


Benefits of System of Rice Intensification (SRI):
Pro-poor option for household food security and resource conservation

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OUTLINE

- Background
- Genesis of SRI
- SRI practices
- On farm quantification of SRI benefits
- Governance of SRI
- Policy Interventions

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MOTIVATION


- **COMPLACENCY and FOOD SECURITY:** Food production scenario in the post independent India was satisfying. But, things changed in the post modern agriculture. Because.
- **THE IMPENDING WATER CRISIS AND COMPETING SHARE OF WATER IN AGRICULTURE** adversely affected food production & productivity


Hence

1. Is the need for enhanced crop productivity and farm profitability
2. To ensure Sustainability:

Future food security, conservation of precious water in irrigated rice (conjunctive use) crop diversification for income security, and input use efficiency is essential

Actually complacency is more at National Level as compared to Household Level, where the household food security is at stake





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Rice is an important item in the food basket.
 It is a staple food of 2.4 billion people worldwide, which is expected to reach 4.6 billion by 2050, hence would require 70 per cent growth of production by 2025 (A Study sponsored by Bill Gates Foundation and team consists of Wegningen University, Cornell University and IRRI)

But decline in per capita availability of rice is a concern and have implication on food and nutrition security

Therefore, more effective cultivation practice is required for sustainable productivity and innovative conservation practices.

System of Rice Intensification is one such innovative practices

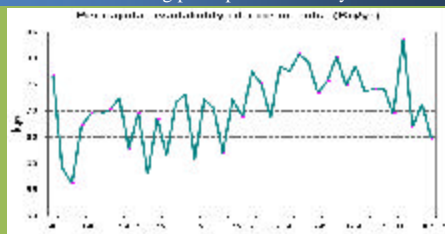
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DOMINANT CHARACTERISTICS OF RICE

High water demand

Deceleration and stagnant production and productivity

Declining per capita availability



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SRI

- *Is defined as an amalgamation of set of practices that generate synergistic effect resulting in higher yield*
 - *Novelty of SRI is the dual power of enhancing yield while conserving resources*
 - *converts the neglected resources such as the vigour of the young seedlings into wealth, enables efficient use of solar energy and aeration*
 - *Enhances the power of the plant due to lesser competition, which provide enabling condition for full realization of the potentials and genetic expression that the rice plant is endowed.*
 - *Gives more number of healthy plants powered by healthy root growth*
 - *Enriches soil health due to invigorating microbial activities*
- SRI is being cost effective increases crop income and employment, Opens up opportunities for crop diversification***

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A set of simple practices enables farmers produce reasonably more rice with lesser inputs.



A SET OF PRACTICES SYNERGISTICALLY IMPROVES THE PLANT PERFORMANCE

RICE PERFORMS BETTER WITH	– Wide spacing , Careful transplanting ,Young seedlings (better growth potential)
RICE PERFORMS BETTER IN FAVOURABLE SOIL ENVIRON:	– Freedom of growth, more energy and air, less attack of pest and disease enemy . This success is mainly due to the ideal crop establishment accompanied by effective soil management and crop care
AGRONOMIC PRACTICES ADAPTED TOLOCAL CONDITIONS	Early transplanting -- < 15 days, best between 8-12 days, only two tiny leaves – Careful transplanting within 15-30 minutes and root laid into soil 1-2 cm, – Wide spacing – single plants per hill, in square pattern, at least 25X25cm – Well-drained soil during vegetative growth phase – (a) no continuously standing water with (b) alternate wetting/drying (4-5 days). – A thin layer of water (1-2 cm) advisable, to drain before harvesting – Early and frequent weeding , 10-12 DAT, up to 4 times, with a rotary weeder – Nutrient amendments ; Preferred compost over chemical fertilizer

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Distinctive visible Features	
Less seed rate:	A seed rate of 2-5 kg as against 30-40 kg per acre of average normal rice
Less nursery area:	A mat nursery area of 1 cents (40 sq.m) while in normal methods, 8 cents per acre is required.
Efficient Soil aeration:	Cono-weeding facilitates proper aeration in the root zone to enhance the power of root system
Water saving:	Water requirement under SRI is less than 600 to 700 mm thru intermittent irrigation while in conventional method, 1200 – 1500 mm of water is required for continuous flooding.
Skill Labour :	Labour required for nursery period is less (12labours) for SRI nursery compared to conventional nursery (30 labours).
Small farmer Orientation	More production with lesser resources
Higher yield:	The additional yield advantage in SRI more than 1500 kg/ha . The reason is mainly attributed to more number of productive tillers with increased number of filled grains.
Control of malaria & green house gas	By avoiding flood irrigation and adopting limited irrigation, the breeding of malarial mosquito in rice fields is checked.

