A PARADIGM SHIFT FOR AGRICULTURE : AN EXPERIENCE OF SRI, A FARMER'S TECHNOLOGY

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PARADIGM SHIFT

- Perhaps the greatest change in mindset in human history was from the belief in a geocentric view of the universe (Earth at the orbital centre of all celestial bodies) to a Heliocentric (the sun at the centre).

- In agriculture: GREEN REVELUTION

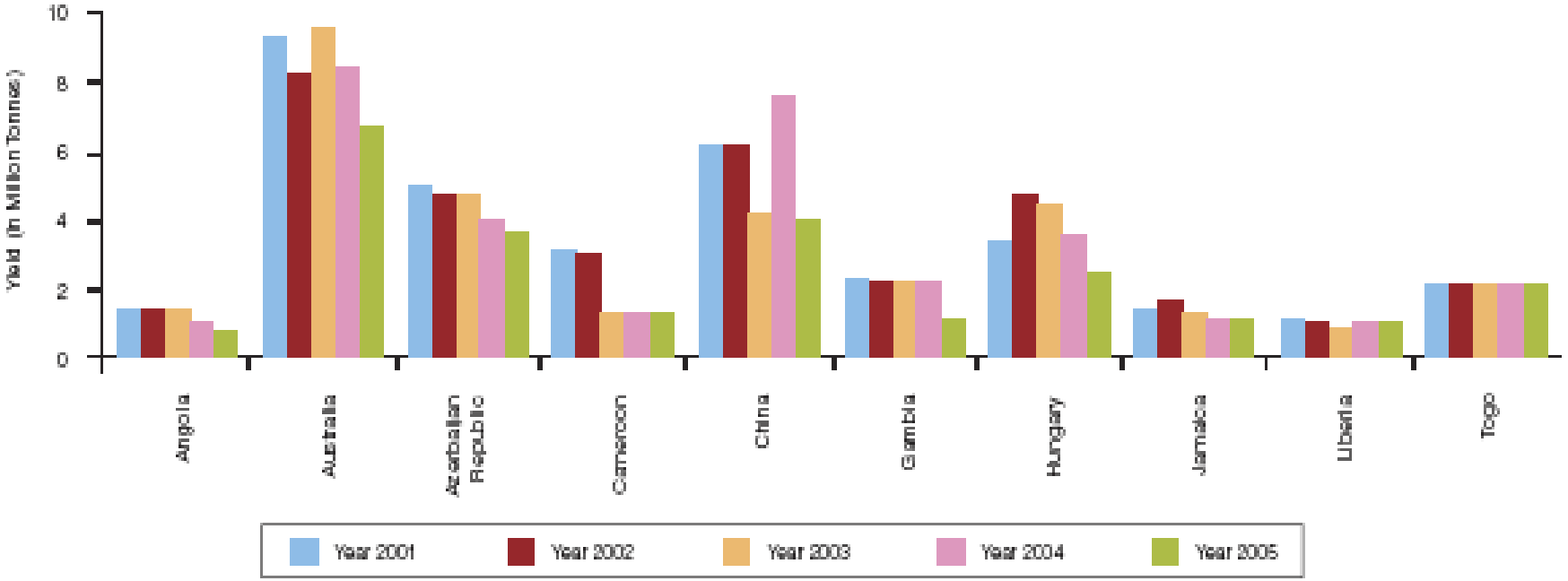
- SUSTAINSABLE AGRICULTURE : SRI
- → ***SRI (System of Rice Intensification)*** as a promising agricultural innovation?: Fiercely debated within the scientific community → how promising a technology is it (on farmers' own plots)?
- SRI: A major departure from conventional approaches to yield increase

The two major strategies of **Green Revolution** are : (a) **Changes and increased CROP GENETIC POTENTIAL (**nutrient- responsive, high- yielding varieties of crops**) and (b) use of EXTERNAL INPUTS (**more agrochemicals, more fertilizers and more pesticides, more water**)**

Priorities in agriculture research are gradually moving from a focus on maximization of crop production to a total **system productivity with due attention on stability, product quality and environment safety.**

[redacted]

Figure 3.1: Country-wise Decline in Rice Yield



Source: Global food suppl[redacted]

- **World food production per capita peaked in 1984 and if we are to achieve global food security we require, according to Norman Uphoff, political scientist at Cornell University and lead of the SRI-Rice group, a similar paradigm shift.**

WHAT IS SRI (SYSTEM OF RICE INTENSIFICATION)?

