





System of Rice Intensification (SRI) in Afghanistan: 2010 Campaign Results & Recommendations



Participatory Management of Irrigation System Project (PMIS)











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# I. General information:

## > On-farm trials with SRI volunteers:

In 2010, 104 farmers, including 7 farmers serving as resource persons (RP) and 97 new volunteers, have been applying SRI method for rice cultivation in two districts of Baghlan and Takhar provinces as part of the **Participatory Management of Irrigation Systems** (PMIS) project, managed by the **Aga Khan Foundation** (AKF). The project is part of a larger government-led initiative, the **Panj-Amu River Basin Program** (PARBP), which is funded by the **European Union**.

Douticipation	Districts		
Participation	Doshi	Taloqan	TOTAL
Resource persons	2	5	7
New volunteer	42	55	97
TOTAL	44	60	104

Four volunteers from 2009 have become resource persons and have led four Participatory Technology Development (PTD) groups, while 3 new volunteers have actually been selected as resource persons based on their motivation, even though they had not tried SRI in 2009. Each RP has been leading a group of new volunteers. Thus, a total of 7 PTD groups have been formed. Their results are discussed in a further below section.

We note that in 2010, it was not possible to continue the SRI program in a formal way in central Baghlan district, under the Jangharoq and Ajmer canals, where the program started in 2007. Last year there were 42 farmers using SRI methods in Baghlan district, getting an average yield of 10.0 T/ha on their SRI fields, compared to 6.3 T/ha from their fields cultivated with traditional methods (http://sri.ciifad.cornell.edu/countries/afghanistan/AfgreportAKF\_APMIS09.pdf). Fifteen farmers started out with SRI practices in Doshi and Taloqan districts that year, and this year the number of SRI users is up to 104. Unfortunately, we do now know the number for Baghlan district this year. Although AKF staff could not visit Baghlan district, we know through phone conversations that the area under SRI cultivation methods has expanded in 2010, and farmers report that they got good yield. However, it is not possible to report any exact results here. For more information on the AKF experience in Afghanistan, see: <a href="http://sri.ciifad.cornell.edu/countries/afghanistan/edu/countries/afghanistan/index.html">http://sri.ciifad.cornell.edu/countries/afghanistan/AfgreportAKF\_APMIS09.pdf</a>).

# SRI research plots :

In addition to the on-farm trials, the PMIS team conducted different experiments in the research farm of the Baghlan Agriculture Faculty (see location on Map 1). The plan of the different experimental plots is provided in Figure 1.

The following experiments were conducted:

- Testing the effectiveness of application of different types of fertilizers (for the same transplantation date and same variety).
- Testing the impact of different transplantation dates (for the same fertilizer application and same variety).
- Testing the use of direct seeding (using same varieties with different seed soaking date).
- Testing the use of different varieties (for the same transplantation date and same type of fertilizer application).

The results of these evaluations are reported and analyzed in a later section in this report.



Figure 1: Plan of the different SRI research plots located at the Baghlan Agriculture Faculty.

# II. Methodology:

## > Farmers' technical support and PTD approach for on-farm trials:

In order to ensure that SRI volunteer farmers could get the necessary technical assistance and follow-up support in a learning environment, the following steps have been implemented. The work was done in cooperation with the Department of Agriculture, Irrigation and Livestock (DAIL):

### 1) Awareness-raising:



Before the start of the irrigation season, awareness-raising about SRI was carried out through individual and group meetings. During this process, presentation of results from 2009 and registration of volunteers was conducted; also RPs were involved at the awareness-raising campaign about SRI.

Photo : SRI Campaign in Kelagai 23<sup>rd</sup> March 2010

### 2) Formation of PTD groups:

Groups of volunteers were formed so that each small group of volunteers can be related to one DAIL staff and one resource person (RP) who has experience with the SRI methods. This was undertaken to ensure that at any time, a participating farmer can request assistance from a nearby resource person and can easily see in the field how SRI methods should be implemented. DAIL staff received practical training on SRI method in 2009, with each of them now taking the responsibilities for one PTD group.

