Experiences with the System of Rice Intensification in CAMBODIA

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CEDAC is a Cambodian NGO founded in August 1997 with initial assistance from GRET, a French NGO. Since its creation, CEDAC has been working with farmers and other organizations in Cambodia to develop and disseminate innovations in ecological agriculture. Our priority has been the improvement of rice-based farming systems in rainfed lowland areas. We have been working on rice intensification since 1998, with a focus on improving soil and nutrient management practices.

It was thus very timely when CEDAC learned about SRI from the ILEIA's newsletter in December 1999 (Rabenandrasana 1999). In early 2000, we received also more information on SRI from CIIFAD (Uphoff 1999 and 2000), and in the wet season that year, we integrated the elements of SRI, namely, its principles for water and plant management, into our sustainable rice intensification program. Here I will summarize the results and experiences of SRI adaptation in Cambodia since 2000, including some thoughts on the future of SRI in my country.

SRI Compared with Traditional/Conventional Rice Cultivation

Rice is the main staple food in Cambodia, and rice farming provides income and employment opportunity for around 65% of its population.[1] Officially, the national average yield of rice is estimated to be between 1.65 and 1.80 tons per hectare in the wet season (MAFF 1995-2000, and FAO/WFP 1999). This is relatively low compared with other countries in the region.

Improvement of rice productivity has to be one of the main objectives of any agriculture and rural development program in Cambodia. During the last three decades, especially in the 1980s and 1990s, a lot of effort went into improving traditional rice farming. This effort focused on developing and diffusing recommendations for fertilizer applications and on introducing improved, high-yielding varieties as well as integrated pest management (IPM).

Although this approach can help farmers to increase their yields, the environmental sustainability and economic advantage of this for small farmers, and for Cambodia, still remains an issue. Rice productivity remains relatively low compared to the growing demand, while farmers' costs of production are increasing, mainly due to the cost of fertilizer and fuel (for pumping water in the dry season). SRI offers opportunities to increase rice production through changes in plant, water, soil and nutrient management rather than through the use of new or purchased inputs. Thus it can will be very attractive if initial results can be sustained.

Results and Evaluation of SRI Experience

SRI under rainfed conditions

Rainfed rice cropping makes up around 80-85% of the total rice area cultivated in Cambodia. In the wet season 2000, 28 farmers experimented with the principles and techniques of SRI in four provinces of Cambodia. Their total area under SRI was 1.57 ha, and their average yield was 5 tons per ha, which is 150% more than with traditional practices. The most significant advances were made by two farmer brothers in Kampong Thom who got more than 7 t/ha (one of them used SRI on 4,000 m^2), and by one farmer in Prey Veng who was able to harvest more than 10 tons per ha (11.8 to 13. 7 t/ha from his different plots). Even though the plots of the latter were small (11 and 8 m^2), they showed that even a traditional variety can give a very high yield when grown with SRI practices (Koma 2000).

[1] *About 85% of Cambodia's 12 million people live in rural areas, and about two-thirds of this rural population depend mainly on rice farming.*

In 2001, about 500 farmers adapted SRI in Cambodia, mainly supported by CEDAC, GTZ in the province of Kampong Thom, and by the European Commission's Support Programme for the Agricultural Sector in Cambodia (PRASAC) in Prey Veng and Takeo. According to the data collected from 393 farmers in 6 provinces of Cambodia (see Table 1), the yield under SRI varies considerably, depending mainly on how many elements of SRI are adapted by farmers. More than 80% got yields above the national average.

Even in the same village, there is one farmer who got just 2 tons per ha with SRI methods while another farmer got 10 tons per ha. This showss that SRI is not a fixed technology, but rather a set of principles that farmer can adapt to own specific needs, preferences and circumstances. Also the yield obtained from SRI adaptation depends upon strongly farmer skills and knowledge for managing their plants, water, soil and nutrients.

Most of the farmers got 3 tons per ha or more while rice yields under traditional practice vary between 1 and 2 tons per ha. The most interesting result was that 57 farmers got more than 5 tons per ha, and among these, 3 farmers get more than 10 tons per ha. The highest yield for 2001, 14 t/ha, was obtained by a woman-farmer supported by the GTZ rural development program in Kampong Thom province.

At least 70 different rice varieties were used by farmers, most of these being traditional ones. Table 2 shows that with SRI, higher yields are possible for any variety. However, improved local varieties seem to do better than traditional and IR varieties. Improving seed selection with traditional varieties is crucial for increasing their productivity. Since with SRI, farmers require only small amounts of seed, they can more easily undertake their own seed selection and improvement based on a traditional variety.

