Water-saving irrigation practices reduces greenhouse gas emission intensity in double rice-cropping systems in the Southern China

zhongdu chen[1] and fu chen[2]

[1]China National Rice Research Institute
[2]China Agricultural University

May 5, 2020

Abstract

The development of water-saving irrigation strategies is crucial because of the increasing demand on water resources. There is a need to improve our understanding of water use strategies that save water and reduce greenhouse gas (GHG) emissions without causing yield losses in paddy soil. The current study was carried out to examine the net global warming potential (NGWP) and net greenhouse gas intensity (NGHGI) based on net GHG emissions calculations, including soil organic carbon (SOC) change and indirect emissions (IE). The experiment was carried out under flood irrigation (FI), shallow irrigation (SI), and intermittent irrigation (II) conditions. The results showed that average double rice yields under SI and II were significantly higher than those under FI by 4.5% and 12.2%, respectively, but without significantly difference at annual mean SOC sequestration rate (0-30 cm) over 2 years among the three irrigation regimes. Compared to FI, the annual methane (CH4) emissions decreased by 34% and 45% under SI and II irrigation regimes, respectively. In contrast, nitrous oxide (N2O) emissions under the SI and II increased by 27% and 50%, respectively. IE were nearly the same among the three irrigation regimes, with fertilizer use as the top contributor, and followed the order FI > SI > II. The NGWP and NGHGI respectively decreased by 40% and 45% under II compared to those under FI. In conclusion, water-saving irrigation strategies, especially the II practice, are an effective choice that can simultaneously achieve great success in saving water, increasing rice production, and reducing GHG emissions.

Hosted file

`Manuscript.docx` available at https://authorea.com/users/303504/articles/434877-water-saving-irrigation-practices-reduces-greenhouse-gas-emission-intensity-in-double-rice-cropping-systems-in-the-southern-china

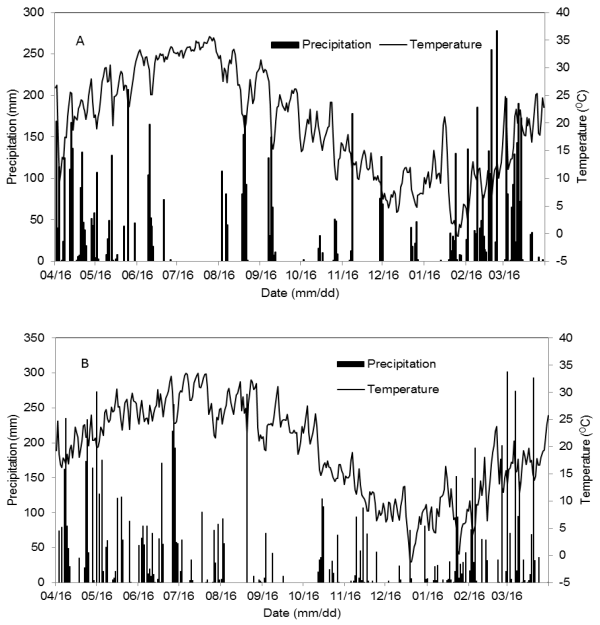

Fig. 1. Daily means air temperature and precipitation for (A) April 2013-April 2014 and (B) April 2014-April 2015 at the experimental site.