ADRA Cambodia

SRI Report September 2004

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Preamble

The System of Rice Intensification or SRI, first identified in Madagascar 20 years ago-- is a methodology for increasing the productivity of irrigated rice by improving plant management through many interventions ranging from soil improvement to field maintenance. These interventions contribute to both healthier soil and plants through greater root growth and the development of soil microbial diversity. Individually most of the interventions have the potential to increase yields, however packaged together in the SRI approach has shown to dramatically increase yields.

Why SRI benefits Farmers, Consumers & Environment[1]

SRI's benefits lie in important differences from conventional rice growing practice, which, proponents believe, interact synergistically to give high yields.

First, seedlings are transplanted at 8-12 days instead of 15 to 30 days after germination, singly as opposed to 2-3 seedlings, and spaced up to 6 times apart compared to traditional practice; for example, up to 50cm x 50cm instead of 20cm x 20cm. This represents a substantial saving on seeds, up to ten-fold or more in some cases. The increased spacing has the effect of encouraging tillers or side shoots to develop quickly, giving many more rice-forming panicles per plant.

Second, the fields are kept moist during all or most of the growing season instead of being flooded continuously. This tremendous saving on water is particularly important in areas of water scarcity, and avoids the damages of salination that accompanies over-irrigation. It also encourages vigorous root development, which in turn gives more vigorous growth of the rice plants.

Third, no herbicides are used. Weeding is done with or a simple rotary hoe, which returns the weeds to the soil as green manure. This financial saving is offset by increased labour, but labour shortage is seldom a problem for farmers in the Third World, and weeding becomes less arduous in successive years. Giving up herbicides is a health bonus for all concerned: the farm worker most of all, and the consumer; and there is no pollution of the environment and ground water.

Fourth, no mineral fertilizers are used, only liberal application of organic compost. This financial saving is accompanied by an improvement to the quality and fertility of soil, reducing runoff, and improving its water-retaining properties.

Despite its early start in Madagascar, SRI has only begun in other countries since 2000, and already, positive results are pouring in.

[1] Institute of Science in Society http://www.i-sis.org.uk/

Summary

ADRA Cambodia's first introduction to SRI was on a field trip by team members from the AusAID funded Sustainable Agriculture and Family Empowerment (SAFE) project to CEDAC[2] organisation in June 2002. The SAFE team immediately embarked on trialling SRI in the project target area in the Districts of Kralanh and Angkor Chum in Siem Province. Harvest of the trials was conducted in December 2002, which showed average yield increases of 148% and 85% respectively or 3.24t/ha and 2.3t/ha. Results from the 2003 season showed 130% and 92% increase or 2.94t/ha and 2.26t/ha this showed a consistent higher yield. Reduced results in 2003 were due to poor rainfall in the area, many families were unable to grow any rice which has resulted in food shortages and reinforces the need to improve methodologies to increase rice yields.

Traditional Cambodian Rice Growing

Rice is the main staple food of Cambodians with rice production providing 65% of the population with seasonal employment opportunities. About 85% of the population of 13 million lives in the rural areas with 95% of those growing their own rice. The main rice growing ecosystem is the rain fed lowland rice which represents 86% of the total annual rice cropping area of Cambodia. It is characterised by flat bunded rice fields which depends almost entirely on rainfall or surface runoff for water supply, this usually means only 1 crop per year. Most families in our target area do not have sufficient rice from their own fields for the full year. The average yield using traditional methods is 1.3t/ha, with farmers having an average of 1.8 Ha of land for planting although not all rice fields are utilised.

Rice field preparation in the ADRA target area predominantly begins when the first rains set in and the ground is sufficiently moist enough to begin ploughing which is around May/June. Rice seed bed planting takes place soon after with seed scattered around a prepared bed close to the homestead. The soil in this seed bed is usually sparsely fertilized with cow manure and is clearly indicated by the clumps of vigorous growing seedlings where the cow manure was dumped. After about 30 - 45 days the seedlings are pulled from the seed bed and dashed against the workers legs to dislodge any excess soil. They are then tied together in small bundles with the tops of the seedlings cut to a uniform length for aesthetic appeal. They are then either left standing in the pooled water for up to a few days or stacked ready for transport to the paddy field for transplanting, usually within 36 hours.
Seedlings are then hand planted by pushing the stalks into the mud of the now flooded field, three per hill and spaced about 20cm apart. Generally once this is completed the field is not revisited for any further maintenance until harvest time. However, the fields do provide additional food sources during the growing period, with families scouring the fields at night using a flashlight looking for small fish, frogs and crabs. Closer to harvest, rats can become a problem and these are also hunted as they can significantly reduce a crops yield. Harvest by hand generally takes place in December, however this can vary by up to a month or two depending on the rice varieties used and other factors.

