System of Rice Intensification (SRI)

Growing more rice while saving on water

Practical Notes for SRI Farmers

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"TECHNOLOGY FOR DEVELOPMENT"

Kenyans Want More Rice

The demand for rice in Kenya continues soar as more Kenyans show progressive changes in their eating habits, coupled with urbanization. Rice is currently the third most important cereal crop after maize and wheat. The national rice consumption is estimated at 300,000 metric tons compared to an annual production range of 45,000 to 80,000 metric tons. The deficit is met through imports, valued at Ksh.7 billion in 2008. Moreover, rice is currently the most expensive cereal (of any grain) in the country, retailing at about Ksh.120-200/kg. The annual national consumption of rice is increasing at a rate of 12%, as compared to 4% for wheat and 1% for maize. Thus, rice is set to become the main food cereal in the near future.

Most of the rice in Kenya is grown in irrigation schemes established by the Government, which include Mwea, Bura, Hola, Perkera, West Kano, Bunyala and Ahero. Smaller quantities are produced along river valleys. About 80% of rice in Kenya is grown under continuous flooding as is typified in the Mwea Irrigation Scheme. The paddy system of rice production depends on a continuous supply of large volumes of water and soils with high water holding capacities. In most irrigation schemes, water scarcity and thus rationing is common. These shortages will escalate as population grows and climate change.

We Need to Grow More Rice and to Save Water

Throughout Kenya, the shortage of water and land suited for rice production means that extensive expansion of rice growing farmlands is not a likely option. Whereas there is need to mobilize more water and to open up new irrigation schemes to grow more rice, it is also possible to grow more rice with the water we have, on the same land, within the existing schemes. There is therefore need to consider water saving technologies and any intervention that will increase the productivity of rice and also save water is a welcome initiative.

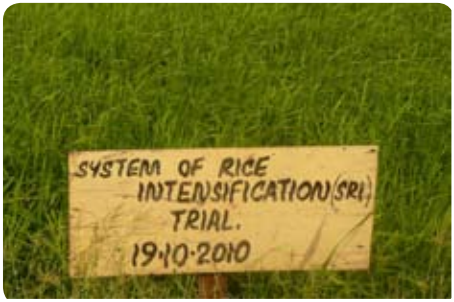
The System of Rice Intensification (SRI) therefore, offers this opportunity to improve food security through increased rice productivity, increase farmers' income, water savings and reduction in the national rice import bill.

Moreover, SRI makes use of assets already available to rice farmers. Many farmers are now adopting SRI, so as to increase their rice yields, while also saving on inputs and water. This Training Manual is meant for use as a do-it-yourself guide by farmers wishing to adopt SRI.

Go on, give SRI a try!

What is SRI?

SRI stands for System of Rice Intensification. SRI is a combination of practices that improves the productivity of rice grown in paddies. It changes how we manage the soil, water, nutrients and the rice plant to achieve higher yields. SRI is differs from conventional way of growing rice in continuously flooded paddies.



What SRI is Not

SRI is NOT a new type of rice. It does not modify the genetic make-up of rice. Also, SRI is NOT about growing upland rice varieties. Rice is an aquatic plant, but SRI has shown that the crop does not have to be grown in continuously flooded paddies.

What are the benefits of SRI?

- SRI increases rice yields, achieving 50% or more, sometimes double crop yields, while also producing a heavier grain.
- SRI saves water by about 25-50%. The water saved can be used to expand irrigation or put to other beneficial uses.
- SRI saves on inputs – using 25% of seed used in conventional paddy. Also, SRI uses less fertilizer.
- SRI makes use of what the farmer has (seed, manures). It may not be necessary to purchase extra external inputs.
- SRI works with nearly all rice varieties, but some varieties respond better than others.

What are the Practices under SRI?

SRI works best when the following rice agronomic practices are combined:

1. Use young seedlings, i.e. 8-12 days old, maximum 15 days – so as to enhance the plants' growth potential

2. Avoid trauma (or shock) to the roots - transplant quickly, at shallow depth (1-2 cm). Avoid inversion of seedlings' root tips as this could delay the plants' growth after transplanting.

3. Transplant one plant per hill instead of the usual 3-5 seedlings ("ngundi"). Plant in lines and in a square pattern.



4. Give plants optimally wider spacing – about 25cm x 25cm.

   With wider spacing and a single plant per hill, plants get more sunlight, air and nutrients, allowing faster growth of roots and canopies, producing stronger stalks and more tillers.

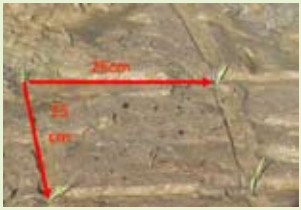
5. Do not continuously flood the soil. You can keep the soils just sufficiently moist or practice alternate wetting and drying (AWD). This enables the soil to hold air. This has been scientifically proven to allow plant roots to grow more profusely due to presence of oxygen in the soil, leading to effective nutrient uptake, healthier plants and better grain.

6. Weed control is preferably done using a simple mechanical (rotary) weeder. This kind of weeding actively aerates the soil better, while mixing weeds with the soil to form green manure.

7. Enhance soil organic matter as much as possible applying compost, mulch, manure. Chemical fertilizers can be used with SRI, but the better results are obtained with organic fertilizers.