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Pro-poor orientation of SRI

- **More accessible to the poor** due to less external inputs and indifferent to variety (modern or traditional).
- **Reduced demand for water:** *About half as much water is required due to alternate drying and wetting system vis-a-vis the continuously flooded fields.*
- **Potentially reduce environmental externalities** (*greenhouse gas emissions, healthy soil, conservation of water and lands*)

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SRI offers opportunities to:

- 1. Increase production** even double or tripling yield averaging about 8 t/ha, which can change the rice availability globally, with less land, water and other inputs.
- 2. Raise factor productivity, and**
- 3. The property of varietal invariant, reducing chemicals and use of other inputs make SRI accessible to the poor (a pro-poor option), while being Environmentally friendly**

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SRI MOVEMENT (Pathway of SRI)

- ❑ Developed in Madagascar almost two decades ago under the guidance of Fr. Henry de Laulanie, who rediscovered this novel practice by putting together basic combination of several practices at his young farmers' school.
- ❑ **Initial skepticism, hindered acceptance of SRI for adoption in India, but there is welcome change in mind set.**
- ❑ **ICAR reported 48% yield gain due to SRI and**
- ❑ In a quick succession of less than two decades, SRI spread to as many as 49 countries 2008.
- ❑ Tamilnadu and Andhra Pradesh are the two pioneer states in India, joined by Tripura of late.
- ❑ **NCAP has launching nation-wide campaign in 2008 to promote SRI**

Rice is a water loving crop

- But, water is the most limiting factor for rice, which is under severe stress, as Irrigation infrastructure has not increased

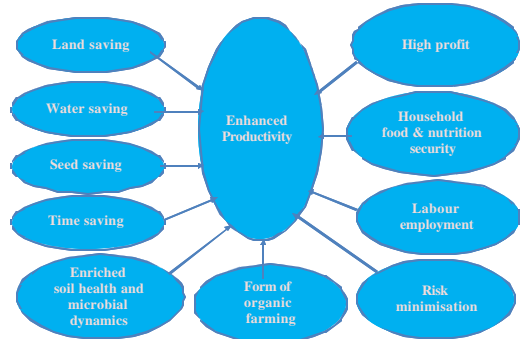
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SRI ADVANTAGES

If the advantages of SRI are proven and cultivation practice becomes profitable, not only the small farmers, even landless farmers may benefit. SRI is particularly attractive as it produces more rice with lesser inputs.

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In Brief: SRI Advantages (Multiple benefits)



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Underlying Challenges

1. Challenge in irrigated rice: To save water by promoting conjunctive uses

2. Rainfed agriculture in India is itself a challenge: Need is to produce more with less water

SRI PRACTICE HAS POTENTIALITY TO CONSERVE WATER AND ENHANCE YIELD. The reduction in water use in rice production is a major benefit to the nation and the people

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CONFLICTING VIEWS

YES SRI CAN address the issues of

1) Small Farmers needs to household food security of the Small Farmers related to

- Producing more food from small plot of land they own
- Adopt conservation practices
- To solve the problems of household food security on sustainable manner
- therefore it important that SRI evolve from the farmers' fields

NOT EXACTLY

2) SRI benefits are exaggerated to believe

- Extra ordinary increase in yield is biologically impossible
- Scientific information sparse
- Knowledge/skill intensive
- Labour intensive
- On account of high nutrient uptake, reduced use of nitrogen fertilizer is counterproductive

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UPDATED PROGRESS OF SRI AROUND THE WORLD

SOUTHEAST & EAST ASIA	SOUTH ASIA	AFRICA AREA	AMERICA
<ul style="list-style-type: none"> • China • Cambodia • Indonesia • Laos • Myanmar • Philippines • Thailand • Vietnam 	<ul style="list-style-type: none"> • Bangladesh • India • Nepal • Pakistan • Sri Lanka • Afghanistan • Bhutan 	<ul style="list-style-type: none"> • Madagascar • Benin • Ethiopia • Gambia • Ghana • Guinea • Mali • Mozambique • Sierra Leone 	<ul style="list-style-type: none"> • Barbados • Brazil • Colombia • Cuba • Dom. Rep. • Guyana • Haiti • Peru • USA

