

Construction of New Irrigation and Drainage Systems Aimed at Pollution Emission Reduction in Rice-based Cropping Systems, South of China

Dong Bin, Mao Zhi and Cui Yuanlai

(State Key Laboratory of Water Resources and Hydropower Engineering Science, Wuhan University, Wuhan City 430072 China; E-mail: dongbin@whu.edu.cn)

ABSTRACT Traditional irrigation and drainage systems are designed and constructed to cope with drought, waterlogging and salinity, and the corresponding engineering measures are irrigation channel system and drainage ditch system. These traditional systems regulated soil moisture content on the basis of water quantity only, without considering the issues of water quality and water environment improvement. However, the overuse of irrigation water and chemical fertilizer and their inefficient use in rice production of China have resulted in serious non-point source pollution, which has become the main contribution of water eutrophication. Aimed at pollution emission reduction in rice-based cropping system, south of China, the technological concept, “Four Lines of Defence”, which consist of four components, i.e. on-farm water saving irrigation (WSI), field drainage ditches, constructed wetlands (irrigation ponds) and ecological trunk channels has been proposed and applied in different irrigation districts to study the treatment effects.

This paper is about the correlative theory and practical application of new irrigation and drainage systems in south of China and it includes four parts. The first part is an introduction of “Four Lines of Defence” and its construction principles of each line; the second part is a review of the current state of new irrigation and drainage system construction in south of China and the experimental results on effect and removal law to nitrogen and phosphorus at different scales of channels and constructed wetlands. The third part is a summary of the design and operation management of this new system, including efficient use of water and fertilizer, ecological channel forms and pond wetlands construction, as well as application conditions, which provide the technology support and reference to the new system construction. The last part is the discussion and conclusions.

Keywords Four Lines of defence Non-point source pollution Irrigation and drainage Paddy rice Nitrogen and phosphorus Pond wetland Ecological channel