Preliminary Results
Rice Production and the System of Rice Intensification (SRI)
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Introduction

SRI is a system that is being proposed in many Asian and African countries as a means of increasing rice production without using chemical inputs such as pesticides and fertilizers. The crops nutrient requirements come from animal manure and all weed control is done manually. Advocates of this system are claiming rice yield in access of 10tons/ha and even as high as 20 tons/ha.

The SRI system

In the SRI system, seedlings are transplanted at 10 days of age (2 leaf stage) into well-prepared and puddled seedbeds. Seedlings are planted in single seedling hills at row and plant spacing of 30 or 40 cm. The distance between the plants is determined by soil type and nutrient status. Ten (10) tons of animal manure is incorporated 10 days before transplanting. No additional fertilizer is applied during the cropping season. The fields are irrigated by overnight flash flooding and then allowed to dry and crack at the surface before the next flooding event. Permanent water of 1-3cm is maintained in the field at the onset of flowering up until 25 days before harvest. All weeding is done using a conical hand weeder and the first weeding is undertaken 10days after transplanting

Rice Cropping Systems Studies at IRRI

Preliminary study (2002)

A preliminary rice cropping system study, which included SRI, began at IRRI in the dry season of 2002 in a non-replicated trial. In this study 4 different rice cropping systems were compared in large fields (1250m). The treatments included the tradition systems of transplanting and broadcasting rice into puddled fields and also dry seeding into dry soil, which was then irrigated. These 3 treatments were continuously flooded from establishment through until 15 days before harvest, while SRI was flash flooded until flowering and then continuously flooded until 15 days before harvest. All treatments were planted with IR65. All inputs such as water, energy, nutrients and chemicals were recorded and all outcomes measured.

Results

Crop Inputs

Inputs per plot	**Transplant**	**Broadcast**	**Dry seeding**	**SRI**
In crop water (Ml/ha)	5.4	5.2	6.2	4.1
Labor (hrs/ha)	799	666	643	1920
Seed (kg/ha)	40	80	90	8
Fertilizer (N kg/ha)	120	120	135	10,000 (animal)
Pesticide (l/ha)	3.5	3.5	3.5	2.0
Fuel (l/ha)	98	98	128	120

Plant and yield measurements

Plant Measurements	**Transplanting**	**Broadcasting**	**Dry seeding**	**SRI**
Tillers (no/plant)	8	6	7.5	31
Tillers (m2)	472	473	428	282
Panicles (m2)	464	466	380	266
Grains (no/panicle)	80	67	na	93
Grain yield (kg/ha)	**3117**	**3979**	**2108**	**1440**

Observations

SRI

- Plant spacing was too wide. The crop never closed up which resulted in greater green leaf hopper activity and more plants affected by Tungro virus
- Insufficient tillers were produced to compensate for wide plant spacing (40% less tillers)
- There was obvious nitrogen deficiency at panicle initiation

- Lower grain yields were recorded (46% of transplant)
- High labor inputs were used (2.4 times greater than transplant)
- In crop water use was less (24% less than transplant)

Cropping Systems Study (wet season 2002)

A long -erm replicated cropping system trial was implemented in the wet season of 2002. Six treatments were planted with IR 73855, each replicated 3 times. The treatments were:

- Puddled transplanted (3 seedlings per hill, 15 days old seedlings)
- Puddled broadcast (seeded 80kg/ha, pre-germinated broadcast into water)
- Dry direct seeded (seeded 80 kg/ha, dry machine seeded, irrigated to establish)
- Bed direct seeded (seeded 80kg/ha, pre-germinated broadcast into water)
- Zero tillage (seeded 80 kg/ha, dry machine seeded, irrigated to establish)
- SRI. Following the results from the preliminary study in the 2002 dry season, SRI was planted on 30cm x 30cm spacing to try and increase the number of panicles and tillers per m2.

A non-weeded section (5m wide) was left across all treatments to determine the effect that weeding had on crop yields in the different treatments.

Results

Crop Inputs

Inputs per plot	**Transplant**	**Broadcast**	**Dry seeding**	**Zero till**	**Bed**	**SRI**
Irrigation (Ml/ha)	9.5	7.4	17.0	12.0	17.4	5.5
Rainfall (mm)	1145	1145	1145	1145	1145	1145
Labor (hrs/ha)	248	400	312	328	520	776
Machine (hrs)	12	14.5	5.5	5.5	6.5	9.5
Seed (kg/ha)	40	80	80	80	80	8
Fertilizer (N kg /ha)	80	80	90	90	80	10,000 (animal)
Pesticide (l/ha)	3.8	2.8	2.8	6.0	2.8	
Fuel (l/ha)	144	112	64	64	80	112

Plant and Yield Measurements

Plant Measurements	**Transplant**	**Broadcast**	**Dry seeding**	**Zero till**	**Bed**	**SRI**
Tillers (no/plant)	8	11	9	11	10	22
Tillers (m2)	389	348	397	407	371	219
Panicles (m2)	366	325	344	389	335	213
Grains (no/panicle)	90	107	106	90	108	110

Grain yield - non weeded (kg/ha)	**4474**	**2130**	**1627**	**1891**	**879**	**2401**
Actual grain yield (kg/ha)	**4052**	**3601**	**3371**	**3477**	**2787**	**2996**

Observations and comments

SRI

- The plant spacing was too wide and the crop never closed up
- There was insufficient tillers produced to compensate for the wide plant spacing (44% less tillers)
- There was obvious nitrogen deficiency at panicle initiation
- Lower grain yield (26% of transplant treatment)
- High labor inputs (3.1 times transplant)
- The total water use was less (42% less than transplant)
- Weeding had less effect on SRI than all other treatments except transplanted treatment (weeds reduced yields by 19%). This would also support the fact that there is insufficient production of plant material.

Beds

- Bed width (65cm) was too narrow
- Lower yield (31% less than transplanted)
- Water use was 63% higher than transplanted
- Labor requirement were 1.3 times that of transplanted
- Weeds reduced yields by 71%

Zero-till

- Water use was 26% higher than transplanted
- Higher N requirement (10kg/ha)
- Weeds reduced yields by 46%

Dry prepared, dry planted

- Water use 75% higher than transplanted
- Higher N requirement (10%)
- Weeds reduced yields by 52%.

Broadcast

- Water use was decreased by 22% when compared to transplanted
- Weeds reduced yields by 41%