

REPORT ON MEETING OF CAMBODIAN SRI FARMER-PROMOTERS, April 4, 2013

Norman Uphoff, SRI-Rice (draft)

This Thursday morning, a group of about 60 farmers, coming from 10 provinces where organic SRI rice production is being most actively promoted, met at the headquarters of CEDAC in Phnom Penh at 9:30. The **Cambodian Center for Study and Development in Agriculture** started introducing SRI methods in 2000, with just 28 farmers willing to try out SRI's apparently risky practices. Much of the subsequent spread of SRI has been farmer-driven.

Unfortunately, the first SRI farmer-promoter, **Mey Som**, could not attend the meeting because of poor health. Once he was persuaded of SRI's merits, he began spending of his own time going from village to village carrying typical rice plants as shown below -- an SRI plant on the left and a conventionally-grown plant on right. He talked about SRI methods and results with whomever he could engage in discussion. This commitment was a good example for other Cambodian farmers to follow.



Good SRI results, plus the energetic efforts of CEDAC, joined in by other NGOs and then by the government's **Ministry of Agriculture, Forestry and Fisheries** (MAFF) from 2005 onward, has brought the number of SRI users now to over 200,000. Most of them are rainfed rice farmers with no access to irrigation facilities. By modifying the management of their rice plants, soil, rainfall and nutrients, paddy yields with SRI practices have been usually 1 to 1.5 tons/ha higher than with conventional crop management, and often SRI has given even greater increases when farmers' efforts mobilize the services of beneficial soil microorganisms.

Rice farming is not very profitable for most Cambodian rice cultivators because of low farmgate prices and high input costs, and also because of the adverse environmental impacts of using

chemical fertilizers and agrochemicals. Accordingly, CEDAC has begun emphasizing **organic versions** of SRI practice, to raise farmer incomes and to produce rice that is higher quality, both for them and their families and for the general consuming public. Results are showing that paddy yields can be considerably enhanced this way over what farmers obtain with their usual methods and as many purchased inputs as they can afford.

Further, CEDAC is undertaking to improve farmers' **marketing connections** so that they can obtain higher prices for their rice, and particularly to capture the price premium that their higher-quality rice deserves. A new CEDAC initiative is to raise the capital for farmer groups to be able to own and operate their own **rice mills**, to turn out quality milled rice suitable for export and for the higher prices that their better rice can command, also keeping valuable by-products of milling for themselves.

CEDAC's president, **Dr. Y.S. Koma**, opened the session, welcoming everybody and reviewing the objectives of the workshop:

1. To learn about progress with SRI in Cambodia, (a) considering the preliminary results of a systematic study that CEDAC staff have begun carrying out, and (b) hearing from farmers from different districts who have used SRI methods, both organic and 'basic,' i.e., not fully organic, with considerable success;
2. To hear from me, as I am visiting Cambodia again for the first time since 2009, to meet tomorrow with the Minister of Agriculture and others in the Ministry, regarding the progress with SRI management in other countries around the world; and
3. To prepare plans, province by province, for next steps in the promotion of organic SRI, working in groups in a participatory manner.

Koma then introduced **Un So Phal**, president of the **Farmer-Nature-Network (FNN)**, to open the workshop. FNN is a national farmer-managed organization assisted by CEDAC which has chapters now in 1,107 villages. Its membership of over 40,000 farm households is a subset of the 200,000 plus SRI users. They are the farmers who are most intent upon improving their agricultural livelihoods in an environmentally-friendly way.

Un So Phal welcomes everybody and thanks the organizers for arranging this meeting where everyone can learn from experience over the past dozen years. He says, "we have learned that SRI is a successful way of farming for Cambodian farmers." This is seen from the results that will be reviewed today, comparing experience across districts. "We have always to rethink," he advises, "to get better results." Organic rice production is good because both plants and farmers benefit from this. Now farmers need to think about how they can create their own better markets, for selling their better products. "We hope through this workshop to get more ideas from the best farmers to make further improvements." As Him, the CEDAC staff member assisting me, could not translate everything that Un So Phal said, this is the gist of the FNN president's message.