SRI (SYSTEM OF RICE INTENSIFICATION) FROM MADAGASCAR

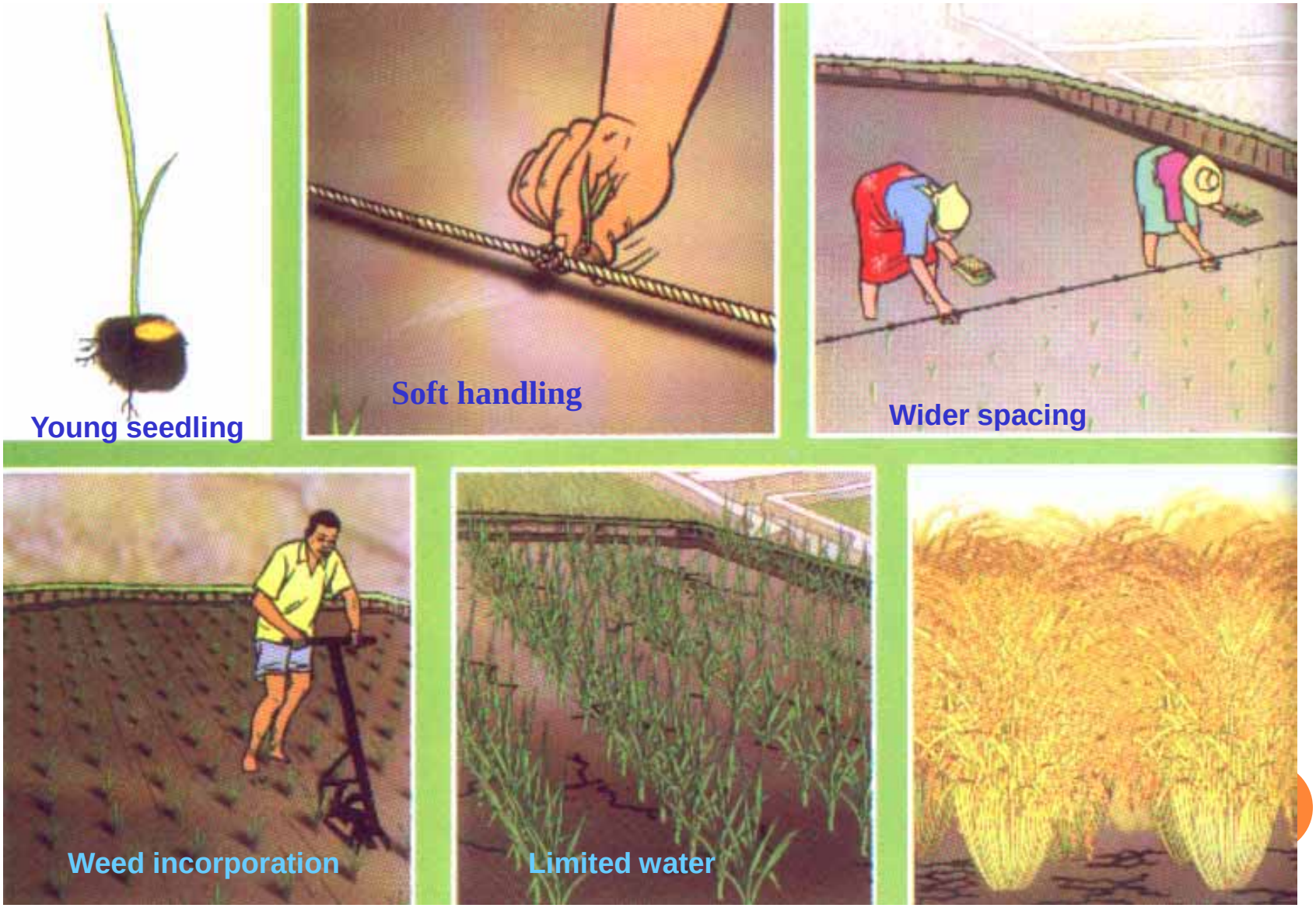
From 1 plant

20 years ago

The System of Rice Intensification was developed in Madagascar and popularized in the 1990s by Henri de Laulanié, a French Jesuit priest. Developed quite experimentally and inductively, SRI is not a standardized technological method. More importantly, it is a methodology for comprehensively managing resources— changing the way land, seeds, water, nutrients and human labour are used. SRI is an amalgamation of multiple beneficial practices.


