

# The Effect of Iron-Rich Hot Spring Water on Reduction in Methane Emissions from Rice Cultivation

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## Introduction

### Background

- 44% of Japan's total methane emissions is from **rice paddies**
- Methane is **27.0±11 times more potent** than carbon dioxide

### Key Components of Our Research

- Methanogens produce methane within rice paddies
- **Iron interferes with methanogenesis** as a competitive electron acceptor

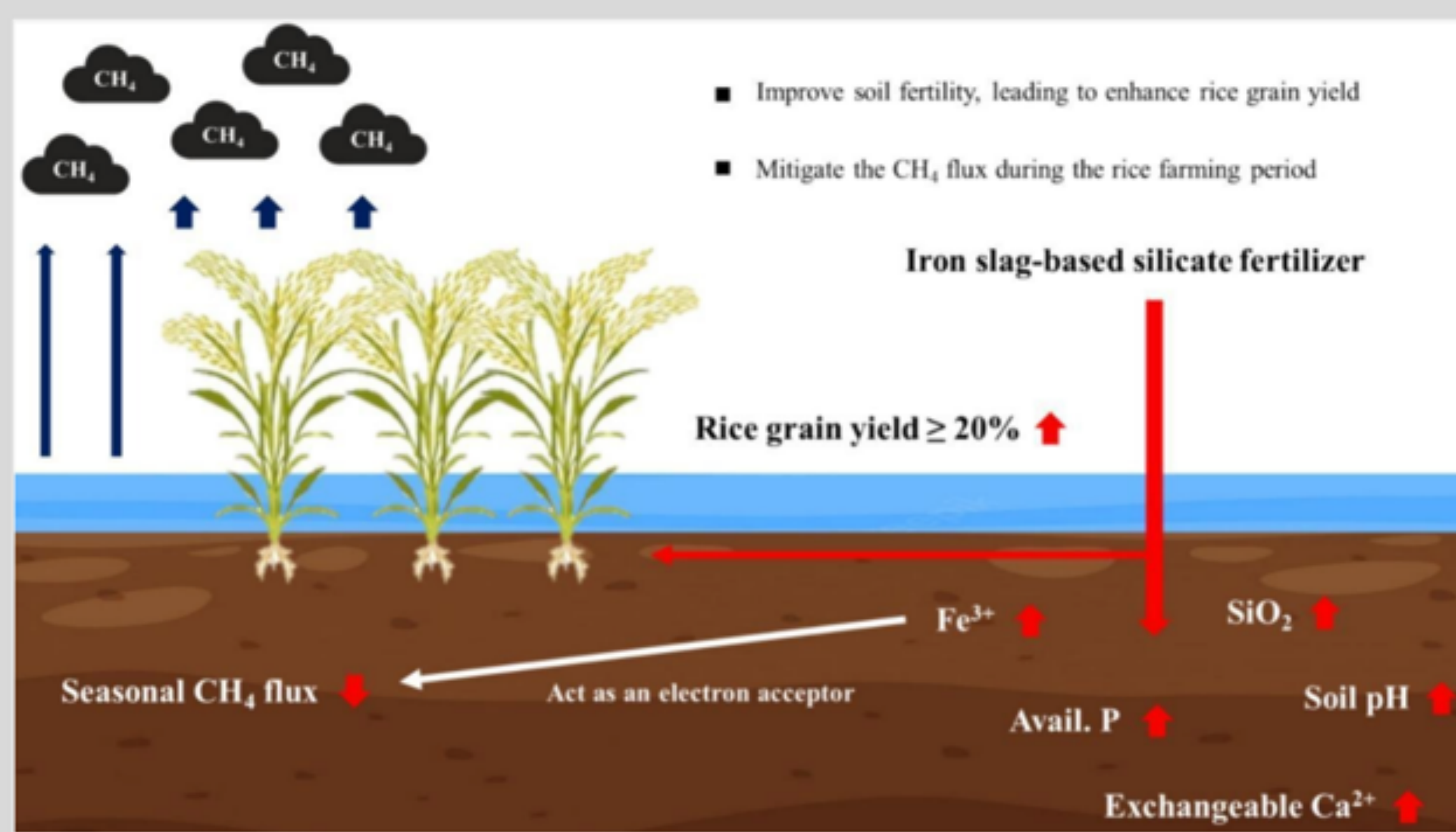


Figure 1. The effect of iron on methane emissions and rice cultivation

## Objective

To investigate the effects of iron-rich hot spring water on methane emissions from rice paddies to develop a more sustainable rice cultivation method.

