

**REPORT ON A VISIT TO CAMBODIA TO REVIEW SRI PROGRESS,  
July 14-18, 2007 – Norman Uphoff, CIIFAD**

**SUMMARY**

Cambodia was the first country to launch SRI on a national scale, thanks to the work and vision of CEDAC, the Center for Study and Development of Cambodian Agriculture, and its director, **Dr. Yang Saing Koma**. The government has incorporated the promotion of SRI into its national development plan for 2006-2010, and political leaders from the Prime Minister on down are publicizing SRI in their interactions with rural communities, encouraging its use (see report below on the Sunday, July 8 activities). Probably 80,000 farmers will be using SRI methods by the end of the current planting season, which is still in progress.

The contribution that Cambodian colleagues and farmers are making to the spread and utilization of SRI concepts and practices is no longer so much in terms of demonstrated benefits and rapid spread. Rather, they are taking advantage of SRI productivity opportunities to develop **new marketing arrangements** and **more integrated farming systems** that enhance food security, environmental conservation, and farmer empowerment, as seen from this report.

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This was my fourth visit to Cambodia since January 2003 to see how the concepts and methods of the System of Rice Intensification (SRI) are being adapted and extended to meet the needs of rural households here. CEDAC has provided leadership for SRI extension and improvement since 2000, when Koma was able to persuade just 28 farmers to try out these methods that he had himself validated the year before on his own rice plot.

Upon arrival Saturday noon, July 14, I was met by a CEDAC driver at the airport and went with Koma for lunch at a restaurant along the Mekong river. While there, by chance we met **Chhim Kimchhorn**, executive technical officer for **Star Cell**, one of the up-and-coming cell phone companies in Cambodia. Kimchhorn and Koma have been discussing how farmer associations associated with CEDAC's program throughout the rural sector could each be outfitted with a cell phone, to have continuous access to market price information. This would be good promotion for the company and would give farmers greatly expanded knowledge of market opportunities – and ability to coordinate better among farmer associations – at very low cost.

This is the kind of innovation for rural development that CEDAC has pioneered in Cambodia since its founding 10 years ago. It now has a strong grassroots membership base to work with, about 30 thousand farmers grouped in 1,100 local associations in what is called the **Farmer Nature Network** (FNN). CEDAC almost two years ago opened a consumer sales store in Phnom Penh, assisted by Oxfam GB and Oxfam Americas selling 'natural' (chemical-free) products of farmer-members, with SRI rice as its leading commodity. These 'natural' products are actually 'organic,' but CEDAC thinks many people in Cambodia find this term difficult to understand. Evidence that the operation is going well is that it ran out of its supply of rice that it procured before the next harvest has come in. CEDAC is preparing a booklet on rice for consumers, to inform better more about the value of organic rice and other products, such as organically-grown chickens which meet the growing concern about hormones and other chemicals used in commercial production of poultry.

**Sunday, July 15 – Field Visit with the Minister of Agriculture and Meeting SRI Farmers**

Koma picked me up at 6:15 for a long drive to Takeo province, where we planned to meet up with the Minister of Agriculture, **Chan Sarun**, for several events planned at commune level that morning. This was an opportunity to catch up on things that CEDAC has been working on, with SRI and in addition to SRI. Among other things, CEDAC is trying to improve farming systems within ‘protected areas’ where, for natural resource conservation reasons, restrictions are placed upon what local residents can do. SRI concepts are being adapted for the upland production of soyabean without reliance on chemical fertilizer so far with encouraging results.

CEDAC is emphasizing three things to improve SRI practices at present: (a) better seed selection by farmers, planting only well-developed seeds, (b) nursery improvement to ensure healthy seedlings, and (c) compost making. One woman farmer in Kampot has started raising her seedlings on raised beds which she mulches with *eupatorium (cromalaena) odoratum*, normally considered a useless weed, with good results. When I told Koma about the research findings of Abha Mishra at AIT on the value of dry vs. wet nurseries and of seeding them sparsely vs. densely, he said that their observations confirm her results.

Koma spoke about the research program emerging at the **Royal University of Agriculture (RUA)**, where **Edwin de Korte**, a DED technical advisor is working with the **Dean Chuong Sophal** and developing a cadre of students doing evaluations of SRI. Among other things they have developed is a scoring system for assessing the ‘degree’ of SRI practice adoption, based on a cumulative score between zero and 50, that avoids dichotomizing between ‘SRI’ and ‘non-SRI’ when a *continuum concept* is more appropriate – to what *extent* are SRI principles being used?

During my previous visit, I learned that CEDAC has conducted since 1998 an internship program for young university graduates who wanted to gain experience and training in grassroots rural development work. Not all of them can be hired by CEDAC, but the best of them are taken on by CEDAC, and all are given certificates for their training. This expands the pool of young Khmer men and women are more professionally qualified and motivated for rural development work. Koma says that the demand for this opportunity has been very great, so screening potential trainees has become a big challenge. We discussed some group interview/problem-solving processes that could make the selection process both more efficient and more effective.

Koma said that CEDAC is planning to reorient this program to take in youth from rural areas aged 19 or 20 who do not have a university degree for a year of internship with its field programs. There is a ‘baby boom’ in this age cohort; 300-350,000 young persons a year are entering the job market, with few prospects. The brightest among these offer excellent human resources and are better prepared to live and work in rural areas, whereas the majority of university graduates come from urban areas. Rural recruits are also more likely to remain in rural areas for most or all of their lives, so this seems a win-win opportunity for CEDAC and them. Those whom CEDAC is not able to take on as staff will be in considerable demand from other NGOs or from government agencies once they have gotten some CEDAC training.

Koma noted that one rural official recently commented that the farmers who work with CEDAC have ‘more positive attitudes’ than other farmers, not just complaining or remaining silent, but

becoming engaged in development activities. This, of course, is what CEDAC aims for, but it is good to have this observed and remarked on from outside the organization.

CEDAC has stopped making reference to ‘the poor’ in its communications and internal discussions, Koma said. This implies that poverty is these people’s only or most important characteristic. “CEDAC doesn’t want to work with ‘the poor,’ but with people who despite their low incomes can contribute something to their own development.” I agreed that the development enterprise would benefit from striking this deprecating terminology from our vocabularies. Koma said that one farmer had commented recently that farmers, after beginning to work with CEDAC, when they meet don’t just talk about ‘useless things’ but rather like to talk more about productive opportunities.

Stopping at the CEDAC district center for Tramkok, we met up with **Hart Feuer** and his interpreter who joined us for the rest of the day. Hart is a M.Phil. candidate at Oxford who is doing his master’s thesis on farmer adoption of SRI and any resulting socio-economic impacts here in Takeo province. He and I had corresponded previously by email, but this was our first chance to meet. He wanted particularly to discuss issues of field methodology and data analysis. As we drove along, we passed a piece of land that Koma pointed out as the site which CEDAC has purchased to build a farmer training center on.

