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"Solidarity in a competing world — fair use of resources"

Sesbania rostrata (Bremek and Oberm.) as Biological Nitrogen Fixator for Sustainable Lowland Rice Production

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Abstract

Nitrogen plays a crucial role in rice cultivation. It is usually supplied as chemical fertiliser (urea). However, rice monocropping without fallow and loss of urea-N through leaching often lead to decreased soil fertility, decline in soil organic matter and environmental pollution. As a result, rice yield decreases and this is predicted to worsen by climate change. This may affect food security especially in view of the continuing rise in human populations, particularly in sub-Sahara Africa. New and alternative nitrogen resources should be explored to sustainably supply rice crop needs and to reduce the adverse environmental effects of current urea-N use in rice.

Biological Nitrogen Fixation (BNF) by legumes is a promising and friendly mechanism that can be used to convert atmospheric di-nitrogen into valuable substances such as fertilisers for agriculture. As such, BNF could contribute to sustainable traditional rice production with its current low productivity figures. In this respect, *Sesbania rostrata*, which is native to Africa, is one of the best nitrogen-fixating plant species because of its nodulation on both stem and roots, fast growth, high nitrogen-fixation rates and tolerance of waterlogged soils. *S. rostrata* is often used as green manure between rice crops in lowland. The plant, when plowed under at 34–42 days after sowing, can add 90 to 150 kg N ha^{-1} and 7.4 t ha^{-1} of biomass to the soil. It has been found that *S. rostrata* supplied as green manure can double rice yields after one rice cultivation cycle. Findings further reveal a 35 % residual effect of the same green manure application on grain yield in a second rice cultivation cycle. It may thus easily be the cheapest alternative nitrogen source to smallholder farmers. This paper reviews the potential and challenges of using its green manure to sustain lowland rice system in developing countries.

Keywords: Agro-ecology, climatic change, farming systems, green manure, smallholder farmers' income, soil fertility

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