Source: www.CIFAD.org 2005

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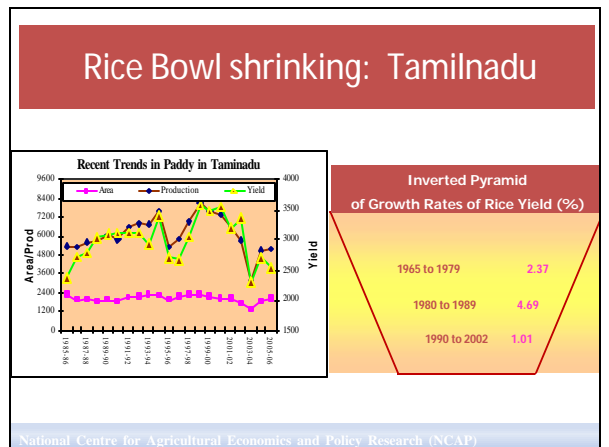
SRI Research in India

Location	Organisation	Activity	Operational Area	Yield performance
Hyderabad	IWMI/ICRISAT	Major emphasis is on water saving	In Guntur, Rangareddy & Medak (40-50 farmers: Ref: Dr. P Narayana)	
Hyderabad	CRIDA	50 FLD in RR District on SRI	Rangareddy districts (Dr. Y V R Reddy)	On average diff. 2 t/ha. But 8-17 t/ha Mr. Naidu, a farmer
Hyderabad	CESS/Govt. of Andhra Pradesh	Major emphasis is on water saving	Govt programme	4.8 t/ha (survey)
Anantapur	CESS/NGO	Organising & training farmers	V Ratna Reddy, to contact Dr. Satyanarayan/ Dr. Sheriff	
Tamilnadu	TNAU/ Govt. of Tamilnadu	Scientific expl. Conducted for past 3-4 yrs.	Govt programme: Ref: C Ramaswamy/ KN Selvaraj	6-8 t/ha (Thyagarajan)
Karnataka	Govt. Of Karnataka	Farmers field school	Govt programme; contact Dr. G Nagaraj/Dr. Chandra Kant	
CIMMYT	Delhi	Prefer DSR (Dr. RK Gupta)	Approx 8-10 mh	

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A case study (on-farm survey): Tamilnadu (4 districts)

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Major Questions:

- Does higher productivity translate into farmers' income, particularly for small farmers?
- How much resources, it conserves?
- If above true, will it be adopted or what constrains will limit it?
- Public policy on upscale and governance

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OBJECTIVES

1. To evaluate the economic and ecological advantages of SRI and compare its merits and demerits with the conventional practices
2. To assess the economic implications of input saving due to SRI (land, water and seed saving).
3. To examine the usefulness of SRI practices for small farmers possessing unviable size of land.
4. To examine the factor use intensity and the efficiency of land, water, fertilizer and labour under SRI practice.
5. To identify the factors influencing adoption of SRI and the conditions of success.
6. Finally, the policy imperatives for SRI as driver for alleviation of rural poverty and hunger and the strategy for wider upscaling.

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Impact indicators



- **More (output) with less (inputs)**
 - Activities for save inputs and use neglected resources (on farm orientation)
- **Empower rural community**
 - Augment farm income
 - Food & nutritional security
 - Ownership (land & assets)
- **Entrepreneurship ability**
 - Small farmers orientated technology
 - Capacity strengthening

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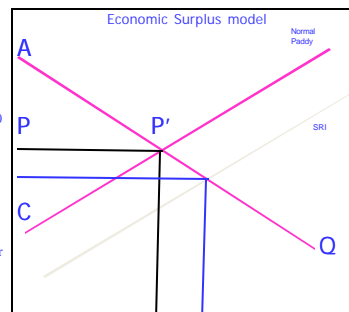
METHODOLOGY:

Analytical tools

- Production function analysis
- Economic surplus model
- Resource valuation methods
- Adoption behaviour (Probit model)

IMPACT INDICATORS:

- Cost and input saving
- Gains in yield/returns
- Involvement of small farmers/gender
- Employment impact
- Water saving and soil health



Total Economic surplus= Consumer surplus + Producer surplus

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Production Analysis, by size class and ecosystem: Decomposition proc

$$Y_{SRI} = f(\text{less seed, Fert \& chemicals, Water, Labour, capital}) \quad (1)$$

$$Y_{(Conv)} = f(\text{more seed, fert \& chem, more water, Lab, capital}) \quad (2)$$

Differences/Gain in productivity = $Y_{conv} - Y_{SRI}$

Arise due to

- change in seed and seedling
- change in soil nutrients (space)
- change water use, and so on....

