In addition to SRI extension, the program has concentrated upon on-farm research directly through the partner organizations from 2009 and collaborative research along with the State Agricultural Universities in the later stage. For wider replication and to make the practices more farmers’ friendly, on-farm research trial was planned taking different probable treatments under particular aspect. Accordingly, during 2009 the SRI Secretariat (Promoted by SDTT and hosted by Livolink Foundation) had come up with a compact research plan involving various research scientists and practitioner. Since Kharif’2009 the on-farm research trial on SRI has been conducted in de-centralised agro-climatic zones of Koraput, Kalahandi and Cuttack (Odisha), Gaya (Bihar), Raigarh (Chhattisgarh), South 24 Praganas (West Bengal) and Deheradun (Uttarakhand) in order to obtain comparative results.

Table 1: Year wise locations under on farm research:

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Agro-climate Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Koraput, Odisha</td>
<td>Eastern Ghat Highland</td>
</tr>
<tr>
<td></td>
<td>South 24-Praganas, WB</td>
<td>Coastal saline</td>
</tr>
<tr>
<td></td>
<td>Dehradun, Uttarakhand</td>
<td>Hill Zone</td>
</tr>
<tr>
<td></td>
<td>Cuttack, Odisha</td>
<td>Mid Central Table Land</td>
</tr>
<tr>
<td>2010</td>
<td>Koraput, Odisha</td>
<td>Eastern Ghat Highland</td>
</tr>
<tr>
<td></td>
<td>South 24-Praganas, WB</td>
<td>Coastal saline</td>
</tr>
<tr>
<td></td>
<td>Gaya, Bihar</td>
<td>Alluvial Plains</td>
</tr>
<tr>
<td></td>
<td>Raigarh, Chhattisgarh</td>
<td>Chhattisgarh Plains Zone</td>
</tr>
<tr>
<td></td>
<td>Kalahandi Odisha</td>
<td>Western undulating zone</td>
</tr>
<tr>
<td></td>
<td>Dehradun, Uttarakhand</td>
<td>Hill Zone</td>
</tr>
<tr>
<td>2011</td>
<td>Koraput, Odisha</td>
<td>Eastern Ghat Highland</td>
</tr>
<tr>
<td></td>
<td>South 24-Praganas, WB</td>
<td>Coastal saline</td>
</tr>
<tr>
<td></td>
<td>Gaya, Bihar</td>
<td>Alluvial Plains</td>
</tr>
<tr>
<td></td>
<td>Raigarh, Chhattisgarh</td>
<td>Chhattisgarh Plains Zone</td>
</tr>
</tbody>
</table>

Objectives of the study:

- Refinement of practices of SRI for wider adaptability
- Documenting the action research findings and disseminate among various stakeholders including farmers for wider replication of SRI.

System of Rice Intensification known by its acronym ‘SRI” and was introduced in India a decade back. It is a set of farming practices which requires less input in terms of seeds, fertilizer and water etc. to maximize the production. Sir Dorabji Tata Trust (SDTT), Mumbai, piloted the methodology with a couple of partners under its existing livelihood program during 2006. The number of partners increased to five during 2007 with a coverage of 11,000 farmers.

The appreciable success of the initial years prompted the Trust to start a full-fledged program on System of Rice Intensification (SRI) in 2008. This program was launched as part of the Trust’s strategy to address the issue of food security at household level in rainfed areas for small and marginal farmers. The other salient features of the Program includes demonstrating at the State level to establish SRI as a means to attain household level food security, mainstreaming SRI through effective policy advocacy, facilitating interaction amongst different players and promoting and encouraging innovations in the SRI methodology for wider replication.
Design of experiment:
The trails were conducted in Randomized Block Design (RBD) where, each farmer’s field was treated as one replication/block. These blocks were selected in contiguous manner maintaining homogeneity w.r.t. soil type, previous crop and agricultural practices followed during the previous crop season. Each block is divided into number of subplots (100m²) equal to the number of treatments for a particular aspect of research. Identical package of practice were followed in all plots except the treatment effect. Five hills from each unit plot were taken randomly to record yield contributing attributes and crop from 25m² area was harvested to estimate grain and straw yield. The data were analyzed by taking three seasons pooled variance. Though the experiment was conducted at 7 locations, but due to consistency, we have only considered data of Pragati (Koraput, Odisha), PRADAN (Gaya, Bihar) PRADAN (Raigarh, Chhattisgarh) and PRASARI (South 24 Praganas, WB) for analysis. This analysis is based on the research data submitted by the said partner organizations over three consecutive years (2009-2011). The collected data were analyzed using the ANOVA technique and the significance of the mean differences was adjudged by the Duncan’s Multiple Range Test (DMRT) or Least Significant Difference (LSD) at 5% level of probability.

