

# Effect of intercropping dry rice with spinach and turnip on rice yield and weed suppression

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# Intercropping dryland rice with spinach and turnip did not improve land use efficiency or reduce weed pressure



## INTRODUCTION

- Dryland rice cultivation -- an alternative to flooded rice paddies -- can reduce water use and methane emissions.
- Weed management is a particular challenge in dryland rice production.
- Intercropping has been used to suppress weeds and improve land use efficiency.

## OBJECTIVES

- Compare rice and vegetable (spinach and turnip) monocultures and mixtures in terms of:
  - Yield;
  - Land use efficiency; and
  - Weed pressure.

## METHODS

- Randomized Complete Block Design with five replicates and three treatments:
  - Rice monoculture
  - Spinach and turnip monocultures in succession
  - 1:1 mixture of rice and spinach/turnip succession
- Three week-old rice transplants planted on June 5<sup>th</sup>, 2023
- Two week-old spinach transplants on June 5<sup>th</sup>, 2023
- Turnip direct-seeded (3-4 seeds/hole) on July 7<sup>th</sup>, 2023, after spinach harvest
- All plots hand weeded 1, 2, and 6 weeks after transplanting.
- Dry weight of rice grain recorded after hand harvesting, drying, threshing, and winnowing
- Fresh weight of spinach and turnip recorded at harvest
- Mixture to monoculture efficiency comparisons
  - Land equivalence ratio
  - Relative land output
- Mixed effects model and one-sample Student's t-test used to analyze weed cover data and land use efficiency, respectively

## RESULTS

- In average, the yield of rice obtained from rice monoculture was ~61% higher, than from mixture.
- Weed cover did not differ between treatments during the first two weeks after transplanting, when the vegetable crop was spinach.
- Weed cover was lower in the turnip monoculture than the rice and turnip mixture six weeks after transplanting (Fig. 1).

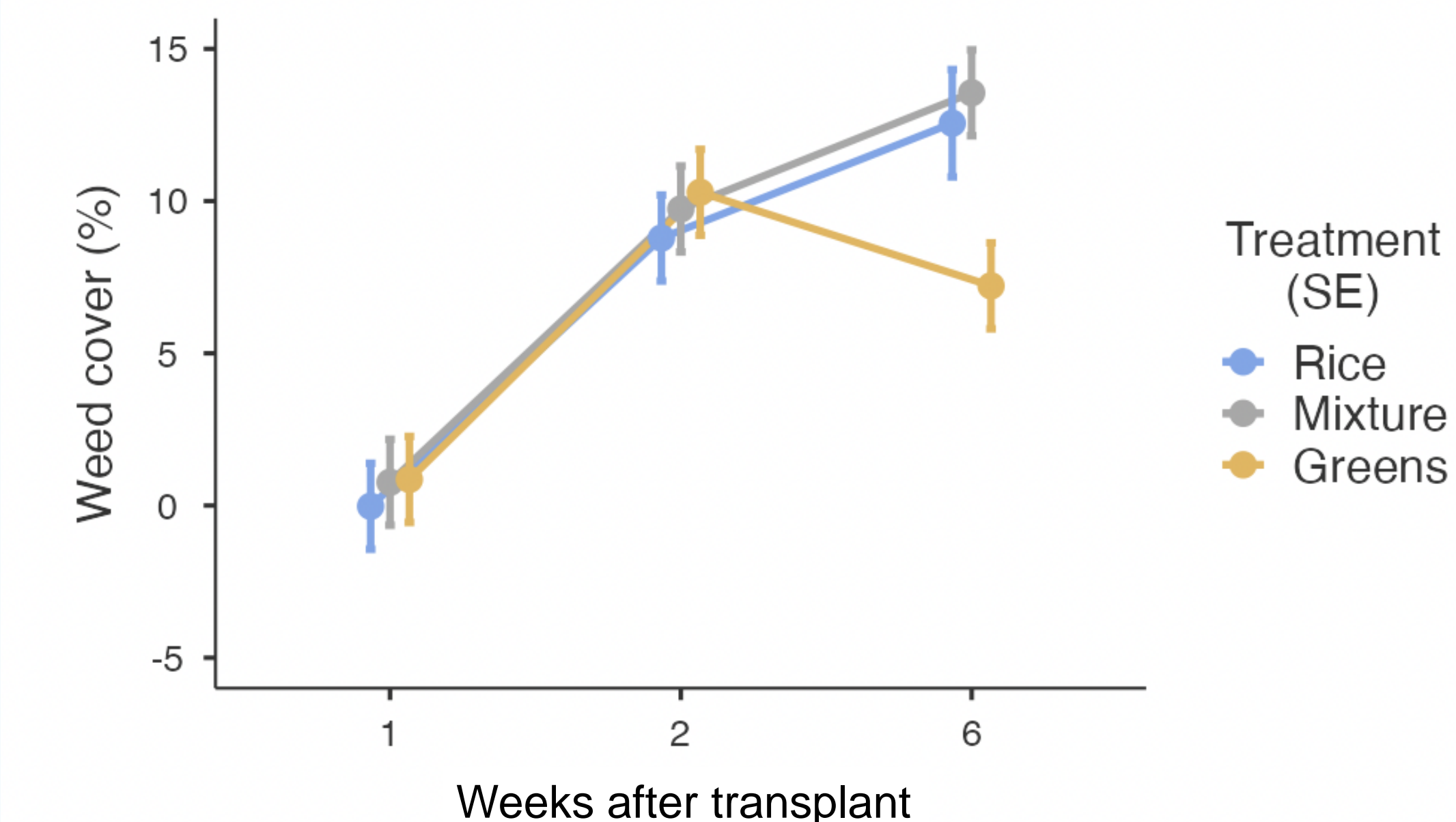


Figure 1. Weed cover removed by hand weeding 1, 2, and 6 weeks after transplanting rice. Error bars denote standard error around means.

