Report on the System of Rice Intensification in Padek Project Areas – 2004

Introduction

In the 2004 wet season, around 135 farmers from Padek project areas participated in on-farm trials of the System of Rice Intensification (SRI). These farmers had all received training on SRI from Padek staff prior to trialing the techniques on their farms. For half of these farmers it was their first experience with SRI but half of them had experimented with SRI in 2003. This report presents the results from a follow-up survey that was conducted with 58 farmers in order to learn from their experiences of testing SRI on their farms.

Farm Characteristics

A total of 58 farmers were surveyed for this study, including 29 farmers from Svay Rieng Province, 19 farmers from Kampong Speu Province, 5 farmers from Prey Veng Province and 5 farmers from Siem Reap Province. The household characteristics of these farming families are summarised in Table 1. The average size of family was just over 5 people and the average number of people available for farm labour was just under three people. Each family had an average of 1.6 hectares of rice land, or 0.32 ha person^{-1}. The average monthly rice requirement was reported at 18.3kg for each family member, or 0.59kg person^{-1} day^{-1}, which is slightly higher than the 0.5kg person^{-1} day^{-1} that the Ministry of Agriculture uses as their benchmark for food security. It was found that 47 percent of the families reported that they experienced food shortages each year in the months prior to the harvest of their next rice crop, with the average length of food shortage being a period of 3 months.

Table 1: Summary of Household Characteristics

Household Characteristics	Mean	Std. Dev.
Family Size	5.2	1.6
Farm Labour Availability	2.8	1.5
Family Rice Requirement (kg person^{-1} month^{-1})	18.3	5.3
Total Size of Rice Land (ha)	1.60	1.08
Size of Rice Land per Person (ha person^{-1})	0.32	0.19
Size of Village Land (ha)	0.31	0.60
Size of Other Land (ha)	0.45	1.54
Size of Rented Land (ha)	0.04	0.14
Number of Buffalo	1.1	2.3
Number of Cattle	2.2	2.3
Number of Pigs	1.8	1.4
Number of Chickens	12.0	16.7
Number of Ducks	6.6	13.8

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As well as growing rice, farmers raise a number of animals, such as buffalo, cattle, pigs, chickens and ducks. Most farmers have a few of each of these animals for home use and sale, but some farmers have up to 100 chickens or ducks, which they raise specifically for sale. Many farmers also grow fruit trees and other crops, either in homegardens and orchards or on their rice fields. It was found that 62 percent of farmers grow other crops on their rice fields following the main rice crop, as seen in Table 2. The main crops grown are watermelon, cucumber and morning glory (kang kong).

Table 2: Other Crops Grown On Rice Land

Crops Grown After Rice	Number of Farmers	Percentage of Farmers
Watermelon	29	50.0
Cucumber	16	27.6
Morning Glory	15	25.9
Corn	7	12.1
Long Bean	7	12.1
Pumkin	7	12.1
Herbs	5	8.6
Sponge Gourd	4	6.9
Eggplant	3	5.2
Mung Bean	3	5.2
Peanut	3	5.2
Wax Gourd	3	5.2
Bottle Gourd	2	3.4
Bitter Gourd	1	1.7

Application of SRI Practices

All of the 58 farmers in this study had participated in training sessions on SRI prior to the 2004 wet season rice crop and had some familiarity with the set of SRI practices. During the training it is stressed that while SRI is a combination of interacting practices, farmers are free to pick and choose the ones that they feel comfortable applying in their fields. Table 3 presents the SRI practices that were remembered by farmers and also the practices that they actually applied in their fields.

All of the SRI practices were remembered greater than 87 percent of farmers, except for the practice of growing a green manure crop, which was only remembered by 38 percent of farmers. In terms of application of practices, over 90 percent of farmers reduced the amount of seed for raising seedlings and transplanted only 1-2 seedlings per hill.

