SYSTEM OF RICE INTENSIFICATION

A DOCUMENTATION OF ISSUES AND CHALLENGES FOR
SRI EXPANSION IN KOTPAD
PRAGATI, KORAPUT EXPERIENCE

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SDTT, MUMBAI
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We extend our sincere thanks to
All the SRI Farmers who are part of the study.
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AND
CHALLENGES FOR SRI EXPANSION IN KOTPAD

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SIR DORABJI TATA TRUST
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List of Abbreviations Used

BPL   Below Poverty Line
IEC   Information Education & Communication
FGD   Focus Group Discussion
NABARD National Bank for Agriculture and Rural Development
SRI   System of Rice Intensification
MIS   Monitoring Information System
PDS   Public Distribution System
INTRODUCTION

The System of Rice Intensification (SRI) is a set of farming principles developed in Madagascar by Fr. Henri de Laulanié in the early 1980s to improve the rice productivity of small and marginal farmers tilling in not too favourable land conditions. It is basically a soil and plant management system which aims to optimize the natural growth potential of rice by early transplanting and creating good soil conditions (e.g. wider spacing in transplanting, keeping the soil moist not flooded, aerating the soil, using organic matter as fertilizers and pesticides). The SRI principles translated into practices are as follows:

1. Transplanting of young seedlings, preferably 8-12 days old and not older than 15 days;
2. Selection of only strong seedlings for transplanting;
3. Transplanting the seedlings after uprooting without delay, preferably within 30 min;
4. Seedbed at transplanting should be moist but not flooded;
5. Shallow transplanting depth, preferably 1-2 cm deep in the soil;
6. Transplanting of 1-2 seedlings per hill;
7. Wider spacing with 25x25 cm to 50x50 cm apart;
8. Planting in square pattern or at least in rows to facilitate weeding;
9. Alternate flooding and drying of the field during vegetative growth;
10. Early and frequent mechanical weeding to control weeds and to aerate the soil;
11. Add nutrients to the soil, preferably in organic form such as compost or mulch.

The benefits of adopting SRI are multiple. The most immediate and visible benefit is the significantly higher yield i.e., sometimes double or even treble of that from paddy grown using conventional methods under the same land and climate conditions. There are also larger returns per unit of labour and money expended. Less seeds planted per hill and with wider spacing means a larger field size is covered with only a fraction of seeds normally used under traditional cultivation. Water savings can be as much as 50 percent without sacrificing the yield. In the longer term, SRI contributes to ecological sustainability with its emphasis on organic input. There are also studies which evidence the benefits to the environment of the water and soil management under SRI. Methane emission from flooded paddies is estimated to be as much as 25 percent from the total annual amount. By discouraging flooding of fields SRI contributes to the reduction of green gas emissions (Karki 2010, Uphoff and Randriamiharisoa 2002, Nguyen et al. 2007 and Yan et al. 2009 as cited in Africare, Oxfam America, WWF-ICRISAT Project 2010). The high SRI yields in areas determined to be chemically poor also indicates a positive link between SRI soil management systems (e.g. non-flooding, aeration of soil, weeding) and improving soil health (Uphoff and Randriamiharisoa 2002).

It is important to note that SRI has no set formula apart from the baseline practices listed above. As a set of principles rather than of specific techniques, SRI also has leeway for farmers to experiment and innovate on the above practices and to test out SRI’s viability and limitations in their geo-physical context. Trials on the seed varieties, age of seedling for transplanting and spacing between plant hills for instance are being done to determine the optimum combination of practices for particular soil and climate conditions. In some areas, combination of nutrients, i.e. organic and chemical inputs, to maximize results under SRI are also being tested. Innovations in SRI included adapting spacing markers and weeders to better suit the farming conditions.
SRI ADOPTION AND DIS-ADOPTION

Since its development in the 1980s in Madagascar, the System of Rice Intensification (SRI) has gained ground as a viable and sustainable way of cultivating paddy among many farmers, researchers and ecologists worldwide. The benefits of SRI adoption are multiple, and go beyond increasing rice yield of small and marginal farmers: it uses less seeds and other farming input (savings), it uses less irrigation water (less vulnerability to droughts), it promotes organic practices (enrichment of soil). On a broader level, SRI has also been promoted as a response to global food insecurity and the water crisis. There is also an active push among SRI supporters for organic SRI which not only produces healthier food but also contributes to revitalizing soils long dependent on chemical inputs.

Studies on SRI adoption and dis-adoption are also informative of the challenges to its acceptability among farmers. The process of technology adoption is a complex one, and it cannot be assumed that farmers base their decision to adopt SRI on the basis of its low input – high yield feature alone. This was validated in study by Barett and Moser (2002) of the SRI adoption and dis-adoption patterns among Malagasy farmers in Madagascar. It is with the Malagasy farmers whom Fr. Henri de Laulanié started developing SRI. Despite the marked increase in paddy yield and the intensive extension support to farmers by an NGO, the trends in SRI adoption was disappointing. Moreover, the rate of dis-adoption (i.e., abandonment of the practice) was as much as 40 percent, while farmers who continue the practice rarely put more than half of their paddy fields under SRI (Barett and Moser 2002). Similarly, Van Der Maden (2006) observed that the levels of SRI adoption relied not only in the technological viability of the practice but should also look into other factors as well.

What are these factors affecting SRI adoption? Many technology adoption studies look into individual resources and capacities. Specific to SRI, adopters display common characteristics such as better education, high motivation and interest to observe their fields and are efficiently organized (Stoop 2006). In addition to these, Karki (2010) noted a significant relationship between SRI adoption and factors such as farmer’s age, availability of irrigation to their paddy fields and food security status. Membership in farmers association as much as it facilitates access to agricultural information is also a characteristic of SRI adopters (Moser 2002, Karki 2010). The resources farmers have or can mobilize also play a part in the decision to adopt a practice. For instance, large landowners are in a better position to absorb the risks and possible initial losses which shifting to a new practice entail. On the other hand, small and marginal farming households which stand to benefit most from SRI in terms of better income and food security are likely to be averse to adopting SRI for the same reason (Moser 2002).

