Farmer Experimentation with the System of Rice Intensification in LAOS

Sengthong Vongsakid, Oxfam/Community Aid Abroad, Laos

Agriculture is the principal economic sector in the Lao People's Democratic Republic, accounting for about 52% of total GDP and employing 80% of the labor force. Rice is the single most important crop in the country. In 1999, the rice-growing area was approximately 717,000 ha, representing more than 80% of the cropped land area. The focus of agricultural activities in the Oxfam CAA-Laos program is the promotion of low-input, low-cost production systems not depending on any synthesized chemicals. In 2001, when OCAA learned about SRI principles and techniques through information provided by Prof. Norman Uphoff (CIIFAD) and Koma Yang Saing (CEDAC), it thought that this system might appropriate for Laos to help in finding long-term alternatives for poor farmers.

In the wet season 2001, OCAA launched the first trials of SRI in two project areas, Feuang district in Vientiane province in northern Laos, and Ta Oy district in Saravan province in southern Laos. Three farmers engaged in a first round of experimentation. This trial was based on self-study of available information and the voluntary efforts of farmers.

Following the first on-farm trials with SRI, a fourth farmer experimented with SRI methods for irrigated rice production in the 2001-2002 dry season in Toumlane district, Saravan province. This trial was initiated by one technical staff member from the Toumlane district Agricultural Extension Section and the experimenting farmer, with OCAA technical and financial assistance.

2001 Wet Season On-Farm Trials

1. **Demonstration plots:** The planted area was 100 square meters in the southern experimental area (Padou village, Ta Oy district, Saravan province), and 360 square meters at the northern site (Nawan village, Feuang district, Vientiane province).
2. **Rice varieties:** Both improved and local rice varieties were used in the experiment. The improved varieties used were both glutinous Thai-IRRI crosses, RD8 and TDK1.[1] The local varieties planted with SRI methods were Feuang Lauang (a local glutinous variety) and Khao Chao Khao (a local non-sticky variety). Rice seedlings were produced in a moist, but not saturated seedbed. Young seedlings were watered once a day only on days when no rain had fallen and there was not enough moisture in the seedbed.
3. **Transplanting:** Seedlings with an age of between 12 and 18 days were transplanted at spacings of 25 cm x 25 cm, 30cm x 30 cm, and 50 cm x 50 cm, with only one young seedling per clump. One exception was that one farmer in the northern area planted two seedlings per hill, because he anticipated incidence of foot rot disease. Approximately 30 percent of his transplanted rice plants suffered from this disease.
4. **Soil fertility management:** Prior to transplanting, 20 kg of chicken manure was applied to the 360 m^2 demonstration plot (in the SRI experiment in northern Laos).
5. **Water control:** A two-day wet and three-day dry water regime was applied in the transplanted areas.
6. **Weeding:** There were no obvious problems with weeds due to well-prepared land and good water control. So the first weeding was done nearly two months after transplanting.

Results and discussion

- Remarkable tillering from single transplanted young seedlings was seen in all three demonstration plots.
- At the **northern location**, the average number of tillers per clump was 11 after one month, 20 after

[1] *These are the rice varieties recommended for the wet-season lowland environment of Laos, according to the National Rice Research Program and the Lao/IRRI Project.*

two months, and 25 three months after transplanting, using TDK1. In the southern location, the local rice variety had on average 23 and 31 tillers per plant transplanted at spacing of 30 cm x 30 cm and 50 cm x 50 cm, respectively (Table 1).

Table 1: Effects of seedling age and hill spacing on tillering

Variables	Average number of tillers per hill
Age of seedlings	
9 days old	43
12 days old	28
18 days old	23
Spacing	
25cm x 25cm	23
30cm x 30cm	25
40cm x 40cm *	43
50cm x 50cm	31

** There is a combination effect here between age of seedlings and hill spacing that influenced tillering as only seedlings 9 days old were transplanted at 40cm × 40cm spacing.*