Over 80 percent of farmers sowed with a well prepared seedbed, selected vigorous seedlings, uprooted and transplanted on the same day and used wider and shallower planting of their seedlings. Around 74 percent of farmers transplanted their seedlings in rows and 67 percent levelled their fields prior to transplanting for better water spreading. Around 60 percent of farmers weeded their fields and 57 percent of farmers were able to alternately flood and dry their fields. In Kampong Speu, 8 of the 11 farmers who were not able to alternately flood and dry their fields mentioned that this was due to the drought they were experiencing. Alternately, in Svay Rieng, 3 of the 13 farmers who didn't alternately flood and dry their fields mentioned that this was because their fields were flooded and they were unable to manage the water.

The SRI practices that were applied by the lowest proportion of farmers were the addition of compost to the field, transplanting young seedlings and growing a green manure crop prior to the rice crop. Only 50 percent of farmers applied compost to their fields, although 90 percent of farmers applied some form of organic matter to their fields, either manure, compost or other organic matter such as tree leaves. Less than 30 percent of farmers used young seedlings (<15 days old) and only 12 percent of farmers grew a green manure crop on their fields prior to planting the rice crop.

Table 3: SRI Practices Remembered and Applied by Farmers

SRI Practice	Farmers Who Remembered Practice (%)	Farmers Who Applied Practice (%)
Reduced amount of rice seed for raising seedlings	98.3	91.4
Transplanting 1-2 seedlings per hill	94.8	91.4
Uprooting and transplanting on same day	96.6	87.9
Selecting only vigorous seedlings	96.6	86.2
Wider spacing of seedlings (25-50cm)	98.3	86.2
Shallow planting of seedlings	98.3	86.2
Sowing in flat, well prepared seedbed, with compost	96.6	82.8
Transplanting in rows	93.1	74.1
Field levelling	93.1	67.2
Early and frequent weeding	94.8	60.3
Alternately flooding and drying the field	94.8	56.9
Adding compost to the field	87.9	50.0
Transplanting young seedlings (<15 days)	87.9	29.3
Growing a green manure crop in the field	37.9	12.1

Comparison of SRI and Non-SRI Fields

A comparison of the field characteristics of the SRI and Non-SRI rice crops for these 58 farmers is presented in Table 4. Most of these farmers were experimenting with SRI for the first time, and as is to be expected they used small fields for their SRI trials, with the average size being

0.08 hectares. However, these fields did range from less than 0.01 hectares up to 0.6 hectares in size. For comparison purposes, all input data and yield data was calculated on a per hectare basis, however, due to the small size of some of these fields, this can generate a considerable amount of error. To overcome this weakness, Anthofer (2004) excluded all fields smaller than 0.3 ha from any quantitative analysis. The vast majority of the fields in this study were smaller than 0.1 ha, and excluding them would have returned too few data points for analysis. Instead the data was screened and any yields of greater than 5000 kg ha^{-1} were excluded from the analysis (yield data was available for 50 SRI fields and 11 of these returned yields of greater than 5 tons ha^{-1}). Several fields, both SRI and Non-SRI were affected by drought and returned yields of less than 500 kg ha^{-1}, however these were left in the analysis to more closely represent field conditions.

Despite these limitations, the yield data does compare to those reported by other authors in Cambodia, although the SRI yield is slightly higher and the Non-SRI yield is lower than that reported by other authors. The average yield for SRI fields (n=39) was found to be 2887 kg ha^{-1}, which is higher than the 2750 kg ha^{-1}reported by CEDAC (2004) and the 2289 kg ha^{-1} reported by Anthofer (2004). The average yield for Non-SRI fields (n=20) was found to be 999 kg ha^{-1}, which is lower than the 1340 kg ha^{-1}reported by CEDAC (2004) and the 1629 kg ha^{-1}reported by Anthofer (2004).