The System of Rice Intensification (SRI) improves yield with less water, less seed and less chemical inputs than most conventional methods of rice cultivation.

SYSTEM OF RICE INTENSIFICATION



SIX COMPONENTS OF SRI

1. **RAISED SEEDBED**

2. **EARLY TRANSPLANTING**

   seedlings 8-12 days old, when plant has only **two small leaves**,before fourth phyllochron

   - More **tillering** potential
   - More **root growth** potential

3. **CAREFUL TRANSPLANTING**

   Minimize trauma in transplanting

   Remove plant from nursery with the seed, soil and roots carefully and place it in the field without plunging too deep into soil

   - More **tillering** potential

RAISED SEEDBED

Different methods of raising nursery

RAISED SEEDBED WITH IN THE MAIN PLOT

UPROOTING OF SEEDLING WITH SOIL

Pulling out of seedlings

Conventional

SRI

TRANSPORTING OF SRI SEEDLING

Transport of seedlings

Conventional

SRI

MAIN FIELD FOR SRI

CAREFULL HANDLING OF SEEDLING

3. WIDER SPACING

plant single seedlings, not in clumps, and in a square pattern, not rows, 25cm x 25cm or wider

- More **root growth** potential

4. WEEDING AND AERATION

needed because no standing water; use simple mechanical “rotating hoe” that churns up soil; 2 weedings required, with 4 recommended before panicle initiation; first weeding 10 days after transplanting

- More **root growth**, due to reduced weed competition, and aeration of soil, giving roots more oxygen and N due to increased microbial activity

After 12 days in nursery
the plant height
is 7.7 inches
(18.8cm)

Length of main root
is 5 inches
(12.7 cm)

4 leaves

8 small roots

SINGLE SEEDLING TRANSPLANTING

WEEDING BY ROTARY WEEDER

Cono Weeder

Single drum Weeder

Kollur Weeder

Japan Weeder

Star Weeder

Contd..

5. WATER MANAGEMENT

regular water applications to **keep soil moist but not saturated**, with intermittent dryings,alternating aerobic and anaerobic soil conditions

- More **root growth** because avoids root degeneration able to acquire more and more varied nutrients from the soil

6. COMPOST/FYM

applied instead of or in addition to chemical fertilizer; 10 tons/ha;

- More **plant growth** because of better soil health and structure, and more balanced nutrient supply

SRI RICE FIELD WITH CONTROLLED WATER

Roots of SRI Vs Conventional

AN EXPERIMENTAL SRI INTRODUCTION IN WEST BENGAL

AN EXPERIMENTAL SRI INTRODUCTION IN WEST BENGAL (1): DEBRA BLOCK, WEST MEDINIPUR DISTRICT

- 2 distinctive study objectives:
  1. To test the performance of SRI rice cultivation, as operated by farmers on their own plots (*how promising is SRI?*)
  2. To examine how (e.g., how fast?, who adopts first?, etc.) SRI cultivation spreads among neighboring farmers, in response to the experimental-cum-demonstration plots (*how receptive are farmers to SRI?*)

AN EXPERIMENTAL SRI INTRODUCTION IN WEST BENGAL (2): DEBRA BLOCK, WEST MEDINIPUR DISTRICT

- sample village selection: a random sample of 30 villages in Debra Block (458 villages in total), West Medinipur district, West Bengal
  - Irrigated rice ecosystem
  - Relatively easy access from/to Kolkata
  - Some prior NGO activities in the area (e.g., organic farming by Chaplin Club, etc.)