## Methodology

- Group 1: Substitute tap water for Hot spring water from Yokoya
- Group 2: Tap water Onsen (Nagano)
- Sampling once a week using "The closed chamber method"

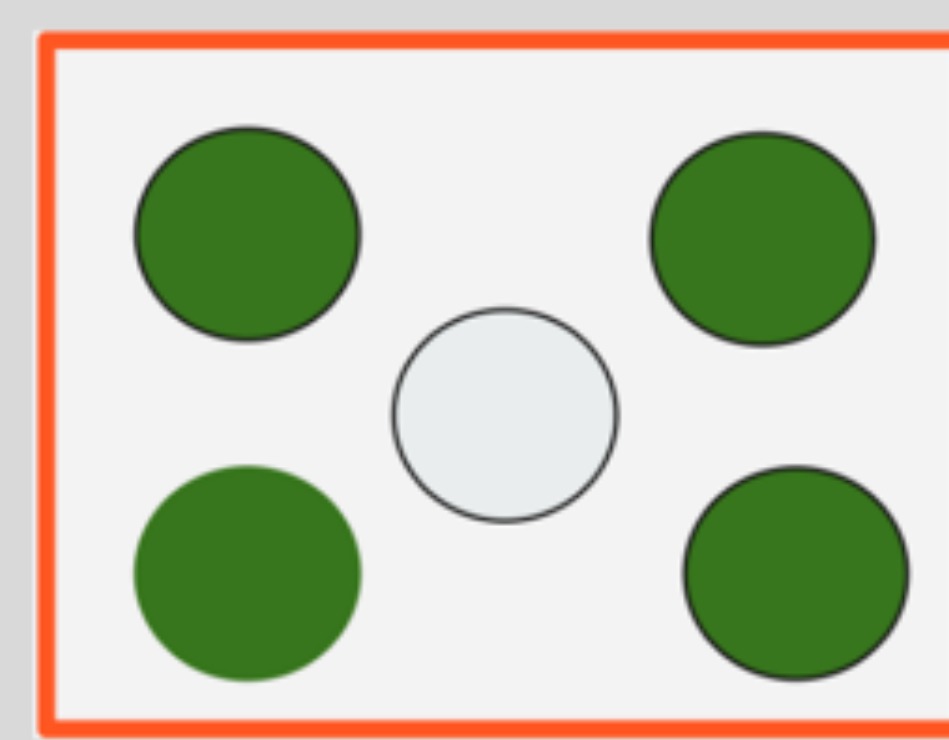


Figure 2. Sample groups

Pots with rice  
Pots without rice

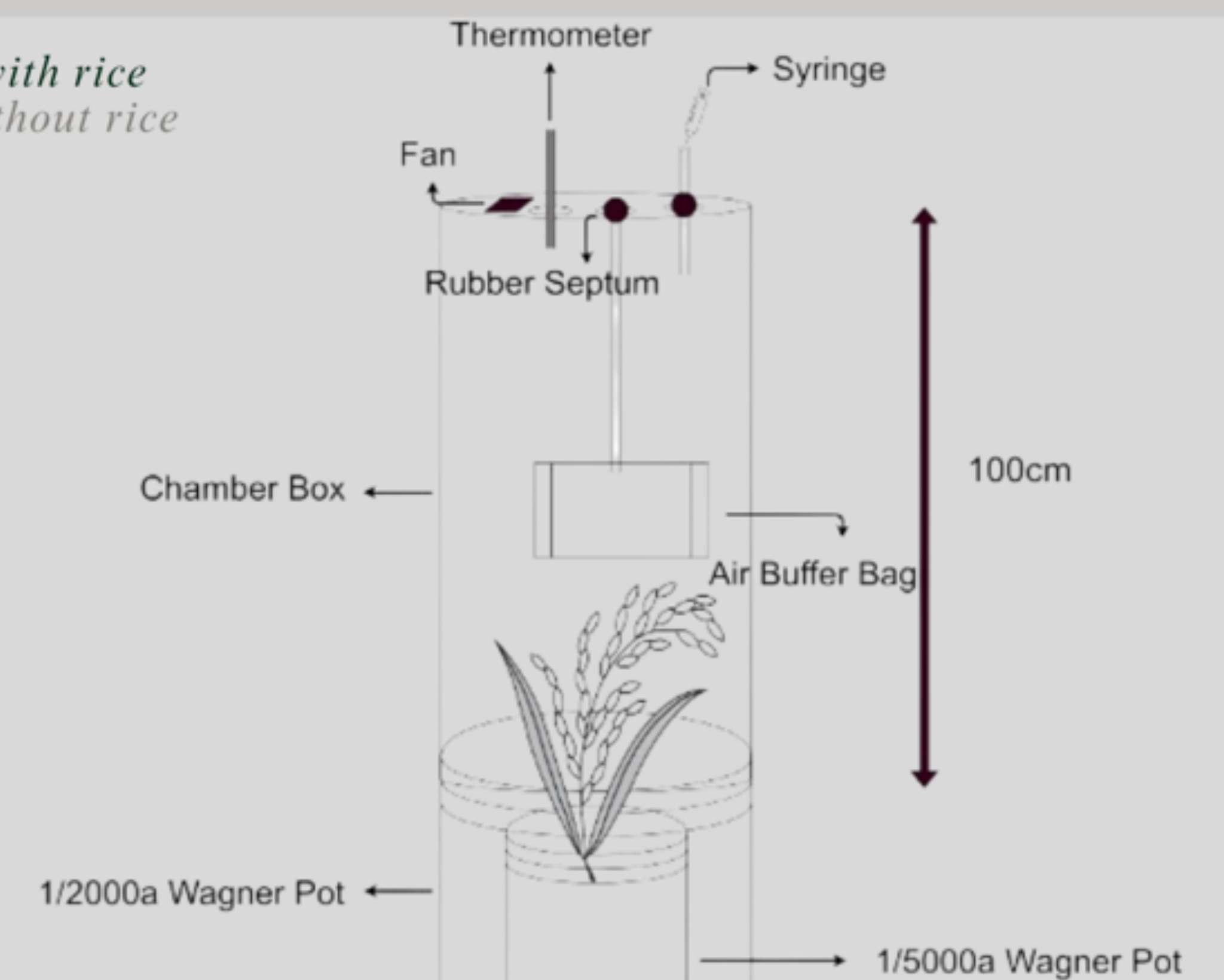
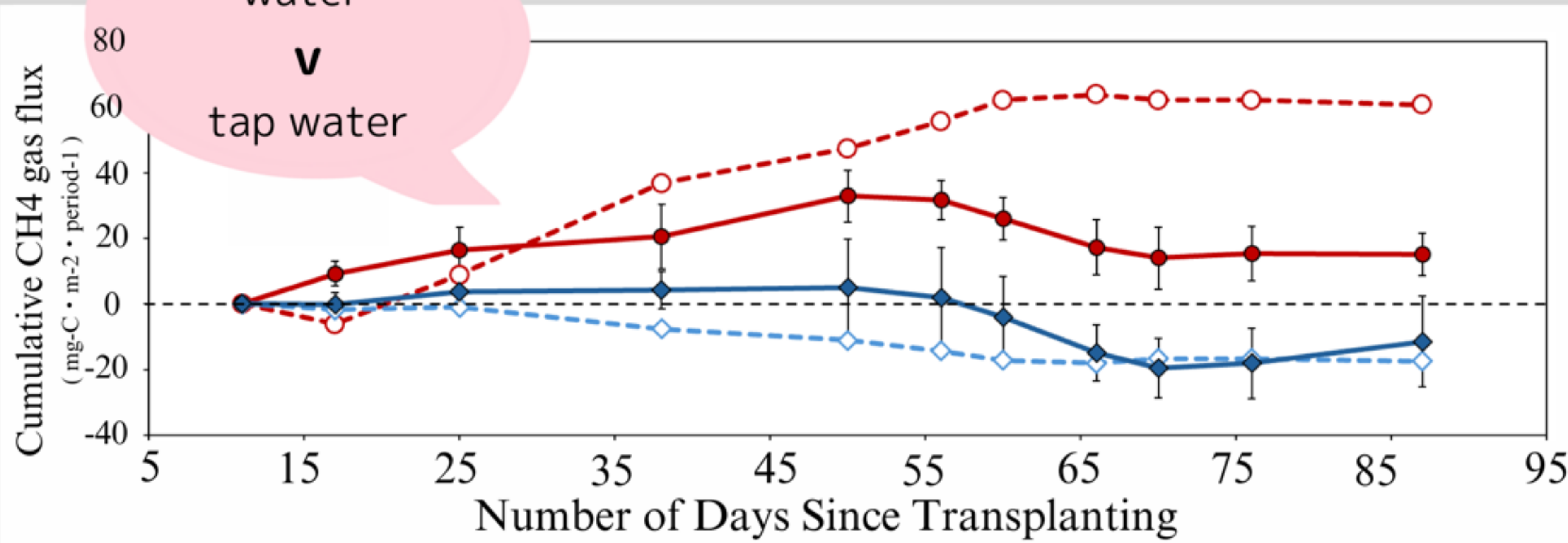