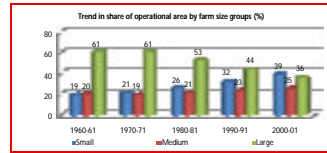
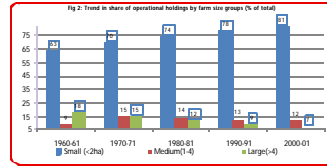
Resulted to more benefits from

- Change in productivity
- Change in income
- Change in employment (by size, operations and gender)
- Cost saving (due to seed saving, water saving, lesser chemicals)
- Conservation of natural resources (soil, water and biodiversity)
- Environmental sustainability

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RESULTS:

Pro-poor and small farmer orientation of Indian Agriculture



Farmers Category	% of total	% Rice farmers
Small Farmers #	> 80%	
Small Farmer (Area)	< 39%	
Large Farmer #	< 7%	
Large Farmers (Area)	36%	

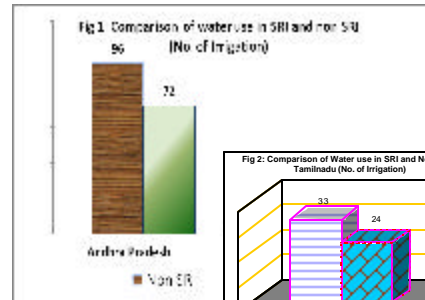
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Relative Gains due to SRI Tamilnadu (per hectare)

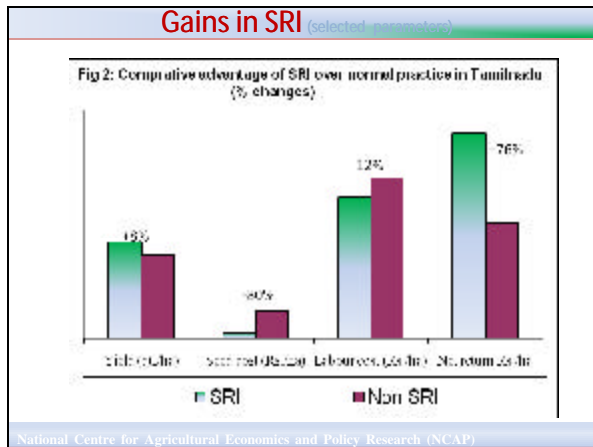
Particular	Coimbatore		Kanchipuram		Ramanathapuram		Tanjore		All	
	SRI	Non-SRI	SRI	Non-SRI	SRI	Non-SRI	SRI	Non-SRI	SRI	Non-SRI
Seed cost in Rs.	504	1800	187	2250	562	2160	217	1575	341	1673
Labour use	192	267	242	216	182	226	179	236	203	204
Labour Cost	9546	12705	7988	11990	4960	9111	10715	11524	8636	9821
Yield ton/ha	6.52	6.07	6.54	5.41	5.10	4.25	5.06	4.76	5.79	4.89
Total cost Rs/ha	16774	20283	16604	18938	11589	15953	16699	19010	15417	18546
Gross income	33329	34848	34233	32325	27745	25216	31575	31653	31720	31010
Net income	16555	14564	17629	13386	16155	9263	14875	12643	16304	12464
Cost (Rs./q)	261	335	257	350	229	376	331	400	269	365
B.C. Ratio	1.99	1.72	2.06	1.71	2.39	1.58	1.89	1.67	2.06	1.67
No. of irrigation	24.73	34.33	24.73	34.07	25	32.07	20.27	32.67	23.7	32.79
% saving	28%		27%		22%		38%		28%	
%Adoption of SRI	45%		18%		20%		59%		40%	

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Water Saving



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Pattern of Labour use in SRI (No. Labour)

	Marginal	Small	Medium	Large	All
Coimbatore	77	76	76	80	77
Kanchipuram	99	58	52	98	77
Ramanathapuram	77	77	71	79	76
Tanjore	75	68	74	75	73