Apart from individual and household characteristics, the technical feasibility of SRI, its economic benefits and its socio-cultural viability are also important factors to consider. Technical feasibility relates to the practice of SRI, that is, can it be done and will it result to better yields than traditional cultivation in a given area? Factors such as topography, location and physical characteristics of soil, climate, soil type, availability of water and farming materials, and the interplay of these to produce positive results are considerations. Uphoff (n.d.) states that SRI methods can be inappropriate or impractical, for instance, where there is little water control and flooding creates anaerobic soil conditions.
An evaluation of SRI’s performance in 21 different districts across India showed that its viability is location-specific (Viraktamath 2006). Only in half of the sample areas did SRI manifest a higher yield than the traditional farming systems; in selected districts in Tamil Nadu, Punjab, Bihar and Gujarat yields cultivated under conventional methods produced more than those under SRI. In general, however, SRI trials had more positive results in representative areas in Central and South India then in the Northern states.

Economic viability refers to the cost-benefit analysis which farmers make to determine whether or not to adopt SRI, and to what extent they would adopt it. This goes beyond computation of their financial investment alongside the potential yield. There are also the more intensive time and labor input under SRI which are also considered by the farmers. The time and labor required under SRI covers a wider range of activities including field levelling, training and overseeing of hired workers for SRI-specific practices (transplanting, weeding, water management) and more visits to the field to check water conditions, which are not done in traditional cultivation. Time pressures are also a discouraging factor particularly in areas where the water supply is irregular and contentious.

One of the more neglected aspects in assessing the economic viability of SRI is its opportunity costs to farmers (Moser 2002). Farming households will be reluctant to adopt or expand their adoption of SRI if its demand on their labor and time comes into conflict with more stable or predictable sources of income such as crafts making, salaried employment or even wage labor. With regard to agricultural wage labor, this may be an important cash income source for many small and marginal farming households compared to their own farming which produces rice mainly for consumption (subsistence farming).

Socio-cultural viability refers to the acceptability of a practice in the context of the farmers. Paddy cultivation is a centuries old practice which is closely interwoven in the culture and belief systems of the farmers and their communities (Stoop 2006). As such, introduction of a new and radical practice such as SRI will not surprisingly be met with scepticism and resistance (Uphoff 2006). Resistance to SRI is manifested not only in non-adoption but in dis-adoption as well. For instance, Barett and Moser (2002) observed that social conformity is major factor in the SRI adoption of Malagasy farmers. Specifically, the resistance to SRI was overcome by the presence of NGO extension workers because of the Malagasy culture of respect for authority figures. However, the sharpest rate in dis-adoption also occurred when the NGO extension support was interrupted due to funding issues. While this points to the critical importance of technical support to SRI farmers, it does not adequately explain the dis-adoption of even established SRI farmers.

The limited studies on the socio-cultural dimensions of SRI, particularly as these affect its adoption, was observed by Resurreccion et al. (2008). Changes brought about by SRI adoption are often focused on the impact on individual farmers or household finances, while ignoring the broader social systems which support or block these changes, as well as the changes in the social system itself resulting from the adoption of the technology.
PRoMOTING SRI IN KORAPUT: THE PRAGATI EXPERIENCE

The above studies on SRI provide background to the experience of Pragati in promoting SRI in Koraput. Pragati piloted SRI in 2006 with only 11 farmers and on 5.50 acres of land. The aim was to determine the viability of SRI in the area where it has never been tried before. The results were encouraging: all the farmers got a yield ranging from double to quadruple the amount they normally get under traditional farming (Pragati 2008).

The success of the pilot phase inspired farmers to continue with SRI, and Pragati to actively promote it as a response to food insecurity in their action areas. The following year, the number of SRI farmers increased to 36 and a total of 14.2 acres. Pragati produced information, education and communication (IEC) materials, conducted farmers orientations and joined agricultural fairs to showcase SRI. In 2008, Pragati received support from two agencies, SDTT and NABARD to promote SRI on a wider scale. This enabled Pragati to cover all the 14 blocks of Koraput district. It organized a local SRI network, the Jaivik SRI Samaj, which also facilitated the spread of SRI in the villages. Not surprisingly, adoptions in 2008 went up by more than 200 percent in terms of the number of farmers who have taken up SRI that season, while the number of acres put under SRI increased by more than 150 percent.

Table No. 1: Number of Villages with SRI Fields, Farmers Adopting and Acres Covered Per Block from 2008-2012

