Development of System of Rice Intensification in Cambodia

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Background

Rice farmers make up around 60 percent of Cambodia's population of around 14 million people. Most of the rice farmers are living in poverty as they cannot produce enough food, particularly rice, for their own consumption due to their small land holdings (less than one hectare per family) and their low productivity (yields less than 2 tons per ha), and they have limited income opportunities from other sources.

In order to address the issues of poverty among subsistence rice farmers, I started to work with them in 1998 with a focus on improving their production by the effective use of organic fertilizers to improve soil fertility. In 1999, I learned about SRI from the ILEIA magazine, and to test out its methods and the hard-to-believe results, as an agronomist I tried them out myself on a small scale that year. This gave me confidence to introduce SRI to farmers for field experimentation in 2000.

When I started to introduce SRI in 2000, the general belief was that rice farmers can only increase their rice production if they use external inputs -- such as improved varieties and prescribed use of chemical fertilizers and pesticides. People tended to believe that there is limited potential in our existing traditional varieties of rice and in organic farming methods for raising rice productivity, and to make rice farming profitable.

People also thought that because rice farmers are poor, they need support in the form of government or NGO provision of inputs to improve their rice production. This attitude made farmers feel dependent, and they concluded that their chances for improvement depended more on other people than upon themselves.

Starting from 28 farmers who first tried out SRI ideas and methods in 2000, there are now more than 200,000 rice farmers throughout Cambodia who are using SRI ideas to improve their rice production. More importantly, the majority of the SRI rice farmers who have worked directly with CEDAC are now able to produce a surplus of rice for the market whereas before they had to rely on buying rice from the markets to feed their family for the shortage period of up to 3 months. SRI methods have brought several hundred thousand Cambodian households, over 1 million people, from food insecurity to a chance to lead more secure and prospering lives.

SRI principles and practices

SRI is as an alternative approach to rice production, emphasizing sustainable practices and ones utilizing better the resources that farmers already have access to. The 'intensification' is not for purchased inputs but for knowledge and skills that improve the management of rice seeds, plants, soil, water and nutrients. SRI was developed in Madagascar by a French priest Henri de Lalaunié in the 1980s. With the help of the Cornell International Institute for Food, Agriculture and Development (CIIFAD), especially its director from 1990 to 2005, Prof. Norman Uphoff, SRI ideas have now spread worldwide. The validity of this innovation has now been demonstrated in more than 50 countries.

The goal of SRI is to create optimal conditions for growth in the plants' ***roots and tillers.*** As root growth increases, there will be more tillers and more grains per plant. Conversely, the greater photosynthesis in the canopy supports roots' growth and metabolism. Therefore, we can also consider SRI as a **system of root intensification**, which can also apply for other non-rice crops as well. Farmers are applying the ideas and methods to wheat, sugarcane, millet, pulses, also vegetables.

The basic SRI ideas or principles include:

- First, start with transplanting healthy, vigorous, relatively **young seedlings** grown from **healthy, full-bodied seeds** which are sown in **an upland nursery bed,** similar to that of a vegetable bed, just watered by hand as needed.
- **Wider spacing** between each rice plant, preferably with *one seedling per hill and with wider and equal spacing between each hill,* in a square pattern, to avoid competition among individual rice plants for the spread and growth of their roots and canopies.
- **Shallow** and gentle transplanting (just 1-2 cm deep) to ensure faster root growth.
- **Aerobic soil conditions** by avoiding continuous field saturation with flooded standing water.
- Frequent **weeding** to control weed competition, preferably with a mechanical hand weeder -- such active **soil aeration** favors root growth and the growth of beneficial soil organisms.
- Increased **organic matter** in the soil through application of compost, which increases **soil biological activity**

