

Effects of introduction of cyclic irrigation system on mass balances of SS and T-P in Lake Inbanuma, Chiba, Japan

*Tomijiro Kubota¹

1. National Agriculture and Food Research Organization, Institute for Rural Engineering

Introduction

The introduction of cyclic irrigation has been advanced since 2010 in the Lake Inbanuma as part of the update project of the irrigation facilities. In the present study, mass balances of SS and T-P were examined before and after the introduction of the cyclic irrigation.

Materials and methods

The irrigation block where the cyclic irrigation began in 2015 was selected as the investigation site, and the investigation was executed to the irrigation period in 2014 and 2015. The hydrological and water quality investigation was executed at ① division works of irrigation canal and ② drainage pumping station. Water samples were taken at the two points and the TOC, SS, TN, NO₃-N, NO₂-N, NH₄-N, TP, and PO₄-P were analyzed in the regular investigation executed about once a month. Besides regular investigation, water samples were taken once a day (8:00AM or noon) by the automatic water sampler and SS and T-P were analysed. The turbidity and water level were measured every ten minutes by using data loggers at same sites. The turbidity data were converted into the concentration of SS and TP by using the regression curve. The quantity of water intaken from the lake and drainage to the lake were obtained from the records of the facility manager.

Result and discussion

The inflow and outflow loads and the balance were calculated before and after the introduction of the cyclic irrigation. In 2014, before the start of cyclic irrigation, both the outflow loads of SS and T-P were small to compare with those inflow loads. The amount of accumulation of SS and T-P were about 1.3t and 2kg respectively when having no rainfall in the irrigation block. On the other hand, the outflow of SS and T-P were about 3.5t/day and 20kg/day respectively in rainy days. If 2015 year is compared to 2014, it had increased in T-P though the load of irrigation water each day at no rainfall periods and it had not been change in SS though an accurate comparison is difficult according to the missing value. However, after the cyclic irrigation had been started, the amount of the outflow loads had decreased greatly like 35% in SS and 38% in T-P. The balance of the outflow loads during the irrigation periods of 2014 were -470kg/day in SS, which meant the purification type, while +2.6kg/day in T-P. as a result, it was found that the introduction of cyclic irrigation system had worked for water purification in SS and T-P effectively.

Keywords: cyclic irrigation system, water pollution, suspended solid, total phosphorus