Koma then invited me to speak. I congratulated and thanked the farmer-promoters for their initiative and commitment, and commented on the larger number of women farmers present than when I spoke to such a group four years earlier, adding that the number of women was still a minority, and I hoped it would be larger next time I visited. I said that one of the things

that I had learned since my last visit to Cambodia was to emphasize that SRI as '**not a recipe**' – do A, B, C, etc. – but '**more like a menu**' where farmers need to make a series of choices – what kind of salad, what kind of soup, what main course, etc. This emphasizes that SRI is not a set technology but rather a set of ideas and opportunities. I endorsed the emphasis that is being put now on **economic considerations**, not being satisfied just with **agronomic success**. It was good to see the SRI community in Cambodia taking on challenges like improved marketing opportunities and farmer-owned and farmer-operated milling. I looked forward to learning more about their experiences and initiatives in the meeting today.

Koma thanked the president and me for this introduction and noted that so far, the work on SRI has had to depend very much on donors and NGO support, over and above what assistance the government is giving. Now it is up to farmers to learn how to depend more upon themselves and on their own businesses if they are to become self-sufficient and make more rapid progress. With production improving, farmers need to pay attention to how they can link their SRI production to the market to increase profitable opportunities. Otherwise, raising output can lower rice prices and not give farmers the returns that they deserve.

It is important that farmers look at **profitability, not just yield**. Even with higher yields, they can still lose out because of various difficulties that they face. CEDAC is reorienting its efforts in working with farmers: (a) to encourage farmers to make explicit allocations of their land, some for their own consumption and some for market sales, so that the latter are not just a residual, what is left over; (b) to get rice farmers to keep track of costs and to think about profits and losses having their own information; and (c) to sell their SRI paddy to their own mills, not just to traders after harvest. When farmers do not do their own milling, they lose paddy by-products that have value; and farmers end up having to buy back their own husks or bran for animal feed, for example.

Especially when growing organic SRI paddy, there are good opportunities, as will be seen from the data to be reported. CEDAC is encouraging FNN members to:

- a. Designate as much area as they can for **market sales**, being able to reduce their area for household consumption when getting higher paddy yields with SRI;
- b. Reduce their **expenditures** for paddy production as much as possible, given that they can acquire biomass from many sources and can process it into compost or mulch, and that healthier plants should not require, or require as much, agrochemical protection;
- c. Practice **seed selection** to always start with the best possible seeds to grow their seedlings, and use **local varieties** adapted to local conditions wherever possible;
- d. Undertake **ecological farming**, as these products (not just rice but also other foods) are better for the market and better for human and environmental health;
- e. Improve their **soil health and fertility** through organic management to further enhance yields.