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Overall Benefit cost in Tamilnadu

Particulars	SRI farmers	Non-SRI farmers
Total cost Rs./ha	21637	25778
Total income Rs./ha	30371	27603
BCR	1.53	1.07

Net return and cost of production of rice under SRI in Tamilnadu

District	Farm size	SRI	Non SRI	% Change
Coimbatore	Marginal	11327	9942	14
	Small	10824	11140	-3
	Medium	9980	10567	-6
Kanchipuram	Large	17524	na	na
	Marginal	18168	na	na
	Small	16514	10388	59
Ramanathapuram	Medium	16557	11108	49
	Large	10013	8150	23
	Marginal	12914	4238	205
Tanjore	Small	14149	6256	126
	Medium	12273	6988	76
	Large	11689	10342	13
	Small	10730	12613	-15
	Medium	10929	8820	24
	Large	11046	7475	48

SRI adoption, yield difference and cost reduction under SRI in Tamilnadu

District	Adoption % SRI (area to total rice area)	Yield t/ha			% Cost saving per	
		SRI	Normal	%	ac	qtl
Coimbatore	48.8	6.52	6.15	6.1	22.3	29.9
Ramnthapuram	29.2	5.51	4.71	17.0	19.7	41.4
Kanchipuram	20.5	6.50	5.45	19.3	23.7	47.5
Tanjore	59.4	5.06	4.75	6.7	81.9	94.2

Adoption and cost reduction by farm size under SRI in Tamilnadu

District	Farm size	% SRI area to total rice area	Yield t/ha			% Cost saving per	
			SRI	Normal	%	ac	qtl
Coimbatore	Marginal	54.2	6.20	5.85	6.0	25.9	33.5
	Small	50.3	6.48	6.09	6.3	24.6	32.5
	Medium	51.9	6.42	6.01	6.8	27.3	36.0
	Large	38.8	7.00	6.65	5.3	11.6	17.4
Ranathapuram	Marginal	33.3	5.25	4.20	25.0	14.8	43.5
	Small	22.8	5.09	4.20	21.3	24.4	51.0
	Medium	11.8	5.16	4.29	20.4	17.4	41.4
Kanchipuram	Marginal	33.3	6.83	5.78	18.2	18.0	39.4
	Small	22.6	6.48	5.43	19.4	21.4	44.9
	Medium	14.9	6.42	5.37	19.6	25.0	49.5
	Large	11.1	6.30	5.25	20.0	30.3	56.3
	Marginal	50.0	5.10	4.65	9.7	79.8	97.5
	Small	65.6	5.18	4.85	6.7	77.5	89.5

Factors of production & cost in SRI at different locations by farm size category

Farm size	Location	SRI		Normal	
		Wage/ha ₹/ha	Seed kg/ha	Wage/ha ₹/ha	Seed kg/ha
Small	Coimbatore	5115 (194%)	7544	7459	3241 (71%)
	Thanjavur	5071 (63%)	2674	7541	3721 (56%)
	Ramanathapuram	5085 (64%)	2322	7541	3756 (54%)
	Tanjore	5111 (61%)	3670	6791	1215 (34%)
Medium	Coimbatore	5533 (61%)	7474	8176	3256 (39%)
	Thanjavur	4908 (71%)	7075	6415	5716 (71%)
	Thanjavur	4761 (67%)	7076	6772	3206 (47%)
	Tanjore	5046 (72%)	1742	6242	3206 (51%)
Large	Coimbatore	5780 (74%)	2020	7540	3420 (45%)
	Thanjavur	5470 (72%)	1571	7120	5445 (76%)
	Coimbatore	5470 (72%)	1571	7120	5445 (76%)
	Coimbatore	5470 (72%)	1571	7120	5445 (76%)

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Total Gains due to SRI in Tamilnadu

1. Land	1. More rice with less land.
2. Labour	2. Provides more labour employment (prominently family labour)
3. Water	3. Alternate drying and wetting system substantially saves water
4. Seed	4. Phenomenal saving in seed (important for hybrid seed)
5. Income	5. Increase in crop income and yields (income & food security)
6. Cost of production	6. Reduction in cost due to input saving
7. Perception	7. In the changing circumstances and eroding resource base, there is overwhelming response from farmers