# 3) Technical assistance at field level from PMIS/SRI Team and DAIL staff for each stage of SRI method:

At each important stage of SRI, field-level demonstrations have been organized for each PTD group, bringing the RP and his volunteers together at the RP plot. Technical discussions and practical demonstrations were carried out by the DAIL staff with the support of the PMIS/SRI Team. Inputs from the RP were provided to illustrate to new volunteers the tasks they would have to carry out to reproduce SRI results in their own fields (see photos 2 to 7). Each session was concluded by a small group discussion to summarize the learning points (see photos 8 & 9).

## 4) Replication of demonstrated practices:

Demonstrated practices were replicated by the volunteers themselves with assistance (if needed) of their RP. At the next meeting with DAIL staff and PMIS/SRI specialist, the volunteers were invited to comment and ask questions on possible remaining issues faced in their field.

### 5) Field days:

Field days were organized on 2 occasions for all volunteers from Baghlan and Doshi to see different fields and to share experiences. The research plots were also visited by farmers to assess the results of different SRI experiments, including different usage of fertilizers, different dates of transplanting, with different varieties (see photos 10 to 17).

### Suggestions on methodology improvements for the next 2010 SRI campaign:

- 1) The awareness-raising campaign should start earlier for the 2011 campaign.
- 2) In 2011, the 3 DAIL staff who have now been trained for a year should be given responsibility to supervise one or more PTD groups again. Logistical and material support could be provided by AKF-A, and SRI Resource Persons should be promoted as Supervisors taking on more responsibilities.
- 3) Although the learning environment has been very good (despite security threats) while applying the methodology described abbove, it would be wise to conduct again a PTD training session, tailored to the specific requirements of promoting the SRI method, and to give more training fpr farmers on compost and green manuring through PTD approach.



Photo 2: Demonstration of seed-soaking by DAIL staff and PMIS/SRI Team for new volunteers.



Photo 5: Demonstration on transplanting with support of the RP to new volunteers.



Photo 8: Discussion and recap of lessons learned after a field demonstration session by SRI Team Leader & SRI Team.



Photo 3: Demonstration of field marking with RPS to new volunteers.



Photo 6: Practical/demonstration of mechanical weeding by RPs & DAIL staff to new volunteers.



Photo 9: Discussion and recap of lessons learned after a field demonstration session.



Photo 4: Demonstration on transplanting with DAIL staff to new volunteers.



Photo 7: Demonstration by RP on how SRI young seedlings are ready for transplanting



Photo 10: Demonstration on removing SRI young seedlings from the seedbed by DAIL staff to new volunteers.



Photo 11: Information board on SRI research plot.



Photo 14: Group work after field day to summarize lessons learned.



Photo 16: SRI farmers from different districts visiting a RP plot just before harvest to share their experience of the 2010 SRI campaign.



Photo 12: Discussion on crop development at a SRI plot.



Photo 13: Haji Din Mohd, SRI experienced farmer, is explaining SRI to farmers & DAIL staff from 5 eastern provinces of Afghanistan brought by AWATT.



Photo 1 : New volunteer sharing his experience with farmers & DAIL staff from 5 provinces of eastern Afghanistan during visit organized by PMIS and AWATT.



Photo 17: SRI farmers assessing the crop development at an SRI research plot.



Photo 18: SRI farmers at an SRI research plot.