It took about half an hour to find **Trapaeng Thum** village where the first event was taking place. The village’s name means, appropriately, big pond. There were tents pitched for the event beside a large pond, with a pontoon boat moored to the edge for the release of fish fingerlings into the big expanse of water to restock the area’s fish supply. The Minister of Agriculture greeted us while a local official was speaking about government efforts to improve local conditions. Among other things, he spoke about the need to increase biodiversity in the rice fields and to reduce chemical applications, saying this will help to promote poverty reduction. The fish that would be released this morning would help to propagate farmers’ rice fields, not just the village pond.

Next, the district governor spoke, urging people to use SRI and to diversify their production, noting that over 30% of the area in this commune is already under SRI methods (6,105 ha out of the total area of 20,000 ha), and sowing is not yet completed. Flooding in the area delayed the start of planting this year. Farmers cannot continue to follow their old ways, he stated. There is not enough rice to support families with the population continuing to grow, especially with natural conditions becoming less hospitable. Irrigation facilities are being further developed, but there is still a long way to go to develop this country. “We need to start right away to improve the lives of farmers.” SRI offers this opportunity.

The governor then spoke about the need to practice ecological management, protecting the natural predators of pests, including indigenous snakes which feed on rats. The assistant to the Minister, **Sun Hean**, who was translating for me, was very supportive of this advice, having earned a MS in conservation biology from the University of Minnesota. The governor advised farmers not to use destructive methods of fish capture, like small-seine nets or chemicals or grenades (an increasing problem).

The Minister then gave his talk, welcoming Koma and me ('the guru of SRI'), but here he focused on fish rather than rice. He spoke factually about the great dependence of Cambodians upon fish, and about the many ways they consume fish (fresh, in paste, dried, smoked, etc.) Every family eats fish, he said, at least in fish sauce. On average, Cambodians each consume 35 kg of fish annually, compared with 5-6 kg of cow or buffalo, 8 kg of pork, and 1.8-2 kg of chicken. Those who live along rivers consume up to 70 kg each. Fish is a healthy food, unless raised in contaminated waters, and is especially good for old people and pregnant women.

After giving advice and guidelines for fish raising and capture (no electricity, don't use pesticides that reduce frogs, toads, etc.), the Minister recommended use of organic matter as much as possible in agriculture. He then led invited guests and several hundred farmers to the pontoon boat where five varieties of fish were released into the pond with much fanfare. The process began with Buddhist priests taking small nets and scooping the wriggling creatures out of a big glass tank and shaking them into the water. Koma and I took our turns too. Hundreds of plastic bags tied to ropes suspended along the edge of the pond were then opened to release the fingerlings inside them into the big body of water. This mission accomplished, we got into our vehicles and followed the Minister's car to the next village **Trapeang Krabas**, still in Tramkok district.

While getting seated under the ceremonial tent, the Secretary of State for the Ministry of Environment, **Khieu Muth**, who was traveling with the entourage (this was his home area), gave me his card. His rank is equivalent to Deputy Minister. It was impressive to see such senior government officials spending their Sunday in face-to-face contact with rural communities, admittedly with a political as well as developmental purpose. Koma said this is how they spend most of their Sundays.

The purpose of the event in Trapeang Krabas was distribution of good-quality rice seed to the villagers, whose initial planting of rice had been destroyed by flooding. The seed (CAR11) is an improved local variety, normally giving 2.5-4.5 tons per hectare with 7.3 ( $\pm$  2.2) productive tillers per plant and 99 ( $\pm$  24) grains per panicle, according to the technical specs on it. With SRI methods, it should certainly be possible to improve upon these levels. The write-up said that the variety was susceptible to brown planthopper (BPH), something that SRI methods should be able to reduce. When Vietnam's National IPM Program evaluated SRI across eight provinces in 2005-2006, it found that with SRI methods, BPH incidence was reduced by 62.4% in the spring season and 83.0% in the summer season, compared with farmer practice (<http://ciifad.cornell.edu/sri/countries/vietnam/vndungipmrpt06.pdf>).

Along with the hundreds of small and large sacks of seeds, there were copies displayed of the SRI manual in Khmer that the Minister had commissioned and Koma had helped prepare, to be distributed with the seed. The Minister called farmers' attention also to a new illustrated book published by his Ministry in Khmer on "The Unpaid Guards." It described in simple story form how frogs, toads and snakes control the populations of insect pests in the field and how agrochemical use adversely affects these "volunteer guards who ask for no payment."

When Muth spoke, he started by saying that he brought greetings from the Prime Minister Hun Sen and the president of Parliament. They all wished farmers to have good rice results, and they

thus encourage farmers to use SRI methods. He thanked Koma and me for our work on behalf of SRI and thanked the Minister for his bringing seed for farmers. He talked about ecological management practices and also organic farming, holding out the possibility of exports to the U.S.

When asked to speak, I complimented the Minister and his Ministry on their new publication, suggesting they prepare a similar one on “The Unpaid Workers.” This would tell the story of the endless millions and trillions of soil organisms below-ground that we cannot see also provide valuable uncompensated services, like the frogs and snakes, which are visible. I talked mostly about the importance of roots and soil aeration. Even SRI farmers are not yet doing much active soil aeration in Cambodia (or Vietnam). I explained how promoting root growth and soil organisms can enhance yields substantially, at relatively little cost. There was a lot of head-nodding as Koma translated my comments, although it was not possible to know how much had been fully understood.

The Minister talked about the importance of good nursery management, reinforcing my remarks. He talked out managing the nursery ‘like a garden,’ not flooded. He also endorsed seed selection, drawing a nice analogy. “Before you give your son or daughter in marriage, you want to know that the intended partner comes from a good background.” Similarly, when growing rice, one should have seed with a good lineage. He talked about the importance of good field leveling and plowing, and of frequent weeding, advice derived from CEDAC experience.

After a ceremonial handing out of the first seed packets by the Minister, Muth and myself, the task of distribution hundreds of sacks was left to staff remaining behind while the Minister and his entourage drove to the center for Tramkok district, **Angtasaom**. This is the town nearest to where Koma grew up. During lunch in a favorite restaurant, a video crew from Oxfam and CEDAC showed up in the town to begin producing a multipurpose promotion and training video for SRI. We hoped they would have a good technical knowledge of their subject to match whatever filming skills they had.

After lunch, we returned to the CEDAC district headquarters. I copied some figures on SRI uptake in Tramkok:

	Farmers using SRI	Area under SRI (ha)	Yield (t/ha)
2001	60	13	4.0
2002	230	30	3.7
2003	980	150	3.5
2004	2181	348	4.0
2005	5305	1678	3.0
2006	13295	5962	3.2
2007	~20000	to be determined	???

Average SRI yields have been 3.7 t/ha, which compares favorably to the average yield previously with conventional methods, 0.7-1.7 t/ha. This doubling/tripling of yield has been achieved with reduction of inputs and cost, which helps explain the rapid spread of SRI once farmers’ initial reservations have been overcome by the demonstration effect. Koma said that it is no longer possible to have any real ‘controls’ in the district for scientific evaluation because most farmers have adopted at least some of the recommended SRI practices now.

