Cheonsu bay in South Korea, Oosaki City, Sado and Toyooka City are famous for scarce water bird conservation using winter flooded rice fields, in Japan. Winter flooding is often conducted in combination with organic farming and is expected to increase biodiversity of aquatic life. We researched the effects of winter-flooded and organic farming on the aquatic biota in paddy field.

Material and Methods

The field experiment was conducted in 2009 and 2010 in the paddy fields of the Field Science Center, Tohoku University. In 2009, treatments were organic farming without winter flooding (OF plot) and conventional farming (CF plot) with chemical fertilizers and pesticides. Organic farming is characterized by no use of chemical fertilizer and pesticides and use of organic fertilizer. In 2010, the OF plots were shifted to organic farming with winter flooding (WF plot). These experiments were conducted with three replications with area of 900 to 1200 m^2.

To determine the data on aquatic animal density, aquatic animals were collected using a square sampler (1×1m) and a sample net (mesh size: 2 mm) with three times in each year.

Results and Discussion

A total of 15,867 individuals and 32 taxa of aquatic animals were found in all fields in two years. The density and taxa number of aquatic animals were higher in OF and WF fields than CF fields throughout the growing season, but the biodiversity index of OF and WF plots were sometimes lower than CF plots, mainly due to large number of Chironomidae larvae in OF and WF plots.

The densities of 18 taxa were higher in OF or WF plots than in CF plots. The density of only one taxon was higher in CF plot. The possible reasons for the aquatic biota richness in the fields with organic and/or winter-flooded farming are no use of insecticide (Mesleard *et al.*, 2005), Lemnaceae richness due to no use of herbicide that increase hiding space for some Pyralidae, and applyication of organic fertilizer supplying nutrients to Chironomidae and Culicidae (Ikeshoji *et al.*, 1980; Simpson *et al.*, 1994).

Diurnal pattern of nitrous oxide emissions from a sewage-enriched river: references to IPCC indirect emission factor

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There remains considerable uncertainty in the magnitude of indirect nitrous oxide (N_2O) emitted from streams or rivers by the Intergovernmental Panel on Climate Change's (IPCC) methodology. The uncertainty is partially due to a lack of onsite data and great variability of N_2O production, especially on high temporal pattern. Therefore, we measured the N_2O emission rates, concentrations of dissolved N_2O, and potential controlling variables on an hourly basis over one site in a typical sewage enriched river in the Taihu Lake region, China. Results showed that distinct diurnal patterns were observed in N_2O emission, concentrations of dissolved N_2O, and river physicals and chemicals during a 72 h period. N_2O emission and dissolved N_2O saturation averaged 56.1μg N_2O-N m^{-2} h^{-1} (ranged from 41.1 to 87.7μg N_2O-N m^{-2} h^{-1}) and 813% (ranged from 597% to 1 372%), respectively. Correlative analysis indicate that dissolved N_2O, pH, DO, NH_4^+, SO_4^{2-}, air temperature, and water temperature operate as important controls on N_2O production, while TN, Cl^-, DOC, and NO_3^- seems less important. The patterns of N_2O production may contribute to coupled nitrification-denitrification processes and the rates might be greater during day than those at night. The results suggested the compounds of salinity such as SO_4^{2-} concentration would expect to be a more reliable factor than salinity in accounting for N_2O variation in aquatic systems.

To include individually explicit N_2O emission in rivers or river sections, we suggest a more constrained emission factor considering river length (EFL):

$$\text{EFL} = \frac{N_2O}{Nr \times L}$$

where EFL is the mean emission factor of N_2O from river surface water per unit length of river (kg N_2O-N kg inorganic-N km^{-1}); Nr is inorganic N inputs (kg N yr^{-1}); L is river length (km); Using the EFL metholodogy, we calculated that 0.28 Tg yr^{-1} of reactive N inputs to N_2O-N in river networks globally, lower than the results of the IPCC methodology and a global river network model.

Our resulting emission factor was 0.24%, very close to the revised IPCC value of 0.25% .Thus our study strongly support the recent revision of EF5-r from 0.75% to 0.25%. Although the revised value of EF5-r agrees well with our results, our EFL methodology is more applicable in reducing uncertainty and simplifying calculation and validation.