## Procedures for measurement of results:

Measurement of harvest has been done in the presence of (at least) the PMIS/SRI specialist, the DAIL staffs trained in SRI, and the participating volunteer farmer. In addition, other DAIL staff and farmers were invited to witness the process and see the results. Harvest has been collected from representative samples from both SRI plot and neighboring traditional-method

plot for comparison. In order to ensure that the results are representative for the entire plot, 3 samples of  $1 \text{ m}^2$  were collected and averaged. Indeed, as a plot is not always even in terms of production, the volunteer and DAIL staff were asked to select 3 different samplings as follows:

**First sample:**  $1 \text{ m}^2$  was selected from the best part of the plot in terms of production.

**Second sample:**  $1 \text{ m}^2$  was selected from the worst part of the plot in terms of production.

**Third sample:**  $1 \text{ m}^2$  was selected from a part of the plot which looks about average in terms of production. This ensured that the average was taken from a range of 3 sampling results.



Photo 19: DAIL staff trained on SRI by PMIS is throwing the 1m<sup>2</sup> frame in the traditional method



For each part, 1 m<sup>2</sup> would be cut, which gave a total of 3 bunches (*Qaudah*). Note that with SRI practice, each m<sup>2</sup> as 16 hills, as 16 seedlings were transplanted on 25 x 25 cm spacing. Thus it is very

easy to cut 1  $m^2$  of SRI. For the traditional-method plots, a  $1m^2$  metallic frame was used. Tossing the frame into the field helps

to select precisely the hills which fall within  $1m^2$  (which can be between 17 and more than 30). While in the field, the height of SRI and traditional plants was measured from 3 tillers in each sample. An average was then calculated from the 9 tillers measured.

Using the bunches (*Qaudah*) previously cut, the following steps were carried out for plants grown with both the SRI and the traditional methods:

1. Count number of **hills/m<sup>2</sup>** for traditional method (the total

number of hills for the 3 bunches (Qaudah) were counted

- and divided by 3 to get an average).
- 2. Measure the **fresh weight/m<sup>2</sup>** (grain + straw).
- Measure the dry weight/m<sup>2</sup> (grain + straw). This is usually done 1 day later than the measurement of fresh weight.
- Count the number of total tillers/m<sup>2</sup> (the total number of tillers for 3 bunches (*Qaudah*) were counted and divided by 3 to get an average per m<sup>2</sup>).

Photo 20: Cutting a 1m<sup>2</sup> selected sample: M. Azam from Baghlan Research Farm & Mohd Aga, admin. officer of Baghlan Agriculture Faculty.



Photo 21: Cutting a 1m<sup>2</sup> selected sample.



Photo 22: Counting the number of tillers per m<sup>2</sup> from the cut sample. In this case, the PMIS/SRI Team, DAIL staff, volunteer farmer and his RP were participating.

5. Count the number of grains/panicle. For this it is necessary to

choose three samples of panicles (from the longest, medium and shortest panicles) from each sample of cut  $m^2$ . The total was divided by 9 to get an average per  $m^2$ .



Photos 23 & 24: Counting the number of grain per panicle (right) and



Photo 25: Removing empty grains

- Measure the total weight of grains/m<sup>2</sup>. The grains from 3 bunches (Qaudah) were weighed together and the result was divided by 3 to get an average.
- 7. Measure the **net weight** (after separating the empty seeds) of **grains/m<sup>2</sup>**.



Photo 27: Measuring the fresh weight (grain + straw).



Photo 26: Measuring the net weight of grain.

# III. Results analysis for SRI on-farm trials:

## > Average yield per district:

In both districts, the average results clearly showed a net improvement in SRI yield compared to yield with traditional method. For the two together, the average increase in yield was **+ 58%**.



Figure 2: Yield comparison SRI vs. traditional method in 2 districts. The results are based on a sample of 102 farmers for the 2010 irrigation season.

Districts	SRI (T/ha)	Traditional method (T/ha)	% increase
Doshi	9.0	5.9	+52 %
Taloqan	8.6	5.24	+64 %
Grand Total	8.8	5.6	+58 %

 Table 1: Yield comparison SRI vs. traditional method in 2 districts. The results are based on a sample of 102 farmers for the 2010 irrigation season.