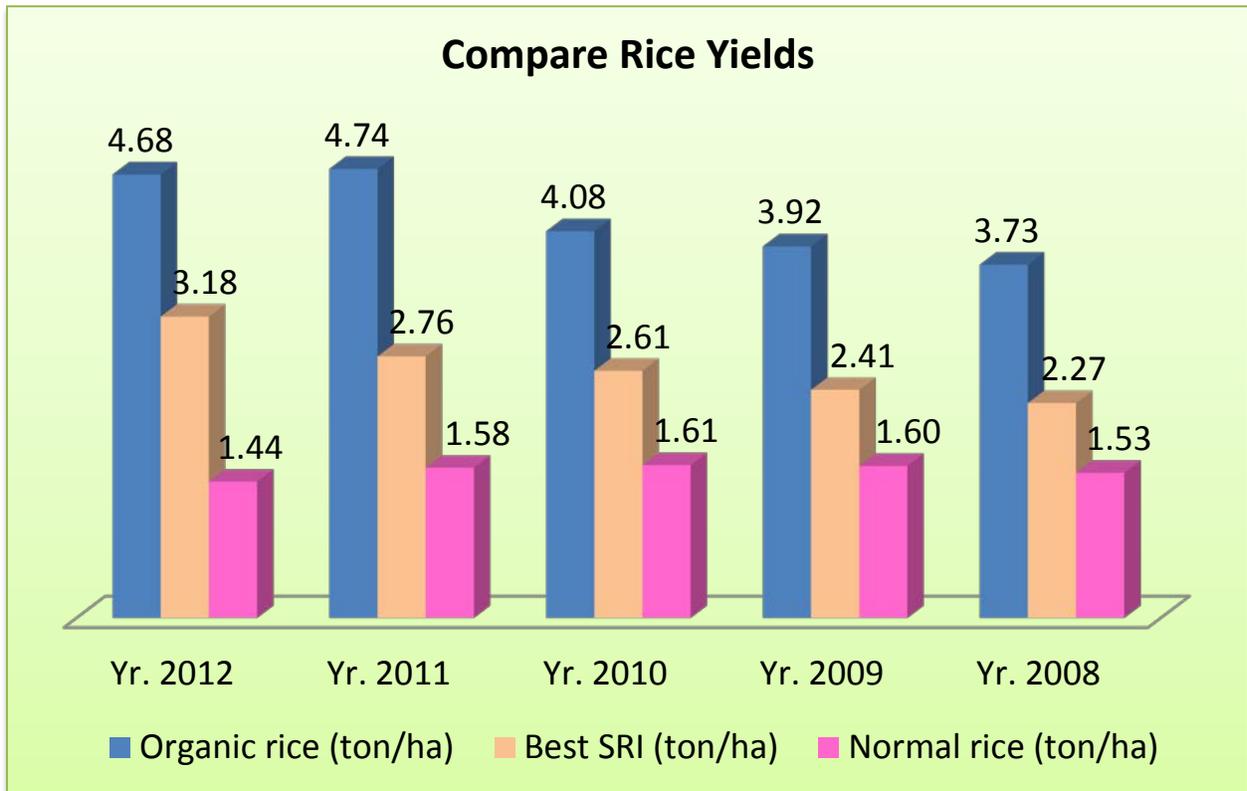
Koma added that farmers should start this transition gradually, not starting with too large an area for SRI management if they are not acquainted with its methods. They should seek to find ways to reduce their labor inputs and other costs. The results of such a change can be seen from the study results which would be reported.

Study Report: At this point, Koma gave the floor over to **Eng Seng**, the CEDAC researcher who had headed up the study team. He reported on the first round of data gathered from two target villages, one which had been cooperating with CEDAC for some time and the other not, aiming among other things to see what difference, if any, CEDAC cooperation had made in farmer results. The data reported were gathered from 30 farmers, selected to constitute three groups having five years of experience in their respective methods of rice-growing, 2008 to 2012:

1. Farmers using fully organic SRI methods (N=10);
2. Farmers using basic SRI methods, not fully organic (N=10); these were referred to in the graphs as 'best SRI' which was not clear;
3. Farmers who were using conventional methods (N=10)

First, **paddy yields** were reported from these 30 farmers:

