

7. Paddy/rice Varieties

All kinds of rice can be harvested successfully through SRI. Hybrid varieties have achieved the highest SRI yields however SRI methods can often double the yield of indigenous rice varieties. Farmers are encouraged to try SRI methods with **many different varieties**, to determine which perform best under their local conditions and which will earn the highest income.

8. Pest and Disease Control

Agrochemical protection for pest and disease control is not required with SRI methods. In Sri Lanka, pests and diseases have not been observed in SRI fields. SRI farmers have found they do not need such protection or that chemicals are not worth their labor and cash costs. When agro-chemical protection is not used, it is better for the health of farmers, their soil, surrounding ecosystems, and for rice consumers with agro-chemical free rice.

The 6 basic ideas of SRI

To stimulate plant growth:

1. Use **young seedlings** to preserve growth potential (however **direct seeding** is also an option).
2. Avoid **trauma to the roots**. Transplant quickly to a shallow depth with no inversion of root tips that will halt growth.
3. Give plants **wider spacing – one plant per hill** - and in a **grid pattern**.

To enhance the growth and health of roots and soil biota:

4. Keep Paddy soil moist but **unflooded** – mostly aerobic and not continuously saturated.
5. Actively **aerate the soil** as much as possible.
6. Enhance **soil organic matter** as much as possible.

Comparison Between Conventional Paddy Cultivation and SRI Method

Components	Conventional Method	SRI Method
1. Seed requirement	50-60 kg per hectare (21 kg per acre)	7 kg per hectare (2-3 kg per acre)
2. Transplanting	Seedlings about 30 days' old	Seedlings about 8-12 days' old (younger the better)
3. Clump density	30-40 per sq m	16 per sq m
4. Seedlings	3 or more per hill	1 per hill
5. Fertilizers	Chemical fertilizers,	Mix of chemical and Organic fertilizers; or Organic Fertilizers only
6. Water management	Continuous flooding	Moist conditions only (wetting and drying)
7. Weed control/removal	Spraying herbicides/ agro-chemicals or Manually	Manually with a weeder/soil aeration
8. Pest Control	Spraying pesticides, and insecticides	Not required
9. Yield	2-3 tonnes per hectare	5-6 tonnes per hectare (Average)

9. Resistance to Drought and Storm Damage

Paddy farmers need to reduce their vulnerability to increasingly unpredictable weather. Rice plants with larger, deeper root systems have more drought tolerance. Similarly better root systems and stronger tillers enable rice plants to withstand wind and rain damage. SRI methods produce crops that are ideally resilient to weather extremities.



Above: The resilience of SRI crops is demonstrated in a scene after a typhoon. The SRI field is still standing strong while a non-SRI field in the foreground has been flattened by the wind.

10. Possibilities to reduce maturity time

SRI farmers usually transplant rice seedlings at the age of 8-10 days. This assists early harvesting of paddy crops; nearly 2 weeks before conventional plant maturity. Early harvesting positions SRI farmers better to gain higher prices.

11. Milling Outturn

SRI methods increase not only the amount of paddy rice produced per hectare, but also the amount of polished rice available after milling by 10-20%. There are 100% filled grains (less chaff) and fewer broken grains (less shattering). SRI rice also reportedly has more desirable characteristics in **taste, texture, and cooking qualities**.

Escalating costs of production and increased demand and prices of rice globally signals the need to urgently improve rice productivity. SRI is a flexible, adaptive approach to achieve this. It is still evolving and improving with inputs from farmers, government agencies, I/NGOs, universities, research institutions, the private sector, input suppliers, and other stakeholders across 32 countries. Further information on SRI can be found online at:

www.sri-india.net
www.wassan.org
www.tropantag.de
www.farmingsolutions.org
www.ciifad.cornell.edu

www.wikipedia.org
www.ikisan.com
www.cropscience.com
www.echotech.org

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The System of Rice Intensification (SRI)

An introduction for Sri Lanka



- ✓ Less seeds required
- ✓ Reduced water use
- ✓ Lower costs of production
- ✓ Increased paddy yields
- ✓ No agro-chemicals
- ✓ Increased farm income
- ✓ Environmentally sustainable with a shift to organic inputs

System of Rice Intensification (SRI)

System of Rice Intensification (SRI) emerged in the 1980s as a synthesis of traditional Madagascan rice production practices encountered by Father Henri de Laulanie. In the late 1990s Professor Norman Uphoff from Cornell International Institute for Food and Agriculture (USA) brought this method to the world. Today, practice by farmers in Asia, Africa, Central America and South America has made SRI a widespread success.

Introduction

The System of Rice Intensification (SRI) is not a technology, but an **opportunity** for farmers to improve their income and land productivity. SRI is a set of new ideas and environmentally friendly practices yielding greater outputs and profits for farmers.

Just by changing the way that rice plants, soil, water, and nutrients are managed, paddy yields can be increased by 45%-50%, and sometimes by 100% or more, with:

- ✓ **Less seed**, only 10-20% of usual amounts because plant populations are greatly reduced,
- ✓ **Less water**, by 50-75%, as paddy is not continuously flooded,
- ✓ **Lower costs of production per hectare**, by 10-20%, resulting in cost savings for farmers,
- ✓ **Increased farm income** by 25% through cost savings and increased productivity,
- ✓ Shifting from chemical to **organic fertilizer** gradually; and
- ✓ **No use of agro-chemicals**.

