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Research Article

SYSTEM OF RICE INTENSIFICATION - AN OVERVIEW

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ABSTRACT

Rice is one of the principal cereals and is cultivated and consumed in most parts of the world. About 90% of the world's total rice production is from Asia and the remaining from Africa and Latin America. The world population survey states that the total number of living humans is now greater than 7 billion and the average addition to population is currently estimated at around 80 million per year. It is hence necessary to develop various methods to increase the production of rice crop to satisfy the need of each and every people. One such method developed in early 1980's was the system of rice intensification otherwise called as SRI method. SRI was developed in Madagascar and popularized by a French Jesuit priest named Henri de Laulanie'. It is an alteration of management practices to make better yielding phenotypes from the same genotype of rice plant. SRI mainly includes modified techniques of land preparation, transplantation of seedlings singly, ensuring wider spacing between seedlings, alternate wetting and drying of the field rather than continuous flooding of the field, use of organic matter or vermicompost, etc. SRI has since been very much improvised and is being used in different parts of the world, especially in countries like Indonesia, China, India, etc. SRI improves the productivity of land, labour and irrigation water and the economic inputs used in rice cultivation. Thus, the system of rice intensification helps to improve the yield with limited water usage and lesser quantity of seeds when compared to conventional methods of rice farming.

INTRODUCTION

Rice is one of the world's most important food crops and the most widely consumed food grain for more than half of the world's human population (Surekha *et al*., 2016; Prasertsak and Fukari, 1997). Rice belongs to the genus *Oryza*, family Graminae (Poaceae) and tribe Oryzeae (Roschevicz, 1931). Rice has long been believed to be an aquatic plant, or at least a hydrophilic one. Rice thrives on lands that are water saturated, or even submerged, during part or all of its growth cycle. Most rice varieties maintain better growth and produce higher grain yields when grown in a flooded soil than when grown in non-flooded soil (De Datta, 1981). But Ramaswamy *et al*. (1997) considered this view as incorrect. Still, farmers and agriculturists widely believe that rice grows better in standing water.

Satyanarayana *et al*. (2006) brought out certain implications of saving irrigation water by changing resource management rather than by using one or more different inputs. The validity of SRI concepts and practices has been demonstrated in more than 20 countries to date.

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In many countries, rice farmers at a time begin finding ways to achieve their production goals with less use of water, because of growing water shortages and competing demands, and an innovation in rice farming methods has become available known as the system of rice intensification (SRI). It can increase the production of rice so that economic and food security goals are met. It can reduce farmers' costs of production enhancing profitability and decreasing the quantity of irrigation water required (Stoop *et al*., 2002; Uphoff, 2003; Randriamihariosa *et al*., 2006). SRI, first conceptualized by a French Jesuit Priest, named Father Henri de Laulanie' during the early 1980's has been promoted as a sustainable route towards superior rice yield (Stoop *et al.,* 2002; Uphoff, 2002). It improves rice yields through multiple management practices that have been presumed to interact synergistically (Menete *et al.,* 2008). SRI practices were reported to yield higher and save water compared to farmers' practices in Madagascar, Bangladesh, Sri Lanka and many other countries (Namara *et al.,* 2004). It is not a fixed technological package, but rather a set of principles for raising the productivity of all of the factors involved in rice production, *i.e.,* land, labour, seed and water (Stoop *et al*., 2002). Trial results in Madagascar suggest that the use of young seedlings is the single most important component practice of SRI, increasing yields in that region by 2.5 Mg ha^{-1} (Uphoff and Fernandes, 2002). This introduces diverse influences of quality of management, timing, etc. and also the variability of biological processes and potentials in soil systems which can differ widely among agro-ecosystems (Randriamiharisoa *et al*., 2006).