<table>
<thead>
<tr>
<th>Block</th>
<th>Villages with SRI Fields</th>
<th>No. of Farmer Adopting</th>
<th>Area (Acres)</th>
<th>Villages with SRI Fields</th>
<th>No. of Farmer Adopting</th>
<th>Area (Acres)</th>
<th>Villages with SRI Fields</th>
<th>No. of Farmer Adopting</th>
<th>Area (Acres)</th>
<th>Villages with SRI Fields</th>
<th>No. of Farmer Adopting</th>
<th>Area (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>89</td>
<td>324</td>
<td>194</td>
<td>127</td>
<td>1024</td>
<td>706</td>
<td>204</td>
<td>2748</td>
<td>1140</td>
<td>216</td>
<td>4205</td>
<td>1635</td>
</tr>
<tr>
<td>Koraput</td>
<td>19</td>
<td>46</td>
<td>26</td>
<td>21</td>
<td>144</td>
<td>92</td>
<td>20</td>
<td>178</td>
<td>78</td>
<td>14</td>
<td>74</td>
<td>40</td>
</tr>
<tr>
<td>Nandapur</td>
<td>31</td>
<td>80</td>
<td>27</td>
<td>38</td>
<td>326</td>
<td>190</td>
<td>40</td>
<td>254</td>
<td>105</td>
<td>40</td>
<td>453</td>
<td>222</td>
</tr>
<tr>
<td>Kotpad</td>
<td>6</td>
<td>38</td>
<td>27</td>
<td>11</td>
<td>118</td>
<td>82</td>
<td>13</td>
<td>116</td>
<td>98</td>
<td>13</td>
<td>334</td>
<td>83</td>
</tr>
<tr>
<td>Kundra</td>
<td>8</td>
<td>32</td>
<td>18</td>
<td>13</td>
<td>110</td>
<td>84</td>
<td>11</td>
<td>232</td>
<td>96</td>
<td>11</td>
<td>346</td>
<td>80</td>
</tr>
<tr>
<td>Laxmipur</td>
<td>7</td>
<td>19</td>
<td>12</td>
<td>14</td>
<td>104</td>
<td>69</td>
<td>8</td>
<td>223</td>
<td>93</td>
<td>13</td>
<td>525</td>
<td>160</td>
</tr>
<tr>
<td>Pottangi</td>
<td>12</td>
<td>41</td>
<td>23</td>
<td>12</td>
<td>74</td>
<td>47</td>
<td>22</td>
<td>350</td>
<td>127</td>
<td>22</td>
<td>724</td>
<td>291</td>
</tr>
<tr>
<td>Semiliguda</td>
<td>4</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>53</td>
<td>49</td>
<td>21</td>
<td>242</td>
<td>136</td>
<td>21</td>
<td>501</td>
<td>177</td>
</tr>
<tr>
<td>Jeypore</td>
<td>2</td>
<td>58</td>
<td>54</td>
<td>9</td>
<td>95</td>
<td>93</td>
<td>14</td>
<td>163</td>
<td>91</td>
<td>16</td>
<td>237</td>
<td>156</td>
</tr>
<tr>
<td>Bandhugam</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>5</td>
<td>98</td>
<td>34</td>
<td>5</td>
<td>54</td>
<td>11</td>
</tr>
<tr>
<td>Narayanpatana</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>5</td>
<td>28</td>
<td>4</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Lamtaput</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>5</td>
<td>16</td>
<td>4</td>
<td>5</td>
<td>119</td>
<td>26</td>
</tr>
<tr>
<td>Boipariguda</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>12</td>
<td>235</td>
<td>77</td>
<td>24</td>
<td>328</td>
<td>72</td>
</tr>
<tr>
<td>Dasmanthpur</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6</td>
<td>120</td>
<td>40</td>
<td>10</td>
<td>222</td>
<td>110</td>
</tr>
<tr>
<td>Boriguma</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>22</td>
<td>493</td>
<td>157</td>
<td>22</td>
<td>288</td>
<td>207</td>
</tr>
</tbody>
</table>

By the end of 2012, the number of SRI adopters has increased to 4,205 farmers and SRI coverage to 1,635 acres across 216 villages. The number of farmers outpaced the size of the land under SRI due to the partial adoption of SRI by farmers on their total paddy land. It should also be noted that the SRI program’s targeting mainly small and marginal farmers i.e. those who cultivate two hectares of land at most.

1 From Pragati reports and MIS. Another note to the amount of land covered is that it represents only SRI adoptions through the Jaivik SRI Samaj (i.e. direct beneficiaries). There are also other organizations promoting SRI in different Koraput blocks, in addition to adoptions that were encouraged by the results of SRI farmers covered by the network but are not beneficiaries of the local SRI network.
Overall, it can be said that Pragati’s SRI program and its network was responsible for putting 0.57 percent of the total paddy lands in the Koraput district under SRI.

Chart No. 1: Trend in the Number of Farmer and Land Adoptions of SRI in Pragati and Jaivik SRI Samaj Action Areas from 2006-2012

In general, SRI is accepted among its practitioners and supporters to be viable in Koraput. In 2009, Pragati in partnership with research organizations engaged in a three-year experiment regarding the optimal combination of SRI factors. These factors were the age of seedling, number of seedlings per hill, spacing of plants, varietal response, and nutrients.

Apart from increased yield, Pragati also documented the following benefits and advantages of SRI over traditional paddy cultivation (Pragati 2010):

- Seed quantity was significantly reduced from 35 to 45 kg per acre under the conventional farming method to only 2 kg in SRI per Acre.
- Water use was also greatly reduced with SRI farming uses 60 to 70 percent less water than traditional cultivation.
- There is less insect, pest and disease attack and less infested grains
- Maturity of the crop is sooner (about 15 days)
- Labour cost for field preparation, nursery management and weed control has been reduced due to less number of labourers involved.
- Fodder production has been improved by 40 to 50 percent more than in the conventional method.
- Better soil aeration and sun light penetration due to wider spacing result in better root development and photosynthesis in leaves.
- Plants under SRI have higher tolerance of climate stresses. No lodging of crops due to stronger root growth. Better water management and time schedule can better cope with the dry spell and erratic rainfall. Arrangement of one or two life saving irrigation can further multiply the crop yield. Those who have controlled irrigation have found SRI more suitable.
- Women’s agricultural work became lighter as SRI-specific activities like transplanting and weeding requires less time to complete.
- Spending on costly chemical inputs (fertilizer and pesticides) was reduced because farmers practice organic SRI
- Markers, important in SRI transplanting, can be very easily manufactured by farmers from local materials.
The data on the number of adoptions can be complemented by the data on the rate of adoptions i.e. how quickly (slowly) SRI is being adopted by farmers in the target villages. As the chart below showed, the rates of adoption since 2006 mirrors the trend with regard the number of farmer and land size adoptions i.e. an increasing trend over the years.²

**Chart No. 2 : Rate of SRI Adoption in Pragati and Jaivik SRI Samaj Action Areas from 2006-2011**

![Chart showing rate of SRI adoption from 2006 to 2011](chart.png)

A note on the increasing rate of adoption was that the infusion of resources to the program was a critical factor in raising awareness about SRI in the district. The spike in the rate of adoption happened in 2008 when Pragati secured external funding for its SRI program. This enabled the organization to expand the intervention to cover more villages in all the 14 blocks of Koraput.