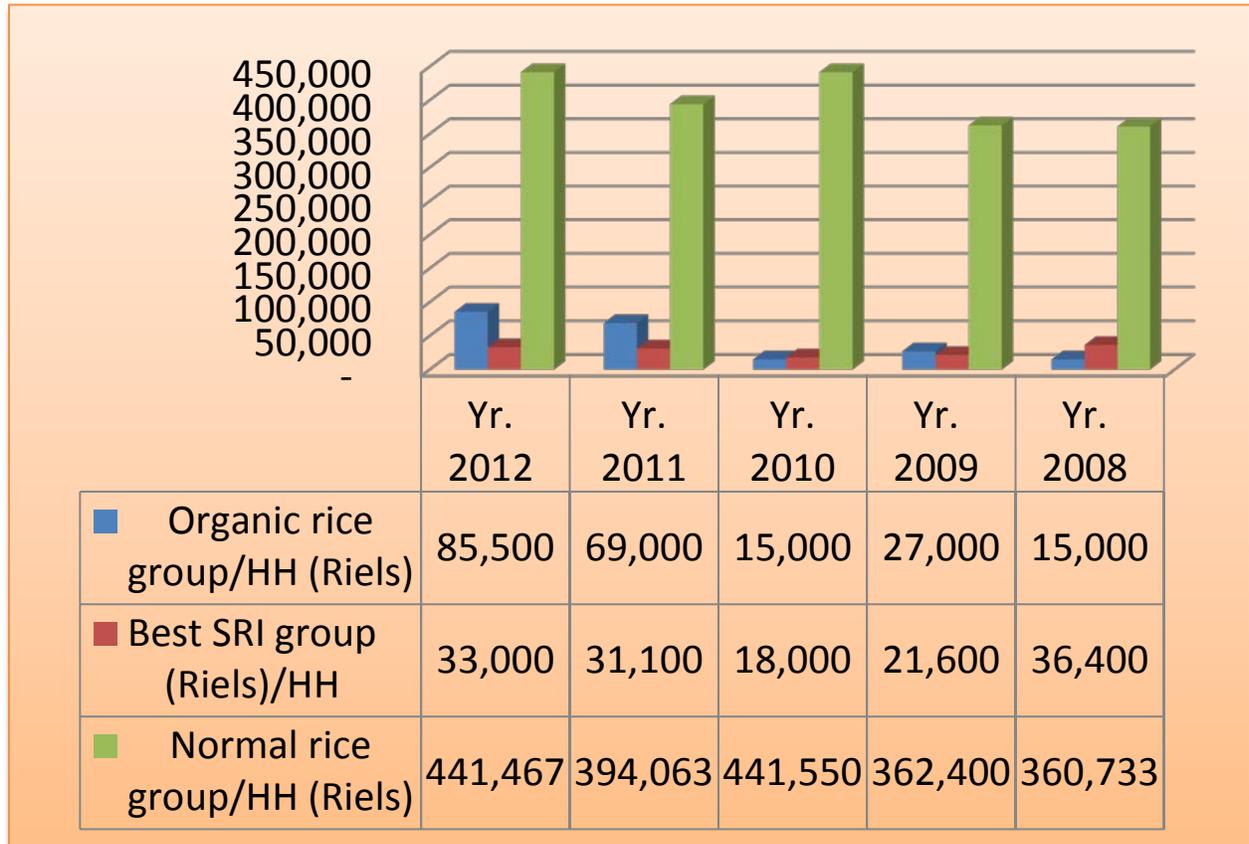
- a. Conventional methods ranged from 1.43 to 1.53 t/ha, not changing much over the 5 years,
- b. Basic SRI methods ranged from 2.27 to 3.18 t/ha, rising somewhat over the five-year period.
- c. Organic SRI methods ranged from 3.73 to 4.68 t/ha, rising markedly during the five years.



