Climate change and SRI @ AIT

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An alternative approach and set of practices for cultivating irrigated rice

Developed in Madagascar several decade ago and now practiced in 42 countries

achieving more productive crops of rice from their existing varieties by making certain changes in the way that they manage both the rice plants and the resources that these draw upon: soil nutrients, soil biota, air, soil moisture, and solar energy

critical factors in this transformation are enhancing the size and functioning of plant root systems and promoting the abundance and diversity of soil biota

Useful website: http://ciifad.cornell.edu/sri/
Plants (phenotypes, $P$) are the result of interaction between their genetic potential ($G$) and their environment ($E$). This relationship is summarized in the symbolic equation: $P = (f) \ G \times E$.

SRI considers how making modifications in rice plants’ $E$ can have large, beneficial impacts on $P$, and in turn on Yield.

- Most visible effects – **Larger root system** of the SRI plants. Under SRI’s mostly aerobic soil conditions, roots remain healthy longer and access larger volumes of soil.
- **Roots continue growing and functioning throughout the crop’s growth cycle**, rather than suffocate and degenerate, as occurs under continuous flooding and hypoxic soil conditions.
SRI principles

1. transplanting of *young seedlings*, preferably only 8-12 days old (before the start of fourth *phyllochron*) *raised in a dry seedbed*;

2. *transplanting quickly and quite carefully, also singly* and with *wide spacing*;

3. paddy fields are not kept continuously flooded. Instead, mostly *aerobic soil conditions* are maintained throughout the vegetative growth period;

4. a *simple mechanical, soil-aerating weeder* is used to eliminate weed growth;

5. the best yields and greatest cost-saving for farmers are attained with *application of compost* or other organic fertilizers;

6. SRI are *more like a menu than a recipe*

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Climate change adaptation (and mitigation) and SRI
Adaptation strategies

- Enhance carbon sequestration
- Use strategies for efficient conservation of water
- Reduce greenhouse gas emission from rice

C- sequestration

- Increase soil organic carbon in agriculture system (apply organic matter): improves C sequestration potential; lower CH$_4$ and N$_2$O emission; conserve farming energy; store more water, increases soil quality and fertility, better soil structure and water availability

**SRI principle**

Apply compost as much as possible
Efficient use of water and CH$_4$ and N$_2$O mitigation

- Intermittent irrigation/mid-season drainage/non-flooded soil condition reduces methane 70-90%.
- Use of compost + aerobic soil condition reduces methane emission
- Aerobic rice rhizosphere can oxidize methane 19-90%
- Avoiding continuous soil saturation reduces methane emissions from rice fields without generating offsetting nitrous oxide emissions.

SRI principles: intermittent irrigation/ non-flooded soil condition, single seedlings transplant, transplanting with wider spacing and use of compost

Higher root length density and prolong root activity could be maintained by micro-environment management

Larger oxygenated rhizosphere
Adaptation strategies that encourage efficient use of fertilizers, maintain soil C and sustain agricultural production are likely to have greatest synergy with sustainable development.

Climate change adaptation (CCA) and SRI

The challenge of climate change adaptation is to (i) produce more food, (ii) more efficiently, (iii) under more volatile production conditions

- Higher crop productivity
- Higher water productivity
- Those practices that confer tolerance to drought
- Early maturation in order to shorten the growing season and reduce farmers’ exposure to risk of extreme weather events
- Tolerance to pest and diseases
- Less economic loss
CCA and SRI contd.

- **Higher crop productivity**: Increase grain yield by 20-50%, though often by even more, with less inputs of water and other resources

- **Higher water productivity**: With SRI reducing irrigation water use usually by 25-50%, water can be freed up for other crops and for people, and for the maintenance of natural ecosystems


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CCA and SRI contd.

- **Early maturation**: SRI are often, though not always, harvested 5, 10, even 15 days earlier than the same variety raised with standard practices (reported from Nepal and Mali) (see Mishra and Uphoff, 2011, SATSA article)

- **Tolerance to pest and diseases**: SRI is more resistant to biotic and abiotic stresses and so reduces farmers risk, also due to reduced cost of production there is less investment to be lost
CCA and SRI contd.

- **Less economic loss:** reduce costs of production, which is more important to farmers operating with limited economic inputs. Since, reduced cost of production so there is less investment to be lost.
Cambodia – SRI’s root systems and grain yield

Evaluating legumes as cover crops and then as a green manure for enhancing water use efficiency and soil fertility status using FFS approach.

Documents:


Available at: http://sri.ciifad.cornell.edu/countries/thailand/index.html

Video: Available at: http://www.youtube.com/watch?v=b3LgNMu-hg
Rejuvenating soil with bentonite + legumes for enhancing water use efficiency and soil fertility status using FFS approach

see at: http://www.cgiar.org/csos/cso.cgiar.grant.program.html

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CSO-CGIAR contd.

Article: Facilitating learning in soil and crop productivity management: assessing potential of SRI-IPM management practices in Northeast Thailand (in synthesis)

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Thailand: Ratchaburi province, Central Thailand (APFED Showcase 2008)

Community preparedness for climate change and increased water use efficiency for rice cultivation using principles of System of Rice Intensification (SRI) in Central Thailand


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Future plan
- Broader and collaborative efforts at regional level.

- Opportunity to scaled-up and scale-out project idea at spatial scales.
Thank you for your attention!

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