Dis-adoption can be gleaned from the data in two ways: the decrease of the number of farmers adopting SRI and the decrease in the land size put under SRI by the farmer. While the overall numbers show an increasing trend in SRI adoption, the data per block indicate dis-adoption occurring in certain areas, namely the Koraput and Nandapur blocks. In Koraput, despite the increase of the number of farmers adopting SRI from 2008 to 2010, the number of acres put under SRI decreased by 15.22 percent from 2009 to 2010. In Nandapur on the other hand, the decrease from 2009 to 2010 was seen in both the number of farmers and the land put under SRI by 22 percent and 45 percent respectively (See Table No. 1).³ Farmers adopting in Kotpad also decreased from 118 in 2009-10 to 116 in 2010-11, despite the expansion to two more villages in the latter year.

Various Pragati reports mention dis-adoption happening for the following reasons:

- Irregular availability of inputs (organic manures, green manure) and materials (markers and weeders) when needed
- Erratic rainfall which affected SRI process, specifically transplanting and weeding
- Difficulty in adhering to SRI practice (“regimented”);
- Need for regular crop monitoring

² The figures and chart reflect only the adoptions in areas reached by Pragati and its SRI network interventions in the district. There are also other NGOs promoting SRI in Koraput but are not members of the Jaivik SRI Samaj. The government also promoted SRI in its extension work for a time, according to the Pragati SRI coordinator.

³ In general, tracking of dis-adoption data is overlooked in the SRI documentation of Pragati and its network which is more focused on the total number of adoptions. It is possible too that dis-adoptions occurred in the other blocks, however was not reflected in the tabulated figures. For instance, adoptions from a new village can compensate for the number of dis-adopting farmers in the villages reached by the SRI program in the previous years. Thus the overall figures can still indicate an increasing trend.
There is no report explicitly stating farmers dropped out because of lower yield under SRI, although there had been cases of lower yields in some villages. For instance, 65 SRI farmers suffered crop loss after their first year of adoption in 2009.

The SRI Coordinator also cited the active promotion of other methods of paddy cultivation under Govt. schemes as a factor in slowing down SRI rate of adoption. Active promotion for line sowing for instance began in 2010, and government support for its adopters included seed and chemical fertilizer subsidies, as well as regular extension services. On the other hand, project management is also identified as a factor, for instance, concerns over project resources (especially where it relates to provision of needed materials like weeders), staff capacities, frequency of monitoring.

**OBJECTIVE OF THE STUDY**

The aim of this study is to document SRI from the perspective of small and marginal farmers who have adopted it, identify challenges to its wider adoption and recommend actions to address these challenges. “Wider adoption” in this sense refers to two things: first, SRI adoption of farmers who have not practiced it yet and second, and expansion of the area covered by SRI among its adopters. It should be noted that the report is not an extensive research on the subject, rather a broad documentation of the issues in SRI adoption.

The data presented were culled out from the surveys and focus group discussions conducted in the villages of Chitra, Ghumar and Hordoli in Kotpad block from June 2011 to January 2012. Several discussions with Pragati SRI Project staff supplemented the field data. A cursory review of reports and journal articles on SRI as well as Pragati documents was also done.

One of the objectives was to study impact on food security at household level which is not mentioned here, besides we also have a design to continue the study over 3 consecutive agriculture seasons.

**THE CASE OF SRI IN THREE KOTPAD VILLAGES**

The feedback from Kotpad farmers who adopted SRI may provide some insight on the adoption and dis-adoption patterns. A total of 50 Kotpad farmers from the villages of Chitra, Ghumar and Hordoli took part in the survey and discussions facilitated by Pragati on their experience with adopting SRI in Kharif 2011. All the farmers have adopted SRI in a portion of their fields at least in one season as shown in the table below; all were also interested in adopting SRI in Kharif 2011. However, 7 out of 14 farmers in Ghumar, and 3 out of 18 farmers in Hordoli were unable to transplant seedlings on time in Kharif 2011 and, in effect, dropped out of the SRI practice.

<table>
<thead>
<tr>
<th>Year and Season of SRI adoption</th>
<th>Number of farmers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chitra</td>
<td>Ghumer</td>
</tr>
<tr>
<td>2008 Kharif</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2009 Kharif</td>
<td>---</td>
<td>1</td>
</tr>
<tr>
<td>2010 Kharif</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>2011 Rabi</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>2011 Kharif</td>
<td>64</td>
<td>8</td>
</tr>
<tr>
<td>Farmers selected for sample survey</td>
<td>18</td>
<td>14</td>
</tr>
</tbody>
</table>
PROFILE OF KOTPAD SRI FARMERS SURVEYED

While the profiles of the Kotpad SRI farmers vary in detail, some general patterns were observed:

- **Individual characteristics:** The SRI farmers who participated in the survey and focus group discussions are generally male (92.17 percent), in their 30s and 40s (66.67 percent), and married (94.12 percent). They are often the household head (80.39 percent).

- **Household characteristics:** The SRI farming households in the three villages in Kotpad are mostly scheduled tribe households (88.24 percent). Household members range from one to 13, with many having 4-6 members (54 percent). In terms of economic status, 37 out of 50 households (74 percent) have an annual income of not more than Rs.50,000, 19 households of which earn not more than Rs.10,000 per year.

- **Land ownership:** Around 80 percent of them are small and marginal farmers who cultivate not more than two hectares of land. The land they cultivate may not even be their own, instead leased from bigger landowners, as in the case of three landless SRI farmers. With regard to irrigation, only 57.45 percent of the respondents have access to irrigation for all of their lands.

- **Source of income:** Hiring out their labor for agricultural work and the sale of their own crops were identified as the primary sources of income by 60 percent and 30 percent of the SRI households, respectively. Agriculture-based activities such as trading also supplement the household income in some cases. There are also households which draw income from selling cooked food, employment of members (government and NGO) and pensions.