RELATIONSHIP OF VARIOUS ASPECTS WITH YIELD ATTRIBUTING FACTORS

Nutrient Management
Irrespective of application of inorganic fertilizer, application of Organics is generally recommended in SRI. With an objective of find out the best combination of organic and inorganic fertilizer that gives higher yield, this trial has been carried out in Koraput(Odisha) and in South 24 Pragana (WB). Keeping other inputs and package constant, trial was done for assessment of crop performance by satisfying nutrient requirement from organic and inorganic sources in various combinations.

The results against each treatment are as follows.

Table-1: Nutrient management in SRI

<table>
<thead>
<tr>
<th>Name of the treatment</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4(control)</th>
<th>SEM (+)</th>
<th>LSD 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>352.00</td>
<td>68.20</td>
<td>73.27</td>
<td>22.22</td>
<td>124.08</td>
<td>11.85</td>
</tr>
<tr>
<td>T3</td>
<td>359.68</td>
<td>68.20</td>
<td>73.47</td>
<td>22.22</td>
<td>124.08</td>
<td>11.85</td>
</tr>
<tr>
<td>T4(control)</td>
<td>304.00</td>
<td>68.20</td>
<td>73.47</td>
<td>22.22</td>
<td>124.08</td>
<td>11.85</td>
</tr>
<tr>
<td>SEM (+)</td>
<td>7.52</td>
<td>2.60</td>
<td>0.76</td>
<td>3.97</td>
<td>1.30</td>
<td>0.31</td>
</tr>
<tr>
<td>LSD 0.05</td>
<td>23.20</td>
<td>8.00</td>
<td>NS</td>
<td>12.24</td>
<td>NS</td>
<td>0.96</td>
</tr>
</tbody>
</table>

T1- 100% organic based on N content assuming proportionate availability of P and K. T3-50% organic + 50% Inorganic (NPK) T4- Farmers practice in that areaNS-Non significant

Results of variance analysis show that T3 (50:50) registered highest grain yield (5.73t ha⁻¹) among all the treatments with highest harvest index of 46.21%. T3 (50:50), T2 (100% inorganic), T1 (100% organic) registered enhancement in grain yield by 40.75%, 30.42% and 20.35%, respectively compared to T4 (Farmers’ practice). The better performance of rice under T3 due to significantly increase in the number of tillers m⁻² (362.24), Panicle conversion per centage (78.49%), panicle length (23.57cm), filled grains panicle⁻¹ (127.20), test weight (23.42g) and lower sterility per cent (11.49%) compared to others. But the panicle length and sterility per cent age has no significant effect due to various methods of nutrition. Highest grain to biomass ratio (46.21%) was observed in T3 (50:50).

Method of nutrition has no significant impact on panicle length and % sterility. From the above results, it clear that the 50% organic + 50% Inorganic (NPK) helps exploit the full potential of paddy varieties.

Age of seeding:
Age of seeding at planting has a strong bearing on vegetative growth and biomass yield of a plant. With an objective to find out the effect of age of seeding on the growth vigour of SRI paddy and yield the trial was conducted at Koraput(Odisha), South 24 praganas(WB) and Gaya(Bihar). Keeping other inputs and package of practices remaining same trial was conducted for assessment of crop performance transplanting seedling of different age.

