System of Rice Intensification (SRI) in Africa: A Win-Win Technology with Multiple Benefits for Farmers and Climate Change Adaptation in Africa

Presented by:

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Problem Statement – Africa’s Rice Deficit

- Demand for rice is increasing with growing populations, urbanization and changing culinary habits
- All the countries in Africa are net importers of rice
- Rice yields are low, less than 3 t/ha (potential can be to 15 t/ha)
- Traditional agronomic practices also result in low productivity of rice.
Problem Statement
Fully flooded paddies have low paddy productivity

- Rice grown under fully flooded paddies utilizing too much water (3,000 - 5,000 litres/kg of grain)
- Rice grown in fully flooded paddies does not achieve optimum productivity
- Fully flooded paddies become habitats for water borne disease vectors
- Water scarcity is a major problem in many parts of Africa, even within irrigation schemes
Agro-ecological and water management systems for Rice

Source: Breeding Rice for Drought-Prone Environments (IRRI: International Rice Research Institute, 2003)
Introduction to SRI

• SRI is a package of practices especially developed to improve the productivity of rice grown in paddies.

• Unlike the conventional method of continuous flooding of paddy fields, *SRI involves intermittent wetting and drying of paddies* as well as specific soil and agronomic management practices.

• The SRI concept is built on the premise of “growing more with less water.”
What SRI is Not

• SRI is NOT a new type of rice.
• It is NOT a new rice variety
• SRI is not GMOs
• It does not modify the genetic make-up of rice.
• SRI is also NOT about growing upland rice varieties, *albeit upland varieties can also benefit from SRI.*
• Rice is an aquatic plant, but SRI has shown that the crop does not have to be grown in continuously flooded paddies.
Components of SRI

*SRI has seven major components (deviating from conventional flooded paddy)*

1. Transplant **very young seedlings**; i.e. at 8 to 12 days old, *(instead of the conventional 3-4 weeks)*

2. Raising the seedlings in **un-flooded nurseries** and well-supplied with organic matter,

3. Transplant seedlings at **wider spacings** and in a square pattern, usually 25x25 cm, giving roots and leaves more space to grow,
   - Transplant seedlings quickly, carefully and shallow – taking care to have minimum trauma to roots,
Comparing conventional paddy nursery with SRI Practice

Conventional flooded nursery

Transplanting conventional rice seedlings

SRI requires less seed

SRI dry nursery, and 8-day old seedling

Transplanting SRI young seedling
Components of SRI contd...

4. Transplanting only one seedling per hill (NOT of clumps of 3-4 seedlings),

5. Alternate wetting and drying of the paddy field (do not continuously flood the soil) to ensure aerating of the root zone.

6. Weed control is preferably done with a simple mechanical rotary weeder. This aerates the soil as it eliminates weeds, giving better results than either hand weeding or herbicides,

7. Providing as much organic matter as possible to the soil.
Comparing conventional paddy with SRI Practice

Conventional fully flooded paddy

SRI wetting & drying paddy field

Women weeding conventional rice paddy

Weeding SRI paddy with rotary weeder
Common practices to both conventional and SRI

• Land preparation (primary tillage, flooding the paddy field, rotavation, levelling)
• Crop protection against pests and diseases
• Flooding the paddy after panicle initiation
• Draining paddy at crop maturity for rice to dry
• Harvesting
• Post harvest processing
Reasons why SRI is Win-Win Technology for Africa
Under SRI, Rice Yields have Increased
Growth pattern for the tillers under SRI and CF
Results show that SRI works!