Figure 3. Setup for methane gas sampling

## Results and Discussion

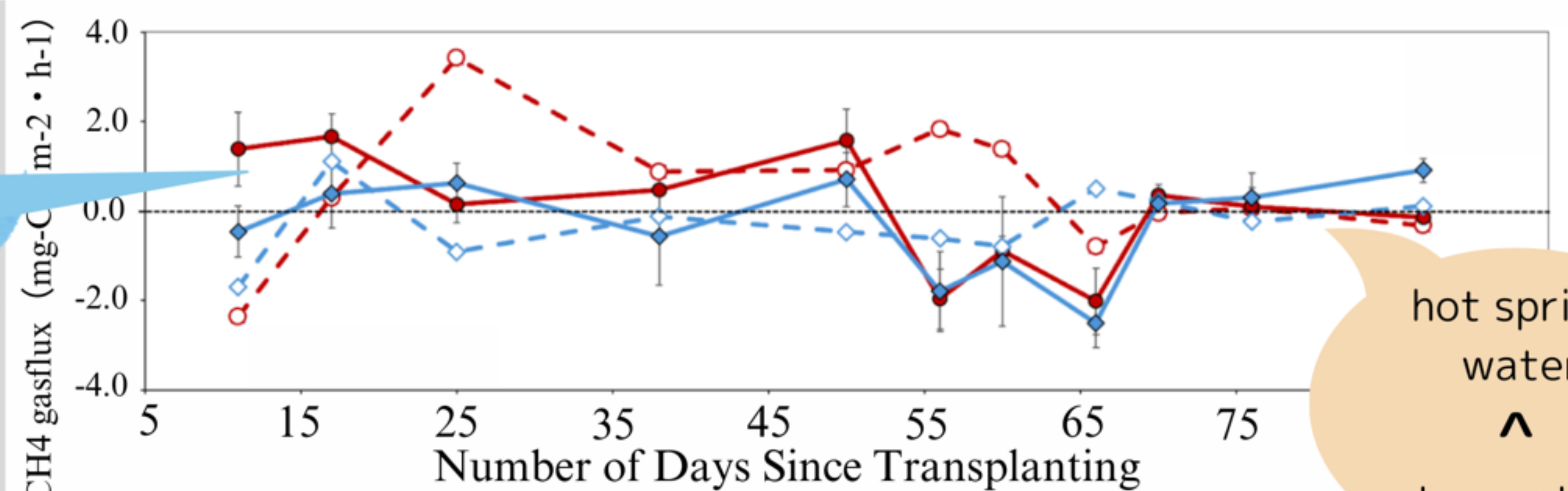


- Cumulative methane flux was **higher** with hot spring water throughout the entire season
- Methane flux from hot spring water **decreased** while tap water **increased slightly**

● Hot spring water ● Tap water

Hot spring water containing iron could potentially lead to a decrease in methane emissions

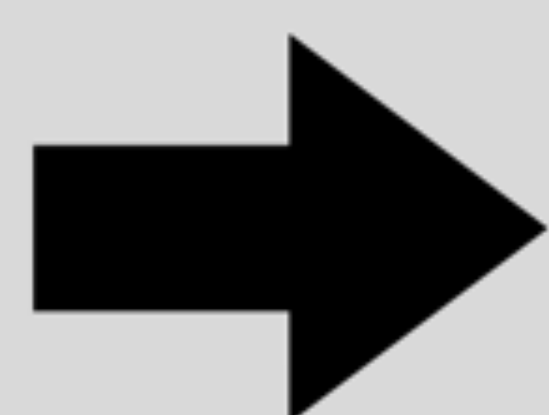
hot spring water v tap water



hot spring water ^ tap water

## Conclusion

Iron-rich hot spring water is worth exploring as a method to reduce methane emissions in rice cultivation.



- Reduction of methane emissions
- Geothermal utilization
- Connects tourism and agricultural industries

## Future works

- Investigate the mechanisms that cause an increase in methane flux when hot spring water is applied to soil without rice
- Experiment other types of hot spring waters and groundwaters