The crop performance in term of yield attributing factors and yield are tabulated below.
Table-2: Effect of Age of seedling in SRI

<table>
<thead>
<tr>
<th>Name of the treatment</th>
<th>Tillers m²</th>
<th>Panicle Conversion Ratio</th>
<th>Panicle Length (cm)</th>
<th>Filled grains panicle¹</th>
<th>Sterility (%)</th>
<th>1000 grain weight (g)</th>
<th>Grain Yield (t ha⁻¹)</th>
<th>Harvest Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>242.08</td>
<td>68.27</td>
<td>19.28</td>
<td>97.53</td>
<td>21.60</td>
<td>20.61</td>
<td>3.30</td>
<td>39.20</td>
</tr>
<tr>
<td>T₂</td>
<td>380.80</td>
<td>67.73</td>
<td>21.50</td>
<td>116.76</td>
<td>18.04</td>
<td>21.28</td>
<td>5.10</td>
<td>47.10</td>
</tr>
<tr>
<td>T₃</td>
<td>378.72</td>
<td>80.44</td>
<td>22.67</td>
<td>118.75</td>
<td>16.29</td>
<td>22.38</td>
<td>5.55</td>
<td>47.35</td>
</tr>
<tr>
<td>T₄</td>
<td>346.88</td>
<td>74.17</td>
<td>21.41</td>
<td>108.08</td>
<td>15.09</td>
<td>22.22</td>
<td>4.46</td>
<td>45.54</td>
</tr>
<tr>
<td>T₅</td>
<td>317.44</td>
<td>71.27</td>
<td>20.38</td>
<td>102.04</td>
<td>19.40</td>
<td>21.16</td>
<td>4.22</td>
<td>43.30</td>
</tr>
<tr>
<td>T₆</td>
<td>298.08</td>
<td>70.63</td>
<td>19.32</td>
<td>98.30</td>
<td>20.40</td>
<td>20.62</td>
<td>3.80</td>
<td>39.92</td>
</tr>
<tr>
<td>SEM (+)</td>
<td>12.8</td>
<td>3.30</td>
<td>0.50</td>
<td>5.57</td>
<td>1.05</td>
<td>0.46</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>LSD₀.₀₅</td>
<td>38.4</td>
<td>9.95</td>
<td>1.51</td>
<td>16.79</td>
<td>3.17</td>
<td>1.40</td>
<td>1.44</td>
<td></td>
</tr>
</tbody>
</table>

T₁: Sprouted seed T₂: 8 DAS seedlings T₃: 12 DAS seedling T₄: 16 DAS seedling T₅: 20 DAS seedling T₆: 25 DAS seedling

The above results reveals that, the treatment T₃ with 12 days seedling produce highest grain yield (5.55 t ha⁻¹) followed by T₂ with 8 days seedling. The grain yield of T₃ and T₄ are statistically at par, but T₄ registered highest harvest index of 47.35%. The highest productive tillering rate (80.44%), panicle length (22.67cm), filled grains panicle¹ (118.75) and test weight (22.38g) was observed in case of T₃ with 12 days seedling.

From the above results, it is clear that, transplanting of younger seedlings increases yield attributes and economical yield.

No. of seedlings/hill:

Number of seedlings hill¹ influences the root growth, nutrient and water uptake, tiller formation, and ultimately affects the growth and development of rice plant. In view of above fact, the study was carried out at Sunderban, Gaya, Raigarh and Koraput to determine the effect of number of seedlings hill¹ on yield of rice in SRI.

The crop performance with no of seedling per hill as follows.

Table-3: Impact of number of seedlings transplanted hill¹ in SRI

<table>
<thead>
<tr>
<th>Name of the treatment</th>
<th>Tillers m²</th>
<th>Panicle Conversion Ratio</th>
<th>Panicle Length (cm)</th>
<th>Filled grains panicle¹</th>
<th>Sterility (%)</th>
<th>1000 grain weight (g)</th>
<th>Grain Yield (t ha⁻¹)</th>
<th>Harvest Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>363.68</td>
<td>84.43</td>
<td>21.46</td>
<td>115.27</td>
<td>15.80</td>
<td>22.90</td>
<td>6.39</td>
<td>48.72</td>
</tr>
<tr>
<td>T₂</td>
<td>362.40</td>
<td>88.48</td>
<td>21.40</td>
<td>112.85</td>
<td>15.11</td>
<td>22.75</td>
<td>6.73</td>
<td>48.29</td>
</tr>
<tr>
<td>T₃</td>
<td>308.96</td>
<td>78.09</td>
<td>20.10</td>
<td>102.19</td>
<td>16.42</td>
<td>21.09</td>
<td>4.93</td>
<td>43.38</td>
</tr>
<tr>
<td>T₄</td>
<td>248.00</td>
<td>70.71</td>
<td>18.81</td>
<td>95.04</td>
<td>19.48</td>
<td>20.51</td>
<td>4.24</td>
<td>40.41</td>
</tr>
<tr>
<td>SEM (+)</td>
<td>7.20</td>
<td>2.10</td>
<td>0.17</td>
<td>2.53</td>
<td>0.79</td>
<td>0.15</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>LSD₀.₀₅</td>
<td>22.08</td>
<td>6.45</td>
<td>0.52</td>
<td>7.81</td>
<td>2.45</td>
<td>0.46</td>
<td>0.57</td>
<td></td>
</tr>
</tbody>
</table>