- **Food security:** The produce from their fields is their main source of food. As such, any adverse change in their crop yield due to weather or other factors has a great impact on their food security. In the previous year (2010), 68 percent of the farmers related experiencing food insecurity from six to three months. These months are the months during planting until just before harvest when agricultural expenses are prioritized (June to December). There were also farmers (28 percent) whose crops were able to provide for them for 12 months, while one farmer said their household was food insecure for nine months in 2010.

  To cope with food insecurity, the farmers usually resort to borrowing from money lenders (46 percent) and/or hire out their labor (36 percent). Government welfare schemes, such as the PDS rice (which can be bought up to 30 kilos a month per household @Rs 2/- per kg), are also safety nets in the lean periods. Another source of food, at the same time a coping mechanism, is the small stores in their community which can sell food to them on credit.

- **Community participation:** Community participation among respondents was generally low based on survey results. While all of them are members of farmers’ clubs (organized by Pragati for SRI farmers), membership in other community-based organizations like Forest Protection Committees and Self-Help Groups is very low at 2 percent, and 38 percent, respectively. There are no cooperatives or federations in the three villages.

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4 See Annex for the complete baseline on Kotpad SRI farmers. This includes the profile of all 51 farmers who indicated interest in adopting SRI for Kharif 2011. As noted above, only 40 of the 51 farmers actually adopted SRI; the other ten farmers were not able to do the transplanting on time, in effect, dropped out from SRI this season.

5 According to the Pragati staff, the decision to adopt SRI is often a family decision, although more often than not, it is the head of the household (generally male) or an adult male member who attend the trainings, meetings and related activities called by Pragati on SRI. The term “SRI farmer” is used in this report refer to this household representative.

6 SRI farmer separated from her husband and living alone.
Farming Practices in Kotpad

In general, the picture of agricultural life in Kotpad is one that is heavily dependent on paddy cultivation. Using 2010 as the base year, 28 out of the 47 (59.57 percent) landowning farmers reported devoting all their cultivable land to paddy, while another nine farmers (19.15 percent) use more than 50 percent of their land for paddy. For these farmers, paddy is the only crop they cultivate for both income and domestic use. Only very few farmers reported cultivating other crops during the last Kharif season (2010): one Hordoli farmer cultivated / harvested mangoes; in Chitra, one farmer cultivated vegetables, another one ragi, and a third farmer cultivated ragi and black gram.

With regard to seed use, there was almost twice as much farmers who used commercial paddy seeds compared to those who used their own seeds last year i.e. 60 percent compared to 32 percent. Only four farmers out of 50 (8 percent) who used a mix of their own seeds and commercial seeds. Chemical fertilizers are also used by farmers. Out of the 50 farmers surveyed, 39 of them (78 percent) use only chemical fertilizers in their paddy land. The common chemical fertilizers used are urea, potash and DAP. Ten farmers (20 percent) use cow dung alongside chemical fertilizers. Only one farmer in Hordoli uses organic fertilizers (e.g. cow dung).7

SRI in Kotpad

As with the other areas, initial Pragati SRI Intervention in Kotpad emphasized educating farmers on SRI, organic farming and sustainable agriculture. This was done mostly through orientations and trainings in the village, in addition to visits to demonstration farms and organizing SRI farmers fairs and forums. Input support was also provided: seeds, organic fertilizers and materials such as markers and weeders. Financial support was also extended to some small and marginal farmers under the project.

These interventions resulted positively in terms of the number of adoptions in the area. Starting with 38 farmers on 27 acres in 2008, the number of SRI farmers and land coverage increased to 334 and 83 acres in 2011-12. Based on the Pragati and Jaivik Sri Samaj data, the rate of adoption in Kotpad showed a positive trend, although the number of farmer adoptions in 2010-11 was slightly lower than in the previous year (116 compared to 118 in 2009-10). In 2011-12, though the number of farmers increased, the area under SRI was reduced to 83 acres as against 98 acres in 2010-11. Similar to the district adoption trends, the steepest increase occurred after the first year of SRI project implementation in Kotpad which can be attributed to factors such as the expansion of the SRI project to more villages, and the initial enthusiasm of farmers to try SRI after seeing the results from SRI fields the previous year.

7 The finding on fertilizer use is notable because 17 Hordoli farmers also indicated having adopted organic farming in 2008. This can be traced to the initial efforts of Pragati to promote SRI and organic farming in Kotpad in the same year. These 17 farmers received training and support from Pragati. However because of coordination difficulties with the partner NGO directly working in the area, the initiative was discontinued.
However it is not clear in this overall data from Kotpad whether this positive trend in SRI field coverage is due to (a) the increase in new SRI farmers, (b) farmers who have tried out SRI in the previous seasons increased the coverage of their SRI practice, or (c) both.

This is an important point in tracking adoption and dis-adoption patterns and in monitoring sustainability of the practice. In the case of the surveyed SRI Kotpad farmers, the area covered by SRI decreased from 19.5 acres in 2010 to 10.5 acres in 2011. There were more farmers who have decreased the percentage of their total paddy land under SRI (27 out of 40) than those who have increased it (3 out of 40). This is in addition to 10 farmers in Ghumar and Hordoli who were not able to adopt SRI at all in Kharif 2011, despite their intentions to do so.

The percentage of dis-adoption, i.e. the decrease in land coverage, ranged from 1.70 percent to 80 percent (modal range is 10-20 percent). On the other hand, two farmers increased their SRI fields by 10 percent, while one increased it by 75 percent. Only one farmer put all her paddy land under SRI, compared to the previous season wherein two farmers put all their paddy lands under SRI. Moreover, these two farmers indicated the largest decrease of their SRI paddy lands i.e., from 100 percent they scaled down their SRI fields to only 20 and 40 percent of their paddy land in Kharif 2011.

There were also 10 farmers who adopted SRI in the same portion of their land as in the previous season.

