

BROWN MANURING : A TOOL FOR SUSTAINABLE RICE CULTIVATION

*Dillip Ranjan Sarangi & **Biswanath Sadangi

Rice is the staple crop of Odisha. It is cultivated in most of the cultivated area (4.41 m ha) in our state yielding 6.94 million tonnes of rice for our consumption. But, the average production of rice in our state 1572 kg/ha is very meager when compared with that of our national average 2118 kg/ha. This low yield of rice can be due to various reasons like imbalanced nutrient application, improper cultivation practices and ignorance about micronutrient application. As farmers solely depend on farm manure and chemical fertilizers for rice cultivation, the imbalance supply of nutrients take place. Lack of adequate knowledge and limited facility for soil testing in the state also results in fertilizer application without any scientific basis. The major nutrients in excess in the soil or deficient in them are not clearly known. The use of single nutrient fertilizers adds to the misery. There is also increasing advocacy for use of green manure and natural nutrients for preventing the harmful effects of chemical fertilizers.

Recently, Dr M.S. Swaminathan, the "Father of Green Revolution in India" called for "*Evergreen Revolution*" by use of organic



nutrients for farm production and maintaining the soil fertility and sustainability. This has generated a lot of attention for the integration of nutrients from organic, inorganic and biological sources. But, it is still far from practice. In practice, farmers either use very less organic manure or no manure in rice cultivation. The practice gradually reduces soil fertility and productivity. In our state many farmers cultivate rice in their fields one after another mostly in irrigated lands. This method of cultivation reduces the soil pH leading to higher soil acidity.

Green Manuring

For improving crop production, nitrogen, phosphorus and potassium are the most important elements. Nitrogen is needed for growth and metabolic activities. Usually nitrogen is supplied through chemical fertilizer urea and farm manure. Green manuring is being used in many parts of India to supply nitrogen in its organic form. For this, different species of plants having specific microbes in their root nodules that fix atmospheric nitrogen are used e.g. *Sesbania* spp. In Dhaincha (*Sesbania* spp.) plant root nodules *Rhizobium* species of bacteria reside and fix nitrogen found abundantly in the air. These plants are grown before rice cultivation and when

ploughed after 45 days of growth the nitrogen mixes in the soil and available to the rice plants planted afterwards. This method is very effective where monsoon is predictable and assured irrigation facility is available. But, in India and more typically in Odisha green manuring has varying degree of adoption due to untimely monsoon setting and lack of assured irrigation facility in addition to lack of knowledge about its benefits.

Brown manuring

Brown manuring is similar to green manuring, except the fact that rice and *Sesbania* spp. are both grown together and when these dhaincha plants overtake the rice plants in height at about 25 days of co-culture, a weedicide 2, 4-D is applied to kill these *Sesbania* plants. After 4-5 days of spraying *Sesbania* plants will appear brown and then start dying. As it is a selective herbicide, it kills only *Sesbania* plants and not the rice plants. This is called knocking down effect. Brown manuring is usually recommended for the rice which is directly seeded, but not when transplanting is done. If the rice is broadcasted then at the time of *beusaning* dead *sesbania* plant parts will be incorporated in soil, whereas, in case of line sowing at the time of weeding it mixes in the soil supplying the nitrogen and other nutrients to rice.

Social Feasibility of the Technology:

- The technology is more suitable for risk prone agro-ecosystems in which direct seeding of rice is done.

- As most of the Indian rice growers are resource poor, the technology can add more benefit with very marginal input cost.

Benefits :

- Brown manuring increases the soil organic carbon content, thereby supplying required nitrogen for the rice plants. Thus, a part of nitrogenous fertilizer (upto 25%) can be replaced by brown manuring.
- It also increases the rice yield as shown in our experiments, thereby improving the economical benefit of the farmers.
- It also improves the soil health parameters like organic carbon content and earthworm population of the soil.
- Brown manuring reduces the weed population in the early stage due to its high growth rate and competition with the weeds.

Conclusion

As there is a rising trend in chemical fertilizer cost, brown manuring can be used as an alternative approach for higher production and thereby more benefit for the farmers. As the brown manuring practice is eco-friendly and improves the overall soil health, it should be widely advocated by the extension agencies to realize its benefits for the farming community of the nation.

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*Subject Matter Specialist (Soil Science)

**Head, Social Science Division

Krishi Vigyan Kendra,

Central Rice Research Institute, Cuttack-753006, Odisha

E-mail: dillipsarang99@gmail.com, Mob: 9438843142