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Management of *Sesbania rostrata* green manure crops grown prior to rainfed lowland rice on sandy soils

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Abstract

Extremely infertile sandy soils and erratic rainfall are major constraints to rainfed lowland rice yields in northeast Thailand. Response to inorganic fertilizers is low and variable. Farmers rely on farmyard manure and leaf litter from trees and shrubs to stimulate yield responses in rice. Field experiments on an Aeric Paleaquult soil were conducted in two successive wet seasons to develop production systems for *Sesbania rostrata* as a green manure (GM) crop prior to lowland rice. In the first experiment sesbania was grown at seeding rates of 15, 30 and 60 kg ha^{-1} with or without P application at 22 kg/ha. Sesbania was soil-incorporated at 46 or 61 days after seeding (DAS). Biomass production and accumulation and their effects on rice were determined in comparison with the effect of zero or 50 kg ha^{-1} of inorganic N. The second experiment evaluated the effect of 2, 14, and 21 day intervals between incorporation of 50 day old sesbania and rice transplanting. P application, and increased growth duration (61 vs 46 DAS), significantly improved sesbania total dry matter yield (TDMY) and nutrient accumulation. The effect of seeding rate on yield was positive only when P was applied, unless incorporation was delayed to 61 days. P application to sesbania and delayed sesbania incorporation significantly increased rice grain and TDM yields. GM seeding rates did not significantly affect rice yield or TDMY. GM effects compared favorably to inorganic N. Rice yield response to inorganic N application was significant, but not to unfertilized, incorporated weeds.

In the second trial GM (2.26 t ha^{-1} dry weight) contributed 76 kg N ha^{-1} to the rice crop and significantly increased grain yield and TDMY. Differences in the interval between sesbania incorporation and rice transplantation did not affect crop performance. Products of GM decomposition tended to depress seedling vigour and survival in the 2 d interval treatment but grain yield was still 159% higher than the no-GM control after replanting the affected rice hills. The optimum incorporation-to-transplanting interval at the site is about 5–7 days to avoid adverse effects of decomposition.

Keywords: Sesbania rostrata; Green manure; Phosphorus deficiency; Seeding rate; Rainfed rice; Incorporation time

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