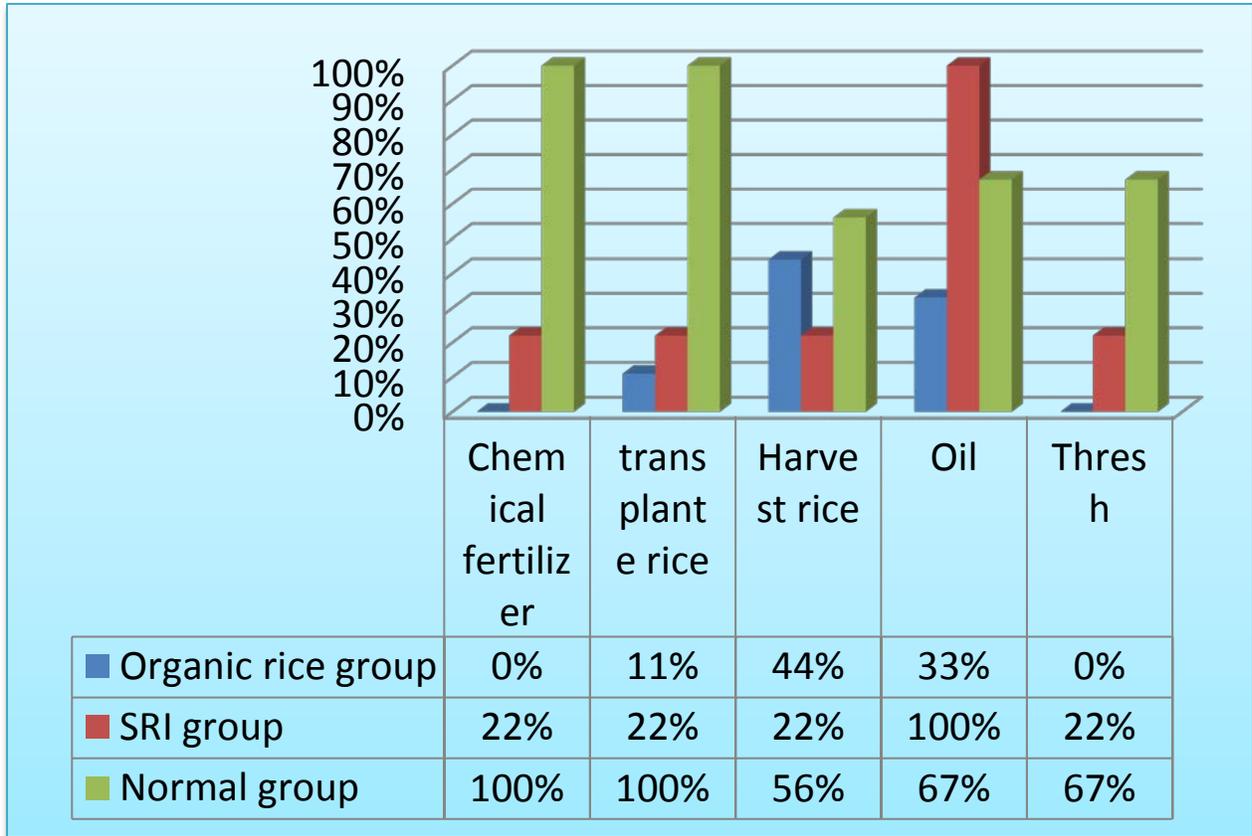
Unfortunately, the bar graphs were organized with most recent year on the left, which reverses the usual mode of presentation and made the trend over time less evident.

An analysis of **household sales of rice**, over and above household consumption, showed that those using conventional methods over the five-year period produced 278 to 323 kg for sale, while those with not-fully organic SRI management had 450 to 968 kg to sell, and organic SRI producers had even more rice for sale, 1,188 to 2,149 kg.

