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Continuous field investigation assessing nitrogen and phosphorus emission from irrigated paddy field

Kanami Kogure (1,2), Masaatsu Aichi (2), and Matthias Zessner (1)

(1) Institute for Water Quality, Resources and Waste Management, Vienna University of Technology, Vienna, Austria, (2) Energy and Environment Laboratory, Graduate School of Frontier Sciences, The University of Tokyo, Japan

In order to maintain good river environment, it is very important to understand and to control nutrient behavior such as Nitrogen and Phosphorus. Other than urban and industrial waste water, nutrient emission from agricultural activity is dominant pollution source into the river system. Rice is one of the staple products of Asia and paddy field occupies large areas in Asian countries. Rice is also widely cultivated in Japan. Paddy field occupies large areas in Japanese river basin areas. While paddy field can deteriorate river water quality by discharging fertilizer, it is also suggested that paddy field has water purification function.
Regarding to nutrient emission from paddy field, existing monitored data are insufficient so as to discuss quantitatively seasonal change of material behavior including flooding season and dry season and to evaluate year round comprehensive impact from paddy field to the river system. These are not sufficient data for discussion of material flow and emission impact quantitatively as well as qualitatively.
We have carried out field investigation in paddy fields in middle reach of the Tone River Basin. The aim of the survey is understanding of water and nutrient balance in paddy field. In order to understand emission impact from paddy field to river system, all input and output flow are measured to calculate nutrient balance in paddy field. Therefore we observed quantity of water flow into/from paddy field, water quality change of inflow and outflow during flooding season. We set focus on a monitoring paddy field IM, and monitored continuously water and nutrient behavior. By measuring water quality and flow rate of inflow, outflow, infiltrating water, ground water and depth of flooding water, we tried to quantitatively understand N and P cycle around paddy field including seasonal tendency, change accompanying with rainy events and occurred according to agricultural events like fertilization.
At the beginning of flooding season, we took measurement two or three times per day. When water quality change got stable two weeks after transplanting, measurement was took place every second or third day. When it rained, we sampled rain water and measured change in inflow and out flow. Evaporation and transpiration were also observed by evaporating dish and bucket with rice plant.
Obtained data shows that dissolved nitrogen concentration is lower in discharging water from paddy field than inflowing water into the field. Additionally N load discharging from paddy field is lower than N load inflowing into paddy field. It showed tendency that similar P concentration both in inflowing and discharging water but discharging P load is less than inflowing P load.
N and P surplus is calculated by difference between input and output. Surplus shows minus in IM as N and P content in rice product. However N and P cycle roughly balance under consideration of irrigation water as nutrient source. Load difference between inflow and outflow agreed with imbalance value in surplus calculation. It suggests that irrigation water is one of nutrient sources in rice cultivation and potential to contribute effective and sustainable agriculture.