Farmers' Guide on How to Grow SRI Rice

Illustration	Description of Activities



1. Land Preparation

- Soak field for 5 days, then rotavate.
- Harrow 2-3 times, with a 2-3 day pause – this ensures proper soil-water mixture.
- Spread appropriate amount of Organic fertilizer (or manure) or chemical fertilizers equivalent for the size of your land before the last puddling/levelling.
- It is important to level the field so that water can reach all areas.
- Divide the field using grids. This is achieved by raking the field using a specially constructed rake to mark grids on the muddy surface.
- Start with 25cm x 25cm spacing (or 20cm x 20cm spacing). If the soil is fertile, use wider spacing of 30 x 30cm.
- During grid making, the field should not have much standing water. If the field does not hold the marking, it is a clear sign it is not ready to transplanting.

2. SRI Nursery Preparation

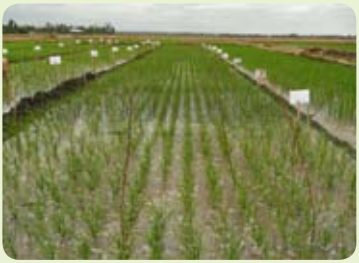
- Should be started while land is being prepared
- Select good seed because in SRI every seed matters. Use available methods for good seed selection eg., soaking in salty water of specific density of about 1.6 (enough to float an egg)
- On top of a plastic sheet, make a 2-3cm thick seedbed of a mixture of soil and organic fertilizer or well dried fine manure, at a ratio of 1:1. The sheet prevents seedling roots from running too deep into the soil at the time of transplanting.
- Sow 5-7kg/ha of treated and pre-germinated seed not too densely on the seed bed
- Spread organic fertilizer on the seed bed 2 days after sowing
- Spray organic pesticides if needed
- Water the nursery daily. Do not flood, but just keep the soil moisture saturated.
- Seedlings can be grown on plates, or banana leaves.

3. Transplanting SRI Seedlings

- Transplant before the third leaf appears, at 8-10 days old.
- Before transplanting, disassemble the seedbed and remove the seedlings. Be careful not to damage the young roots. Put the seedlings on a tray and take them to the field.
- Allow no more than 30 minutes between the uprooting of seedlings and their transplanting. It reduces mortality and stress on the young seedlings, and they will grow faster.
- Plant one seedling per hill on the grid intersections marked on the field, in a square pattern.
- Plant seedlings at shallow depth, just 1-2cm deep
- Slip the seedlings into the soil sideways so that the roots stay horizontal into the soil. Do not push the seedlings in from above as this may cause the root tips to point upwards from the soil, slowing down their growth
- With wider spacing and a single plant per hill, plants get increased exposure to sunlight, air and nutrients, allowing profuse growth of roots and canopies. These in turn produce stronger stalks and more tillers.

4. Intermittent Irrigation

- As a start, try a 3 to 7 day cycle. i.e., irrigate field for three days and let it dry out for 7 days. This cycle can be modified based on soil, the weather and plant conditions.
- The idea is to keep the soil moist and not saturated to allow air to get into the soil for the benefit of the roots and soil organisms.
- Begin the cycle 10 days after transplanting.
- Adjust the time and the amount of intermittent irrigation according to the availability of water especially in the dry season.
- You can determine visually when to irrigate depending on the size of the cracks that appear on the soil surface.
- Intermittent irrigation promotes root elongation and aerates the soil.
- When the panicles start to appear, shift to continuous irrigation in which a thin layer of water, 1-2 cm depth, is retained on the field.
- Irrigation should be stopped 1-2 weeks before harvest for the field to dry and the plant to transfer maximum nutrients into the grains.



5. Rotary Weeding

- Start weeding 10-12 days after transplanting
- Repeat 2-3 times every 10-12 days
- Spike-teethed rotary tools are recommended to manual weeding or chemical spraying because this way, weeds are mixed into the soil as green manure. It also enhances the tilth.
- Intermittent irrigation requires more weeding than the common practice, as weeds tend to grow more rapidly under un-inundated conditions. However, farmers will note that this extra effort has a payoff because the method of weeding aerates the soil more, leading to even increased yield by 1-2 tons per hectare.

6. Organic Fertilization

- Farmers can use compost made locally using rice straws, other crop residues, farmyard manure or vermiculture.
- Farmers can also use organic fertilizers together with the chemical fertilizers depending on materials available for making organic compost.
- The idea in organic fertilization is to enrich the soil and let the soil feed the plant.

7. General care of the field and crop

- Ensure the field is clean and the crop is protected against pests and diseases.
- At panicle initiation, flood the field continuously till grain filling and senescence starts.
- At maturation of the grains, drain the field as usual to allow rice to dry before harvesting.
- For further assistance, contact the SRI staff based at Mwea, Ahero, West Kano and Bunyala irrigation schemes, MIAD and JKUAT.

SRI Works! Farmers are Adopting!

SRI was introduced in Kenya at the Mwea Irrigation Scheme in July 2009, through collaborative efforts of NIB, JKUAT, AICAD, World Bank, farmers and other stakeholders. The initiative has implemented scientific research on SRI, farmer trials and capacity-building and outreach activities for farmers and other stakeholders. By July 2011, over 1,800 individuals had been trained on SRI.

Generally, farmers in Mwea have proved that SRI increases rice yields and saves water. SRI rice obtained yields ranging 6.0 to 8.5 t/ha compared to 5.0-6.0 t/ha normally recorded in Mwea. Farmers also noted that a bag of SRI paddy weighed 100-110 kg compared to 80-90 kg for conventional rice. Also, when SRI rice was milled, it had higher quality grains, a stronger aroma, thus sold faster. Farmers weeded SRI paddies three times compared to conventional two times, so extra labour was not that bad. But SRI used less seeds thus reducing production costs. Furthermore, there was 25% water savings under SRI. Farmers are encouraged and many are adopting SRI.

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