Table 4: Field Characteristics of SRI and Non-SRI Fields in 2004

Field Characteristics	SRI Fields	Non-SRI Fields
Field Size (ha)	0.08	1.13
Distance of Field from House (m)	199	723
Seedling Spacing (cm)	25.4	13.9
Farmers Using Traditional Variety (%)	78.9	96.9
Farmers Using Improved Variety (%)	21.1	3.1
Number of Tillers at Flowering	19.6	6.8
Amount of Seed Used for Seedlings (kg ha^{-1})	23.1	81.1
Paddy Yield (kg ha^{-1})	2887	999
Amount of Urea Fertiliser (kg ha^{-1})	3.5	26.5
Amount of DAP Fertiliser (kg ha^{-1})	2.5	35.5
Amount of NPK Fertiliser (kg ha^{-1})	6.6	19.4
Total Amount of Chemical Fertiliser (kg ha^{-1})	12.6	81.4
Amount of Compost (kg ha^{-1})	1373	25
Amount of Animal Manure (kg ha^{-1})	2982	198
Amount of Other Organic Matter (kg ha^{-1})	357	0
Total Amount of Organic Matter (kg ha^{-1})	4711	223

The average seedling spacing was 25.4cm in SRI fields compared to 13.9cm in Non-SRI fields and the average number of tillers at flowering for the SRI plants was 19.6 compared to 6.8 for the Non-SRI plants. The seedling spacing and the number of tillers were used to determine the average number of tillers/m^2 of rice field. Somewhat surprisingly, given the reported yield differences, the average number of tillers/m^2 was higher for the Non-SRI fields at 419 tillers/m^2 than the SRI fields at 324 tillers/m^2, although they both showed a large variation as seen in Figure 1. It was also noted during field visits that many of the SRI fields were not achieving full canopy cover of the soil until late in the season, while the Non-SRI fields, due to closer spacing of seedlings were achieving greater canopy coverage earlier during the growing season. While it is acknowledged that yield is not just dependent on the number of tillers per plant, the issue of optimising soil coverage warrants further investigation, particularly given the weed problems experienced by some farmers in their SRI fields.

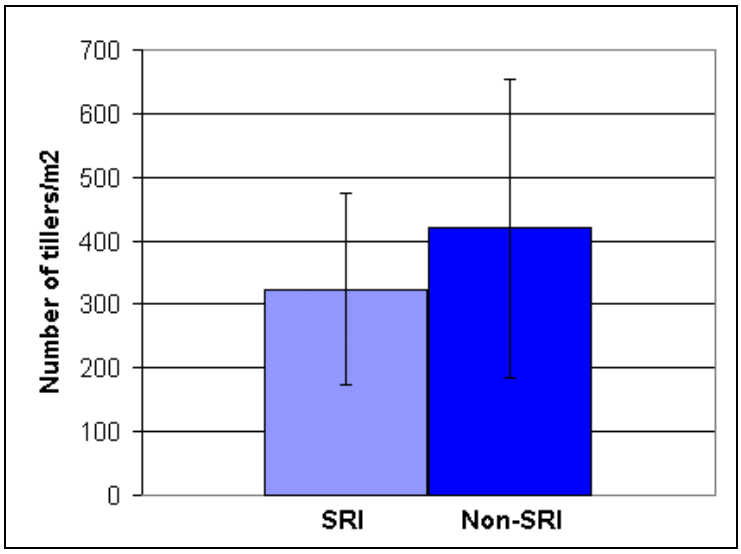

Figure 1: Average Number of Tillers/m^2 for SRI and Non-SRI Fields

The amount of seed used for raising seedlings was greatly reduced for SRI fields, at only 23.1 kg ha^{-1} compared to 81.1 kg ha^{-1} for Non-SRI fields, a saving of 58 kg ha^{-1} of seed. On average, farmers used 1373 kg ha^{-1} of compost on their SRI fields, compared to only 25 kg ha^{-1} for Non-SRI fields. As well as the compost, they also used 2982 kg ha^{-1} of Animal Manure and 357 kg ha^{-1} of other organic matter, such as tree leaves, on their SRI fields, compared to 198 kg ha^{-1} of animal manure and no other organic matter on the Non-SRI fields. The amount of chemical fertiliser was also greatly reduced on SRI fields, at only 12.6 kg ha^{-1} compared to 81.4 kg ha^{-1} for Non-SRI fields.