- There was, however, no increase in yield in the northern trial. The yield calculated at 2.9 t/ha did not surpass the national average rice yield (2.93 t/ha in 1999; 3.2 t/ha in 2000). This lower than expected yield from the trial plot was attributed to the outbreak of foot rot disease at the maximum tillering stage. However, the experimenting farmer was satisfied with the outputs of his trial when he considered the ratio of seed used for transplanting compared to the paddy rice he harvested. This ratio was 1 kg of seed to 207 kg harvest from the SRI trial, whereas with usual rice farming practices, this ratio has been usually 1 kg to 43 kg, nearly a five-fold improvement with SRI methods.
- On the **southern plots**, one of the two experimenting farmers achieved 4.55 t/ha with SRI, using a local rice variety. The other one yielded 3.35 t/ha, using an improved rice variety. The latter farmer had expected to achieve 6 t/ha, but he could not do this because of an early halt in the rainfall that season and the related problem of having used a long-duration rice variety (RD8). Therefore, only 50% of the developed ears could bear full grain.
- Overall, the average yield with SRI in the southern trials was 23% higher than the national average rice yield in 2000. Furthermore, the outputs of these trials in the south were relatively high in comparison with the high-cost, high-input rice production strategy promoted by the Lao National Rice Research Station. According to the Lao-IRRI Project, the previous top yield of intensive rice production was 6 t/ha at the on-farm level and 7.5 t/ha in the research station.[2]
- No calculations were made of the productivity of labor in economic terms, an important consideration. Since this was the first time that OCAA was experimenting with SRI methods at the farm level, we were trying to see how SRI principles might work technically. Thus the knowledge we have gained about SRI so far is only technical.
- The Deputy Head of the Saravan Provincial Agriculture and Forestry Department has gotten a good impression of SRI techniques after visiting the demonstration plot and observing the tillering and harvesting possible in southern Laos. He is anticipating to introduce SRI experimentation in three rice-growing areas around his province in the next wet season 2002.

2001-2002 Dry Season On-Farm Trial

1. **Demonstration plot:** The experimental area was 200 square meters.
2. **Rice varieties:** An improved rice variety, TDK 1, was used in the trial. Single young seedlings with an age of 9 days were transplanted at spacing 40cm x 40cm.
3. **Water management:** The SRI trial implemented in the dry season was dependent on irrigation water. The experimenting farmer faced problems with water just after the single young rice seedlings were transplanted, because he could not afford to purchase fuel to run his pump. It took 10-12 days to get water from the irrigation facility. Therefore, it was observed that the tillering was not much as possible due to the drought stress of newly transplanted rice plants. Afterwards, alternate wet and dry water control was applied, with a two-days-wet, five-days-dry watering system.
4. **Soil fertility management:** 20 kg of rice husk ash mixed with 20 kg of animal dung was once applied to the experimental area of 200 square meters.

[2] *According to Karl Goeppert, IRRI Representative in Laos, and Kouang Douangsila, Coordinator of Lao-IRRI Project.*

5. **Weeding:** This was done three times. The first weeding was 20 days after transplanting, the second at 45 days, and the last at 75 days, respectively. Prior to doing weeding, the field was drained to use hoes and spades for hand-weeding, which differs from use of the rotary weeder.
6. **Pest control:** At the maximum tillering stage, the experimenting farmer encountered stem borers, especially yellow and zigzag stem borers. The damage was estimated at less than 20%. SRI helped the farmer to restrict the stem borer damage to a certain extent.

Results and discussion

- Tillering was very good, with an average of 11, 26 and 43 tillers per hill at 38, 49 and 91 days after transplanting, with the maximum of 58 tillers per hill (Table 2).
- By the end of April 2002, the experimenting farmer harvested his field. After drying the rice in the sunshine for three days, the whole harvest was measured and calculated to be 3.3 t/ha. He could not achieve the expected yield of 5-6 t/ha because of rice bug damage, which was estimated at 40% after winnowing the harvest.
- Despite this loss, the trial output was 65% higher than the average dry season yield of 2 t/ha in Toumlane district of Saravan province using external inputs (100-150 kg/ha of chemical fertilizers). The yield was 120% higher than the usual wet season rice farming practice in the area (1.5 t/ha).

Lessons learned and follow-up

On May 15, 2002, OCAA and the Toumlane District Agriculture and Forestry Office (DAFO) organized a meeting to evaluate SRI experience. Twelve farmers from 8 target villages working with OCAA, the experimenting farmer, two deputy heads of Toumlane DAFO, one technical staff member of the Agricultural Extension Service, one deputy director of the Provincial Agriculture and Forestry Department, one deputy head of the provincial Agriculture Section, and two OCAA agricultural extensionists attended.