Methodology of SRI

SRI is mainly based on the alleged synergy among several agronomic management practices and their interaction with the crop biophysical environment and management. It includes:

- Transplanting young seedlings, preferably 8-12 days old. It should be quickly and carefully transplanted inorder to avoid root damage trauma.
- Using 1-2 seedlings per hill that are up to 20cm × 20cm – 50cm × 50cm apart.
- Keeping the soil moist to the point surface cracking but not inundated during the vegetative growth phase. In the reproductive phase, 1-3cm of water is kept in the field to make water available to the plant continuously.
- Adding organic nutrients, mostly compost or mulch to promote soil microbial activity instead of chemical fertilizers.
- Controlling weeds early and frequently.

Merits Highlighted

These practices interact in reinforcing ways to produce more yield than those for plants grown under traditional practices (Berklaar, 2001). These methods have been claimed to dramatically increased yields, more efficient resource use and reduced pest and disease pressure (Stoop *et al*., 2002; Uphoff, 2007).

SRI could be an artifact of simple good agronomy, since any intensification of farming practice such as the improvement of soil fertility would inevitably have a big impact in any context where a farmer's existing methods deviate substantially from recommended best management practices (McDonald *et al*., 2008). Prasad (2006) who attempted to document the history of SRI in India, labels it 'a fascinating case of rural innovation' that has developed outside the formal rice research establishment both in India and the rest of the world. Farmers who use SRI methods widely report that their rice plants are more resistant to damage from pests and diseases, so that use of agrochemical protection becomes unnecessary or uneconomic (Chauboussou, 2004). But research needs to be made to ascertain the extent and explanations of this effect, which not only lowers production costs but has benefits for soil and water quality. The effect seems to be associated with an increase in organic sources of fertilization accompanied by a reduction in the uses of synthetic fertilizer. Hence, SRI is considered as a 'civil society innovation' that spreads from farmer to farmer of different parts of the world (Uphoff, 2007).

Limitations Indicated

SRI may serve the important needs of resource poor farmers in areas with poor soils, but is likely to have little potential for improving rice production in intensive irrigated systems on more favourable soils, where high yields can be achieved through implementation of more cost efficient management practices (Dobermann, 2004). However, skepticism has been raised by many rice scientists about the yield benefits of SRI suggesting that it has no inherent advantage over conventional practices and that the extraordinarily high yield reported are simply the consequence of measurement errors (McDonald *et al*., 2006; Sheehy *et al*., 2004; Surridge, 2004). Therefore, SRI results have also been characterized as non-scientific based on 'unconfirmed field observations' (Sheehy *et al*., 2005; Sinclair and Cassman, 2004) because of poor methodology and inadequate record keeping (Dobermann, 2004; Sheehy *et al*., 2004; Sinclair and Cassman, 2004). Sheehy *et al*., (2004) studied the yield potential of SRI using a theoretical model for different locations in China and Madagascar and showed that SRI has no major role in improving rice yields. Moser and Barrett (2003) destined that it is difficult to practice SRI because it requires significant additional labour at a time of year when farmers do not have sufficient cash. Into the bargain, it is suggested that the adoption of SRI related practices may require additional considerations, including the availability of organic amendments, short and long term production risks (Dobermann, 2004) and access to finance and labour, all affecting farmers' adoption and disadoption choices (Moser and Barrett, 2003).

CONCLUSION

System of Rice Intensification (SRI) represents an integrated and agroecologically responsive, interdisciplinary approach to rice cultivation presumed to interact synergistically. Also, it has generated considerable debate globally, particularly with regard to its potential to raise rice yields. Regardless of several controlled studies, farmer surveys, and theoretical arguments by proponents and opponents alike, disagreement over the merits of the SRI, continues apace in the agricultural research and development community (Stoop *et al*., 2002). The larger context for this debate is the perception that rice yields are stagnating and that new solutions are required to keep ahead of the caloric demands of a growing world (Surridge, 2004). SRI should not be considered as a fixed technological package, but rather as a set of principles for raising the productivity of all of the factors involved in rice production, land, labour, capital, seed and water (Stoop *et al*., 2002). These practices are said to fulfill three underlying principles: exploiting the youthful vigour of young, healthy seedlings, optimizing competition among rice plants for soil nutrients, sunlight and growing space and promoting aerobic soil conditions to stimulate soil microbial activity and encourage large and healthy root systems (Uphoff, 2003).

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