Fertilizer use has come down from 150 kg/ha to about 75 kg/ha, and “all cooperating farmers have stopped using pesticides. They are no longer necessary,” said the SRI district coordinator. Actually, there was not a lot of pesticide use with rice previously because farmers could not afford it, Koma said, given their low yields.

More than 1,000 farmers in Tramkok are now practicing ‘organic SRI,’ qualifying them after two years for a higher price through the CEDAC retail sales outlet in Phnom Penh. There are 119 ‘organic SRI’ groups in the district, with 1,034 members at present, out of a total of 173 groups with 4,691 members. The savings groups in the province are now up to 272 with 4,293 members.

CEDAC staff had a list of the different activities that the Tramkok farmers working with then are now involved with, with SRI leading the way:

SRI	13,295
Compost-making	6,513
Home gardens	1,601
Green manures	1,100
Fish raising	904
Field crops	545
Ecological chicken raising	474
Fish trapping	459
Pig raising	291
Liquid compost	216
Botanical pesticides	187
Rice-fish culture	123
Fish in plastic containers	73
Multi-purpose farming	57
Frog culture	16
Earthworms	6
Eel culture	5

Koma suggested that we visit **Roas Mao**, who has been a pioneer on ‘multi-purpose farming,’ to see how he has progressed since my visit in January 2006. This is not yet a large component of the CEDAC program, but it is probably the most important for long-term consequences. We drove 15 minutes outside Angtasaom, to the **Popel Farmer Resource Center**, a large but simple facility built several years ago with JICA support. The farmers there, on a Sunday afternoon, were repackaging a large sack of salt, purchased at wholesale price, to be resold to members in small retail packages at a price lower than local merchants now charge.

Garlic, sugar, MSG and other staples are similarly handled by this farmer organization, which functions as a consumer cooperative and also as a producer cooperative, selling organic products to the Phnom Penh market. I asked whether there has been any ‘pushback’ from traders and merchants, who stand to lose by such self-help collective action from farmers. Koma said there has been some resistance to CEDAC’s program for pig program in Prey Veng province. But this has not been serious because it is clear that the government gives high priority to poverty reduction.

On the way to Roas Mao's farm, we stopped at the homestead of a neighbor, **Lach Khti**, to see his 'ecological chicken rearing' in practice. A fairly large area, about 5 x 2.5 m, has been fenced in and enclosed with netting. There is an area of green grass growing, covered by a mesh wire fence laid on top of it. This is so that the chickens can eat the green vegetation but cannot destroy it by their scratching. There was a small pond where Azolla was growing. This aquatic fern grows symbiotically with blue-green algae, which fixes N. So at no cost, a N-rich green food is grown within the pen for the chickens.

There was also cassava growing all around the pen's edge, its leaves being a rich source of nutrients. Bananas were also growing within the enclosure, and squash and gourds grow on the net-ceiling. Koma said that ecological chicken rearing is "very paying" and one of CEDAC's fastest growing programs, since there is good and remunerative demand for organic chicken in urban markets. This activity comes from a village initiative that I learned about in March 2005.

At Mao's farm, we first met his wife who was cutting some of the cassava plant leaves that were growing profusely on field bunds -- to be used as green manure for the SRI rice, she said. This farm is a leading example of the SID (system for intensification and diversification) strategy that CEDAC is supporting. Mao was practicing intensive fish culture in conjunction with SRI, and also frog culture in one pen. Vines were growing everywhere, many on heavy strings that suspended them overhead at several levels.

Mao had a new SRI field which he apologized for because it was not yet very level. He had just gotten it in an exchange agreement with a neighbor. There were tomato plants everywhere, and a second frog pond/pen with bittergourd growing across it on strings.

Mao said that before he started improvising his own SID, he could harvest only 10 tang of paddy (240 kg) from his 30 ares of land. (He has another small plot far from the village, but he is truly a small farmer.) Now, only 17 ares of this area are used for growing rice (0.17 ha); from this remaining rice area, Mao can harvest 25 tang (600 kg), which is 150% more than before from a larger area. In addition, he can produce 300 kg of fish and 20 kg of frog legs for sale, in addition to what his household now consumes.

Mao figured that beyond own-consumption, his sales now reach 2.5 million rials, whereas before SRI, he could produce only enough rice to market for 150,000 rials. His family is now better nourished, with plenty of protein, and he is able to hire his son as a full-time salaried employee on the farm, which makes migration to Phnom Penh less attractive and unnecessary. Three of his five children are in school, and two work on the farm for cash income.

What makes this story even more significant is that Mao's land is unirrigated. His improvements have all been accomplished under rainfed conditions, utilizing available rainfall to the fullest. We stopped under a canopy of vines at a table on which Mao had set out a pot full of tea for us. This was a pleasant bower where Mao can take rest during the day when it becomes too hot to work.

Mao showed us one of his rice fields where he has experiments laid out, with 15-day seedlings, comparing mulched rows with weeded rows. One is row left unmulched and unweeded as a control. The rice plants already had 9-11 tillers already at 15 days after transplanting. Mao made the comment that with this strategy of diversification, farming is “more fun.” He can lead a much more interesting kind of life than when he “just a rice farmer.”

Mao also had a field with raised-bed SRI to compare with SRI grown on flat field surfaces. The raised-bed plants were already visibly ahead in their growth even though there was only 1 day difference in age, and seedlings came from the same nursery and were growing on the same soil. A second field was flooded and mulched, to see what the results would be from this combination of practices. Elsewhere on this small farm we could see cucumber, eggplant and sugarcane growing. Koma said there were 30 ‘SID’ farmers in this area of Takeo province, although Mao is surely one of the 5 or 6 best.

I asked Mao how many farmers have come to see his operation. He said about 100 groups. With 10-20 farmers each, this makes a total of 1,000-2,000. I asked his wife how many women have come to see the farm? She said about 30% of the visitors have been women. Obviously there is a lot that both men and women farmers can learn from this innovative diversified farming system.

On our drive back to Phnom Penh, we passed through Kampong Speu province and stopped at **Da Pok village**, where Koma said he had visited just once before. There was a colorfully-decorated open village meeting hall that serves also a lecture hall for monks to teach *jatika* stories from the Buddhist literature, vivid pictures illustrating different stories in turn. Our meeting with three farmers, **Sok But, Sam Pheng** and **Duk Vong**, started just before a torrential rain began pouring all around us and making resounding noise on the tin roof.

In this village, there are 73 families, of whom 58 are members of the CEDAC-affiliated farmer organization. SRI was first tried here in 2003, with just 7 farmers on 1.2 hectares. By 2006, there were 60 farmers using the methods on about 40 hectares. “This year, maybe all will use SRI” (except 5 landless households). The farmers cannot be certain because planting is still going on.

This has been a difficult year because rain was delayed, and then there was flooding. Generally, farmers here now transplant just 1-2 young seedlings, shallow and quickly. They do mostly hand weeding as there are only two mechanical weeders in the village. They would like to have more. The farmers said that they understand the importance of soil aeration. Chemical fertilizer use has been reduced. But has cut his use from 2 bags to a half bag, he says; Pheng used to use 1 bag on his field but now applies none; Vong says that he has cut his use back from 3 bags to no bags.