T₁: One seedling hill¹  T₂: Two seedlings hill¹  T₃: Three seedlings hill¹  T₄: Four seedlings hill¹

From the pooled analysis over three years, it was found that T₂ with 2 seedlings hill¹ resulted in better grain yield (6.73 t ha⁻¹) compare to all other treatments. But there was no significant difference between single and double seedling transplantation in case of filled grains panicle¹, grain yield and straw yield. But grain yield in T₄ is 5.30% higher than that of T₃ with 1 seedling hill¹.
This may be due to unfavourable climatic condition prevailing at the time of transplantation. Highest harvest index was recorded in $T_1$ (48.72%). Single or double seedling(s) transplantation promotes better utilization of nutrients and light and creates favourable condition for high photosynthesis. The grain yield also drastically affected with increased number of seedlings hill$^{-1}$.

In the study under focus, transplanting of single/double seedling was found to have enhanced both vegetative and yield traits of rice and consequently produced higher yield.

**Spacing:**

Spacing plays an important role in maintaining optimum plant population and intra plant competition for resources above and below ground level. In view of the above facts, the experiment was conducted at Koraput, South 24-Praganas and Raigarh to evaluate the impact of spacing on plant growth and thereby yield of rice. All other inputs remaining same, trial was conducted for assessment of performance of crop at different spacing. The results so obtained are tabulated below.

**Table-4: Relationship of plant spacing with yield attributes of rice under SRI**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Tiller$^{-1}$</th>
<th>Plant Height (cm)</th>
<th>Panicle Conversion Ratio</th>
<th>Length of the Panicle (cm)</th>
<th>Filled grain$^{-1}$</th>
<th>Sterility (%)</th>
<th>1000 grain weight (g)</th>
<th>Grain Yield (t ha$^{-1}$)</th>
<th>Harvest Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_1$</td>
<td>246.72</td>
<td>109.68</td>
<td>74.58</td>
<td>19.90</td>
<td>103.89</td>
<td>16.20</td>
<td>21.75</td>
<td>4.10</td>
<td>43.14</td>
</tr>
<tr>
<td>$T_2$</td>
<td>275.52</td>
<td>111.57</td>
<td>74.80</td>
<td>23.28</td>
<td>119.19</td>
<td>20.68</td>
<td>22.61</td>
<td>4.61</td>
<td>45.00</td>
</tr>
<tr>
<td>$T_3$</td>
<td>354.56</td>
<td>115.98</td>
<td>85.56</td>
<td>23.60</td>
<td>120.83</td>
<td>15.56</td>
<td>22.58</td>
<td>6.10</td>
<td>47.85</td>
</tr>
<tr>
<td>$T_4$</td>
<td>343.68</td>
<td>115.48</td>
<td>84.36</td>
<td>23.52</td>
<td>120.42</td>
<td>17.84</td>
<td>23.01</td>
<td>5.91</td>
<td>47.58</td>
</tr>
<tr>
<td>$T_5$</td>
<td>237.12</td>
<td>116.34</td>
<td>73.95</td>
<td>19.01</td>
<td>100.33</td>
<td>18.76</td>
<td>22.08</td>
<td>4.10</td>
<td>42.51</td>
</tr>
<tr>
<td>$T_6$</td>
<td>213.75</td>
<td>117.03</td>
<td>67.95</td>
<td>18.21</td>
<td>97.24</td>
<td>21.40</td>
<td>20.04</td>
<td>3.12</td>
<td>37.33</td>
</tr>
<tr>
<td>SE (m)</td>
<td>3.21</td>
<td>11.80</td>
<td>5.07</td>
<td>4.10</td>
<td>0.71</td>
<td>13.72</td>
<td>2.26</td>
<td>0.41</td>
<td></td>
</tr>
</tbody>
</table>