In most cases, farmers' yield and profit per day of labor invested in rice production is higher with SRI. It enables farmers to get **more output with less input** because its methods contribute to:

1. The growth of **larger, deeper, and healthier root systems**
2. Greater **numbers, variety and activity of soil creatures** (eg. soil bacteria, fungi, protozoa, and earthworms) producing more fertile soil and productive plants with more nutrients.

SRI methods can, and should always be **adapted to farmers' own local conditions**. Farmers in India, Myanmar and the Philippines have adapted SRI concepts and practices for non-irrigated **rainfed** SRI. They have achieved average yields as high as 7 tons per hectare. Some farmers are adapting the ideas for **direct-seeding** rather than transplanting rice, and some have adapted SRI to **zero-tillage** and **raised-bed** cultivation (eg. China). Other farmers are applying SRI concepts to **other crops** like wheat, sugar cane, finger millet, and mustard. Farmer innovation is encouraged as part of SRI.



Normal broadcast paddy field (left) and SRI paddy field (right)

SRI Methods

1. Land Preparation

For irrigated SRI, no change in land preparation practices is necessary. Good **land leveling** is important so that water distribution across the whole field can be very efficient. To ensure good field drainage where there is abundant water supply or rainfall, **parallel drainage channels** should be every 2-3 meters. Water control can also be improved by maintaining a drainage channel around the inside of the field.

2. Nursery Preparation

Seedlings need to be kept for 10 days or less in a nursery. For one acre of SRI paddy, farmers need to make 5 (10'x 3') elevated beds with one kg of seed paddy for each bed, covered with paddy straw for 3 days. After 10 days, seedlings are ready for transplanting. Trays are another option.



The tray approach to raising seedlings.

3. Transplanting

Seedlings should be transplanted when young; between **8 and 10 days old**. The field should be marked in a **square grid pattern**, as shown below, with initial spacing of 25x25cm. In less fertile soil, 20x20cm may give a higher yield. In more fertile soil (or as soil becomes increasingly more fertile with SRI practices), at least 30x30cm is recommended. Wider spacing creates opportunity for both leaves and roots to grow with vigor in all directions. Depending on the age of the paddy/rice variety, the spacing needs to be changed.

Seedlings should be removed from the nursery and taken to the field carefully and quickly, with no harm to the roots, preferably within 20-30 minutes. Seedlings should be placed into the soil:

- **Singly**, not in a bunch of seedlings as conventionally done;
- **Very shallow**, only 1-2 cm deep, at 25x25 cm or other square spacing (12'x12')
- **Very carefully**, with roots laid in the muddy soil as horizontally as possible.
- **Plant roots should not be pushed down into the soil**. The transplanted seedling should be L-shaped, not J-shaped. If root tips are pointing upward, there will be a delay of 7-10 days in the plants' resumption of growth after transplanting.



Transplanting young seedlings into a grid pattern traced by a marker.

4. Water Management

By not continuously flooding the soil, SRI promotes the growth of roots and soil micro organisms. The soil should be just moist enough through alternate wetting and drying to meet the needs of the rice plants and soil organisms.

The original SRI method of water management was to **apply a small amount of water daily**. No flooding enables the soil to absorb the sun's energy during the day, and oxygen from the air. Farmers should even dry their soil for periods of 3-5 days during the growth phase, even to the point of surface cracking.

To save labor, some SRI farmers practice **alternate wetting and drying**, flooding their fields for 3-6 days then draining and drying out for 3-6 days. Farmers should use observation and experimentation, according to the needs of their soil and plants. The objective is to provide **both water and oxygen** to plant roots and soil organisms.

5. Weed Control

When paddy fields are not continuously flooded, there may be more weed growth. Manual weeding or spraying herbicides can be used but for best SRI results, we recommend a **mechanical hand or motorized weeder** (rotary hoe or cono-weeder). Such weeding promotes **active soil aeration**, raising yields by one or more tons per hectare and enhances soil fertility by returning weeds to the soil. For best results, the first weeding should be done 10-12 days after transplanting. Subsequent weeding should follow every 10-12 days until the canopy closes.



Cono-weeder Used in Soil Aeration/weeding

6. Fertilization

Initially SRI was developed using chemical fertilizer. However, the best results in SRI have come with the **application of organic fertilizer or compost**. As much organic matter should be added as available, but 2 tons of can be sufficient to begin with. Compost can be made from **any decomposed biomass** – rice straw, garden weeds, crop residues, garden waste, animal manure, kitchen waste, or half-burned paddy husk.

Many SRI farmers are moving to **'Organic SRI'** which does not rely on any chemical inputs. This reduces their costs of production provided they have enough family labor to carry out organic soil enrichment and enough biomass is available. Organic SRI rice can earn a premium market price, making this production strategy even more profitable.



Applying organic fertilizer bundles of paddy straw