[2] http://www.tropentag.de/2002/abstracts/datashows/110.pdf

ADRA's Approach and Process of the SRI Trials

The SAFE team identified the farmers to work with on the basis of offering the rice seed to conduct the trial at no cost.
However, as the farmers are very much subsistence they were reluctant to try such a radical change in the method of growing rice for fear that they would not have any rice to harvest. With this in mind ADRA made a verbal commitment to the participants that would guarantee them rice at the same yield as they obtained the previous year for the same field, providing they followed the teams directions.

Most farmers were ridiculed by their neighbours, saying they would not harvest any rice for using the new methodology as their ancestors never planted only one seedling.
All trials were also overseen by representatives from the Provincial Department of Rural Development, to ensure protocols were as closely followed as possible.

The following is the methodology that was used in the rice trials and may not fully follow the generally promoted SRI methodology. Some of this reason was the fact that even our own Agriculture Officers did not fully believe in the methodology promoted and hence were reluctant to fully promote it, so erred on a compromise, mostly in regards to plant spacing and age of seedling transplanting. As their confidence also grows maybe they will follow the protocols more fully in the future. However, they know the people in the community and are in a better position to know exactly how far the people are willing to adopt a new methodology and so make some allowance rather than having the farmers to tell them they don't know what they are talking about and thus erode confidence they had in them for the future. The following is the process promoted to the farmers, while the project team was also overseeing the trials, many farmers did not follow the process as they should have once the Agriculture officer left to visit other participating farmers, so possibly greater results could have been achieved as a result if a reduced form of SRI had not been used.

- <u>Seed selection</u>
  - The seeds must have a minimum of 80% germination rate
  - Suitable for the local area, farm land and local climate
  - Short term of growing
  - Provide fertile clumps and high yield
  - Meet the need of markets
  - The rice seeds selected for this SRI trial were: Sen Pidor, Phkar Rom Duol, Phkar Rom Chong and Phkar Rom Check all local improved varieties.

- <u>Soil management</u>
  1- Seed bed preparation:
  - Seed beds must be flat with the size of 1.20m width x 5m length x 0.20m height, although size did vary.
  - Away from shadow with adequate air flow, with hand irrigation available.
  - Till two or three times up to 15 days before transplanting for weed control
  - Apply 2 Kg of manure or compost per $1m^2$ before sowing
  - Rake to cover the soil

- Seeds must be soaked in water for 12 hours and then dried for 24 hours to enhance germination
- Once seedlings are grown between 15 – 20 days old, then they must be pulled out from seed beds for immediate transplanting.

2- Rice field preparation:

- Till the field once or twice at a depth of 20cm – 30cm to make the field as level as possible
- 10 Kg of manure or compost per 10 m^2 must be used before transplanting to fertilize the soil, cover the field evenly.
- 5 Kg of manure or compost per 10 m^2 must be used 15 – 20 days after transplanting for the growth of transplants.

- Transplanting
  - Seedlings were transplanted from 15 – 20 days old
  - Planting spacing was between 20cm – 25cm and in a square pattern and a single seedling per hill.
  - Seedlings were generally planted immediately after harvest from the seed beds

- Field Maintenance

  Water management
  - The water in the rice fields must be checked and maintained frequently
  - Water depth varied but was promoted as maintaining about 2cm – 3cm to reduce weed growth, although 20% were at 20cm.

  Weeding
  - Weeding was conducted spasmodically but promoted no less than once or twice a month until the rice produces buds

Kralanh District:

In July 2002, 21 farmers were chosen in 3 villages in Kralanh District of Siem Reap Province to conduct rice trials using the SRI methodology, harvest occurred in November/December.

Determination of the yields in all trials was by identifying three obvious areas within the field of varying degrees of yield. A section measuring 4 square metres was cordoned off in an area of low yield, medium yield and high yield respectively, a total of 12 sqm. Once these sections were harvested the grain was weighed on site using hand scales and averaged out to give a per hectare yield. This was conducted in front of the whole community who were present to witness the event. A short meeting followed outlining the process of planting for the field and the resulting yield. The community was asked if they wanted to laugh any more at the farmers, they gave an embarrassed chuckle. When asked who wanted to use this methodology the following year, nearly every hand was raised, indicating they were believers, having seen it for themselves.