$T_1$: 15x15cm$^2$  $T_2$: 20x20cm$^2$  $T_3$: 25x25cm$^2$  $T_4$: 30x30cm$^2$  $T_5$: Rec. spacing for the variety T: Farmers practice  NS–Non Significant

Results of variance analysis show that the highest grain yield of 6.10 t ha$^{-1}$ was obtained of $T_3$ (25x25cm$^2$) with highest harvest index of 47.89%. There was a yield advancement of 48.78%, 32.32%, 3.21%, 48.78% and 95.51% obtained over $T_1$ (15x15cm$^2$), $T_2$ (20x20cm$^2$), $T_3$ (30x30cm$^2$), $T_4$ (recommended practice) and $T_5$ (farmers’ practice), respectively. $T_3$ (25x25cm$^2$) recorded the highest panicle conversion ratio (86.75%) compared to closer spacing. Though there was no statistically significant difference in productivity between $T_3$ (25x25cm$^2$) and $T_4$ (30x30cm$^2$), then yield reduction in $T_5$ (30x30cm$^2$) is due to less number of hills m$^{-2}$. The highest no. of grains panicle$^{-1}$ (120.83) and panicle length (23.60cm) was recorded from $T_3$ (25x25cm$^2$). At closed spacing, the filled grain panicle$^{-1}$ was worst affected.

However, from the above results, we can conclude that, wider spacing provides an opportunity to use a mechanical weeder in between rows in both the directions, increasing biomass production in $T_3$ (25x25cm$^2$), below that, all inputs of production fail to produce any appreciable effect on rice yield due to increase in competition for light, water and nutrient resulting in to shorter panicles with lower grain number.

**Interaction of AOS vs Spacing:**

Use of appropriate aged seedlings for transplanting, maintaining optimum plant density are important non cash inputs for realizing the higher productivity in rice. In this context, to find out the appropriate combination of age of seedling and spacing, that performs well in SRI, the trial was conducted at Koraput, South 24-Praganas, Raigarh and Gaya. All other inputs remaining
same, trial was conducted to assess the performance of rice when transplanted at different age at different spacing. The results so obtained are given below.

### Table-5: Interaction effect of Age of seedling and Spacing in SRI

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Tillers m⁻²</th>
<th>Panicle Conversion Ratio</th>
<th>Panicle Length [cm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
<td>Mean</td>
</tr>
<tr>
<td>A1</td>
<td>366.64</td>
<td>316.05</td>
<td>341.35</td>
</tr>
<tr>
<td>A2</td>
<td>336</td>
<td>289.24</td>
<td>312.67</td>
</tr>
<tr>
<td>A3</td>
<td>326.32</td>
<td>280.77</td>
<td>303.55</td>
</tr>
<tr>
<td>Mean</td>
<td>342.98</td>
<td>295.35</td>
<td>319.67</td>
</tr>
</tbody>
</table>

Table: Interaction of Age of seedling and Spacing in SRI

<table>
<thead>
<tr>
<th>Interaction</th>
<th>Filled grains panicle⁻¹</th>
<th>Sterility (%)</th>
<th>1000 grain weight [g]</th>
<th>Grain Yield (t ha⁻¹)</th>
<th>Harvest Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>S1</td>
<td>S2</td>
<td>Mean</td>
<td>S1</td>
<td>S2</td>
</tr>
<tr>
<td>A2</td>
<td>119.15</td>
<td>117.94</td>
<td>118.55</td>
<td>15.93</td>
<td>17.07</td>
</tr>
<tr>
<td>A3</td>
<td>115.24</td>
<td>113.74</td>
<td>114.49</td>
<td>16.48</td>
<td>17.62</td>
</tr>
<tr>
<td>Mean</td>
<td>114.98</td>
<td>113.51</td>
<td>114.25</td>
<td>16.60</td>
<td>17.94</td>
</tr>
</tbody>
</table>

Comparison of Yield vs AOSxSp

The mean comparison of interaction effects shows that the highest tillers m⁻² (366.64), panicle length (23.14cm), panicle conversion ratio (88.96%), filled grains panicle⁻¹ (119.15) with lowest sterility (15.93%) was observed through A₁S₁ (12DAS, 25x25cm²) leading to highest grain yield (6.22 t ha⁻¹). For same spacing, the A₁ (12 DAS seedlings) produced higher grain yield. Treatment combination of A₁S₁ (12 days old seedling transplanted at a spacing of 25x25cm²) was resulted in profuse tillering, facilitated plants for better utilization of the resources resulting in higher grain yield followed by A₁S₂ (12 days old seedling transplanted at a spacing of 30x30cm²).