The results are overall very positive despite agro-climatic conditions for 2010 that were less favorable than in 2008, or even 2009. Indeed, due to relatively greater rainfall during the spring season, the wheat harvest was delayed and occurred much later in comparison to a normal year (as in 2008, for example). As a result, a lot of rice fields had to be transplanted quite late, which led to a large majority of cases where the maturing level was low.

The 5 varieties used in Doshi were:

## Doshi District:



Variety name	Advantages / Disadvantages		Average SRI yield (T/ha)
Surkha-e- Zerati (long Garmah)	Higher market price & more yield than Medium Sardah ; early maturing	Less resistant to dusty weather during the flowering stage - Hawa Zadagi	9.5 T/ha
Loog	Early maturing; no need for parboiling; can grow in colder weather; higher yield	Lower price; cannot be used for <i>Qabli Palaw (a</i> local dish)	8.9 T/ha
Surkha-e- Zerati (Medium Sardah)	Better market price than Long Garmah	Longer cycle than Long Garmah; less yield than Long Garmah	8.7 T/ha
Kajak	Earlier maturing than medium Sardah	Low market price	8.5 T/ha
Baleh	Higher market price	Longer cycle than Long Garmah; less yield than Medium Sardah	7.0 T/ha

The overall results do not show clear and systematic differences in terms of average SRI yield results between the two main varieties: Loog and Surkha Zerati (Medium Sardah). We had only single cases for the other varieties. This makes it difficult to take them into consideration in the analysis.

## The 6 varieties used in Taloqan were:

## Taloqan District:



#### Figure 4: Yield of different varieties in Taloqan District.

Variety name	Advantages / Disadvantages		Average SRI yield (T/ha)
Shah Lawangi	Higher Yield	Low market price	10.5 T/ha
Surkha-e- Zerati (Medium-Sardah)	Better market price than Medium Garmah	Longer cycle than Medium Garmah	9. T/ha
Garmah Baleh	Higher yield than Sardah Balah	Lower market price than Sardah Balah	9.1 T/ha
Silah Safeed	Higher market price compared to Shah Lawangi and Surkha-e- Zerati	Less resistance to climate change(Hawa Zadagi)	T/ha
Surkha-e- Zerati (Medium- Garmah)	Earlier maturing than Medium Sardah	Less yield than Medium Sardah; less resistant to dusty weather during the flowering stage - Hawa Zadagi	8.3 T/ha
Sardah Baleh	Good market price	Less yield than Garmah Balah	7.0 T/ha

### > SRI harvest comparing experienced farmers vs. new volunteers:

It is clear that the experienced farmers had much better yields this year than the new volunteers, while the traditional methods brought (understandably) similar results for both categories.

The reasons are as follow:

First, the RPs were convinced during their first-year trials that SRI can bring excellent results if the method is meticulously applied (including during the critical stages of nursery preparation, transplanting, and 1<sup>st</sup> weeding). In 2010, RPs showed great dedication to applying SRI methods. The table below shows how they have increased their SRI yield by an average of +11.5 % from 2009 to 2010.

SRI harvest 2009 (T/ha)	SRI harvest 2010 (T/ha)	Increase in yield (%)
13	14.5	+ 11.5 %

- Inversely, the new volunteers have often adopted a « wait and see » attitude, and some of them have not put their full effort into taking care of their SRI demo plots, as they were somehow skeptical it would produce results. The same farmers have often discovered too late (after the 2<sup>nd</sup> or 3rd weeding in their plot, or after visiting their RP's plot) that SRI could actually deliver very good results. It is, however, encouraging to note the improvement in SRI yield of the volunteers (even including those who put less effort into meticulously following the different steps). During the measuring of yield results, a number of volunteers regretted not having put more efforts into their SRI and have acknowledged that if they had been a little more careful with their plot, their yield increase should have been even more.