Table 1: 2002 season SRI trial results – Kralanh District

N°	Name of village	Number of farmers	Traditional T/h	SRI T/h	Increase %	Variety	Harvest
1	Kouk Phgnies	1	1.4	3.70	164%	Rom Duol	15 Dec 02
2	Khnar Tboung	3	1.5	3.87	158%	Sen Pidor	05 Dec 02
3	Ta Sokh	1	1.0	2.60	160%	Rom Duol	01 Dec 02
4	Khnar Cheung	2	1.3	2.80	115%	Rom Duol	10 Nov 02
5	Bos Thum	2	1.4	3.84	174%	Rom Duol	28 Nov 02
6	Chro Nieng	1	1.2	2.79	132%	Rom Chang	06 Nov 02
7	Preyla Ngieng	1	1.2	2.95	145%	Rom Duol	10 Nov 02
8	Prey Kieb	2	1.3	3.60	176%	Rom Duol	29 Nov 02
9	Kouk Thnout	2	1.2	2.50	108%	Rom Duol	02 Dec 02
10	Snoul	1	1.3	3.38	160%	Rom Duol	10 Dec 02
11	Roun	3	1.5	4.47	198%	Rom Chang	28 Nov 02
12	Chhouk Roth	2	1.3	2.45	88%	Rom Chang	26 Nov 02

Analysis
The results indicate an average yield increase of 148% over the traditional methodology, for many families this would be sufficient rice for the whole year if they had planted all their rice fields using the SRI method. However, due to their reluctance to commit fully only about 10 % of their fields were planted using the SRI methodology or variation of it. Harvest occurs when about 80% of the crop is ripe. Some villages also experienced less rainfall than normal which may have also contributed to reduced yields.

Table 1: Summary comparisons

Method	Harvest (days)	Tillers[3] / plant	Panicles[4] / plant	Transplant (days)	Yield t/ha
ADRA SRI	120	19 - 25	18 – 23	15 – 20	3.1
Traditional	140	8 - 10	5 -7	30 - 45	1.3

[3] A new or additional shoot arising from the base of the original stem (very common in grasses).
[4] A pyramidal, loosely branched flower cluster; a panicle is a type of inflorescence -rice seed head

Table 3: 2003 season SRI results

N°	Name of villages	Number of farmers	Traditional T/h	SRI T/h	Increase %	Variety	Harvest
1	Khnar cheung	1	1.3	3.20	146%	Rom Duol	13 Nov 03
2	Khnar tboung	1	1.2	3.28	173%	Sen Pidor	17 Nov 03
3	Kouk Thmey	3	1.1	2.70	145%	Rom Duol	26 Nov 03
4	Ksey	2	1.2	3.04	153%	Rom Duol	03 Dec 03
5	Ta Srey	1	1.3	2.80	115%	Rom Check	28 Nov 03
6	Chro Nieng	2	1.2	2.75	129%	Rom Chang	11 Nov 03
7	Tram Kong	1	1.4	3.10	121%	Rom Duol	19 Nov 03
8	Kouk Thnout	1	1.5	3.50	133%	Rom Chang	27 Nov 03
9	Chhouk Roth	1	1.4	2.80	100%	Rom Chang	05 Nov 03
10	Roun	1	1.4	3.60	157%	Rom Chang	30 Nov 03
11	Damrey Slab	1	1.2	2.50	108%	Sen Pidor	07 Dec 03
12	Snoul	1	1.2	2.30	91%	Rom Chang	13 Dec 03
13	Preyla Ngieng	1	1.1	2.30	109%	Rom Duol	29 Nov 03
14	Prey Kieb	1	1.3	3.30	153%	Rom Duol	25 Nov 03

In the 2004 season, the ADRA SAFE project team worked with 30 farmers using the SRI methodology, 20 in the District of Kralanh and 10 in Angkor Chum, results will be shared in 2005.

Angkor Chum District:

In July 2002, 7 farmers in 6 villages were chosen to conduct SRI trials, this area is to the north east of Kralanh District and sees dramatic climatic extremes with drought and floods experienced at varying degrees across the district. (See Annex A – Provincial Map)

The trials were conducted under the same conditions as those described above for Kralanh District. The results while not as impressive were significant for the farmers who participated.

