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System of Rice Intensification (SRI) in Southeastern Lowlands of Amazonia – A Viable Alternative for Smallholder Irrigated Rice Production?

Christoph Gehring[1], Emanoel Gomes Moura[1], Robert Michael Boddey[2]

[1] *Maranhão State University, Agroecology, Brazil*
[2] *Embrapa, Center for Research in Agrobiology, Brazil*

Abstract

The System of Rice Intensification (SRI) has been enthusiastically proposed as an alternative for irrigated rice production by development projects in Asia. Compared to conventional management, SRI supposedly attains higher yields combined with lower input demands, making it both accessible and attractive for smallholder agriculture. SRI is based on the following presumptions:

(i) though wetland rice is well adapted to anaerobic conditions (flooding), it prefers a moist but aerobic environment, and

(ii) high plant densities unduly increase competition and thus reduce plant vigour and overall yield, and increase susceptibility against pests and diseases.

Consequently, SRI differs markedly from conventional management:

(i) careful transplanting of seedlings from a nursery (rather than direct seeding)

(ii) maintenance of moist but non-inundated conditions, and

(iii) plant densities of 25 seedlings m^2 (rather than 500 seeds m^2).

SRI could revolutionize smallholder rice production, but sound scientific data are scarce. We evaluated SRI on an alluvial soil of the Mearim river, southeastern periphery of Amazonia. Experimental layout was a completely randomised block design with 4 treatments involving SRI vs conventional management at 2 levels of N-fertilisation (200 kg N ha^{-1} as cow manure, and cow manure + 100 kg N ha^{-1} as urea) and 4 replications, plot size was 52 m^2.

Rice production was slightly but significantly higher in conventional than in SRI treatments (4.4 vs 3.2 t ha^{-1} grains with manure and 6.2 vs 5.7 t ha^{-1} grains with manure + urea application). Plant biomass and 100 grain weight were likewise higher and root:shoot ratios lower in conventional than in SRI treatments. Plant tissue analyses indicate that SRI may have suffered P-deficiency induced by the prevailing oxic conditions. Weed pressure was a further problem associated with the lack of flooding in SRI. Nevertheless, the merely slightly lower productivity of SRI confirms its potential as management alternative. Future R&D is needed and under way to investigate **(i)** SRI-induced P-deficiency, **(ii)** the potential of SRI in other soils, **(iii)** the danger of greenhouse gas emissions associated with SRI, and **(iv)** better adapt SRI management to the local context.

Keywords: Irrigation, lowland rice, Maranhão state, P-deficiency, plant density, water regime

Contact Address: Christoph Gehring, Maranhão State University, Agroecology, Rua Inácio de Loyola 32, 65000 00 São Luis, Brazil, e-mail: christophgehring@yahoo.com.br