Chart No. 4 :  Percentage of Farmer’s Total Paddy Land Under SRI

<table>
<thead>
<tr>
<th>Percentage</th>
<th>2008-09</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
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<td>Less than 10%</td>
<td>3</td>
<td>12</td>
<td>16</td>
<td>9</td>
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<td>10-20%</td>
<td>14</td>
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<tr>
<td>20-30%</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>30-40%</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50% and above</td>
<td>1</td>
<td>1</td>
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FACTORS IN SRI ADOPTION AND DIS-ADOPTION

Financial viability of SRI

The financial viability of SRI is the most commonly cited reasons among farmers interviewed both those who adopted SRI in Kharif 2011 and those who, for various reasons, did not but had been interested to do so. They all had tried SRI before and seen that if its steps were strictly followed and the weather conditions during the planting season were ideal, their paddy yields could be as high as quadruple of that from traditionally cultivated rice fields on the same size of land.

Relating to financial cost, the average spending for seeds, fertilizers and labor under SRI is reportedly much lower than that under traditional paddy cultivation practices. The table below shows the comparison between expenses and savings for 0.20 acres of paddy land, which is the most common size of fields under SRI in Kharif 2011 (i.e. 26 out of 40 Kotpad farmers surveyed, or 65 percent, adopted SRI in this size of their paddy field).

Table No. 3: Comparison of Expenditure Range and Average of Traditional Cultivation and SRI in 0.20 Acres of Paddy Land

<table>
<thead>
<tr>
<th>Expenditure Items</th>
<th>Traditional Cultivation</th>
<th>SRI</th>
<th>Difference / Savings</th>
<th>Difference / Savings (%)</th>
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</thead>
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<tr>
<td></td>
<td>Expenditure Range (Rs.)</td>
<td>Average Expenditure (Rs.)</td>
<td>Expenditure Range (Rs.)</td>
<td>Average Expenditure (Rs.)</td>
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<tr>
<td>Seeds</td>
<td>50 - 238</td>
<td>140.5</td>
<td>10 - 24</td>
<td>14.25</td>
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<tr>
<td>Fertilizer</td>
<td>165 - 536</td>
<td>304.25</td>
<td>0 - 500</td>
<td>185.71</td>
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<tr>
<td>Pesticide</td>
<td>20 - 70</td>
<td>22.5</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Labor</td>
<td>992</td>
<td>484.62</td>
<td>0</td>
<td>-511.62</td>
</tr>
<tr>
<td>• Nursery Raising</td>
<td>0 - 80</td>
<td>20</td>
<td>0</td>
<td>0</td>
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<td>• Field Preparation</td>
<td>0 - 400</td>
<td>110</td>
<td>0 - 200</td>
<td>150</td>
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<tr>
<td>• Transplanting</td>
<td>144 - 864</td>
<td>552</td>
<td>0 - 480</td>
<td>223.08</td>
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<tr>
<td>• Fertilizer and Pesticide Application</td>
<td>0 - 40</td>
<td>25</td>
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<td>50</td>
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<td>• Weeding</td>
<td>120 - 600</td>
<td>285</td>
<td>0 - 400</td>
<td>61.54</td>
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<tr>
<td>• Water Management</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Animal use / rent</td>
<td>120 - 720</td>
<td>405</td>
<td>0 - 700</td>
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<tr>
<td>Total</td>
<td>1864.25</td>
<td>1101.25</td>
<td>763</td>
<td>40.93</td>
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Not surprisingly, the highest savings of SRI farmers is from the seeds and labor costs. Specifically with the seeds, the farmers were able to cut down 90 percent of their cost. With regard to labor savings, these were due to the less people needed to do the various farming tasks. Thus, the household and its unpaid labor resources (including relatives, other households which help out in agricultural work on a reciprocal basis) were able to absorb a bigger percentage of the work demands than under traditional farming. In weeding for example, 20 out 40 SRI Kotpad farmers did not hire any labor, compared to traditional cultivation where hired workers composed 90 to 100 percent of those doing weeding. In the survey, 52.83 percent of the SRI farmers stated based on their experience, transplanting in SRI is that requires less or no extra laborers.
Field preparation however, demanded more hired labor because SRI requires that land is level for better water management – something which the traditional method of cultivation is not very particular with. Individual farmers with no bullock of their own also report an increase in their spending on animal use / rent because of this reason. The labor for fertilizer and pesticide application was also more expensive than that under traditional cultivation because of the need to hire extra workers or transportation (e.g. cart or motorized vehicle) to bring the organic fertilizers to the fields. For 0.20 acres, the range of cow dung and other organic fertilizers used ranged from 50 to 1000 kilograms.

Time expended on farm work is also a factor in the financial viability of the SRI. Less time on tasks means time for them to these themselves (instead of hiring workers) or more time to do other productive things such as working on their fields which are not under SRI (thus translating to more labor savings), vegetable cultivation or tending to their kitchen gardens and engaging in income generating work such as leaf plate-making.

The time factor also brought about changes in the re-organization of farm and household labor, which were also favorable according to the Kotpad farmers. Men have started to be involved in farming tasks which are traditionally done by women. These were men’s participation in transplanting (“men help in the marking and guiding the women”) and weeding (men now are the ones doing the weeding using the weeder). Application of chemical fertilizer and pesticides was the men’s work in traditional farming; whereas under SRI with application of organic manures and pesticides, this has become a shared task between men and women.

Time savings from SRI also meant that households have more time to work on their other fields that is, portions of their paddy land which are not under SRI. In Hordoli, women stated that they have more time to weed their non-SRI fields because the men are now doing the weeding in the SRI fields.

Because of the time saved from SRI (as compared to the long hours of farm work in traditional paddy cultivation) women and men reported having more time to rest and care for their children. Women also report having more time to clean the house and collect firewood. There was also additional time to engage in productive activities such as making leaf plates and vegetable cultivation for women, and cattle herding and working as hired laborers for men.

