System of Rice Intensification in Kenya: Lessons Learnt for Upscaling SRI in Africa

Presented by:

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Paper presented at the:

Workshop to Enhance Cooperation and Sharing among SRI National Networks in Asia
The Leverage Business Hotel – Skudai, Malaysia

18th to 19th October 2018
Problem Statement – Africa’s Rice Deficit

• Demand for rice is increasing with growing populations, urbanization and changing culinary habits

• Africa rice production is about 26.4 million tons of paddy or **17.3 million tons of milled** rice.

• Rice is grown in 38 African countries

• But all the countries in Africa are net importers of rice

• Rice yields are low, less than 3 t/ha (potential can be up to 15 t/ha)

• Traditional agronomic practices also result in low productivity of rice.

• Water management poses major challenges (from scarcity to poor drainage)
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)

No bund only rainfall
With bund only rainfall
With bund and irrigation
Components of SRI – *practised in Kenya*

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

1. Transplant *very young seedlings*; i.e. at 12 to 14 days old, *(instead of the conventional 3-4 weeks)*

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

3. Transplant seedlings at *wider spacings* and in lines, usually 20x20 cm,

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* *(challenge)*
Transforming from conventional paddy nursery to SRI

Conventional flooded nursery

SRI requires less seed

SRI dry nursery, and 8-day old seedling

Transplanting conventional rice seedlings

Transplanting SRI young seedling
Transforming from conventional paddy to 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
**Background to SRI efforts in Kenya**

- SRI was introduced in Kenya at the Mwea Irrigation Scheme in Aug 2009
- Initial partners - JKUAT, NIB, AICAD, WB, WBI, MoA, MWI, KARI, Cornell University (of USA), Mwea Irrigation Scheme/MIAD, farmers
- Aug 2009 – Jan 2010, only two pioneer farmers accepted to do trials voluntarily & on-station research trials at MIAD – supported by AICAD
- Within that time, Training & awareness creation using the two farmer trials, Video conferences, special ladies’ training
- Since April 2010, **JKUAT Innovation Fund** has been supporting a 3-year SRI research & capacity building project in Mwea.
- From June 2011, **NIB** is supporting a six-month project to upscale SRI in 4 schemes, i.e. *Ahero, West Kano, Bunyala & Mwea and SW Kano (2012).*
- In 2013, lack of funds saw little activity towards promotion of SRI, but framers continued to adopt learning from each other
- In 2014, NIB provided funding for developing a marketing value chain for SRI
- Also in 2014, AICAD provided funding for SRI research on labor and weeds.
- In 2016, Agri-SRI funded a project on Extension f SRI in Western Kenya.
Research on SRI (1 PhD, 12 MSc & MIAD trials)

1. PhD student is assessing SRI for up-scaling in Mwea irrigation scheme.
   - Using AQUACROP model to predict scheme-level grain yields, amounts of water saved, and cost/benefit analysis.

2. MSC assessed adaptability of SRI in Mwea - completed

3. MSC assessed the effects of SRI on mosquito survival rates.

4. MSC has assessed bio-physical characteristics of four schemes; Mwea, Ahero, West Kano and Bunyala for SRI adaptability

5. MSC is assessing impacts of labour SRI

6. Other MIAD research on SRI spacings
Participatory Research (SRI Farmer trials)

**SRI Farmer trials**

**Innovations by farmers**
Extension (Capacity building)

- ToT training with field visits
- Hands-on training
- Training of trainers (ToT)
- Special Training for Ladies
- Several field days across which are rotated from block to block
- Field days according to crop agronomy
- Invited trainers supported by WBI trained staff & farmers from India & Japan
- Exchange visits for farmers & staff
- Capacity building - at least 3,000 individuals trained on SRI
- Some 5,400 farmers had adopted SRI in Mwea, Ahero, West Kano and Bunyala irrigation schemes by October 2018.
Field days & open days for SRI training

