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Straw technology for lowland rain-fed rice production in the Intermediate zone, Sri Lanka and sustainable improvement of soil biological quality

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A long term, 8 consecutive cultivation season (1998 Yala to 2001/2 Maha) field investigation was done in three different Intermediate zone locations under lowland, rain-fed situation with direct seeding (cv. BG 94-1) giving special attention to soil biology. Four treatments (in a nested six treatments arrangement of a RCB Design in selected sites -2 blocks at each site with 18 m^2 plot size), *viz.* I) Control (only rice), ii) Rice with chemical fertilizer in recommended practice, iii) Rice with straw [3 t/ha] incorporation only, and iv) Rice with straw [3 t/ha] incorporation together with reduced amount of recommended synthetic fertilizer application. Fields were kept fallow for one season before this trail. Soil biological & chemical parameters and grain yield data were collected. It was observed that incorporation of rice straw (of the previous season from the same field except first application) together with the use of reduced amounts of synthetic fertilizers gave a statistically valid grain yield increase over all other treatments. Results also proved that the use of straw alone, cannot substitute for the current fertilizer use. At the same time, the results showed that the current recommended synthetic fertilizer levels could be significantly cut down (even 100% synthetic K and 15% of Fert-N) while obtaining a significant grain yield increase by incorporating straw from the same field. In addition, the result proved that there was a gradual increase in Soil-N, and Soil-K along with the continuous incorporation of rice straw along consecutive cultivation seasons. The results were possible to be generalized for the Low country Intermediate Zone conditions of Sri Lanka under rainfed situations, with direct seeding and minimum use of insecticides. A significant improvement in soil-biology was noted with the straw technology which improved along with the cultivation cycles (from data of 4 cultivation seasons), There was a strong positive correlation between soil microbial counts (measured by modified flow cytometry) and soil microbial activity (soil respiration). The improvement of soil biological parameters indicated that soil environmental conditions for healthy plant growth had been gradually developed with the use of straw organic matter.

Straw technology for rice production is practicable because straw is available from the same field from the previous crop. The positive contribution to the natural environment by the use of straw technology should be seriously taken in to consideration over the negative effects of using imported synthetic fertilizers. The significant soil biological improvement showed by this result is essential for the better soil quality and its sustainability. Significant reduction of using imported synthetic fertilizer also reduces the cost of production while maintaining the grain yield under the rainfed, direct seeded, and low-input rice cultivation.

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