Suggestion:

Although it is good that new volunteers have taken their first-year experience as a lesson and acknowledged they should have put more trust in SRI from the onset, the PMIS/SRI team should also put more effort in the awareness-raising campaign, to get the skilled farmers to talk more about their experience in order to convince new volunteers to take the

process seriously, especially in the early stages when new farmers remain skeptical. The SRI manual would also be a good tool for serving that purpose.



Photo 29: Fawad Husain from DAIL and PMIS/SRI team are counting SRI panicles.



Photo 28: Fawad Husain from DAIL watching SRI long panicles with their more grains.

# > SRI land size :

On average, the RPs have taken larger plots for SRI than the new volunteers, due to their successful trials last year. However, the SRI land size remains low in comparison the total size of rice plots.

	Average SRI land size	Max. SRI land size	% of rice land under
	(m2)	(m2)	SRI
Experienced farmer	950.5	2,300	17.6
New volunteers	519.5	2,000	5

It is encouraging to see that SRI experienced farmer, i.e., farmers with one year of experience, are now applying SRI on 17.6% of their land. New volunteers are more cautious as they take only % of their land under SRI. Note that percentage coverage difference is partly balanced by the fact that SRI experienced farmers have on average slightly more land than the new volunteers.

#### Suggestion :

As it seems that there was still some reluctance or prudence to apply SRI on plots larger than 1.5 jeribs (0.3 hectare), more awareness has to be raised and initiatives have to be proposed for at least a few volunteers to try SRI on larger amounts of land (at least between and 5 jeribs). The main blockage might be the labor requirements for transplanting. As an incentive, support in terms of partial labor cost coverage could be provided to farmers who are ready to try SRI on plots larger than 1.5 jeribs (0.3 ha) for the first time.



Photo 3 : Despite excellent results, SRI plots remain relatively small as farmers are experimenting. Here is a field visit in Doshi.



Photo : Despite excellent results, SRI plots remain relatively small as farmers are still experimenting. Field days

# Factors associated with higher SRI yield:

Higher SRI yields in comparison to traditional methods are usually associated with the following three factors:

- Higher number of tillers per m<sup>2</sup>.
- Higher number of grains per panicle (each tiller has one panicle).
- Higher grain weight.



Figure 5: Contribution of the main factors associated with increase in SRI yield compared to traditional methods.

The PMIS trials in 2010 showed that:

- The key contributing factor to higher yield was a 39% increase in number of grains per panicles.
- The second most important contributing factor was the
- 12% increase in tillers per m<sup>2</sup>.

- The average single grain weight was a % increase in weight per grain. However, experienced SRI farmers had an average grain weight increase of %.



Photo 33: Haji Abdul Khalil, a new SRI volunteer, could manage to get a better yield for his first year.



Photo 32: SRI methods (right) produced on average 39% more grains per panicle compared to traditional methods (left).

## > SRI yield and transplanting date:

SRI yield from as first (single) crop was better than from transplanted SRI as a second crop, following wheat. in Doshi, the results for the *Loog* variety cultivated as a second crop seemed to indicate somewhat better results with early transplanting. The same applies with *Surkha Zerati (Medium Sardah)* when cultivated as a first crop. Yet, the number of samples was relatively low (especially in Doshi) to be able to confirm this finding.

#### Suggestions:

From interviews with farmers during harvesting, it appears that in the early stages of SRI (at the transplanting stage), most volunteers are very skeptical about the potential of the young seedlings to development. Thus they tend to reduce their effort in applying SRI methods, and some do not do the first weeding on time, if at all.

The positive point though is that all of the volunteers have now witnessed the results of a higher number of weedings, mainly from their RP's plots. Thus those who didn't do the mechanical weeding properly have now acknowledged that their lower yield was directly related to their lack of care in attending to proper weeding operations.



Photo 34: Each weeding, if done on time, can bring an additional 1-2 T/ha yield.

# IV. Results analysis for research SRI plot trials:

## Impact of different varieties at different transplanting dates:

- Results with Surkha Zerati (medium Sardah), Loog and Kunduz1 varieties:



Figure 6: Comparison of SRI yield with different varieties and at different transplanting date in the PMIS/SRI research plots.