Farmer Perceptions of SRI

At the end of the growing season the farmers were asked a number of questions in order to find out what their perceptions of SRI were. Their responses are presented in Table 5. Farmers were asked if they will use SRI again next year and if so, will they expand the area of rice under SRI. One hundred percent of farmers reported that they plan to use SRI on their farms again next year and 97 percent of them plan to expand the area of their rice crop grown using SRI. Nineteen percent of the farmers reported that they plan to convert all of their rice fields to SRI next year. Farmers were then asked what their perceptions of SRI were. These have been separated into positive aspects of SRI and challenges in the application of SRI.

On the positive aspects of SRI, 75 percent of farmers mentioned that SRI uses less seed for raising seedlings, around 60 percent mentioned that it returns higher yields and saves time and labour, and half of the farmers mentioned that it uses less inputs and expenses than conventional rice growing. Some of the main challenges were difficulty in water management, mentioned by 38 percent of farmers, and increased weed problems and lack of manure/compost to expand to all of their rice fields, both of which were mentioned by 17 percent of farmers.

Table 5: Farmer Perceptions of SRI

Farmer Perceptions of SRI	Number of Farmers	Percentage of Farmers
Farmers who will use SRI again next year	58	100.0
Farmers who will expand the area of SRI next year	56	96.6
Farmers who will expand SRI to whole farm next year	11	19.0
Positive Aspects of SRI		
Uses less seed	44	75.9
Higher yields	36	62.1
Saves time and labour	34	58.6
Lower inputs	29	50.0
More tillers on rice plants	14	24.1
Easy to apply the principles	7	12.1
Increased self-learning of farmer	2	3.4
Challenges in Application of SRI		
Difficulty with water management	22	37.9
Increased weed problems due to flooding and drying of field	10	17.2
Lack of manure/compost for more SRI fields	10	17.2
Difficult to apply the principles at first	2	3.4
Difficult to select young seedlings in times of drought	2	3.4

Conclusions

In conclusion, it seems that farmers were very positive about their experiences using SRI and all of them want to experiment with SRI again next year. The main positive aspects of SRI as listed by the farmers were that it uses less seed, saves time and labour and returns higher yields than conventional practice. Farmers used a much higher amount of organic fertiliser on their SRI fields than Non-SRI fields and greatly reduced their use of chemical fertiliser on the SRI fields. However, these high rates were applied on small fields and 17 percent of farmers mentioned that they did not have enough organic fertiliser to apply to all of their fields. If SRI is going to be scaled up to the whole farm then it will be necessary to address this issue by promoting a more integrated nutrient management strategy. In the case of green manures, less than half of farmers remembered the concept, despite receiving training and only 12 percent of farmers actually grew a green manure crop prior to their rice crop.

Some of the other challenges for SRI include water management and increased weed problems. Water management includes problems associated with too little and too much water. Field levelling can help to spread the water evenly across the field in times of water scarcity. When fields are susceptible to flooding it will perhaps be more difficult to control the water, but many SRI principles would still have application in these situations. Many of the SRI principles are simply good agronomic principles, such as only using good seed, selecting healthy seedlings, timely transplanting, appropriate spacing and adding organic matter to the soil, and should be promoted in rice growing regardless of whether or not it is being called SRI. Due the wider spacing and flooding and drying of the SRI fields it is likely that weeding will be necessary in SRI fields. For many farmers this may seem like and additional labour requirement but it will likely be offset by the reduction in labour required for transplanting. Weeding devices such as small rakes and rotary hand weeders are also being introduced to farmers, but these tend to work much better if the farmers are planing out their seedlings in a grid pattern.

References

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CEDAC, 2004. Evaluation of SRI Experience in Cambodia from 2001-2003, The Cambodian Centre for Agricultural Studies and Development (CEDAC), Phnom Penh