**No. of plants/hill and AOS**

Age of seedling and number of seedlings transplanted per hill influence grain yield in water scarce rice production system, primarily by laying the foundation for determining the number of panicles at harvest. With this view, field experiment was conducted at South 24 Pragana and Raigarh to evaluate the effect of number of seedlings hill⁻¹ and their age on growth and yield of rice under SRI. All other inputs remaining same, trial was done for assessment of performance of a crop when under different combinations of age of seedling and number of seedlings hill⁻¹.

*NS= Non significant at 5% probability*
The results of crop performance under different combinations of seedling age and no. of seedlings hill⁻¹ were presented in the table below.

**Table-6: Effect of interaction of Age of seedling and no. of seedlings hill⁻¹ in SRI**

<table>
<thead>
<tr>
<th></th>
<th>Tillers m⁻²</th>
<th>Panicle Conversion Ratio</th>
<th>Panicle Length (cm)</th>
<th>Filled grains panicle⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1</td>
<td>S2</td>
<td>S3</td>
<td>Mean</td>
</tr>
<tr>
<td>A1</td>
<td>35.64</td>
<td>172.64</td>
<td>130.24</td>
<td>155.34</td>
</tr>
<tr>
<td>A2</td>
<td>20.86</td>
<td>328.64</td>
<td>336</td>
<td>323.84</td>
</tr>
<tr>
<td>A3</td>
<td>20.86</td>
<td>208.67</td>
<td>220.02</td>
<td>202.57</td>
</tr>
<tr>
<td>Mean</td>
<td>30.86</td>
<td>328.64</td>
<td>336</td>
<td>323.84</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interaction</th>
<th>SEm (±)</th>
<th>LSD₀.05</th>
<th>SEm (±)</th>
<th>LSD₀.05</th>
<th>SEm (±)</th>
<th>LSD₀.05</th>
<th>SEm (±)</th>
<th>LSD₀.05</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.36</td>
<td>33.02</td>
<td>3.05</td>
<td>0.48</td>
<td>1.45</td>
<td>6.43</td>
<td>19.27</td>
<td></td>
</tr>
</tbody>
</table>

A₁:12DAS, A₂: 18DAS, A₃: 25DAS S⁻¹ seedlings hill⁻¹, S : 2 seedlings hill⁻¹, S : 3 seedlings hill⁻¹. *NS= Non significant at 5% probability

The mean comparison of interaction effects shows that the highest grain yield (6.29 t ha⁻¹) was observed with A S (12 DAS, 2 seedlings hill⁻¹). This is due to highest tillers m⁻² (366.64), panicle conversion rate (83.43%), panicle length (23.14 cm), filled grains panicle⁻¹ (124.24), test weight (21.86 g) and lowest sterility (17.35%). There is no significant difference in grain yield in A S⁻¹ (12 DAS, 1 seedling hill⁻¹) and A S⁻² (12 DAS, 2 seedlings hill⁻¹). The highest harvest index (48.80%) was obtained through treatment A S⁻¹.

The treatment combination A S⁻² resulted in optimum balance between vegetative and generative growth created and due to proper feeding environment, profuse tillering, highest grain filling was observed. The incremental yield in case of double seedling over single seedling might be due to the erratic rainfall at time of transplantation.

**Direct Seeding SRI:**

SRI concepts and principles can be applied to direct sowing for rice, especially where labour costs and constraints are significant as a potential solution to farmer’s rice production through eliminating nursery raising, transplanting. With this view, the experiment was carried out at Koraput to establish the best method of sowing seeds for enhancing the productivity under SRI. All other inputs remaining same, trial was done for assessment of performance of a variety when sown to field directly in dry bed situation.
The results of crop performance under direct seeded SRI was tabulated as below.