Figure 8: Impact of different spacings on SRI yield on PMIS/SRI research plots.

The results showed clearly that the **earlier transplanting** had a significant impact on yield, whatever the fertilizer application was.



Figure 9: Wider spacing (30x30) has reduced labor by 31% during transplanting compared to 25x25 spacing.

When transplanting later, on 26<sup>°°</sup> May, even though the overall yield was lower than with earlier transplanting, the impact of fertilizer application was overall much higher than with early transplanting.

Late transplanting gave relatively lower results overall, although the impact of chemical fertilizer was still significant and much higher than with animal manure.

Regarding animal manure, it is important to note that this fertilizing method contributes more to soil fertility over the middle to long term. As this was the 2nd experiment done on these plots, it is probably too early to draw any final conclusions about impact. Experiments will have to be iterated on these same plots so that a more comprehensive assessment can be arrived at.

Overall, the results confirmed the excellent results of SRI on the unfertile soils of the Baghlan Agriculture Faculty (considered unsuitable for rice). Indeed, the traditional-method control plot only produced 4.8 T/ha.

#### Training new volunteers on making organic manure very cheaply.

The SRI Team trained SRI new volunteers through PTD groups to make organic manure from their available resources as chemical fertilizers is very expensive. Because farmers are poor, they are not able to buy chemical fertilizers. Making organic manures as learned is very useful for improving land fertility and crop development as use of these manure for the long termprovides all the nutrients for the crop while chemical fertilizers is not so suitable for the land.

The following organic manures were introduced to the new SRI volunteers:

- Fazil Bio Aab
- Bia Kasht
- Ferementere
- Compost



Photo 35: Making compost in Kaj Guzar village, Kelagai



Photo 36: Ferementere ready for applying in Kaj Guzar village, Kelagai



Photo 37: AKF Baghlan regional director & NRM manager visiting SRI plots

AKF senior staff visited SRI plots in Kelagai area at different stages of SRI growth.



Photo 38: Jamila Haider from AKF visiting SRI plots



Photo 39: Baghlan & Takhar PSOs are visiting SRI plots in Kelagai.

## Some interested Non-Governmental Organizations (NGOs) visited PMIS/SRI Plots.

As SRI is spreading rapidly in the world and has started in Afghanistan, some NGOs are interested to experiment with SRI in other provinces of Afghanistan, so they visited PMIS/SRI plots in Kelagai.

The Afghanistan Water, Agriculture and Technology Transfer (AWATT) project supported by USAID brought some farmers from Nangarhar, Kunar and Laghman provinces, including DAIL extension officers from these, and staff from the New Zealand-supported Camp KIWI also visited PMIS/SRI plots.



Photo 40: Abdul Hakeem Khan, water resources and management specialist is discussing SRI methods with SRI new farmers



Photo 41: Farmers and DAIL staff brought by AWATT to visit SRI plots in Kelagai



Photo 42: KIWI staff visiting PMIS/SRI research plot.

# Conclusions and recommendations for the 2011 SRI campaign:

## **On-farm results:**

- ✓ Average SRI yield for the 102 farmers in two districts (Doshi and Talogan) was 8.7 T/ha average.
- ✓ SRI brought +58% increase in yield compared to traditional method for the 102 farmers in Doshi and Talogan districts.
- Experienced farmers have increased their land size under SRI and have improved their SRI yield by + 11.5 % in comparison to their first experiment last year.
- ✓ The increase in SRI yield compared to traditional-methods yield is mainly associated with an increase in the number of grains per panicle (+ 39 %) and the increase in number of tillers per m<sup>2</sup> (+12 %).
- $\checkmark$  The more weeding application (done on time), the better the yield. Results range from 6.6 T/ha average with one weeding to 14.5 T/ha with 4 weedings.