Net return and cost of production

District	Net return/ha			Cost of production/qlt		
	SRI	Non SRI	% Change	SRI	Non SRI	% Change
Coimbatore	41213	10748	15	314	397	-21
Kanchipuram	15313	10431	47	266	404	-34
Ramanathapuram	13112	6170	113	256	461	-43
Tanjore	11098	9703	14	376	461	-19

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Farmers' perception on usefulness (response from selected respondents)

District	Useful (%)
Coimbatore	73
Thanjavur	80
Ramanathapuram	54
Kanchipuram	100
Overall	78



Perception on SRI (preference) (% respondents)

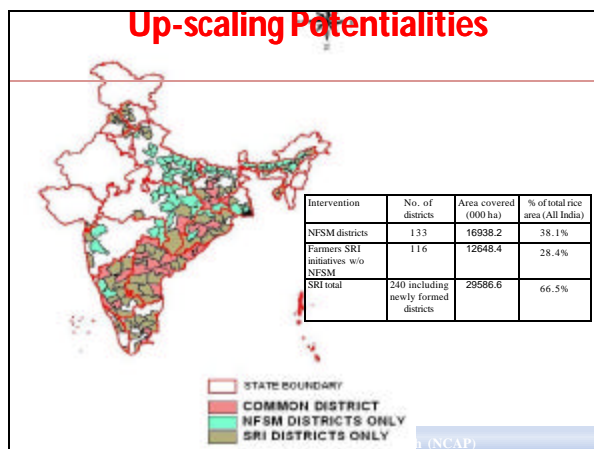
Reason	Coimbatore	Thanjavur (Tanjore)	Ramnathapuram	Kanchipuram
Water scarcity	100	100	100	100
Clear yield advantage in SRI	100	100	100	100
Decline in yield of normal rice	26	53	0	0
Personnel interest	80	80	46	67
Use of Lesser seed	33	100	46	80
Neighbour success	53	40	0	0

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SRI Governance in INDIA

- Policy interventions:
 - Strategies-Easy access to basic inputs, Enhance knowledge delivery
 - Policy Communication and advocacy
- in recognition of pro-farmer orientation, resource conserving properties and yield enhancing capabilities
- Government accepted SRI as a potential practice for rabi paddy (NFSM envisaged a target of 5 million hectare of rice land under SRI during the Xth FYP and the field demonstrations will be fully funded @ Rs.3000 per demonstration. Total of 50,000 demonstration of 0.4ha per 100 ha are planned in 110 selected backward districts).
- Government of Andhra Pradesh, Govt. of Tamilnadu has implemented the programmes of SRI promotion aggressively in every districts and blocks (Allocated Rs.4.00 crores each during 2004-05)
- Government of Karnataka allocated Rs. 3.75 crores for the purpose and intend to use NGO media to popularize it in the dry areas.
- Many SAUs and coordinated schemes have been conducting SRI experiments in various ecosystems.
- ICAR reported 48% yield advantage of SRI over the normal rice. [MAP SRI INDIA DISTRICTS.pdf](#)

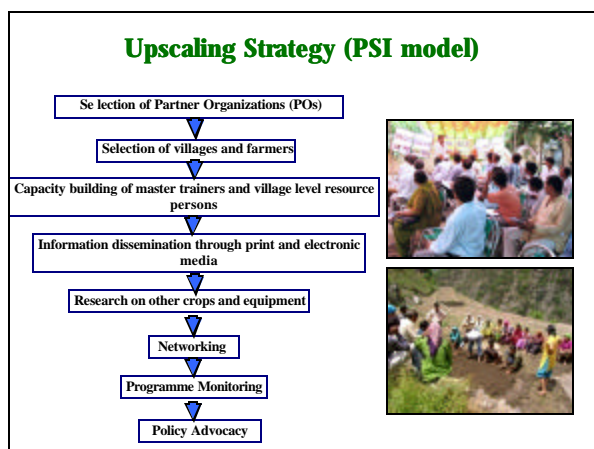
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MODELS OF UPSCALING