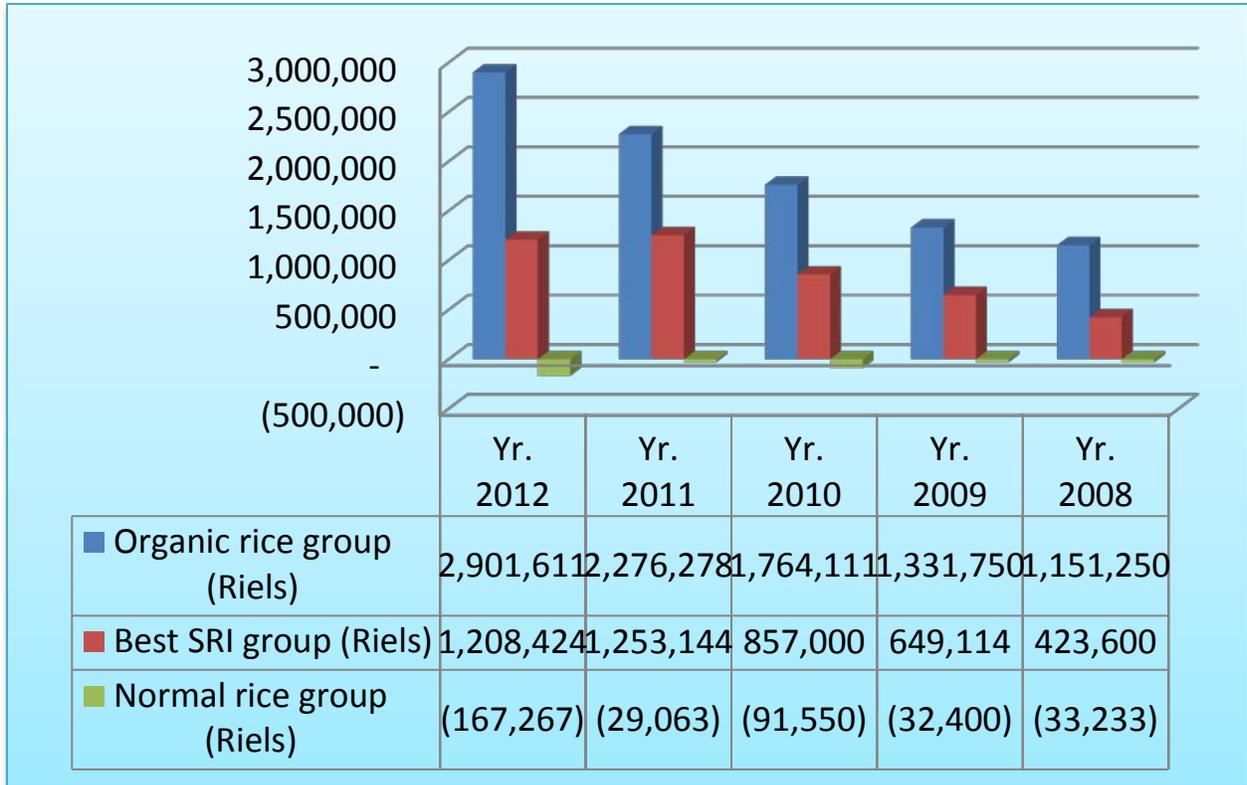
The most dramatic bar graphs showed differences in **cash expenditure for paddy production**, seen below. Households using organic SRI methods spent from 15,000 to 85,500 riels, while those SRI households that were not fully organic spent 18,000 to 36,400 riels, investing even less in their rice production. In contrast, those still using conventional methods spent 5 to 10 times more on their rice production: 360,000 to 440,000 riels. This disparity accounted for the large differences in the profitability of paddy production.



Further interesting data showed how much of the **cost of different paddy-farming operations** was *paid for in cash by the household*, compared with how much of their cost was covered by the *family's own resources*. By spending less on essential operations, households could ***maintain more of the value-added from rice production for themselves.***



The effects on **net household income** were particularly striking, which Koma underscored in reviewing the bar graph which showed this 'bottom line' for rice cultivation. Conventional rice farmers in this sample had no net income per household from their rice production, indeed they showed losses in each of the five years. Basic SRI farmers, on the other hand, had net incomes of 400,000 riels/HH rising to 1.2 million riels/HH over the five-year period, while organic SRI farmers' incomes rose from 1.2 million to 2.9 million riels/HH. The steady increase in organic SRI farmers' net incomes year by year was probably the most impressive trend seen in the data set. Unfortunately, by presenting the figures in a reversed time sequence, left to right from 2012 to 2008, the visual impression was less than usual.



These results, as Koma and Eung Seng (or Seng) emphasized, were just from the first round of data gathering, intended partly to improve the study design and to check out the interview methodology. Each grouping had just 10 farmers in it, so the samples were small. But they were constructed to be representative, and the small numbers permitted the data gatherers to be more thorough in their interviews. During April 2013, CEDAC is going to collect information from more farmers in Takeo and Kampong Speu province. So far, the patterns seen are so divergent and so strong that marked shifts do not appear likely, although there will be more refinement of and greater confidence in the numbers.

Farmer Reports: At this point, Koma invited farmers in the group to come to the front and share their experiences. The first to volunteer was **Samroeun from Takeo province**. He said that he started working with CEDAC on SRI seven years ago. He had just 12 ares (0.12 ha) and had not been able to produce enough rice from this land to feed his own household. He was married, and his life was very difficult. In the village survey, his household was listed as 'poor.'

