System of Rice Intensification (SRI)

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System of Rice Intensification

- An agro-ecological methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients
- Promote the growth of root systems
- Increase the abundance and diversity of soil organisms
- *More outputs from less inputs*

The main concepts, ideas and principles of SRI

Stimulating plant growth by….

- Transplant **young seedlings** to preserve growth potential
- **Avoid disturbance to the roots** - transplant quickly and shallow, *not inverting root tips*
- Provide plants **wider spacing** - *one plant per hill* and in *square pattern*

The main concepts, ideas and principles of SRI

Enhance the *growth and health of roots and of soil Biota by…*

- **Keeping soil moist but not flooded** - soil should be mostly aerobic, not continuously saturated
- **Aerating the soil** frequently
- Enhancing the **soil organic matter content**

Conventional and SRI practices

Conventional Rice Management

- Transplant older seedlings, 20-30 days old, or even 40 days old
- Transplant seedlings in clumps of plants and fairly densely, 50 – 150 plants m2
- Maintain paddy soil continuously flooded, with standing water throughout the growth cycle
- Use water to control weeds, supplemented by hand weeding or use herbicides
- Use chemical fertilizers to enhance soil nutrients

SRI – management

- Transplant **young seedlings**, 8 – 12 days old, and certainly less than 15 days old to preserve subsequent growth potential
- Transplant **seedlings singly**, one per hill, and in a square pattern 25x25 cm, or wider if or when the soil is more fertile
  - Transplant quickly (15 – 30 minutes after removal from nursery)
  - Shallow (1-2 cm deep) and vertical planting
- Keep **paddy soil moist, but not continuously saturated**, so that mostly aerobic soil conditions prevail
- Control weeds with **frequent weeding** by a mechanical hand weeder (rotating hoe or cono weeder) that also aerates the soil
- Apply as much **organic matter** to the soil as possible; can use chemical fertilizer, but best results from compost, mulch etc.,

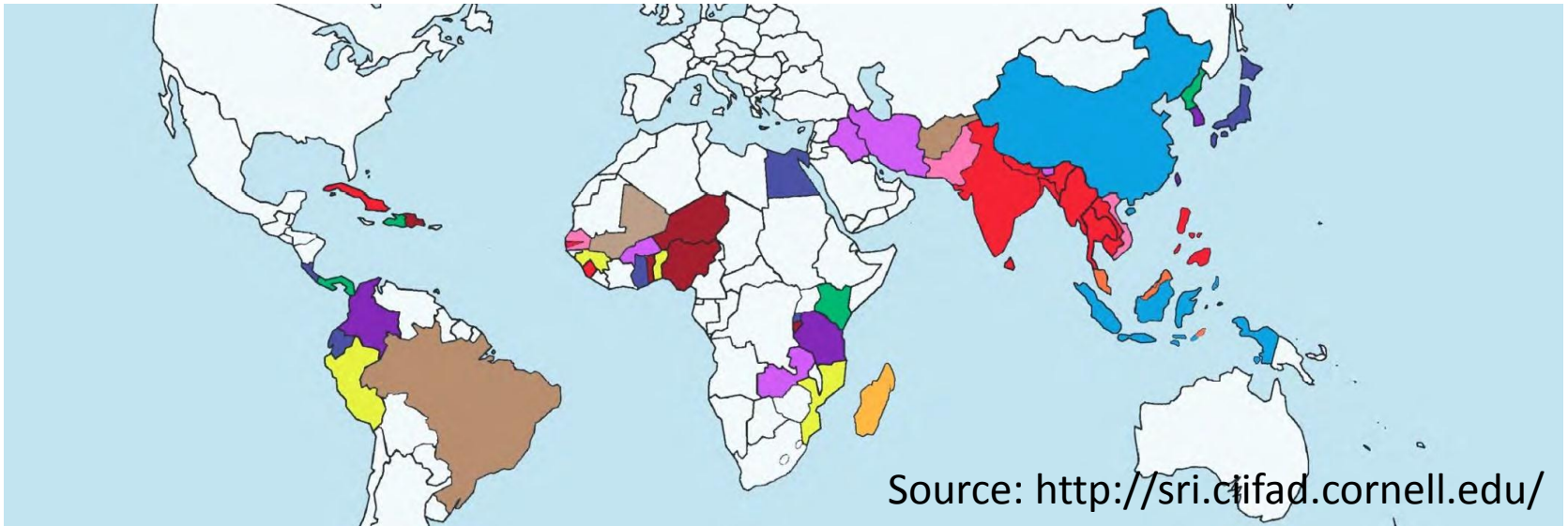
Reported Benefits of SRI

- Increase in yield/ha – **52%** (21 to 105%)
- Increased net income/ha – **128%** (59 – 412%)
- Reduction in cost of production – **24%** (7 – 56%)
- Reduction in water requirement – **44%** (24 – 60%)
- Shorter time to maturity (1-3 weeks less)
- Protection against biotic stresses pests/diseases (Sheath blight, leaf folder, brown plant hopper) – **70% reduction** in incidence
- Tolerant to abiotic stresses - drought, storm damage, extreme temperatures
- Higher milling outturn (by ~ 15%) – lower chalkiness

Uphoff (2007); Zhao et al. (2009); Thakur et al. (2010)

Adoption World wide

- Assembled in Madagascar and promoted internationally since 2000
- Validation of SRI benefits have been reported from more than 50 countries of Asia, Africa, and Latin America
- Increase in area under SRI – China, Indonesia, Vietnam, Cambodia



Adaptation to Climate Change

- Shorter duration and **suitability to fit into changes** in water availability periods
- **Water saving** at the farm level – mainly due to controlled irrigation and alternate wetting and drying (water scarce areas)
- Tolerance to **abiotic** (drought, heat waves, cold snaps, winds) and **biotic** (pest and diseases) stresses
- Increase in productivity

Mitigation of Climate Change

- Methane emission from rice fields are determined mainly by water regime and organic inputs
- Flooding causes methane emission - organic inputs stimulate methane emissions as long as fields remain flooded
- Mid-season drainage and intermittent irrigation can reduce methane emission by 40% (IFPRI 2009)
- Keeping soil nearly saturated conditions may promote N2O release
- 15 to 20% of the benefit gained by decreasing methane emission was offset by the increase of N2O emission
- Soil organic carbon declines after a shift from flooded system to non-flooded system

Key considerations for scaling-up

- Water availability patterns to match with irrigation schedule
- Controlled irrigation and provision of adequate drainage facilities
- Labour-intensive practices? (transplanting single and 8-14 days old seedlings, mechanical weeding etc.,)
- Availability of organic manure at farm level
- Capacity of agricultural support services (Knowledge intensive) – suitable varieties, preparation of seedlings, irrigation and nutrient management)
- Mapping areas and eco-systems suitable for up-scaling
  - Climatic factors – on-set and duration of rainy season and water availability (flooding during initial stages)
  - Rice growing environments – lowland/uplands, irrigated/rainfed, dry/semi-dry, deep/shallow water
  - Soil types (clay soils – maintaining saturated conditions, loamy soils may need frequent irrigation)
  - Cost benefit of conventional and SRI systems

Thank You