Model	Interventions/ salient features	Outcome
1. Tamilnadu	Govt. of Tamilnadu allotted initial Rs.4.00 crores for SRI in 2004-05 Dept of Agriculture, GOT: Subsidy on weeder and markers Conducted 2415 field demonstration trials in 2005-06 Nearly 50,000 farmers trained on 11,320 hectares	Rice production increased from 61.16 lakh metric tones in 2005/06 to 100.35 lakh metric tones in 2007-08 SRI adopted in 10 lakh acres and will be extended to 18.75 lakh acres
2. Andhra Pradesh	Govt. of Andhra Pradesh allotted Rs.4.00 crores in 2004-05 Programme implementation suffered District officials are asked to promote SRI, but not pursued	Doing well in NGO led programmes in drought prone areas such Karimnagar, Anantapur and Mahbobaigar
3. Central India (Covering States: Madhya Pradesh, Chattisgarh, Orissa, West Bengal, Bihar, UP, HP and Jharkhand)	No govt. Initiative, no R&D system in position. On account of isolated effort of some National NGOs and few farmers adopted SRI	Isolated success stories
4. Tripura	Govt. Initiative is active, no R&D system in position, large number of farmers adopted SRI	Rice yield increased and 30,000 hectares are under SRI
5. SDTT model	No govt. Initiative, no R&D system in position, SDTT initiative a promotion programme	60000 farmers covered in 2007 years

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Encouraging features of SRI

The field survey reveals and revalidates the following encouraging features in the peninsular India.

- Average yield of rice under SRI is clearly higher than conventional practices.
- SRI conserves resources both material inputs as well as natural resources.
- SRI is a pro-poor cultivation practice as the pro small farmer orientation is the main placard of SRI.
- SRI ensures household food security as the increased production meet the food needs of the growing needs of the small farm family members from their own farm.
- Since, SRI is basically suitable for post monsoon rabi season, it generates opportunities for off season employment and ensures gender equity
- SRI potentially maximizes the utilization of biological potential of the plant (soil microbiology, soil micronutrients and aeration apart from solar energy). The healthy plants resulted to good grain yield.
- Most importantly water saving in rice cultivation under SRI is substantial

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Quantified advantages of SRI in Tamilnadu

- (i) Less seed in SRI (5 to 8 kg/ha as compared to 40 to 50 kg under conventional practices), which save cost substantially.
- (ii) Uniformly higher yield across the farm size category. The yield varies from about 5 ton per hectare to 7.5 ton/ha as compared to 1.88 ton to 3.85 ton per hectare under conventional practice across the districts.
- (iii) Substantial Water saving due to alternate drying and wetting system even at constant yield, proves socially beneficial in areas where water is premium. The average water saving varies from 16 to 49 per cent in Andhra Pradesh, and 22 to 38 per cent in Tamilnadu. The figure is identical across the farm size, representing equity aspect of water use. These savings resulted to substantial water economy at the state level, which is of societal relevance.
- (iv) Use of organic manure, green manure and biological to nutriment supplementation, the use of fertilizer and other agro-chemicals are unnecessary, which certify SRI as potential organic product.
- (v) Incidence of pest and diseases is less in SRI due to sturdy and hardy stem and leaves repel specific insects.

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Concluding remarks:

Biological properties:

- SRI is **invariant to variety**, which is an advantage in varietal improvement programme
- **Water management:** indulge in conjunctive use and resource conservation
- **Soil quality is important:** SRI performs well in suitable soil. **Soil microbiology** energizes due to enhance soil biota and microbial activities
- **Seedling age:** Younger seedling is likely to have lesser impact of physiological shock in transplanting and help quick recovery. This biological strength should not be wasted.
- **Plants per hill and spacing:** lesser seedling and wider spacing reduce plant to plant competition, which provide sturdy plants and leaves.
- **Root Systems:** Alternate drying and wetting protect the roots from degeneration and strengthen root system

Socioeconomic Properties:

- **Reduced Chemicals:** Organic manure ensures sustainable soil health having advantage of cost reduction too. This is in-built certification of Organic brand
- **Superior practice due to comparative advantages of profitability,** reduced total cost of cultivation, improve productivity of labour, land and water
- **SRI provides crop diversification opportunity to small farmers** (thus there is scope for income stability in less land and water, greater income and improved livelihood).
- **SRI area expansion possibility likely to reduce rice fallow**
- **SRI helps the landless labourers** by utilizing their skill and utilize idle family labour more efficiently