Vong’s two rice plots total 70 ares (0.7 hectare). Before, he harvested 40 tang (24 kg each) from this area (getting 1.37 t/ha). Now he produces 70-80 tang without using fertilizer (2.4-2.75 t/ha). He has cut his seed use from 45 kg to 6 kg. Vong couldn’t tell us the impact that this has had on his net income. But with 75-100% more production, and having completely cut his fertilizer expenditure, and reducing seed cost by 85%, his income from rice should have tripled, especially given what he told us next

I asked Vong about his labor inputs. He said that transplanting time has been cut in half from 50 man-days to just 25 man-days. More important, before he had to hire labor, but now family labor suffices. His weeding takes more time because now they don't just cut the weeds but rather takes care to uproot them. Before, rice plants were not planted in rows, and they were very dense, making harvesting difficult. Now that the rice grows in rows, harvesting is much easier. Even a much-increased yield can be harvested with the same amount of time, and the work itself is more comfortable, less tedious.

Is the ripening simultaneous? I asked. Many agronomists worry that if there is profuse tillering, there will be asynchronous maturation of the SRI crop. But Vong says there is no unevenness, perhaps because all SRI hills are produced by a single plant. In conventional rice cultivation, each hill has 3 to 6 plants, each maturing at its own pace.

When But and Pheng were asked about their labor requirements with SRI, But said that for him, the labor time is about the same as before -- but the work itself is less burdensome. Pheng said that total work is less because there are fewer seedlings. He has no need now to hire people to transport seedlings. Rice transplanting in this village traditionally involves labor exchange, so that farmers receiving their neighbors' help to cook a meal for them become enmeshed in more work. Now, Pheng's family labor is enough, so he can forgo the preparation of a meal.

What about pests and diseases? Pheng said that they have had no significant problems. This year there were some problems with one insect (he couldn't tell us the name of the pest but others said that it has a white butterfly stage). "But this was because of the wetter fields this year." Vong with his upland (unirrigated) nursery has had no problem.

I asked about diversification in this village. This has started, they said, but there is one big constraint. "The village chief is not enforcing rules against letting cattle roam freely, and they eat whatever vegetation they can find, including various vegetable crops." The local authorities need to control the cutting or grazing of trees and shrubs on dikes before diversification can be pursued. Since the village chief has not been willing to take any action to protect new activities, the farmer group is trying to get the commune head to support their initiatives.

They now have a savings group affiliated with the Farmer Nature Network, with all households as members. They have 5 million rials in savings (about \$1,250) and charge interest of 3% per month on loans. When I said that this sounds rather high, they responded that in their village, private moneylenders charge interest of 20% per month, so this is a big relief.

What are their hopes for the farmer organizations? I asked. They are thinking to build up more savings so that they can enter into more collective business ventures, saying they want to be able to buy and sell more things collectively. What innovations have they made in their SRI practice? One might call some farmers' practice 'chaotic SRI' or 'helter-skelter SRI,' they said. Some farmers do not plan 5 in regular rows as this takes more time, but they do take care to leave enough space around the plants for them to absorb enough sunlight and air. Those planting in rows use ropes here for regular spacing, not the rake or roller-marker which I showed them on my laptop screen.

I discussed the advantages of using a rake or roller-marker, but Vong in particular held firmly to the use of ropes or strings as being easier. Why? It turns out he is still transplanting into standing water, something that we discourage. So this means that there is still scope for further yield improvements once farmers begin to maintain more aerobic soil conditions.

Are they using SRI ideas for any other crops? Their vegetable farming has been affected, as they now use fewer seeds, giving the plants more space, and more farmers make use of compost. They plant their bananas and papayas in alternative rows, for example, putting organic matter as mulch in between. It is hard to tell the results of this yet, they said, since this is new soil anyway. But they have no particular problems, they said.

Koma encouraged them to continue their experimentation. They have been comparing rice crop results with and without weeding, for example. They said that they found grain number per panicle was roughly the same for both, but the grain weight was different, higher with weeding. This is the kind of farming we like to see with SRI, doing experimentation and evaluation as a routine activity, to make gains in their productivity wherever and however these can be achieved.

The rain had stopped by 5:30, so we took our leave and drove back to Phnom Penh a different way than we had come in the morning. This ‘dip’ into the farming community had been very informative and gratifying. If such impacts are made village by village, the agricultural sector will over time be transformed from its traditionalism into a new kind of modern agriculture.

### **Monday, July 16 – Field Visit to LDS Charities Program and Another SID Example**

This day was planned for a field trip to Kampong Chhnang province, north of Phnom Penh, traveling with **John Lyman**, country director for the Latter-Day Saint Charities of the Mormon Church, and **Som Rasmei**, site supervisor for the LDS Charities program in Kampong Chhnang. We left shortly after 8 and had good discussions all the way to Kampong Tralang district, reaching CEDAC’s district center in Salalek Pram about 9:30. For many years before he retired, John was a chemist at Los Alamos Laboratories in the U.S. and is now engaged in development work in Cambodia. Unlike many expatriates working development, his is not a paid position but rather a volunteer one, self-financed.

Koma had previously sent me a report on the first year of LDS Charities’ experience introducing SRI in this province in the 2006-07 season, now posted on the SRI home page: <http://ciifad.cornell.edu/sri/countries/cambodia/camldsrpt07.pdf> CEDAC gave training and technical support for this work through its staff member **Lang Chanthea** whom I met at the CEDAC center.

The report by John and his wife Jean together with Rasmei and Than told about the skepticism they encountered at first when suggesting farmers try the new methods. Fortunately, there some farmers like Heng Hein who seized upon the opportunity. Hein’s wife was resistant at the outset, but he planted his entire paddy area (0.9 ha) with SRI methods -- and was rewarded with a 5 t/ha yield -- in a village where average paddy yields the year before were 1.06 t/ha. The 146 farmers who used SRI methods in 2006-2007 had an average yield of 4.01 t/ha, a phenomenal increase. All farmers exceeded their previous year’s yield, and the lowest yield was 2 t/ha, a doubling.

Figure 4 are working all day using the traditional method.



Figure 3: Hang Hein's three sons



Figure 4: Transplanting a plot traditionally

One of the most interesting things reported in the Lymans' was that Hang Hein's entire field was transplanted by his three small sons in a single day -- while neighboring fields required the labor of several times that number of adults [pictures from their report are reproduced above].

As we drove into the project area, we passed quite a few SRI plots, but they contained more standing water than I like to see. Rasmei said that because there had been a lot of rain recently, the fields had not yet drained. The SRI plots were usually identifiable at a distance because their darker green color. Farmers' usual transplanting practices in the region are quite counter to SRI recommendations. Seedlings are uprooted long in advance of their transplanting and are then tied into bundles with their leaves cropped to make them even, because the seedling are so old and the shoots so long. Their roots are set into water to soak (suffocate) for hours, even days.