- Neither LER nor RLO differed significantly from 1 (Fig. 2), indicating no land use efficiency advantage to the mixed plantings.

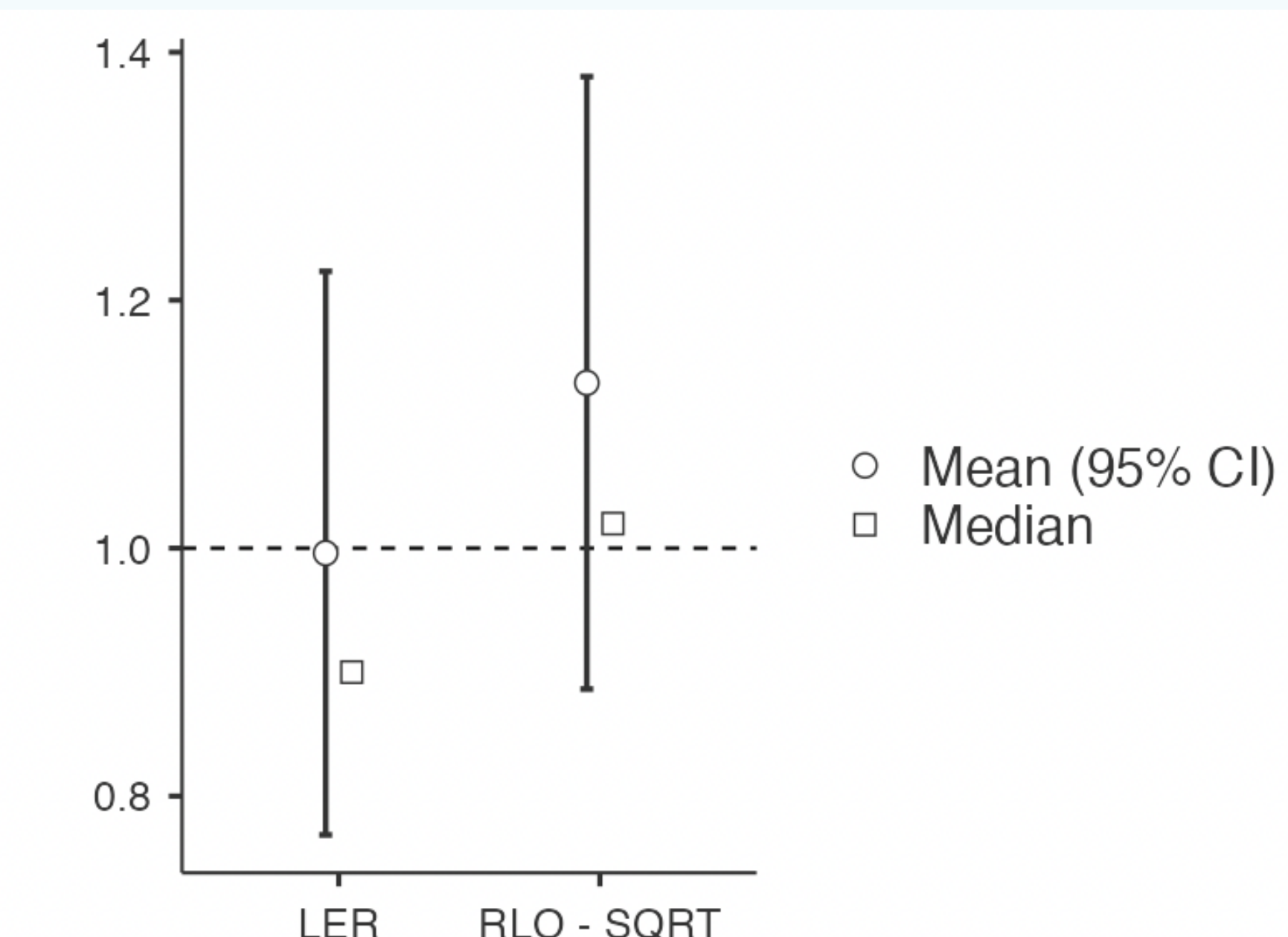


Figure 2. Mixture productivity relative to monocultures, according to the Land Equivalence Ratio (LER) and Square Root transformed Relative Land Output (RLO). Error bars denote 95% confidence interval. Dashed line shows value of one, where mixture and monoculture land use efficiency is equivalent.

## DISCUSSION

- Mixed plantings of rice with spinach followed by turnip had no higher land use efficiency than monocultures.
- Intercropping rice with spinach followed by turnip did not reduce weed infestation.
- Weed pressure was lower in turnip monoculture than in the rice and turnip mixture

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