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Look Ahead

- More scientific ramification needed.
- Creating awareness of efficient soil, water and crop management
- **Reaching out the Technology:** Proactive R&D&E interventions to provide wide range of rice germplasm and knowledge delivery.
- R&D&E on SRI is cost-effective and easier
- **Capacity strengthening:** Sensitised civil society Organisation: eg. RDT, Timblu collective, WWF, ICRISAT, WASSAN and other farmer Organization
- Participatory approach to farmers' acceptance/adoption and other policy backstop for technology generation and dissemination are needed
- Promote mechanism for maximisation of biological power of plants, to reduce the yield gap

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Small farm family needs one more meal a day



Let us create synergy between equity, sustainability, food security and rural livelihood through efficient technology, innovative agricultural practices supported by research and development backstopping

THANK YOU

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<p>Resource conservation is socially desirable in the long run</p> <ul style="list-style-type: none"> • Water saving • Seed saving • Use of organic manure • Healthy root systems: 	<ul style="list-style-type: none"> • Evidences clearly support that the most important feature of SRI is the possibility of conserving water substantially • Low seed rate is very attractive to farmers (71 to 92% saving is observed). Saving of about 30-40 kg • Use of FYM, plough back crop residues improve soil structure, human health (organic food) and save cost <p>Plants utilize more solar energy, space and aeration</p>
<ul style="list-style-type: none"> • Gains from biological power of the plant 	<p>Soil microbiology and aeration due to regular weeding. Good plant health resulted in good grain yield due to wide spacing</p>
<ul style="list-style-type: none"> • Production efficiency in pro-poor cultivation practice 	<p>due to double gain from input saving and higher yield. Ensure household food security particularly in a situation of growing family size of the small farmers who own little land area</p>
<ul style="list-style-type: none"> • Gain in profitability of SRI is more than that of yield. 	<p>High net return due to low unit cost</p>
<ul style="list-style-type: none"> • Increase employment opportunity: 	<p>Analysis of Operation-wise labour use shows greater opportunity for gainful employment and utilising rice fallow (2 out of 3 districts in AP show increase in labour use by more than 42%). The off season (rabi) employment opportunity is useful for the farming community who are struggling to improve their household income</p>
<ul style="list-style-type: none"> • Gender friendly employment 	<p>SRI provides favourable GENDER ADVANTAGE, particularly at individual operation level such as transplanting, harvesting, threshing. Early transplanting requires skill hand and perseverance.</p>
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RESEARCHABLE ISSUES
<p>A: Ecological aspects</p> <ul style="list-style-type: none"> • Spatial variation in changes in Soil chemicals and microbial dynamics • Nutrient use efficiency • Research on enriching organic nutrient contents in soils • Water- less rice • Rice grain quality • Adaptability to various ecosystems (say irrigated lowland to upland) • Reduction in methane gas emission • Scope for addressing the Lodging problem <p>B: Socio Economics aspects</p> <ul style="list-style-type: none"> • Superior practice: Comparative advantages/profitability of various existing practices • Issues on estimation of real cost of production (by accounting for seed, land, water, time savings etc.) • Opportunity for crop diversification of the small farming system (scope for adequate production stability with less land and water, greater income and improved livelihood) • SRI area expansion possibility and using rice fallow • Adoption constraints • Effective Policy Imperatives • Most cost-effective R&D&E on SRI <p>C: Other concerns</p> <ul style="list-style-type: none"> • Gender and household considerations • Cultural and governance considerations • Saving graces and price premium • Improved health (superior grain and enhance availability of food) • Enhance Employment potential • Social developmental benefits- SRI being a skill-intensive and productivity enhancing practice • Steps to popularise the agricultural innovation which is likely to accelerate farmers' interest and adoptions
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FUTURE RESEARCH NEED IS TO EVALUATE SRI for
<p>BIOLOGICAL</p> <ul style="list-style-type: none"> - Variety: Develop SRI friendly varieties - Soil quality: Identify suitable soil - Water management: Develop mechanism and capacity building for conjunctive use and conservation - Seedling age: Younger seedling having more biological strength not to be wasted - Plants per hill and spacing: More space reduced competition. Energy saved contribute to yield - Fertilization: Organic preference - Root Systems: Non-degraded and vigorous roots - SOIL MICROBIOLOGY: Enhance soil and microbial activities - Phyllochron parameters: Speeding up the biological clock <p>SOCIO ECONOMIC :</p> <ul style="list-style-type: none"> • Reduced cost of cultivation • Improve productivity of labour, land and water • Increased food production for the small and marginal farmers • Higher rice recovery • Can SRI help the landless labourers by utilizing their skill more efficiently
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