Rasmei took us to meet one of the leading farmers for SRI, **Nuth Sareth**, who led us on a tour of his area, mostly walking atop paddy bunds. His own fields were neatly planted and well maintained, with good growth. But there is some yellowing of the tips of leaves, which suggested too much soil saturation. I asked Sareth about this, and he agreed that more water was being kept in the fields than recommended; but since rainfall is unreliable here, he and other farmers are afraid there will be no more rain, and thus they are ponding the available rainwater. I explained to him through Rasmei that when fields are kept flooded, the growth of plant roots is stunted and they die back. Sareth seemed to understand the explanation, acknowledging that he had never examined the roots of his crops before.

Koma and I discussed with Sareth the importance of attending to the growth and health of roots, rather than focus entirely on the above-ground plant. If roots are healthy and functioning, the canopy will be vigorous and productive. Farmers should regularly look at the size and color of their roots. We suggest that farmers should have a RCC (root color chart) that parallels the LCC, i.e., the leaf color chart developed by IRRI used for assessing the nitrogen status of rice plants.

As our walk along the paddy bunds continued, we came to a swollen stream. I had to remove my shoes and socks to get across. As we walked further across paddies and along grassy paths, I rediscovered how good walking barefoot on a farm could feel, provided there were no stones or thorns. We reached another of Sareth's fields, which had narrower plant spacing, 20x20 cm. The transplanting had been done with single young seedlings and compost had been applied, so the color and growth at 20 days after transplanting was very good. How well it would do later remained to be seen.

His next field was more pleasing to my eye, with 25x25 cm spacing. Earthworm castings were evident at many places in the field, indicating effective alternate wetting and drying. The loudly-singing frogs all around indicated a healthy ecosystem. Sareth said that last year, he was the only farmer in this area who used SRI methods. This year, there are 36 farmers doing so. His SRI area last year was 4 ares (0.04 ha); this year he has half a hectare under SRI. Yesterday, 60 farmers visited his fields, all from this district. Word about Sareth's fine fields is apparently spreading.

As we walked back to the CEDAC vehicle on this 45-minute circuit through paddy fields, John told me about his father's experience as an alfalfa farmer in Utah. Years ago, he had been able to produce 1000 lbs of alfalfa seed per acre. But gradually this declined to 150 lbs per acre, until it was realized that the use of an agrochemical, parathion, intended to control a beetle pest, was killing off the alkali bee, a crop pollinator. Once the farm reverted to more organic management methods, production eventually recovered to 1000 lbs, although it was also necessary to establish populations of a different kind of bee to do the pollination of alfalfa blossoms.

Koma said that Sareth is going to enter the national competition this year for best SRI producer, with a prize of \$1,000. I commented that in Madagascar, the national prize for rice yield has a reward of \$13,000, and it is always won by SRI farmers. Last year, the winning yield was 13 t/ha. As we left, we wished Sareth success in the competition, and drove back into the district center for lunch before traveling further to visit another example of SID, the system of intensification and diversification, which is based on and subsuming SRI for some farmers.

**Mey Som** was not only the first farmer in Cambodia to try out SRI in 2000, and then the first to begin transforming his productivity gains from SRI into a more diversified and remunerative farming system. He was in his fields when we arrived at his farmstead in Tropaing Raing village, Mkak commune in Kandal province, so Koma led the way to his farm. Mey Som met us there and showed us his paddy fields recently transplanted as well as an elevated flat expanse where melons, squash and various other vegetables were being grown.

One paddy plot was very low-lying and rather flooded for an SRI field. Mey Som explained that he had taken soil from that one to build up his vegetable garden area. He will even out the levels next season. He is not using a rotary weeder to control weeds, doing hand weeding instead, because he said he did not find use of the implement comfortable. Its use would surely enhance his SRI yields, but for now, he is happy with the combination of activities he has worked out.

Before Mey Som practiced SRI on this very sandy and 'poor' soil, his paddy yield was only 900 kg/ha. Now that the soil fertility has been built up, with SRI methods he gets a yield of 3.5 t/ha. This has made it possible for him to take land out of rice and put it into production of other crops.

One of his fields has a lot of iron in the soil, evident from the reddish color of the water in a corner of the field. As he told us, these are not inherently good soils. This season, he had to use 18-day seedlings, older than recommended, because flooding delayed his transplanting. But this is a longer-term variety, Mey Som said, so that using older seedlings like this should still be okay.

There were a lot of earthworm casts on the bunds, and a lot of frog chatter all around, both indications of a healthy agroecosystem. Koma said that he first started working with farmer in this part of Kandal province in 1995, and the soil was then considered “too poor” for successful agriculture. “It has changed a lot.”

Before he learned about SRI from Koma, Mey Som said, he cultivated 2 hectares for rice and that was not enough area to feed his family. “We were perpetually in food deficit, lacking rice for about 2 months every year.” Now he has given half of this land to his children and has kept only 1 hectare for himself. With this, he is feeding his remaining family of five and still has some surplus. With lower costs of production, his economic position has greatly improved.

I asked him about the use of fertilizer, and he said that his farming is now fully organic. Before he applied fertilizer only to his vegetable production, however; he could not afford fertilizer for his rice. Where does he get the biomass for his compost? I asked. Koma said that the area behind Mey Som’s house is ‘an agroforest,’ full of all kinds of trees, producing all kinds of leaves.

To enrich his compost, Mey Som uses cow urine, pouring it into biomass and producing a liquid compost that he shows us the container for fermenting. The part of Mey Som’s farm that we were visiting was 40 ares (0.4 ha). From this area he used to produce 15 tang of paddy (360 kg, or 0.9 t/ha). Having converted 16 ares to upland production, he now has only 24 ares for rice. From this area, he harvested 30 tang of paddy in 2005, a yield of 3 t/ha. Last year, because of the poor weather, however, he harvested only 20 tang (a yield of 2 t/ha).

As we sat on grass mats on a platform that Mey Som has constructed to have a comfortable place to relax in the middle of his farm, enjoying a breeze and a thatched roof overhead, he and Koma added up his income sources. They figured that he is now earning 450,000 rials from vegetable sales and another 50,000 from his fish production (unfortunately, many are stolen). In addition to his sales, he has abundant fish and vegetables for home use. He used to spend about 1,000 rials per day on vegetables, so the value of this consumption is at least another 365,000 rials (\$90), and fish consumed bring this up to at least 500,000 rials (\$125).

As we sat on his platform, John asked Mey Som, “Are you happy?” “Yes, I love to sit here and watch my rice grow,” was the response. He expressed a regret that people steal a lot of his fish, so he get less income from fish sales than does Mao, whom Koma and I visited the day before. He used to grow a lot of papaya, but has been discouraged by the theft of this fruit, so now he has only one papaya tree. He has plans to dig a well here so that he can grow more dry-season crops. After the harvest, he grows beans in his rice fields as a green manure – mungbean, cowpea and melons all serving a good purpose.

