

Stem-nodulating legumes as relay-cropped or intercropped green manures for lowland rice

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Abstract

Green manures have consistently shown positive contributions to tropical rice (*Oryza sativa*) production, but will be produced on a substantial scale only when they fit into appropriate niches in the cropping system. We examined the effects of intercropped and relay-cropped *Sesbania rostrata* and *Aeschynomene afraspera* as green manures (GM) on the companion and succeeding rice crops for three consecutive seasons in an environment where two rice crops are grown each year. Pregerminated seeds of the legumes were sown between rice rows immediately after transplanting or at the ripening stage of the rice crops. They also were broadcast at the ripening stage of hill-planted rice. The effects of the GM on rice, with or without added urea, were compared with the effects of varying urea-N rates in the absence of the GM.

Surface water was detrimental to pregerminated GM seeds. *A. afraspera* was more damaged by flooding because it emerged 4 d later than *S. rostrata*. Green manure effects on either the companion or succeeding rice crops varied as a function of GM crop stand and biomass production. Green manure biomass yield was greater with broadcasting than with row seeding.

Green manure relayed into dry-season rice grew vigorously and increased the grain yield of the succeeding rice crop equivalent to the application of 30 kg urea-N/ha. The growth of GM relayed into wet-season rice was suppressed by the short photoperiod in that season. A urea-N topdress application did not improve the effect of GM on rice yield. The effect of relayed GM on the succeeding wet-season rice crop also was equivalent to or exceeded the effect of 60 kg urea-N/ha. The results indicated the potential feasibility of relaying GM in a rice cropping system when the turnaround time is too short to raise a preceding monocrop GM.

Keywords: *Sesbania rostrata*; *Aeschynomene afraspera*; *Oryza sativa*; Nitrogen fixation

1. Introduction

A critical issue in expanding the use of GM on tropical ricelands is the availability of GM production systems at the farm level that are practical and economically feasible (Garrity and Flinn, 1988). Green manure can compete for time, labor, land, and water (Rosegrant and Roumasset, 1988). Green manure crops must fit into the farming system without sacrificing land or time available for growing food or

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