	First year- 2010			Second year- 2011			Average		
Parameter	non-SRI	SRI	% increase from SRI over non-SRI	non-SRI	SRI	% increase from SRI over non-SRI	non SRI	SRI	% increase from SRI over non-SRI
Plant height(cm)	75.49	85.40	13.13	86.49	100.0	15.69	80.99	92.73	14.50
Number of tillers per sq meter	636.3	1109	74.39	559.7	985.3	76.03	598.0	1047.5	75.16
Number of tillers per hill	11.89	61.09	413.83	16.24	49.77	206.39	14.07	55.43	294.05
Number of reproductive tillers per hill	9.41	50.64	438.30	14.24	43.90	208.16	11.83	47.27	299.70
Panicle length(cm)	18.30	21.12	15.42	18.67	24.28	30.08	18.48	22.70	22.82
Weight of the panicle/hill	64.31	126.6	96.88	49.42	91.40	84.93	56.87	109.01	91.69
Number of seeds per panicle	121.1	162.2	33.90	148.7	208.4	40.09	134.9	185.31	37.31
1000 grain weight(g)	18.60	23.64	27.12	21.82	29.83	36.71	20.21	26.74	32.30
Dry grain yield per plot (kg/ha)	3327	7148	114.83	5380	7219	34.19	4353	7183.7	65.00
Dry straw yield plot (kg/ha)	5524	13086	136.89	6311	8640	36.90	5917	10863	83.57
Change in ph after the crop	(0.09)	0.16		(0.11)	0.08		(0.10)	0.12	
Change in soil organic carbon (%) after the crop	(0.07)	0.12		(0.08)	0.10		(0.08)	0.11	
Change in available Phosphorus (kg ha-1) after the crop	(4.17)	7.98		(4.30)	3.89		(4.23)	5.93	
Change in available Nitrogen (kg ha-1) after									

INITIAL FINDINGS: SRI PERFORMANCES (1)

- Substantial yield advantage of SRI vs. non-SRI: 30%~100%

Table 1. Yield comparison: SRI vs. non-SRI

	Per hectare rice yield (kg)		
year	SRI (# of plots)	non-SRI (# of plots)	Yield difference in %
2010	7,148 kg/ha (15)	3,327 kg/ha (15)	114%
2011	7,219 kg/ha (16)	5,380 kg/ha (15)	34%
2013	11,060 kg/ha (14)	7,333 kg/ha (14)	51%
all years pooled	8,390 kg/ha (45)	5,302 kg/ha (44)	58%

INITIAL FINDINGS: SRI PERFORMANCES (5)

Costs and profits: SRI vs. non-SRI

- Input cost may be higher under SRI
- Profit substantially higher under SRI: 20%~150%

Table 3. Cost and Profit Estimates: SRI vs. non-SRI (Rs/katha)

	2010		2011		2013		All years pooled	
	SRI	**non-SRI**	**SRI**	**non-SRI**	**SRI**	**non-SRI**	**SRI**	**non-SRI**
Input costs (Rs/katha)	95.4 (15)*	84.7 (15)	**140.5** (16)	**65.7** (15)	115.0 (14)	117.1 (14)	**117.5** (45)	**84.7** (44)
Labor costs (Rs/katha)	540.0 (15)	572.9 (15)	439.0 (16)	389.3 (15)	415.5 (14)	417.0 (14)	465.3 (45)	460.7 (44)
Total costs (Rs/katha)	635.4 (15)	646.5 (15)	**579.5** (16)	**455.0** (15)	530.4 (12)	534.1 (14)	582.8 (43)	545.5 (44)
	Profits per katha (Rs)							
Profit (without labor costs) (Rs/katha)	**381.1** (15)	**148.2** (15)	**485.2** (16)	**400.6** (15)	**632.1** (15)	**385.0** (15)	**496.2** (45)	**309.6** (44)
Profit (with labor costs) (Rs/katha)	**-158.9** (15)	**-424.7** (15)	**46.2** (15)	**11.3** (15)	**216.7** (15)	**-32.0** (15)	**30.9** (45)	**-151.1** (44)

* Number of observations in parentheses.


THANK YOU FOR
YOUR ATTENTION!