Plowing is difficult, he said, because the rice plant roots are so strong and the stubble is heavy. But the soil structure is very loose and nice to work with. “Before, there was not even grass growing on some of this land,” Mey Som said. Rice tillers were very small. He never believed that he could get so much production from this soil as he is now getting with ecologically conceived management practices. He points out the abundance of earthworm casts all around, and the variety of plants and crops being grown, pigeon pea, soursop (a wonderful tropical fruit), etc. One wouldn’t call this a tropical paradise, but for a Cambodian farmer, it provides both gratification and security.

We walked back to his house where we were served watermelon from his garden, cut up into manageable pieces. Mey Som kept talking about the improvement of his soil. “Before it was very poor soil; now every kind of fruit or vegetable can grow on my farm.” He commented with satisfaction that he can grow more now compared to before “with less land, but more knowledge.” He used to have to buy even firewood, Mey Som said. But now, thanks to the agroforest behind his house, that is no longer necessary.

CEDAC has a vision of enabling and informing small-scale farmers throughout Cambodia of such opportunities. With a small grant from CIIFAD, passing on funding from the Triad Foundation in Ithaca, NY, CEDAC has recently produced a ‘manual’ based on the experience of 16 of the most innovative Cambodian farmers who are developing this system of intensification and diversification, including Mey Som. The next day Koma gave me a copy of the publication, with color pictures and line drawings that can help any farmer to begin moving in this direction. It is being translated into English, which I will help to polish, so that there can be worldwide access to the results of this farmer experimentation and learning.

### **Tuesday, July 17 – SRI Workshop at the Royal University of Agriculture**

Together with **Yukiko Yonekura** (Yone), country representative in Cambodia for the Japan International Volunteer Center which is starting to get involved with SRI through its JVC volunteers, and **Winfried Scheewe**, DED marketing advisor to CEDAC, Koma and I drove to this university to arrive there by 8:30. Edwin de Korte, a visiting lecturer at RUA who has been advising a research program on SRI, was there, as was **Ms. Angelika Fleddermann** from GTZ and also Hart Feuer, with whom we had traveled on Sunday, as well as about 20 RUA faculty and students.

The vice rector, **Dr. Lao Ny**, opened the meeting at 8:45, but soon handed over to **Choung Sophal**, dean of the Faculty of Agriculture. Dr. Ny’s introduction was somewhat ambivalent, saying he said he had just learned a few minutes before that he was supposed to open the workshop. He referred to several SRI research activities of RUA and also of the agricultural schools at Kampong Cham and Prey Veng. He mentioned some farmer participatory research on SRI being done in Prey Veng, probably the research being done by Abha Mishra from the Asian Institute of Technology, with farmer field school groups there, supported by FAO’s IPM Program.

Regarding SRI, Dr. Ny said that farmers are used to transplanting many seedlings, and if they are asked to transplant only 1 or 2 per hill, they will see this as risky. “So we need to test to see what is most productive and secure.” This, of course, was the purpose of the research being reviewed.

His pessimism about what farmers could and would do contrasted with what I had been seeing and hearing from farmers the previous two days. A paternalistic attitude was hardly appropriate toward them given their commitment to innovation and self-reliance.

The first research entitled ‘Survey of SRI and Other Rice Management Practices on Acid Soils in Prey Veng Province’ was reported by **Dr. Pin Vannaro** from Maharishi Vedic University, having funding from Australian and GTZ agencies. With MVU students and staff, Vannaro had systematically assessed and compared SRI, best management practices (BMP), and conventional practice (CP) in their biophysical, economic and social aspects, surveying farmers and cross-checking with research and extension personnel between November 2005 and November 2006. The study was conducted at locations in Prey Veng Province, in six different districts (out of 12).

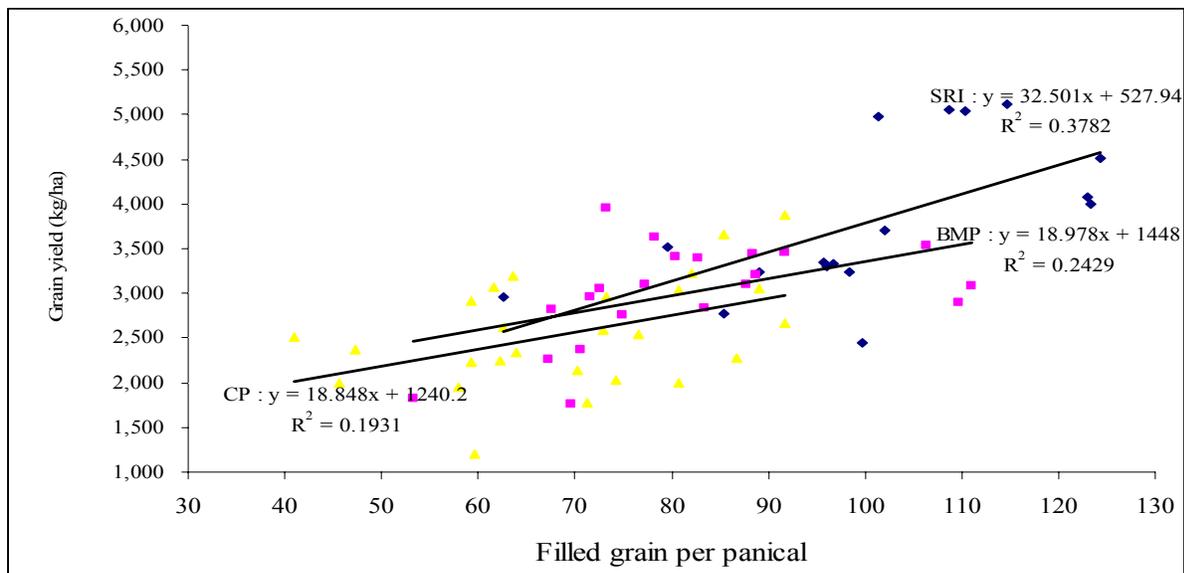
The selection of SRI and BMP farmers was based on the training they had received (or not), rather than on what practices had been used in the field, an interesting approach. Someone raised a methodological concern about this, but Angelika from GTZ said that this kind of evaluation research is much appreciated by donor agencies, who want to know what, if any, impact there is on the ground that can be attributed to the training they have funded.

The study looked at results/impacts for (a) farmers who had received SRI training from CEDAC (N=17), (b) farmers who had received other training in modern practices from CARE, PRASAC or CARDI (N=21), and (c) farmers who had no received such training (N=26). The comparison data for the three samples were interesting:

	SRI	BMP	CP
Average rice area where methods were used (ha)	0.14	0.77	0.38
Seed rate (kg/ha)	22	52	74
Age of seedling (days)	14	26	29
Depth of planting (cm)	1	2	3
Distance between plants (cm)	26	17	16
Height of plant (cm)	77.4	61.4	67.2
*Tillers/m <sup>2</sup>	390	418	510
*Non-fertile tillers/m <sup>2</sup>	36	94	133
Panicles/m <sup>2</sup>	354	324	377
*Panicle length (cm)	23	21	21
*Filled grains/panicle	101	81	70
Unfilled grains/panicle	24	28	21
*Total grains/panicle	125	109	91
1000-grain weight (grams)	21.4	24.6	24.8
*Yield (kg/ha)	3,798	2,990	2,553

\* Difference significant at .0001 level

Vannaro presented a multiple regression analysis that he had done of filled grains on yield (kg/ha) showing a stronger association for SRI rice plants than for those grown with BMP or CP.