Key findings - based on farmer s’ data from Mwea, Kenya

**Conventional paddy**
1. Basmati yields: 4 – 5 t/ha
   (Mwea)
2. BW rice yields: 7 - 10 t/ha
3. A bag of paddy weighs 80-90 kg
4. Water to grow 1 kg of rice: 3,000-5,000 litres
5. Grain easily breaks during milling
6. Flooded paddies suffer lodging from windy storms
7. Weeding flooded paddies is done by women
8. Lower return on investment

**SRI Rice**
1. Basmati yields: 7 – 10 t/ha
2. BW rice yields: 11 - 20 t/ha
3. Bag of paddy weighs 100-110 kg
4. Harder, not easily broken on milling
5. Uses 25-33% less water
6. SRI has strong stems that resist damage from windy storms
7. Weeding can be by men or women
8. Higher returns (30-50% increase in net income)
## Water savings comparing SRI with Conventional flooded paddy in Mwea, Kenya

<table>
<thead>
<tr>
<th>Variety</th>
<th>Rainfall (m³/ha)</th>
<th>Irrigation water (m³/ha)</th>
<th>Water use (m³/ha)***</th>
<th>Water Productivity (kg/m³)</th>
<th>Savings on irrigation water (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basmati 370</td>
<td>613*</td>
<td>2,821**</td>
<td>8,422</td>
<td>11,610</td>
<td>0.7</td>
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<td>9,035</td>
<td>14,431</td>
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<td>BW 196</td>
<td>696*</td>
<td>3,464**</td>
<td>11,573</td>
<td>15,691</td>
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<td>12,269</td>
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<td>IR 2793-80-1</td>
<td>613*</td>
<td>2,644**</td>
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<td>11,033</td>
<td>17,740</td>
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<td>31.0</td>
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</tbody>
</table>

*Rainfall water was drained from SRI plots hence lower than that in the CF plots

Source, Omwenga et al, 2014
Mosquito larvae survival comparing SRI Plots with flooded conditions

MOSQUITO DATA FOR SRI CONDITIONS

% EMERGENCE

DRYING DAYS

- % Emerged from depression
- % emerged from observation dish

Source: Kepha Omwenga - MSC progress report
Benefits of SRI: Less Inputs, Less Water Utilized

1) SRI uses less seed & farmers saved up to 80% of the cost of seed

2) Use of organic manures saves on costs of fertilizers.

3) Fertilizers are applied to individual plants (not broadcasted) – less amounts used

4) Rotary weeding saves up to 75% on costs compared to manual weeding

5) In Mwea, SRI saved 25-33% of water used in irrigation
Quality of SRI Rice is Superior

6) SRI rice has a harder grain, thus less breakage during milling,

7) This results in better grain quality making it sell faster at slightly higher price.

8) Millers prefer SRI due to higher recovery of whole grains.

9) SRI rice weight heavier than conventional paddy.
SRI for Climate Change Adaptation

• Rice cultivation is both an important sequester of atmospheric carbon dioxide
• Under conventional flooded paddy systems, rice fields emit methane (CH4), a greenhouse gas.
• Under SRI, the wetting-and-drying of paddies, promotes aerobic decomposition of organic matter
• This in turn reduces methane emissions, while also saving water.
• SRI is thus a climate change adaptation mechanism
Major Challenges Faced

• Farmers’ traditional mindset, skepticism and thus, resistance
• A higher incidence of weeds under SRI
• Availability of rotary weeders is a challenge
• The planting calendar affects rice yields
• Shortage of SRI trained personnel/ extension workers
• Some farmers applying half-SRI measures,
Lessons Learnt

• The scientific basis for adoption of SRI has been proven
• Aggressive awareness creation and hands-on training results in good adoption rates.
• There are many spin-off innovations e.g. local people can fabricate rotary weeders
• Farmer behaviour changes among non-adopters esp. use of less seeds & less water
• Need to engage the Private sector – entrenching a value chain approach to SRI /marketing incentives
• Policy support helps – extending SRI to other parts of Africa.
RECOMMENDATIONS

• Train extension workers to support SRI farmers
• Innovative ways to encourage farmers to adopt SRI
• Develop rotary weeders suited to local conditions
• Use the value chain approach for SRI
• Conduct more research to assist informed choices
• Link SRI farmers to climate funds e.g. Carbon markets
• Expand SRI to all rice growing areas in Africa to grow more rice with less water!
THANK YOU

For details, please watch: https://www.dropbox.com/s/rhuzup3m9zwr8h/ARD%20ON%20SRI%20-%20KENYA.flv