SRI field day in Mwea - 5th August 2010

SRI field day in Bunyala – Nov 2012

SRI Open Day - 4th November 2010

SRI field day (transplanting) - 21 July 2011
Awareness creation & Outreach

- Open days with invited guests
- Displays in the Nairobi International Show
- Media outings
- Radio broadcast/adverts in vernacular languages
- Engaging with private sector e.g. rice millers
- Scientific papers & forums
- Presenting SRI at Exhibitions and other forums
- SMS Messaging as a mode of extension
- Marketing of SRI branded rice in the new project
Extending SRI to Western Kenya

- SRI project launched in Ahero, Bunyala, West Kano and SW Kano
- SRI Training of Trainers in MIAD for all schemes
- Video conferencing for W. Kenya farmers linking with India, Philippines, Mali (WBI)
- Exchange visits between farmers
- Distribution of rotary weeders
- National SRI Workshop held every year in Kisumu
Up-scaling SRI in Ahero, Bunyala, West Kano & SW Kano

SRI Training in Ahero Scheme

SRI training in West Kano Scheme

Video Conference

SRI Training in Bunyala Irrigation Scheme
Under SRI, Rice Yields have Increased
Growth pattern for the tillers under SRI and CF

Number of tillers per hill

Weeks after transplanting

S...
Results show that SRI works!

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

<table>
<thead>
<tr>
<th>Conventional paddy</th>
<th>SRI Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basmati yields: 4 – 5 t/ha (Mwea)</td>
<td>1. Basmati yields: 7 – 10 t/ha</td>
</tr>
<tr>
<td>2. BW rice yields: 7 - 10 t/ha</td>
<td>2. BW rice yields: 11 - 20 t/ha</td>
</tr>
<tr>
<td>3. A bag of paddy weighs 80-90 kg</td>
<td>3. Bag of paddy weighs 100-110 kg</td>
</tr>
<tr>
<td>4. Water to grow 1 kg of rice: 3,000-5,000 litres</td>
<td>4. Harder, not easily broken on milling</td>
</tr>
<tr>
<td>5. Grain easily breaks during milling</td>
<td>5. Uses 25-33% less water</td>
</tr>
<tr>
<td>6. Flooded paddies suffer lodging from windy storms</td>
<td>6. SRI has strong stems that resist damage from windy storms</td>
</tr>
<tr>
<td>7. Weeding flooded paddies is done by women</td>
<td>7. Wedding can be by men or women</td>
</tr>
<tr>
<td>8. Lower return on investment</td>
<td>8. Higher returns (30-50% increase in net income)</td>
</tr>
</tbody>
</table>
## 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></td>
<td>SRI</td>
<td>CF</td>
<td>SRI</td>
<td>SRI</td>
<td>CF</td>
</tr>
<tr>
<td>Basmati 370</td>
<td>613*</td>
<td>2,821**</td>
<td>8,422</td>
<td>11,610</td>
<td>9,035</td>
</tr>
<tr>
<td>BW 196</td>
<td>696*</td>
<td>3,464**</td>
<td>11,573</td>
<td>15,691</td>
<td>12,269</td>
</tr>
<tr>
<td>IR 2793-80-1</td>
<td>613*</td>
<td>2,644**</td>
<td>10,420</td>
<td>15,096</td>
<td>11,033</td>
</tr>
</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

% Emerged from depression
% emerged from observation dish

DRYING DAYS

Source: Kepha Omwenga - MSC progress report
Costs of Inputs have Reduced under SRI

Inputs costs comparing SRI with flooded paddy (FP) practices at Mwea
(Source: Ndiiri et al 2014)
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
Kenyan SRI project won 1st Prize in Africa

• In December 2012, a documentary video on SRI was filmed in Mwea, Ahero, Bunyala, West Kano & SW Kano.

• **SRI documentary film** entitled “System of Rice Intensification (SRI): Producing More Rice with Less Water! The Kenyan Experience” **won 1st prize** at FARA’s “6th African Agricultural Science Week” awarded on 20th July 2013 in Accra, Ghana.

• This film has been used for training and awareness creation on SRI.
SRI work was recognized by SEED Awards (9 Sept 2015)

The JKUAT SRI Stand at the SEED Awards, at Safari Park Hotel, Nairobi

Prof. Mati addressed the SEED Awards on behalf of past winners (*SRI is a past winner of SEED Awards*)
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 Efforts to develop SRI Value Chain
Registration, Vetting, Branding & Marketing

Findings of paddy milling test – SRI rice is Super Grade!!