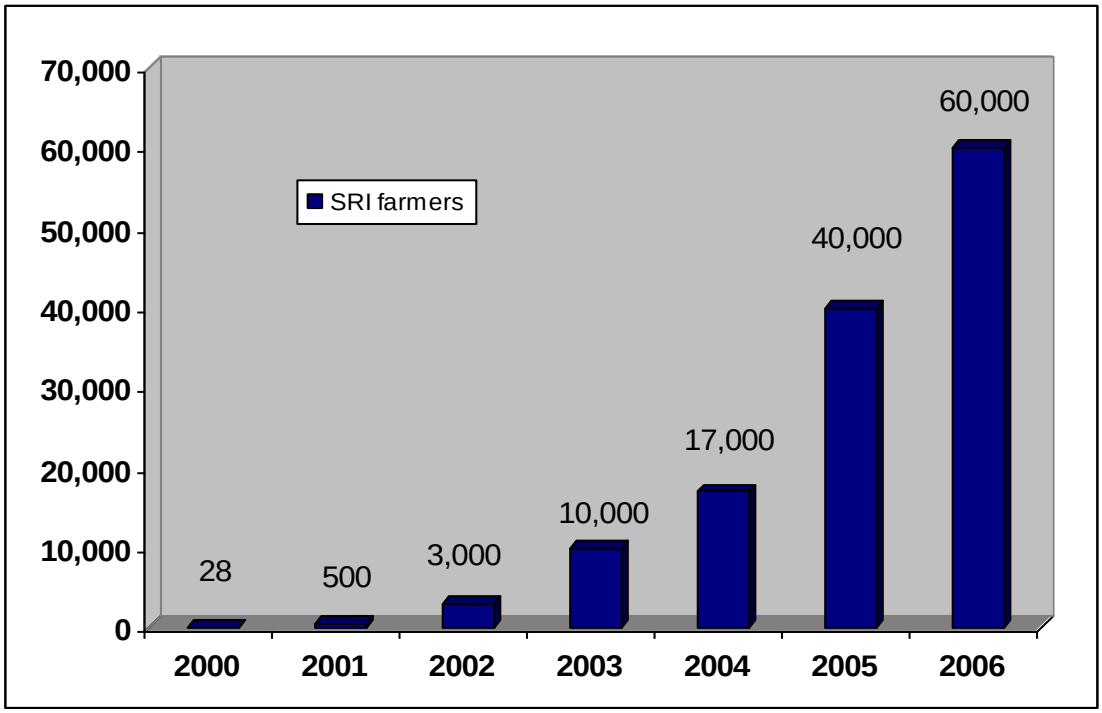
Results and experiences of SRI development and dissemination in Cambodia

When I first started with SRI, there were only a few people who believed that these ideas would work, especially how can we get **more** yields with **less** seeds, and with younger seedlings, with less water, and with less or no nutrients in the form of artificial fertilizers. In spite of the skepticism, we were able to get 28 farmers from four provinces to experiment with SRI that first year. The first farmer who tested SRI ideas started on 30 May 2000, Mr. Mey Som from Kandal province. I also tested SRI ideas on my own rice farm near Phnom Penh in 2000.

The first 28 farmers were able to produce yields averaging 5 tons per ha, which is 150% higher than with their traditional practices. The most impressive advances were made by two farmer brothers in Kampong Thom, who got more than 7 tons per ha, and by one farmer in Prey Veng province who was able to harvest more than 10 tons per ha (11.8 to 13. 7 tons per ha on his two plots). Even though his plots were small (11 and 8 m^2), this showed that a traditional variety can have very high yield potential when grown with SRI practices.

After the success of the first 28 farmers and the success of my own rice farm, I gained more confidence in promoting SRI among farmers and other stakeholders. Since then, SRI has spread widely in Cambodia. The government started to be interested in SRI in 2004, and by 2006, SRI was officially endorsed by the national government in its national strategic development plan. Several high-ranking government officials started to promote SRI, such as the Minister of Agriculture and the Minister of Environment. Even the Prime Minister would speak positively of SRI when addressing farmer audiences.

Figure 1: Progress in the number of SRI farmers in Cambodia



To summarize the benefits of SRI for farmers in Cambodia, data from several evaluation studies are presented as follows:

- Data from 120 farmers who by 2003 had used SRI methods for three years showed that with SRI methods, rice yields were on average 2.75 t/ha – double what they produced with conventional methods, 1.34 t/ha. Since their costs of production were lower, their net income from rice increased from around 58 $US per ha to 172 $US per ha, a tripling of income.
- An evaluation study conducted by GTZ in 2004 showed an average increase in yield of 660 kg/ha, or 41% (from 1,629 kg/ha to 2289 kg/ha), while **gross profits per hectare** went from $US 120/ha with conventional methods to $US 209/ha with SRI methods, an increase of $US 89 or 74%. This consisted of a $US 23/ha saving in variable costs such as seeds and mineral fertilizer, and an increase of $US 66 in the income coming from higher yield. These farmers included many first-year SRI users who had not yet mastered the methods so results were not as good as for farmers who had multi-year experience. [this explains at least in part the difference in results between the 2003 and 2004 evaluations]
- In early 2007, the CEDAC team interviewed 2,304 farm households that had been cooperating with CEDAC for more than 3 years. Results show that 70% of them were practicing SRI methods. Among the SRI users, 25% were able to successfully apply SRI ideas in most or all of their plots. On average, their total household rice production had increased by around 110 percent. The amount of fertilizers that they used had been reduced by more than 50%, and the amount of