Table 4: 2002 SRI rice trials – Angkor Chum

Village	No. of farmers	Trad /ha	SRI /ha	% Increase	Variety	Harvest	Observation
Sre Khvav	1	1.883	3.37	79%	Senpidor	18 Dec	Drought, Crab damage
Kouk Knaing	2	1.20	2.20	83%	Car 4	12 Dec	Flood, Crab damage
Rovieng Thmey	1	1.00	2.00	100%	Phka Rum Duol	12 Nov	Flood
Khan Sor	1	1.20	2.20	83%	Car 4	15 Dec	Flood, drought
Takuoy	1	1.20	2.00	66%	Phka Rum Duol	04 Nov	Drought & flood
Chumnum Reach	1	1.00	2.00	100%	Phka Rum Duol	30 Nov	Flood & Crab damage

Table 5: 2003 SRI rice trials – Angkor Chum

Village	Number of farmer	Traditional /ha	SRI/ha	Increase	Variety	Harvest	Observation
Prey Ar	1	1.00	2.00	100%	Senpidor	28 Nov	Drought, old seedling
Ampil thnung	1	1.10	2.30	109%	Senpidor	27 Oct	Drought, died seedlings.
Kouk knaing	3	1.60	2.40	50%	Senpidor, Phka rumduol	06 Dec	Drought
Rovieng thmey	1	1.20	2.50	108%	Phka rumchang	07 Nov	Drought, crab
Khan sor	1	1.20	2.40	100%	Phka rumduol	06 Dec	Drought, died transplantation.
Takuoy	1	1.20	2.50	108%	Phka rumduol	06 Nov	Flood, drought
Chumnum reach	1	1.00	2.00	100%	Phka rumduol	25 Nov	Drought
Koul	1	1.2	2.00	66%	Senpidor	02 Dec	Drought

Issues, Problems and Constraints Encountered

- Lack of organic matter (SRI practice requires substantial amounts)
- Transplanting in a square pattern requires more work and is slower
- Transplanting really young seedlings, 8 – 12 days, was not widely taken up
- Frequent weeding as weeds grow more easily due to less water in the field, more labour input
- SRI trials done only on a limited size of farm land as farmers still hesitate to commit all their land.
- Farmers usually face natural disaster (drought, flood, crabs and other pests)
- Increased labour input for field maintenance, weed control, water control, making compost.
- Farmer state they can only use SRI on small plots due to the reduced water requirement and increased weeds as it then requires increased labour input for weeding – lack of time and labour, rice is not their only activity.[5]
- Lack of widespread adoption due to farmer's lack of resources – organic matter and labour.
- Farmers do not believe that one grain of rice can yield from 15-25 panicles.
- Farmers also complain that it is difficult to separate seedlings so young so will still put in more than one seedling due to the extra time to separate them.

[5] *Authors personal interpretation not necessarily that of ADRA* - It appears that there is a close relationship between the amount of time they are willing to commit to food production and their socialising activities. Their fatalistic attitude prevents them in many ways from experiencing release from poverty as they believe it is their destiny to be poor so why try to fight against it.

- Not possible in most situations to regulate the water in fields due to surrounding plots and little run off capacity due to low lying fields.

Benefits

According to the experience of the ADRA SRI trial, some farmers will use parts of the system on their own for the following reasons:

- SRI requires less seeds than other systems
- Weeding is made easier as rice is planted in a square pattern and row
- Save money as chemical fertilizer not required
- Soil improvement
- Reduced water application
- Increased rice yields

Conclusion

Due to the expanding population in Cambodia, 2.4% net per annum, there is increasing pressure to ensure higher food (rice) production capacity. The results of using this methodology are obvious however, a number of issues were identified that while farmers want to improve their yields there is a limit on the amount of time they are willing to put into their rice field management. As mentioned previously the SRI methodology is a package of many interventions, any one if implemented can improve yields. This will suit many farmers as they will be able to choose what ones they want and the yield increases they need, thereby balancing labour inputs with other social factors which require their time. ADRA Cambodia is committed to improving a family's food security through new improved locally accepted techniques. This report is provided to share our experience with others that hopefully will lead to a reduction in poverty amongst the poor rural families of Cambodia, thereby helping to 'change the world one life at a time'.