Center for Organic Agriculture Promotion and Studies

# Water-saving irrigated rice cultivation promotes rice plant growth and improves farmers' income

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## Introduction

- Rice cultivation contributes to a large amount of methane gas ($CH_4$) emissions through the decomposition of organic matter by microorganisms under anaerobic conditions.
- Water-saving irrigation technologies can increase the oxygen content in the soil and thus reduce the formation of $CH_4$ gas.
- Recognizing the benefits of water-saving irrigation technologies for rice productivity and farmers' income can motivate farmers to adopt the technologies in practice.
- The project was conducted in a large area to assess the impact of water-saving irrigation technologies on rice crop growth and $CH_4$ emission reduction, as well as the benefits to farmers.

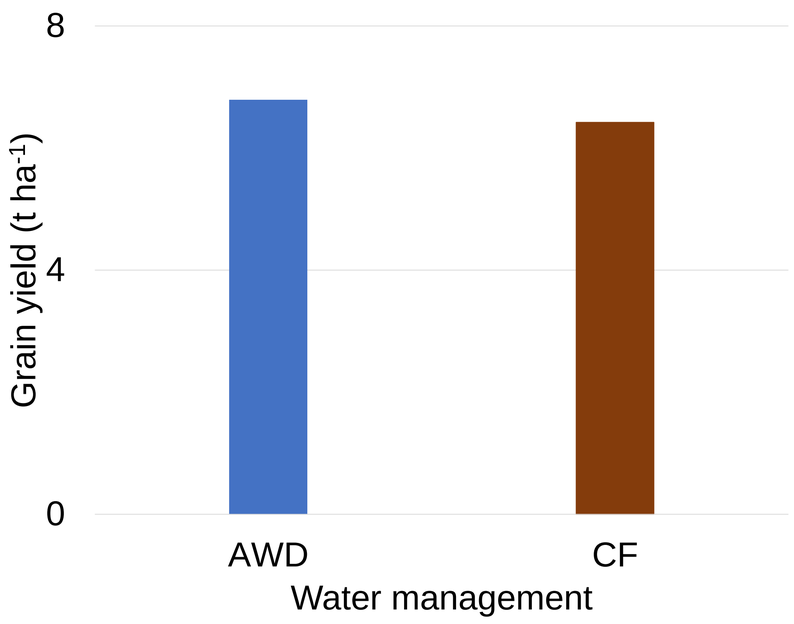
## Conclusion and Outlook

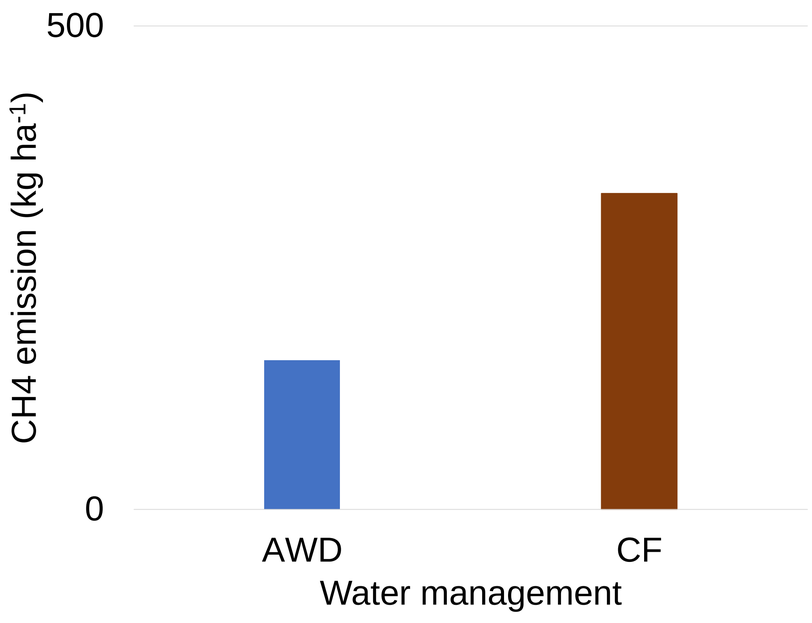
- Water-saving irrigation leads to vigorous rice plants, higher plant biomass, a larger root system, less pests and diseases, and greater resistance to lodging, resulting in higher rice productivity, especially during the monsoon season and typhoons.
- Water-saving irrigation increases biodiversity, mainly because the number of earthworms in the soil increases significantly.
- Water-saving irrigation can reduce up to 55% of $CH_4$ emissions in rice fields, which can be converted into C credits. Irrigation frequency can be reduced up to 3 times per season..
- Water-saving irrigation can save labor and costs for irrigation while generating carbon credits that increase farmers' income.

## Results and Discussion

| Water management | Plant height (cm) | Tiller number $m^{-2}$ | LAI ($m^2$ $m^{-2}$) | Dry biomass (g $m^{-2}$) | Lodging rate (%) |
|---|---|---|---|---|---|
| AWD | 100.4 | 567.0 | 5.1 | 545.1 | 9.2 |
| CF | 100.6 | 525.3 | 4.9 | 498.6 | 26.7 |

*AWD – Alternate wetting and drying; CF- Continuous flooding*




- AWD reduced the frequency of irrigation, while rice growth is favorable. The rice plants in AWD grew well, had higher biomass, less disease infestation and were highly resistant to lodging, so they were less affected by the monsoon at the end of the season than in CF, resulting in a higher grain yield (5.7% on average).
- Alternate wetting and drying (AWD) significantly reduced daily $CH_4$ emissions compared to CF, especially during the productive tillering period. AWD reduced seasonal $CH_4$ emissions by up to 55% in transplanted rice and by 50% in seeded rice compared to CF.
- Therefore, AWD should be widely used in rice cultivation to save water, reduce GHG emissions and generate carbon credits for farmers, which could promote the implementation of AWD.

Earthworm in AWD field

Rice under AWD treatment


Rice under CF treatment

## Materials and Methods

The project was conducted in large fields and in different regions with alternating wetting and drying (AWD) and continuous flooding (CF), both in direct seeded rice and in transplanted rice with different rice varieties. In the AWD treatment, water was only applied when the water level was 15 cm below the soil surface. In the CF treatment, a continuous layer of water was maintained above the soil until about 2 weeks before harvest.

$CH_4$ gas samples were collected every 7 days using the methods mentioned by Minamikawa et al. (2015) and analyzed using a GC instrument. Daily $CH_4$ emission, seasonal $CH_4$ emission and seasonal $CO_2$ emission were calculated according to the methods of Minamikawa et al. (2015). Plant growth, disease infestation and lodging rates as well as productivity parameters were recorded.