<table>
<thead>
<tr>
<th>Properties</th>
<th>SRI</th>
<th>Conventional</th>
<th>SRI Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head rice (%)</td>
<td>90</td>
<td>81</td>
<td>+9</td>
</tr>
<tr>
<td>White rice (Kgs)</td>
<td>631</td>
<td>594</td>
<td>+37</td>
</tr>
<tr>
<td>Recovery (%)</td>
<td>63</td>
<td>59</td>
<td>+4</td>
</tr>
<tr>
<td>Broken (Kgs)</td>
<td>37</td>
<td>56</td>
<td>-19</td>
</tr>
<tr>
<td>Chicken feed (Kgs)</td>
<td>4.4</td>
<td>5.5</td>
<td>-1.1</td>
</tr>
<tr>
<td>Bran/dust (Kgs)</td>
<td>79</td>
<td>101</td>
<td>-22</td>
</tr>
<tr>
<td>Colour sorter (Kgs)</td>
<td>1.5</td>
<td>1.9</td>
<td>-0.4</td>
</tr>
</tbody>
</table>

Note: SRI has superior milling qualities in all the categories
Some of the Research Publications on SRI


• Mati, B. M. 2012. Promoting the Adoption of the System of Rice Intensification (SRI) through Participatory Research and Outreach in Kenya. Paper Presented at NIB/MIAD and collaborators research workshop, Kenya School of Monetary Studies, Nairobi, 30-31st May 2012.


Major Challenges Faced

- Farmers’ traditional mindset, skepticism and thus, resistance
- A higher incidence of weeds under SRI
- Availability (lack) of rotary weeders & equipment
- Lack of funding to maintain momentum of projects
- Shortage of SRI trained personnel/extension workers
- Lack of SRI value chain for the system to be self-propagating.
Developing SRI-Africa Network

• The scientific basis for adoption of SRI has been proven in many countries in Africa,

• The main gap is knowledge flows- upwards to reach policy makers, laterally to reach many farmers and extension workers

• *Because*... Africa is a continent fragmented by national boundaries, languages, geographic zones and cultural barriers

• Technological divides between scientists and farmers, hence missed opportunities

• There has been no one-stop shop knowledge management platform bringing together SRI fraternity in Africa

• Networks break these barriers and help establish human resource pools, their contacts and specific needs/facilities
Way Forward

Main Objective: To build a vibrant Africa-wide Community of Practice on SRI, for knowledge sharing, advocacy and action (one African voice for SRI)

More specifically:

a) Build SRI-Africa network for peer support and as a learning and knowledge sharing platform on SRI
b) Gather, contribute to, share and utilize knowledge and best practices on SRI to facilitate informed choices
c) Resource mobilization to support SRI actions
d) Implement programmes/projects & activities that lead to upscaling of SRI – including meetings, exchange visits, etc.
e) Work towards establishing national SRI networks which can implement projects
Acknowledgements

- Dr. Raphael Wanjogu
- Eng. Hosea Wendot
- Mr. Laban Kiplagat
- Mr. Joel Tanui
- Eng. Daniel Barasa
- Mr. Richard Githaiga
- Mr. Moses Kareithi
- Mr. Kennedy Ouma
- Dr. Jackline Ndiiri
- Prof. Patrick Home
- Mr. Wycliffe Nyangau
- Edith Obunge
- Boaz Ochieng Omondi
- Saverio Ireri
- Innocent Ariemba
- Mercy Kithia
- Moses Kareithi
- Mathew Kamanu
- NIB General Manager
- MIAD
- Staff & SRI farmers in Mwea, Ahero, Bunyala, West Kano
- JKUAT
- AICAD
- WB
- WBI
- Ministry of Water & Irrigation
- Ministry of Agriculture
- Cornell University (USA)
- Media (KBC, Nation, Standard, People, Citizen)
- Friends and well-wishers
THANK YOU