Farmers expressed the following views:

- Rice production with SRI methods can be increased by higher number of tillers and panicles and by the even growth of grains from all panicles in the same hill.
- Spacing of 25x25 cm or 30x30 cm is appropriate. Most farmers felt the spacing of 40x40 cm was too wide.

Table 2: Results at different stages of tillering

Days after transplanting	Tillers per hill	Average plant height
38	Hill 1: 5 (minimum) Hill 2: 13 (medium) Hill 3: 14 (maximum)	10 cm
49	Hill 1: 9 (minimum) Hill 2: 30 (medium) Hill 3: 40 (maximum)	30 cm
91	Hill 1: 28 (minimum) Hill 2: 44 (medium) Hill 3: 58 (maximum)	58.6 cm

- Paying attention to gentle handling of very young seedlings (9 days old) during transplanting is important.
- Farmers should put emphasis on doing two or three, even four, weedings throughout the vegetative growth stage despite the higher labor requirement.

There was agreement on spreading the SRI evaluation during the current wet season for rice to more villages with the support of both OCAA and DAFO. The farmer who undertook SRI trials during the wet season 2001 continues his experimentation in the current wet season.

Problems Encountered and Constraints to SRI Application in Laos

- **Lack and/or limitation of technical staff** at the district level to properly conduct, follow up, monitor and evaluate SRI trials at the on-farm level.
- **Non-availability of appropriate and simple manual weeding machines** in the country, if SRI method is to be applied to middle-sized areas like 1/4 or 1/2 hectare farms.
- **Lack of and/or limited access to sources of information on SRI**, which are available in the region and the world as well.
- **Lack of a large number of practical experiences** in applying SRI methods that can convince others who are working on agricultural development and research.

- **Stable water availability** is necessary, especially during panicle initiation until full grain development, even though less water is required overall with SRI practices.
- **Unsystematic design of demonstration plots**, e.g., careful selection and bounding of trial areas is important for well-planned SRI experimentation. This was the case with the experimental location in southern Laos for the dry season, which makes for difficulty in assessing the trials properly.
- **Lack of practical lessons and experience of technical staff** of the local District Agricultural Extension sections and OCAA field staff in Laos.
- **Lack of proper taking of technical field records** on SRI experiments by technical field staff, including observation of agroecological factors like type of soils, secure water availability, climate change during experimenting, etc.

Strategic initiatives for wider application of SRI in Laos

- An **internal network** needs to be established to work on SRI. This could include the national rice research station under Lao-IRRI Project, Laos Extension for Agriculture Project, NGOs, farmers' organizations, etc. This network would have the tasks and functions of organizing national workshops, training sessions, exchange trips and of coordinating and cooperating with regional networks to share information, lessons, and experiences.
- **Scientific research work** that could cover genetic rice research, soil management, development of appropriate, simple and low-cost weeding technology, etc. should be undertaken. SRI relies on exploiting existing genetic potentials of rice plants. Rice plants grown with SRI techniques develop massive roots that can better absorb soil nutrients. If SRI needs to be applied on a middle- to large-scale land areas, intensive labor is required to do weeding at least two to three times, based on SRI principles. Therefore, research as mentioned above is necessary for the application of SRI techniques in order to reach optimal outputs.
- **Information centers** that could be accessed by different institutions, agencies and interested groups or individuals should be set up.
- **Extension approaches** that are appropriate and effective need to be found out. Such approaches could include farmer field schools, farmer-to-farmer networks, etc.
- **Capacity-building** for technical staff as well as farmers would also contribute to more scientific, effective and successful SRI experimentation.

Conclusion

Although rice self-sufficiency can be covered by rice production at the national level (national rice production reached 2.3 million tons in 2000), rice shortages still remain chronic, even occasionally acute in many rural areas of Laos. This is due to various factors. SRI is a promising approach to improving rice production that has boosted rice cultivation in Madagascar and reached production of 10 t/ha paddy or more. The first season trials supported by OCAA showed relatively good results with SRI methods. Therefore, we think that SRI methods may be appropriate to help Laos find alternatives for poor farmers in the long term.