SRI's Potential for Food Security in Cambodia: Fact or Fallacy?

Ministry of Agriculture, Forestry and Fisheries

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SRI Proposition: For Centuries, Even Millennia, We Have Been ABUSING and even MISTREATING Rice Plants

- We have FLOODED rice plants – drowning their roots
- We have CROWDED them – inhibiting the growth potential of their canopy and roots
- We use FERTILIZERS/AGROCHEMICALS that adversely affect the soil biota
- These provide many services to plants: N fixation, P solubilization, protection against diseases and abiotic stresses, etc.

SRI Results are Remarkable -- but They Have Been Replicated Widely

- Yield increases – 50-100% or more
- No need to change varieties – all respond
- No need for mineral fertilizers – these are beneficial, but compost gives better yield
- Little or no need for agrochemicals -- SRI plants more resistant to pests/diseases
- Reduction in seed requirement by 80-90%
- Reduction in water requirement by 25-50%
- More labor is required initially -- but over time, SRI can even become labor-saving

Additional Benefits

- Because it has low capital requirements, SRI is more accessible to the poor
- The initial labor-intensity of SRI can generate more employment
- By increasing factor productivity for land, labor, capital and water, it raises incomes
- IWMI and GTZ evaluations: reduced risk
- Resistance to abiotic stresses (storm, frost)
- Better grain quality, shorter maturity, etc.
- Environmental benefits from reduced water, fertilizer and agrochemicals – get better water quality, fewer health hazards

Too Good to Be True?

- This perception has been a problem for getting SRI accepted, even tried
- Logical arguments have been used to avoid testing SRI empirically
- SRI creates a new logic for rice – new paradigm that is different from the 'Green Revolution'
- Need to separate questions of FACT from questions of EXPLANATION
- Many good reasons to be skeptical of SRI – but skepticism is better to be optimized than maximized – focus on evidence, then attempt explanations

RICE YIELDS ON HIGH PLATEAU IN MADAGASCAR, 1994/5-1998/9

ANTSIRABE & AMBOSITRA REGIONS

	Peasant Practice	SRA*	SRI
Area			
1994/95	1875.5	4361.9	34.5
1995/96	1501.5	5224.5	88.7
1996/97	1419.0	3296.7	226.7
1997/98	3122.0	2893.8	229.7
1998/99	2768.1	2628.0	542.8
Yield			
1994/95	2.02	3.96	8.62
1995/96	1.96	3.41	7.89
1996/97	2.08	3.30	10.68
1997/98	2.84	3.78	8.59
1998/99	2.97	4.61	8.07
Average	2.36	3.77	8.55

* SRA = System de Riziculture Ameliorée = HYVs, fertilizer, row planting, etc.

From: Robert Hirsch, *La Riziculture Malgache Revisitée: Diagnostic et Perspectives (1993-99)*, Agence Française de Développement, Département des Politiques et des Etudes, Antananarivo (Janvier 2000), Annexes 13-14

Madagascar SRI field, 2003, yield measured by Department of Agriculture as 17.2 t/ha

Some Independent Evaluations

IWMI evaluation: Purulia, West Bengal (2004)

Farmers (N=110) using both methods in fields

Number of SRI users working went from 4 in rabi season 2003, to 150 in kharif 2004 – why?

Still partial utilization: seedlings <15 days (53/110), water management (13/110), weeding (59/110), wide spacing (110/110), and one/hill (107/110)

	Conv.	SRI	*Incr.*	Straw
Balrampur	**1.677**	**2.513**	***49.8%***	**49%**
Jhalda	**1.510**	**1.716**	***11.9%***	**54%**

Yield with 4 weedings 9.02 t/ha; one field 15 t/ha

IWMI evaluation: Purulia, West Bengal (contd)

Productivity of inputs (kg rice/unit of input)

	Conv.	SRI	Incr.
Seeds (kg rice/kg seed)	61.3	845.6	38.5x
Fertilizer (kg rice/kg)	36.6	42.4	16%
Labor (kgs rice/day)	32.3	46.2	43%
Land (kg rice/acre)		32% more	
Labor inputs/acre	401.8	369.1	- 9%

Labor saved = Rs. 184/acre ($75/hectare); this time is now available to use for other activities

China Agricultural University evaluation: Xinsheng Village, Dongxi Township, Jianyang County, China (August 2004)

- 2003 – 7 farmers used SRI (SAAS)
- 2004 – 398 farmers used SRI (65%)
- 2003 – SRI plot size average 0.07 mu
- 2004 – SRI plot size average 0.99 mu
- *86.6% of SRI farmers (65/75) said they would expand their SRI area next year or keep their whole rice area under SRI*

Analysis of Farmer Rice Yields
[N = 75] (20% sample of all users)

	RICE YIELD (kg/mu)		
	2002	2003*	2004
Standard Methods	*403.73*	*297.88*	*375.77*
SRI	*--*	*439.87*	*507.16*
SRI Increase (%)		*+46.6%*	*+34.8%*