He then presented some multiple regression coefficients with yield as the dependent variable:

Organic fertilizer application	0.03 NS
Inorganic fertilizer application	-0.44**
Seed rate	-0.28*
Seedling age	-0.54**
Plant number per hill	-0.55**
Planting depth	-0.55**
Distance between hills	0.53**
Water depth at transplanting	-0.26*

The first two correlations were unexpected: no association between organic fertilizer and yield, and a negative coefficient between inorganic fertilizer and yield. When asked about this, Vannaro thought there might have been some mistake in the data analysis or reporting. The other coefficients were fully consistent with SRI ‘theory’: higher yield was associated with lower seed rate, lower seedling age, fewer plants per hill, shallower transplanting, wider spacing, and less water applied when transplanting.

Vannaro presented data on labor inputs that showed SRI requiring twice as much labor as BMP, and 135% as much as conventional practice, different from farmer reports (and the evaluation done for GTZ by J. Anthofer in 2004, based on a random sample of 400 SRI and 1000 non-SRI farmers in five provinces). His data showed SRI costing 9% more than BMP and 11% more than CP, mostly because of high cost of making organic fertilizer. Income (riels/ha), on the other hand, was 2,089,000 with SRI (\$521), 1,645,000 with BMP (\$412), and 1,404,000 (\$351) with CP.

Given the large input of labor Vannaro’s data showed for making compost, SRI was not the most profitable production system if labor was counted in calculations of ‘gross margin’ (net income).

But if only monetary transactions were considered, which is how most rural households reckon profitability, SRI netted 1,084,000 riels/ha; BMP 724,000 riels/ha; and CP 513,000 riels/ha.

The conclusion of this study was that SRI was economically advantageous for farmers, based on yield increases of 27% vis-à-vis BMP and 48% vis-à-vis CP. The main constraint on use of SRI is the limited availability of organic fertilizer – assuming that SRI methods cannot be used with fertilizer if that is more economical. In the discussion that followed, Koma and I underscored that fertilizer can and should be used with the other SRI methods when biomass supply or labor constraints limit the making of compost.

It was suggested that the study could probably be titled more appropriately: ‘the on-farm impacts of farmer training for SRI and other management practices....’ since the sample was constructed on the basis of what kind of training, if any, that farmers had received. It did not choose farmers on the basis of what production practices they were using (although the data did show that SRI training had significantly shifted farmer practices toward SRI recommendations and had desirable impacts on yield and income.) The use of SRI practices was still, in most cases, partial, so SRI as a system had not been evaluated -- and neither had BMPs per se really been assessed. Happily, even incomplete use of SRI practices showed significant improvement in performance.

The most lively discussion concerned labor requirements for SRI as Vannaro’s data were not in line with other evaluations and farmer reports. It was agreed that labor requirements should be assessed with experienced SRI farmers to know what these are for making long-term comparisons. Also, methods are continually being devised to reduce labor demand with SRI, so this is a dynamic parameter. Unfortunately, there was no analysis of which specific practices were associated, statistically, with different yield outcomes.

Angelika from GTZ endorsed the idea that SRI not be regarded or classified as only ‘organic.’ While she suggested that organic production may be considered as better or more desirable, practical considerations always need to be factored in. Koma pointed out that the small average area of SRI production (in this study, 0.14 ha) was due to the study having been done in the dry season. Irrigated area is limited in the two districts from which SRI data were gathered; in the wet season, SRI is practiced on considerably larger areas in Prey Veng.

Next, **Soun Serei** from the Kampong Cham National School of Agriculture reported on an SRI evaluation that he had supervised: “Assessment of Improvements in Rice Production Technology in Stung Trang District, Kampong Cham Province.” This research, done during a dry season, January-June 2007, was supported like the other research by the Cambodian Agricultural Research Fund, financed by GTZ and Australian aid.

Serei said that there is confusion among farmers about alternative technologies, and he wanted to understand and evaluate these. Farmers in the two communes of Sopheas and Prek Back are poor, but they have their own land and are hard-working. He preferred not to use the term ‘best management practices’ because, as he said correctly, “there is not any one best practice.” Instead, he referred to the practices proposed by government agricultural scientists as CTR (Cultivation Technique Recommendation). It was hard to find farmers who were not combining

some practices from SRI, CTR and their own farmer practice (FP), Serei said, so his study had focused on farmers who are using all three rice production systems.

The respective practices that distinguished the three production methodologies in his study were:

	CTR	SRI	FP
Nursery seed rate (kg/100m <sup>2</sup> )	3	3	8
Seedling age at TP (days)	18-20	>15	30-45
Spacing of plants (cm)	20x20	20x20	Random
Plants/hill	1-2	1	Many
Seedling management	Careful uprooting, quick transplanting	Careful uprooting, quick transplanting	Pulling up, 1-2 days before TP
Fertilization	5 t/ha compost + NPK either 16:23:0 or 60:30:30 (CARDI recommendation)	10 t/ha compost	Farmyard manure + chemical fertilizer

The trials used both IR66 (high-yielding variety) and Sen Pidao (short-duration local variety) on plots that were 500 m<sup>2</sup>. The average yields obtained from the trials with IR66 were CTR 4,930 kg/ha, SRI 4,068 kg/ha, and FP 3,216 kg/ha; with Sen Pidao the yields were, respectively, 5,240, 4,112 and 3,278 kg/ha. In these trials, CTR gave definitely better results than SRI.

Workshop participants were quick to point out that CTR included a number of recommended SRI practices, whereas the SRI practices in the study involved closer-than-recommended spacing, and no active soil aeration, which is important for SRI results. So there was some dissatisfaction that the comparisons were not clear-cut.

Serai reported further that his survey of farmers had showed that almost all farmers preferred CTR practices over SRI. They found SRI ‘too difficult... They think that young seedlings will give lower yield... Farmers should be allowed to keep more water on their fields... Farmer still think their own methods are better.’ These remarks were, however, more a matter of opinion survey than agronomic evaluation, e.g., testing whether young seedlings in fact give lower or higher yield, other things being equal. Factorial trials under controlled conditions have usually shown the latter, so farmer opinion on this matter does not change scientific findings.

Koma took exception to the application of 10 t/ha of compost in the SRI trials, which greatly increased the cost of production, when much smaller rates are sufficient for good results. I reported that replicated trials done by the Faculty of Agriculture in Madagascar had found 2 t/ha of compost giving essentially the same results as 4, 6 or 8 tons. So although large amounts of compost can be beneficial under certain soil conditions, there was no need for them. Koma objected to SRI being ‘stereotyped’ in these trials as ‘organic,’ when it is usually presented to farmers in a much more pragmatic way.