With encouragement from CEDAC, he started to change his orientation. "I learned how to think better about rice farming. I made changes in my livelihood and got higher yields; but also I began to improve myself. Before I didn't know many others in the village. Being poor, nobody paid any attention to me. Now, however, I have a broad network of acquaintances within the district and even across provinces. I have more courage to speak and to share my experiences. I have been able to expand my landholding to more than 4 hectares, and I have a lot of profit every year. . . I have learned a lot from CEDAC, from the Farmer-Nature-Network, and from other farmers. It is true not just me for alone but also for others who cooperate with CEDAC to improve our situation."

Saroeun was asked to explain how he had been able to expand his landholding so much (by more than 30 times). He described the process, talking about how he had to convince his other family members that this was a wise move. He closed by saying: "A word to you all today: Our cooperation, our learning and networking is not useless. It enables us to improve our livelihoods. Time spent in workshops, in meetings, is well-spent. Starting from ourselves, the day will come when many other farmers will come to us for advice and will want to learn from us. I aspire to become the best farmer possible. I think I can reach 10 tons/ha yield. I already earn 17 million riels (\$4,260) from my rice. I can send my children to school, and I can help other family members to study as well. You can all see the difference that changing my farming practices has brought about.'

As Saroeun sat down to a round of applause, I asked to make an observation, commenting that Saroun had personally exemplified the reason why the NGO in Madagascar from which I learned about SRI had the unusual name of Association Tefy Saina. Fr. Laulanie and his Malagasy friends did not give their NGO which promoted SRI a name that meant 'to grow more rice.' Instead the name 'Tefy Saina' meant 'to improve the mind.' Saroeun had shown how the methods of SRI can be a catalyst for changing people's mentality, and thereby for improving their lives.

The next farmer who volunteered to speak was **Son Seun, an organic SRI farmer from Kampong Speu province**. He started working with CEDAC in 2007, he said. At the time he had only 0.6 hectares of land and a family of five. They were quite poor. He had heard about SRI before having contact with CEDAC staff, but he had not changed his practices. Once he learned the alternative methods, he made stepwise improvements, producing for the first time a surplus of 1 ton. This he sold to be able to buy 0.5 hectares more, making his landholding 1.1 hectares. After two more years with CEDAC, he had a surplus of 4.5 tons, and added 2 hectares more. He now divides his land into plots, some for own consumption and other for selling. In 2010, he produced 10 tons of organic SRI to sell, and 7 tons of non-organic SRI rice. Now he has 6.5 hectares of paddy fields, and 14 cows, quite a change from just 0.6 hectares and 2 cows before. His rice yields have been increasing year to year, and he has ever more to sell.

Son Seun said that he is always glad to come to meetings like this and to learn. Among other things he learns how to reduce his costs of production while getting more output. He commented that "at first my wife was angry with me. She was jealous about how much time I was spending with CEDAC. She even said, 'CEDAC is your second wife!' But now she is very happy."

Son Seun said that he had even written an article about his experience, titled "Happiness after Hardship." It got a lot of reader response, he said, and this encouraged his family. "Now they support me very much. I am happy with my life, and I have time to share with other farmers." He said that he is now getting into **multi-purpose farming** (MPF), where given his higher paddy yields from SRI cultivation he can take some of his paddy land out of rice and diversify his farming system to produce vegetables, fruits and animals. This adds to family income and improves also its nutrition.

The third farmer to volunteer was **Mrs. Thet from Kampong Chhnang province**. Before she could not produce enough rice to feed her family, she started out. In 2008 she began working

with SRI. She had been getting a yield of less than 1 ton/ha. But with SRI methods, she raised this to 3.7 tons/ha. I recalled to myself the report from Kampong Chhnang province on how in 2006-07, the NGO LDS Charities with CEDAC assistance had introduced SRI methods to 146 families there, all of them rainfed rice farmers. These farmers' average paddy yields had been 1.06 tons/ha; but already in their first year, their average paddy yields with SRI were boosted similarly to 4.02 tons/ha (<http://sri.ciifad.cornell.edu/countries/cambodia/camldsrpt07.pdf>).