**OPENNESS TO EXPERIMENT ON FIELDS / RISKS**

On the other hand, reluctance to take risks with their major (if not the only) source of income, i.e. paddy cultivation, remains the major factor in adopting or dis-adopting SRI. There was no activity conducted for the purposes of this paper to determine the general profile of farming households in Kotpad. However if the surveyed SRI farmers were the basis, one would observe that only a few of them fit the profile of likely adopters and adopters who would sustain the practice, as culled from literature: majority of the SRI farmers are small and marginalized landowners, lived below poverty line, and have little formal education. Their communities in general have limited access to agricultural information, whether from extension services or media such as radios or printed materials. While there are farmers associations or clubs in the villages, these mostly served as channels for distribution of agricultural support, they need handholding support to roll out as functional organizations for information sharing and mutual support.
**Geo-physical characteristics and the location of farmers’ paddy lands**

The farmers identified the following factors in this regard:

- SRI requires a level land which cannot be done with upland fields without expending additional resources (e.g., for laborers and bullock rent, land bunding). In the survey, 62 percent of the farmers indicated that they have upland agricultural fields.
- Paddy fields not reached by (canal) irrigation will not do well under SRI which requires timely water supply. Based on their experience in the previous seasons, monsoon rains have become more unpredictable both in terms of its rain intervals and rainfall quantity, thus making difficult water control as required by SRI. The farmers (and Pragati) also lack access to timely information which can inform them in this regard.
- Another aspect of access to irrigation by Kotpad farmers surveyed relates to the location of their paddy field. Households with paddy fields which are farther away from the irrigation source reported not getting adequate supply of water to their lands (16.84 percent).

It follows that the Kotpad farmers will be hard put to have their upland and non-irrigated paddy fields under SRI unless changes such as land bunding and securing a more equitable distribution of irrigation water can be implemented, among other things.

**Timely Availability of Resources**

An important observation in the SRI adoption in Kotpad was that it is not a one-time decision with the household committing to shift from traditional paddy cultivation practices to the SRI method – even with households already convinced of the economic viability of SRI. Rather the household’s decision to adopt SRI for that season and the size of their paddy lands to be put under SRI depends on several conditions.

Time is a major variable in the conditions being managed in SRI, for instance the age of seedlings when transplanted, the time duration of transplanting the seedlings and the schedules for weeding and wetting and draining of paddy lands. Unfortunately, these cannot always be followed by the Kotpad farmers because of the following reasons or issues:

- Laborers had not been always available during transplanting period due to (1) decreasing number of agricultural workers for hire specifically among the younger population who prefer factory work to farms; and (2) less number of agricultural workers who are willing to plant in the SRI method. The latter was identified by 69.79 percent of the SRI farmers as an issue in the survey.
- Transplanting the SRI way in particular met resistance from some hired laborers according to SRI farmers. The reasons given related to the lack of skill and unwillingness to learn (which also frustrated the SRI farmers because the workers were not transplanting in the correct SRI way), and meticulousness of the work which included planting in grids of specific measurements. Another reason cited was the laborers found the bending and straightening up to move to the next grid more tiring than long periods of bending to transplant the seedlings as was the practice in traditional cultivation.
The socio-cultural dynamics in farm work which were changed when SRI was adopted were another factor. That is, SRI stated that women workers found the SRI practices isolating, which added to its tediousness. Under traditional farming, women work in groups to transplant and weed fields; they chat and sing together while doing their task. With SRI, the reduced number of workers and time vis-à-vis the exactness of work provided limited opportunity to socialize.

The limited supply of weeders also contributed to the delays in SRI weeding schedule of farmers. That is, since the SRI farmers started their planting at the same time, some farmers had to wait for at least a day for their turn to use the communal weeder.

The issues related to irrigation were already mentioned in relation to the geo-physical characteristics and location of paddy lands.

ORGANIC FARMING AND SRI

The promoting the use of organic fertilizers and pesticides is also part of Pragati’s work with farmers in general, not just SRI practitioners. The transition to organic farming among SRI farmers was not uniform: there are farmers who had used only organic fertilizers like cow dung on their fields, while others used a combination of organic and chemical inputs. Accessibility of organic fertilizers and pesticides and labor input if they had to make these themselves were the main considerations in the adoption of the practice.

The reported benefits of organic farming include reduction in farming costs and relief from the burning sensation women usually get on their hands and feet especially when weeding. With organic farmers surveyed, they also observed that there lands became more fertile (57.77 percent).

LOOKING AHEAD

This report is by no means a comprehensive study. There were various constraints, both internal and external to Pragati, affected the depth of analysis possible on adoption, disadoption and non-adoption trends in Kotpad, or Koraput in general. Nevertheless, the data compiled for this report can already provide an overview of factors influencing farmers’ decisions to continue and expand SRI adoption:

- Financial viability of SRI
- Farmers’ openness to experimenting / risks
- Geo-physical characteristics and location of farmers’ paddy fields
- Timely availability of resources, including material and human resources (laborers)

While some factors, like the irrigation, timely availability of labor and inaccessible inputs and equipment can be immediately addressed to work in favour of SRI, issues such as the coping with the changes in weather patterns (e.g. erratic rainfall) require long-term and multi-levelled responses. The easing the shift to SRI can be facilitated by creating an environment more conducive to adopting SRI which includes educating farmers on the technical aspects of SRI and its short and long-term benefits, and developing with them systems of work to facilitate specific tasks under SRI.
The recommendations below cover only actions which can be immediately taken up by farmers and Pragati to move forward with SRI. It basically answers the question, “What’s next?” after the process of identification and discussion of SRI issues by Kotpad farmers and Pragati staff, as facilitated by the study.

1. Material support

Direct provision of the materials such as weeders, markers and organic structures like vermi compost units is necessary in the case of many small and marginal farming households with whom Pragati works. Material support, whether in part or in full, are important until the household is enabled to earn and save money to purchase these.

Indirect material support can also be through linking farmers to agencies and markets providing materials and services they need, or having agricultural programs which they can avail of. A concrete example where this linkage can be facilitated is between the farmers interested in buying their own rotary weeders and the manufacturers. Some farmers in the FGDs stated that they are willing to invest in their own weeders (in contrast to waiting for their turn to use the group weeder provided by Pragati). Pragati can also provide timely information which can help farmers access resources available for SRI and organic farming (e.g. government programs and subsidies)

Organizing SRI farmers and other interested community groups vis-a-vis SRI requirements is also a form of indirect provision of material support. It was suggested during the FGDs that a group (e.g. self-help groups) can be organized to establish compost pits which can provide for SRI farmers’ requirements of organic fertilizers.