The economic evaluation showed SRI methods to have lower costs of production, 1,578,000 riels/ha compared to 1,644,000 for CTR and 1,308,000 for FP. Since CTR yields and revenue were only 25% higher than SRI in these trials – and SRI production costs were lower -- it was

hard to see how the net profit/ha reported for CTR came out to be 66% higher than for SRI (1,664,251 vs. 1,084,500 riels).

The discussion of the KCNSA evaluation became rather ‘ragged’ as workshop participants tried to sort out the comparisons made. Serai concluded by saying that both CTR and SRI are “still new for farmers.” He said that in Stung Trang district, they are seeing farmers start to use fewer seedlings than before. He acknowledged that there had been no monitoring of water management, so this might explain why SRI plants had fewer tillers than CTR plants, something hardly ever seen in dozens of previous evaluations.

Next came reports by RUA students, introduced by Dean Sophal. They took turns presenting results from their respective theses as part of a larger ongoing project, April 2005-February 2008. Findings from two villages in Dang Tung district of Kampot province were presented first by **Sras Phanny**. Forty farmers were selected, with half using SRI methods and half using their usual methods (unfortunately, the latter were not spelled out in the presentation). Within the two sets of 20, there were 10 farmers each using a high-yielding variety or a traditional local variety.

Phanny presented his comparative results in summary as follows:

	SRI	FP
Land preparation (hrs/ha)	201.50	152.25
Quantity of seed (kg/ha)	19.70	50.60
Seedling age (days)	20.34	36.33
Spacing (cm)	29.85	23.40
Weeding (hrs/ha)	93.26	69.25
Organic fertilizer (t/ha)	5.2	2.5
Chemical fertilizer (kg/ha)	75	112.5
Panicle length (cm)	26.6	25.9
Grains/panicle	217	200
1000-grain weight (grams)	23.6	21.5
Yield (t/ha)	4.12	3.65

His economic assessment was based on data gathered from the sample. However, the numbers did not seem very reliable or complete, e.g., it was unclear how total SRI labor/ha, shown above to be much more for land preparation and weeding, could be less than one-third of the labor used for FP; or why irrigation expenditures with SRI should be more when water use was greatly reduced, unless farmers were having to pump from low-lying fields to avoid standing water.

Expenditures (riels/ha)	SRI	FP
Chemical fertilizer	82,265	158,476
Irrigation	41,160	25,958
Labor	66,572	230,616
Total expenditures	193,997	415,050
Net profit (riels/ha)	1,501,963	1,120,470

One innovation in this research was the construction of a ‘scale’ for SRI practice from zero to 50, that enabled researchers to attach some quantitative value to the set of practices used, making

SRI a matter of degree rather than kind, something that I have been urging for some time. Unfortunately, the scale was not empirically validated. Phanny's regression analysis showed a slightly a positive but non-significant relationship between the aggregate score and yield, something unlikely prima facie given the other associations presented in the several reports.

Another student report evaluated SRI (T<sub>1</sub>) ; SRI plus use of Effective Microorganisms, EM (T<sub>2</sub>); traditional practices, TP (T<sub>3</sub>); and practices recommended by scientists at CARDI, the Cambodian Agricultural and Rural Development Institute (T<sub>4</sub>). I couldn't get a powerpoint of this presentation so didn't get full details. On SRI plots, 10-15 t/ha of cow manure had been added, to match the nutrients in the fertilizer applied on T<sub>4</sub> plots. It was clear that organic soil amendments were being thought of as 'alternative fertilizer,' just in terms of their own nutrient content, which it was assumed would be taken up directly by the rice plants. There was no evident appreciation of how and why compost or manure are profoundly different soil amendments from chemical fertilizer -- 'feeding the soil' rather than 'feeding the plant.'

Organic matter enhances, often immensely, the populations and diversity of soil biota. These in turn can mobilize and cycle nutrients, fix nitrogen or solubilize other nutrients like P from the soil's large reserves of 'unavailable' nutrients. Microorganisms also improve the structure of soil so that it has more porosity (air circulation), water absorption and retention. In these trials, T<sub>3</sub> and T<sub>4</sub> results were often better, but no soil aeration had been undertaken in T<sub>1</sub> and T<sub>2</sub> trials. The recommendation of this researcher was to conduct further trials, not being satisfied that his results resolved all scientific questions. He also recommended that farmers be involved in all steps of the research, as did the other students in their reports.

By the time the student presentations were finished, it was noon, the scheduled time for the workshop to end. Participants were still awaiting my presentation, so we agreed to extend the time and I tried to compress my presentation into 30 minutes, but with Koma's translations and elaboration, they were only about 20 minutes. What was important was that Cambodian researchers are starting to engage systematically with SRI opportunities and puzzles, thanks to support from AusAid and GTZ, with Edwin de Korte and the Dean playing active advisory roles on methodology and analysis.

Participants then walked over to the university's new Organic Cafeteria two blocks away for lunch. I talked with Yone, the JVC country representative, and Hart Feuer told us that the previous week he had met with 10 Japanese volunteers who had come to Takeo province to get oriented about SRI before starting their local-level assignments. I also spent some time with the group of student researchers who were eating at a separate table, partly because of shyness about their English. When they had to use their English, they could raise some questions and make brief comments. While capacity building for advanced research will still take some more time, an encouraging start is being made.

That afternoon, I talked for a while with **Soun Seng**, who serves as CEDAC's director of research, about the subjects I had suggested to the Vietnam Academy of Agricultural Research for SRI studies the week before. Koma then took me to CEDAC's retail store in the city center where organic SRI and other 'natural' products are being sold. He gave me some SRI rice to

bring back to Cornell. Then that evening, I had dinner with Koma, Seng and several other staff at a local restaurant to round out the visit.

The tenor of discussions was somewhat different from that when I visited a year and a half ago. The uptake of SRI is now spreading reasonably well, based on favorable farmer experience as well as research results that are mostly (though not all) positive. The biggest change since January 2006 is that government support is now very explicit, and it is proceeding in cooperation with CEDAC and other NGOs, not making SRI an exclusively official 'project' to be pushed in typical top-down ways.

There are still some hazards to be anticipated and avoided, of course. What is most interesting about SRI work in Cambodia is that it is not being evolved as a stand-alone innovation. Instead, it is being integrated into **marketing initiatives** that address farmers' economic interests and needs, and into **a broad diversification thrust** that deals with questions of natural resource management and agricultural sustainability, nutrition improvement and economic security, youth employment opportunities and making agriculture a more 'modern' and attractive enterprise.

Further, the SRI extension effort is both an impetus for -- and a beneficiary of -- the spread of **village-based farmer organizations**, which are being aggregated into a national Farmer Nature Network that has high ideals and a commitment to avoid politicization, with a strong orientation to farmer participation and innovation.

The government so far has been accepting of these autonomous initiatives, provided they do not represent any kind of partisan political challenge. Some other countries are now spreading SRI more rapidly, so the lead that Cambodia had a year or two ago in terms of the absolute number of SRI users is not likely to continue. It is, after all, not a large country. But thanks to the efforts of CEDAC and its farmer-partners, this country remains in the lead in terms of institutional innovation and organizational underpinnings from which SRI colleagues in other countries can learn.