- Drought year **Water saving/mu = 43.2%**
- Farmers said: **Labor saving main benefit**

SRI rice field, hybrid variety, Yunnan province, 2004 – 18 t/ha

3-S is system of rice cultivation developed in Heilongjiong Province, China in 1990s, essentially the same as SRI

3-S seedlings are started at the end of winter in plastic greenhouses

3-S seedling ready for transplanting at 45 days-- and resulting plant

A. P. Agricultural University evaluation, India

Started on-farm trials [N=300) in wet season 2003, in all 22 districts: results good

- **1.8 t/ha yield advantage in coastal areas**
- **2.5 t/ha advantage in Telangana region**
- **4.8 t/ha advantage in Rayalseema region**

Note: Better-drained soils responded better to SRI

Next two seasons, more on-farm controlled trials

	N	Conv.	SRI	Diff.
DS 2003-04	94	7.13	9.67	2.54
WS 2004	476	5.48	7.92	2.44

Again: much better SRI results with soil aeration

- **Lakshmana Reddy: ave. yield of 16.25 t/ha on 9 acres**
- **N.V.K.D. Raju: ave. yield of 11.15 t/ha on >100 acres**

Swarna variety, normally ‘shy-tillering’

Lakshmana Reddy’s SRI field: 17.25 t/ha

The System of Rice Intensification

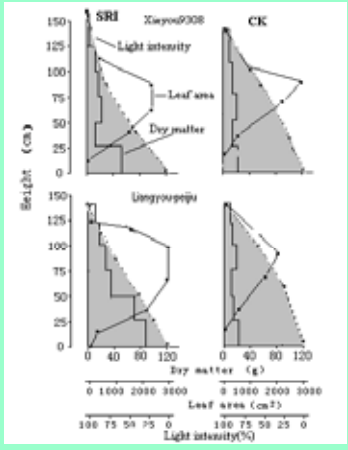
- **Evolved in Madagascar over 20 years by Fr. Henri de Laulanié, S.J. – working with farmers, observing, doing experiments, also having some luck in 1983-84 season**
- **SRI is now spreading around the world – 'SRI effect' has been seen in 22 countries**
- **SRI is a set of principles and insights that when translated into certain practices change the growing environment of rice to get healthier, more vigorous plants**
- ***Get different, more productive phenotypes from any rice genotype: HYVs, hybrids, local variety***

Fr. de Laulanié making field visit

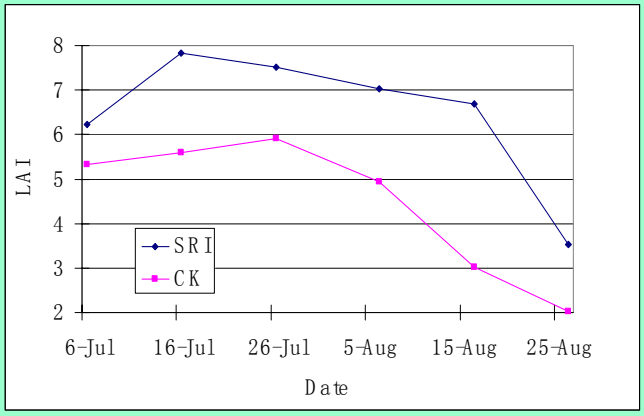
Sebastien Rafaralahy and Justin Rabenandrasana, Association Tefy Saina

Plant Physical Structure and Light Intensity Distribution at Heading Stage

(Tao et al., CNRRI, 2002)

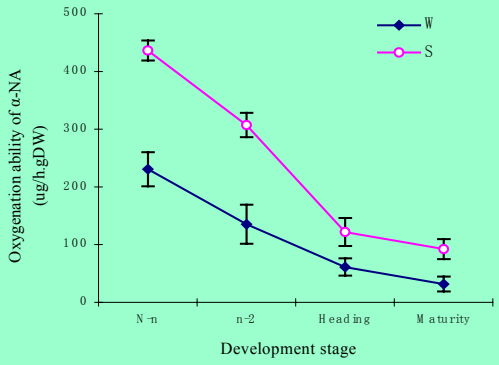


Change of Leaf Area Index (LAI) during growth cycle (Zheng et al., SAAS, 2003)



Roots' Oxygenation Ability with SRI vs. Conventionally-Grown Rice

Research done at Nanjing Agricultural University, Wuxianggeng 9 variety (Wang et al. 2002)



What Are SRI Practices?

- *Transplant young seedlings (8-12 d old, <15 days), quickly (15-30 min), carefully*
- *Plant with wider spacing than at present:*
  - *1 seedling per hill, or at most 2 seedlings*
  - *in square pattern, starting at 25x25 cm, but often get better results at even wider spacing as soil improves biologically, up to 50x50 cm*
- *Practice water control, keeping soil moist but not continuously saturated*
- *Control weeds and aerate soil with rotary weeder; weed/aerate as often as possible*
- *Apply as much organic matter as available*

Ms. Im Sarim (Takeo) with rice plant grown from single seed, using SRI methods and traditional variety -- yield of 6.72 t/ha