seeds was reduced by 70-80%. Also, 13% of farmers interviewed have stopped using pesticides, and 7% have stopped using chemical fertilizers on rice and other crops.

Figure 2: SRI rice plant 3 weeks after transplanting of one seedling

My experiences with SRI in Cambodia in the past 10 years have shown that if farmers can adopt all or most of SRI principles and techniques, they are able to benefit from increased rice yields by more than 2 to 3 times using less or even zero external inputs. The best SRI practitioners are able to obtain more than 7 tons per hectare. Farmers who cannot adopt all or most of the principles and techniques can also achieve significant yield increases (around 20-30 percent) and also save seeds (which is important for poor households).

In term of human development or mind development, SRI also contributes to the increase of self-confidence and pride among farmers as they can get higher rice production just by only using their own resources and relying on their own knowledge and skills. Farmers also develop more positive mental attitude towards farming and life; they take more initiatives and risks to experiment and refine SRI ideas and other farming innovations which contribute to the development of their innovative capacity. SRI farmers also tend to discuss and share more information and experiences on rice farming and other farming activities among each other in the communities.

The main challenge is how to introduce SRI ideas to a maximal number of farmers. According to our experiences, SRI should not be introduced as a fixed set of technologies to be applied by farmers. It is rather a set of principles and ideas that farmers learn to adopt/adapt according to their specific conditions and capacity. As time progresses, farmers will be able to refine their skills and knowledge in using SRI ideas to improve their rice production.

CEDAC has found the best entry point to be facilitating formation of a group of farmers who are interested to rediscover and utilize the natural potential of their rice plants. They are assisted to review their existing practices to consider what is contributing or not contributing to utilization of the natural potential of rice plants. Through discussion, farmers come up with the list of practices, which are SRI practices or more than the original SRI practices. By doing this, farmers will be enabled to have ownership on the practices and to make decision on which practices they want to apply. Some farmers tend to apply all the new practices in a small plot, while some farmers just want to test a few of the practices. From year to year, they expand the areas of cultivation and apply more SRI practices.

We also support the process of implementation of SRI ideas among farmers by organizing regular meetings among farmers to share their experiences, observations, impressions, lessons learned, and insights. After the harvest time, they should be invited for meetings to share their results and experiences. Regular meetings among SRI farmers are very good opportunities for them to learn from each other, and it is also a good opportunity for us in CEDAC to learn more from farmers about rice and SRI.

In order to support the process of sustainable SRI development and dissemination to reach a maximal number of farmers, we should select the best SRI farmers to become farmer promoters. There is a need to build also a network of SRI promoters so that they can better learn from each other and can empower each other in promote SRI ideas more effectively among their peer farmers.

Conclusion and future perspectives

SRI has shown itself to be an appropriate solution to the poverty and food-insecurity constraints for millions of small-scale rice farmers in Cambodia, as it enables farmers to increase their rice productivity by using their own local existing resources. However, SRI should not be promoted as a fixed set of technologies to be applied by farmers. It should be promoted as set of principles and ideas to be adapted by farmers according to their capacity and specific local conditions.

Moreover, SRI does not only enable subsistence rice farmers to have more rice. SRI ideas can be also adapted by farmers to improve their production of other crops.

Successful SRI farmers have better opportunities enter the market as well as to diversify their farming systems. For example, with a rice surplus, farmers are willing to devote part of their rice field area for diversification: to produce more fish, vegetables, beans, and fruit. Many SRI farmers are now forming organic rice groups and cooperatives for collective marketing.

For the benefit of farmers and sustainable food production, it is important that SRI knowledge and experience be further developed and widely shared with all rice farmers in Cambodia and in Asia.