#### **Research plots results:**

- ✓ These results showed that early transplanting is the most significant factor for getting higher yields.
- ✓ The supremacy of animal manure vs. chemical fertilizer was not demonstrated with these experiments. However, it is important to note that animal manure contributes more to fertility in the middle to long term. As it was the first experiment done on these plots, it is probably too early to draw any final conclusions. Experiments

will have to be iterated on the same plots so that a more Photo 44: Mohd. Azam, Khair comprehensive assessment can be arrived at.

 $\checkmark$  More experiments should be conducted with the Loog variety and Kunduz1 as they seem, despite relatively late transplanting, to give reasonable results. As Loog and Kunduz 1 are both earlymaturing varieties, they could be a promising alternative, especially for farmers who do double cropping (wheat and then rice) and who harvest their wheat late.

#### **Recommendations:**

✓ The awareness-raising campaign has to start earlier for the 2011 campaign. As the transplantation/first-weeding period seems to be the most critical period during which new volunteers are still skeptical and prone to switch back to traditional methods, more emphasis should be put on that phase during the awareness-raising campaign. Reporting the experiences from 2010 volunteers who at the end of the season expressed regrets for not taking SRI seriously at first could be useful to convince new farmers in 2011.



Mohammad and Ali M. Ramzi

witnessing the impact of SRI methods on tillers and root

system development, at the

**Baghlan agriculture faculty** 

research farm.



seen here harvesting his SRI plot. This year (2010) he got 14.4 T/ha.

- ✓ The successful SRI farmers in 2009 and 2010 should become supervisors. SRI should be particularly promoted in the upstream zones of PMIS canals as the head/tail issues are more acute in those canals than other areas.
- ✓ Technical support and follow-up from PMIS/SRI specialist could also be more intense during the

transplantation and first-weeding period as this is the key phase when new volunteers are still skeptical and prone to switch back to traditional methods. The importance of **weeding** (on time!) needs to be strongly underlined. The results from the farmers in 20 are particularly telling and can be used for discussion with farmers.

✓ Due to recurrent issues of higher labor requirements of SRI
 Photo 45: New SRI volunteers sometimes underestimate at first the importance of weeding.

during transplanting, research in the Baghlan Agriculture faculty should now focus on labor-saving methods. First, direct-seeding should be experimented with in Baghlan Agriculture faculty. Second, increase in spacing for transplantation could be tested as was done in Iran. Tests could be done on 30x30 cm and 40x40 cm. In theory, a spacing of 30x30 cm (even 40x40 cm) would require 30% (possibly 60%) less labor in transplanting operations than the conventional SRI spacing of 25x25 cm.

- ✓ Incentives should be provided to SRI farmers who are willing to try SRI on relatively large plots. Indeed, some farmers are still skeptical whether SRI can be applied on a large amount of land due to the high labor requirement. As an incentive, PMIS could cover part of the farmer's labor cost during transplanting if he accepts to cultivate more than 1.5 jeribs (0.3 hectare). This should be done only for the first time to help demonstrate to other farmers that SRI can be cultivated on large plots. Economic analysis should show that the results are worth the investment for the farmer.
- ✓ Green manure and compost can bring improvement to the already high SRI yield. A specific training module could be provided in parallel to SRI development so that interested farmers can apply green manuring instead of chemical fertilizers.
- ✓ In 2011, the three DAIL staff members who were trained a year ago and who took responsibility of a PTD group this past second year should be given more responsibility to supervise more PTD groups. Logistical and material support could be provided by AKF-A.
- ✓ Although the learning environment has been very good (despite security threats) while applying the methodology described earlier, it would be wise to conduct again a PTD training program tailored to the specific requirements of promoting SRI methods and capitalizing on the experience from this 2010 campaign.

Photo 47: Ghulam Hazrat(DAIL staff in Doshi district) practicing marking.

Photo 46: Transplanting is seen as more labor intensive at first.



