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Effect of Tree Litter Application on Lowland Rice Yield in Bangladesh

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ABSTRACT

The effect of tree litters on rice yield (cv. BR11) was evaluated in the study. Four kinds of tree litter, i.e., ipil-ipil or lamtoro (Leucaena leucocephala (Lamk) De Witt), sissoo (Dalbergia sissoo), akashmoni (Acacia auriculiformis) and mander (Erythrina orientalis) were incorporated into the soil 15 days before transplanting at rate of 5 ton/ha supplemented with inorganic fertilizers (83 kg N, 48 kg P_20_5, 42 kg K_20, 10 kg S and 3.6 kg Zn/ha). In the control plots only recommended inorganic fertilizer were applied. Results showed that tree litter application had a significantly positive effect on the yield parameters such as plant height, panicle length, tillers per hill, filled grain and index of 1000-grain weight. Grain yield of plots treated with ipil-ipil, sissoo, akashmoni and mander was 5.61, 4.49, 4.95 and 5.36 ton/ha, and the yield increased over control plots 39.6, 11.7, 23.1 and 33.3%, respectively. It is worthy to note that addition of tree litter to inorganic fertilizer produced significantly higher yield than inorganic fertilizers solely. Among the tree litter, ipil-ipil and mander had the greatest increase in rice yield, while akashmoni was intermediate and sissoo was the least.

Key words: Agroforestry residues, rice, sustainable agriculture and tree-based cropping

INTRODUCTION

Bangladesh is a densely populated agro-based country with rice as main staple food. Although the rice production occupies about 80% of total cropped area in the country, the average productivity of rice in Bangladesh is only 2.21 t/ha (BBS, 2004). The rice productivity is quite low in comparison to South Korea and Japan, i.e., 7.00 and 6.22 t/ha, respectively (FAO, 1999).

Poor rice yield in Bangladesh can be ascertained to improper soil management and tillage practices. Chemical fertilizers presently used in rice are neither balanced nor of sufficient quantity for maximum yield. Moreover, continuous use of chemical fertilizers decreases organic matter content and impairs physical and chemical properties of soil in addition to causing micronutrients deficiencies. Sanchez et a1. (1987) reported that there is a correlation between a decline in crop yield with continued production using chemical fertilizer and a decline in organic matter.

Sustainable crop production gets more attention in Bangladesh through introduction of agroforestry system, whereby tree litter is used as a supplement and to enhance crop production. Bangladesh has a homestead area of 13,018,415 thousand acres (BBS, 2004) where retention of trees is being encouraged. Thus there is ample opportunity for green manure sources. In Bangladesh, several non government organizations (NGOs) and government organizations encourage farmers to grow green manure crops such as Sesbania rostrata, S. aculeata, Crotalaria juncia and Vigna unguiculata in crop fields and fallow lands.

Generally, organic matter supplies nutrients and improves nutrient availability (Marschner, 1995). Application of organic matter in dry land has proven to increase stock of slow release nutrients and protects nutrients against leaching. Therefore, maintaining soil organic matter is considered as one of the goals of sustainable land management. Nevertheless, for organic matter application in lowland paddy there is still lack of information in Bangladesh as well as in many other Asian countries.

Several scientists investigated the effect of tree litter incorporation into the paddy field in addition to inorganic fertilizer used. Rathert and Nammuang (1992) reported that application of lopping of Leucaena leucocephala at the rate of 30 kg/ha N had similar to application of chemical N at rate of 50 kg/ha on rice yield. Moreover, Nahar et al. (1996) pointed out that the highest grain yield was obtained from Leucaena leucocephala treated plots than plots applied chemical fertilizer solely. Turkhede et al. (1998) observed that incorporation of Gliricidia leaves as green manure at 5 ton/ha at transplanting time significantly increased the grain and straw yield of paddy, i.e., 3.2 ton and 5.8

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