2. Capacity building of SRI farmers, trainers and extension workers / motivators

One of the recommendations from the farmers is to have orientations with the labourers groups so that they can better appreciate the SRI method of farming, particularly transplanting. This, essentially, is not a new recommendation as there had been discussions before to link up with local women’s self-help groups for the same. This only needs to be carried out – and Pragati can already tap into its pool of SRI farmers for this purpose.

Capacity building also refers to working with the farmers to develop a system of work whether at the household level or as a group. This is important because SRI is more intensive than traditional farming in terms of managing resources used (e.g. seedlings, water) and cultivation practices (e.g. transplanting and weeding). Work systems can be set up around concerns of –

- Establishing nurseries which contain seedlings planted several days apart. This can ensure that there will still be seedlings to use for SRI even if the monsoon rains were delayed.
- Schedule of transplanting so SRI farmers can help each other out when there are not enough labourers to be hired
- Schedule of the weeder use (to date there is only one weeder available for 10 SRI households).
- Establishing collective compost pits to cut cost of buying and transporting organic fertilizers to their field.
3. **Organizing (or working with, as the case may be) Farmers clubs to systematize and equitably distribute irrigation water in the villages**

The water supply issue in farming is a complex one which cannot be addressed with a single action and by a single group of stakeholders. In SRI, this issue is two-pronged: the availability of sufficient water and its availability at the scheduled time for flooding the rice fields. The recommendation of one SRI farmer to have a water users committee to ensure equitable access to canal irrigation water may be a starting point to respond to these.

Land development activities such as land bunding, establishing water catchments or other structures to diversify irrigation sources can also be explored.

4. **Facilitating learning and action processes with farmers clubs**

One of the findings of the study relates to the limited venues for SRI farmers to share their experiences and exchange ideas on how to address their individual and collective concerns. Ideally, there are SRI Farmers Clubs organized towards this purpose, however in the case of Chitra and Ghummar villages, these clubs need more handholding support to function as conduits for agricultural projects or programs in the area.

In the context of the various challenges faced by SRI farmers vis-a-vis the limited Pragati resources for direct support and extension services, strengthening farmers clubs to be more active in looking for solutions to their issues is a viable action. Farmers clubs can be spaces for learning and action. While Pragati can initially facilitate the sessions, sight must not be lost of the farmers eventually owning the process of collective knowledge building, planning and action.

Labour management—through farmers club, an issue discussed in Hardoli and Chitra can be added as a part of Farmers club capacity building and internal management for mutual cooperation.

5. **Expanding and strengthening current linkages and networks to expand the coverage of SRI in Koraput**

Pragati cannot address all the needs of SRI farmers, nor adequately address the issues facing SRI practice by itself. Thus Pragati should be conscious to develop a multi-disciplinary network of individuals and organizations supporting SRI, whether for learning or implementation of activities. Networks for learning are particularly important as Pragati is mainly a social development NGO and itself needs agricultural extension service i.e. technical support on optimizing SRI in specific geo-physical characteristics of its field areas, for instance to address concerns like the most suitable seed to what type of soil and alternative irrigation practices. Networks as a resource for its members is not only in terms of information but also for possible collaborative work to improve various aspects of promoting SRI, such as undertaking common documentation or research projects on Pragati action areas.
6. Systematizing documentation of the SRI experience for learning

Pragati is in a good position to be a learning resource for organizations and individuals interested in SRI, albeit with a critical gap: a systematic documentation of its SRI experiences and lessons from the field. Firstly, documentation does not go beyond the requirements of externally-funded projects which often focus on the quantitative aspects of SRI for instance, how many farmers have adopted, on how much land, how much yield and income? Yet even with this limited scope there are still some gaps for instance, data in previous years were missing (problem with data collection) or conflicting with information from another database.

Secondly, and related to the first, SRI as documented in project reports will not surprisingly reflect a bias for success stories. Pragati’s SRI case stories is an illustrative example. This is not to say that positive experiences are not sources of learning – they are. However, much is also to be learned from the “unsuccessful farmers” or disinterested farmers particularly on the challenges to expanding SRI in Koraput. Why are some farmers still not interested in adopting SRI despite the successes of their SRI-adopting neighbours? Why do farmers already adopting SRI reluctant to expand its coverage to their whole paddy lands? Apart cost-benefit analyses of SRI versus the traditional method of paddy cultivation, what factors do farmers consider when deciding whether or not to adopt or expand SRI? What can be done to address their concerns? Pragati also has to document and analyze SRI from these angles.

It is hoped that this study has provided some guidance in moving forward in this direction. Some themes which can be explored for further documentation along the lines of SRI are (1) opinions of traditional farmers and labourers on SRI; (2) factors influencing decisions of farmers to adopt an agricultural practice whether SRI, organic farming or cultivating a new crop; and (3) changes in the division of labour and time use of men and women due to SRI. Another assumption of SRI advocates is that SRI leads to food security. A purposive and systematic documentation of SRI households can provide empirical evidence to support this claim.

Apart from SRI, Pragati can also begin to systematize its documentation on Koraput “agri-culture” which broadly encompasses people’s knowledge (traditional and current beliefs and practices) technologies (what is used) and systems (how labour and resources are organized) on farming. The is a particularly promising area for documentation as a cursory review of literature show that little has been written on the topic thus Pragati stands to have much to contribute. It is critical that Pragati looks into the broader context into which changes are being introduced and analyze the congruities and disjunctions between the two. It is not enough that Pragati is convinced of SRI – or any technology or community development strategy for that matter – it must take root in the socio-cultural fabric of communities as well in order to be sustained.
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Other Materials

Various Pragati reports
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