Table 1. Number of farmers and yield harvested under SRI, wet season 2001

Yield classification	Number of farmers	Percentage (rounded)
Less than 1 t/ha	20	5
1-2 t/ha	71	18
2-3 t/ha	114	29
3-5 t/ha	131	33
5-10 t/ha	54	14
More than 10 t/ha	3	1
Total	393	100

Table 2. Yield variation according to variety with SRI practices

Category of variety	Number of farmers using variety	Average yield
Traditional varieties	247	3.00
IR varieties	112	3.30
Improved local varieties	34	4.27

SRI used under flood recession

In 2001, we worked with 6 farmers in Prek Lovea village, Kandal province, to test SRI under flood recession conditions in the dry season. Such areas make up about 15% of Cambodia's rice area. The average yield achieved under SRI was 6 t/ha, about 50 % higher than with traditional practices. In 2002, around 40 farmers evaluated SRI under these conditions. Preliminary data show that they are able to get yields from 5 to 10 t/ha (Rady et al. 2001).

Most farmers are using IR varieties in these areas.[2] However, this year at least 3 farmers evaluated the use of SRI methods with a local variety. The first result obtained from one farmer showed that with SRI, the traditional variety could produce 7 tons per ha. This will be a big advantage for farmers since when using IR varieties, they cannot keep seed for more than one season cycle.

Other advantage that flood-recession rice farmers observed was lower expenditure on fuel (for pumping water), pesticides and fertilizers. There is also an environmental benefit as the expansion of area for the cultivation of flood- recession rice has been occurring at the expense of flooded forest. If farmers can produce more rice on a smaller area, then economic pressure on these forest areas can be reduced. On the whole, there is also a benefit for local fisheries because there is less chemical pollution of the water and reduced pressure on the flooded forest areas.

Evaluation of SRI within farming systems

SRI opens the way for more intensified and diversified rice-based farming systems in the rainfed lowlands. All Cambodian farmers who have adapted SRI have con-

[2] *IR varieties are the ones most commonly used in flood-recession rice cultivation. In many communities, the traditional varieties have been lost (Rady et al. 2001).*

sidered it as a good solution for their situation because with SRI they can get a higher yield with less expenditure on purchased inputs and lower seed requirement. The enthusiasm for SRI is very strong in all villages where it has been introduced, and it is expected that around 2,000 farmers will adapt SRI in the wet season 2002. (Note that we avoid the conventional term "adopt" because we expect farmers to be making adaptations in the basic SRI system to fit their own conditions.)

Many SRI farmers consider this methodology as an important means for diversifying their rice-based farming systems because once they can get higher rice production from their small plot, they are ready to convert some of their rice fields into growing upland crops and digging a pond and canal for practicing fish culture. In partnership with farmers, CEDAC is developing SRI into a "System of Intensification and Diversification" of production in the rice field, or SID. Already around 180 farmers have started to develop this system.

Also, as farmers realize that there is a high return from investing in rice farming, they are more ready to invest in increasing the supply of biomass to be applied to the soil through increasing efforts to collect organic matter, grow green manure crops in the rice field, and grow trees for producing green leaves to add as mulch or compost.

Also, with SRI when using a local variety, there is abundant rice stubble after the harvest. This stubble, if used for mulching the rice field, opens the way of minimal tillage or zero tillage. For this wet season, around 10 farmers will be testing this practice as part of SRI.

Conclusions and Future Perspectives

The results of SRI evaluations in Cambodia since 2000 have shown consistently that with SRI, small farmers are able to increase their rice production with less inputs of seed, fertilizer and water. Significant yield increases are possible under a range of natural condition in the lowlands of Cambodia, both rainfed lowlands and flood-recession agroecosystems. Yield increase has been achieved with many different varieties, with traditional varieties doing very well with SRI. Their usual yield is rather low, but their market price is high as consumers much prefer them, so being able to double their yields, or more, is much appreciated.

SRI shows that there is a large biological potential in the rice plant that remains to be tapped. This potential can be effectively used if farmers are enabled to acquire better knowledge and skills for practices of plant, water, soil, nutrient and pest management that capture synergies between root and tiller growth which in turn lead to greater grain filling.

Farmers see SRI as not just a way to maximize rice yield, but as opening the way for them to diversify their rice-based farming systems in the rainfed lowlands. This is good for improving nutrition, incomes, and landscape diversity.

CEDAC has become convinced that SRI is a good solution for millions of Cambodian farmers. Thus, we are stepping up our efforts to develop and diffuse SRI and SID in Cambodia. Collaboration with other organizations is needed to ensure that a maximal number of farmers have an opportunity to learn about SRI. We envision, and are making efforts to ensure, that by the year 2010, all rice farmers in the lowlands of Cambodia will have had an opportunity to learn about SRI.

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