**Table 7: Impact of various methods of direct seeded SRI on yield attributes of rice**

<table>
<thead>
<tr>
<th>Name of the treatment</th>
<th>Tillers m⁻²</th>
<th>Panicle Conversion Ratio</th>
<th>Panicle Length (cm)</th>
<th>Filled grains panicle⁻¹</th>
<th>Sterility (%)</th>
<th>1000 grain weight (g)</th>
<th>Grain Yield (t ha⁻¹)</th>
<th>Harvest Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁ Broadcast</td>
<td>192.80</td>
<td>62.96</td>
<td>16.60</td>
<td>78.60</td>
<td>12.60</td>
<td>23.40</td>
<td>3.25</td>
<td>36.72</td>
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<tr>
<td>T₂ Line sowing</td>
<td>208.40</td>
<td>77.42</td>
<td>19.40</td>
<td>110.60</td>
<td>16.40</td>
<td>24.12</td>
<td>4.33</td>
<td>42.20</td>
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<tr>
<td>T₃ Punji method</td>
<td>288.00</td>
<td>83.33</td>
<td>21.60</td>
<td>127.80</td>
<td>9.80</td>
<td>24.20</td>
<td>5.65</td>
<td>45.56</td>
</tr>
<tr>
<td>T₄ Square sowing</td>
<td>246.40</td>
<td>74.03</td>
<td>21.40</td>
<td>120.40</td>
<td>10.80</td>
<td>24.40</td>
<td>4.96</td>
<td>45.71</td>
</tr>
<tr>
<td>LSDₙ₀.₀₅</td>
<td>15.24</td>
<td>NS</td>
<td>1.03</td>
<td>15.23</td>
<td>6.35</td>
<td>NS</td>
<td>0.73</td>
<td></td>
</tr>
</tbody>
</table>

T₁: Broadcasting  T₂: Line sowing  T₃: Punji method  T₄: Square sowing  NS: Non Significant

From the analysis of variance, it is clear that highest yield (5.65 t ha⁻¹) was obtained through T₃ (Punji method) with the highest harvest index of 45.56%, which is evident from highest number of tillers hill⁻¹ (288), panicle conversion ratio (83.33%), panicle length (21.60cm), filled grains panicle⁻¹ (127.80) and lowest chaffyness (9.80%). There was a yield increment of 33.23%, 73.85% and 52.62% through T₂ (line sowing), T₃ (Punji method), T₄ (square method), respectively over T₁ (broadcasting). Significant higher number of tillers m⁻² (288) and was found in T₃. Seed requirement in case of T₃ (4kg/ac) was quite low as compared to T₂ (16kg/ac) and broadcasting (30 kg/ac) but little higher than T₄ (2 kg/ac). There was no significant difference in grain yield in case of T₃ (Punji method) and T₄ (square method). No significant difference was found among various treatments in terms of 1000 grain weight.

Hence among all the methods of direct seeded SRI, Punji method is the best suitable method for enhancing productivity by reducing risk of gap filling.

**CONSTRAINTS FACED BY THE ON FARM TRIAL**

Some of the constraints experienced in the course of this study includes:

- Prolonged dry spell due to uneven distribution of rainfall results in crop loss in few replications.
- Incidence of disease pest in variable scale at critical growth stages adversely affected the yield, interfering in the results.
- It was not possible to undertake the same trial in a particular field for three consecutive years due to various reasons.
CONCLUSION AND RECOMMENDATIONS

The result of three years’ on farm trial conducted in different agro-climatic conditions, reveals that significantly taller plants, higher number productive tillers, longer panicles, increased number of filled grains/panicle with reduced chaffyness and increased test weight resulting in higher grain and straw yield were obtained when one or two 12 day old young seedling planted in a spacing of 25x25cm², under integrated nutrient management followed by three times cross weeding with mandwa weeder. Transplanting younger seedling with wider spacing, promoted profuse root growth which leads to greater nutrient uptake resulted in increase tiller nos and ultimately higher yield.

Systematic research is required on nutrient management, integrated pest management, cost-benefit analysis and estimation of water saving under a wide variety of soil conditions to determine variations and ranges of practices, rather than recommending any one-size-fits-all conclusions.

The following are few points which must be ensured while undertaking on-farm research trials.

1. Assured irrigation source near the trial plots to provide life-saving irrigation at the critical stages of crop growth
2. Uniform disease pest preventive measures
3. Uniformity in varietal selection etc.

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