Mrs. Thet said that she started her SRI production on just 10 ares (0.1 hectare), but she has been able to expand her SRI area year by year. Now there are 30 families in her village practicing organic SRI. She said that this way they can raise more rice crop and also get more income from the collection and sale of frogs found in their fields. These creatures have come back since they stopped applying agrochemicals. This year, she said, she harvested 400 frogs on her rice plot of 130 m² (an integrated SRI-frog farming system). Given the size of her plot this is the equivalent of about 4 tons/ha of frogs. Frogs are a popular food in Cambodia, perhaps a legacy of the French colonial era, with a market value about 8000 riels (2 USD) per kg of frogs.

With the additional income deriving from organic SRI, she has been able to send her children on to higher education, something impossible before. In her village, the households that belong to a savings and loan group, doing their own microfinance, now have more than 10 million riels in accumulated savings. This is all thanks to CEDAC, she said. "We will never forget CEDAC. With more income, I am able to get my children properly married and even to give them something to start their own new households."

Koma thanked Mrs. Khet for telling her story and for the kind words. He noted how there were similar patterns across the different experiences shared: converting higher rice productivity into expanded land area and production; sending children to school, even higher education; improving livelihoods generally.

Next, another woman farmer spoke, **Mrs. Kunthea from Kampot province**. She started working with CEDAC in 2007. Before that, every year she had to buy rice from the market to feed her family. After she heard about SRI from CEDAC, she tried it on a very small plot, but without any confidence in the methods. Still, she soon saw a big change in the plants, and she has had production increases year by year. Already in 2008 she became self-sufficient in rice.

Before, she said, she was not very much focused on rice. "But once I started SRI management, I started loving my field," and many improvements followed. (I have heard farmers in various countries say how with SRI practice they became attached to their fields as never before.) She now owns 6 cows, rather than just the one she had before she started SRI. She has not yet converted to organic SRI, but she is thinking about this. This year she just bought 0.05 ha of land from by using her income from rice.

A fifth farmer to report was **Buntheun from Kampong Speu province**. He spoke very confidently. (Indeed, I was stuck by how all of the farmers who spoke were articulate, confident, in their own ways quite charismatic.) His experience has been almost the same, he said, getting higher yields with organic SRI. The rice-growing habits of many other families in his village have not changed, he said, but they are seeing what the results can be achieved by changing management practices.

"As good farmers, we have to think about rice, in its totality, about inputs, about markets, everything." He started working with SRI methods in 2008, with 2 hectares. One hectare was for family needs, the other for marketing. Now he cultivates 3.5 hectares, all organic rice. "We farmer-promoters have to set good examples for other farmers," he concluded, with a round of applause.

Review of SRI Around the World: At this point, Koma asked me to make a presentation to the group of farmer-promoters on SRI experience elsewhere. I showed a map with the 51 countries where 'the SRI effect' has been documented colored in. Cambodia was the 3rd or 4th country to get started with SRI, I noted. There was much interest in how SRI use has expanded in other Asian countries: from 10,000 ha to over 1.3 million ha in **Vietnam** from 2007 to 2012; from 1,133 ha in 2004 in Sichuan province of **China** to over 300,000 ha in 2010; from 30 ha in 2007 in Bihar state of **India** to 335,000 ha five years later. These are, of course, much larger entities than Cambodia. They were particularly interested to know about the world-record paddy yield achieved in Bihar in 2011.

I told the farmers that such a high yield (22.4 t/ha) was, for now at least, not likely in Cambodia because its soils are wetter and thus anaerobic (with little oxygen) for much of the year. Also, most paddy lands in Cambodia are rainfed, not irrigated. Still there have been some very high yields here. In 2006, I attended a prize-giving program in Takeo province for best SRI farmers, where the top farmer had an average yield of 13 tons/ha. The 1-m² crop-cuttings in the best, more typical, and poorest parts of the field were 1.7, 1.5 and 0.7 kg/m² (these translate into 17, 15 and 7 tons/ha, giving an average of 13.) The measurements were carefully observed by many other farmers because such a valuable prize (a television set) was at stake.

The most evident interest was when I showed pictures of SRI rice being produced in a range of environments. A picture of Afghan farmers planting 13-day seedlings with 30 cm spacing amidst tall mountains at 1600 m elevation elicited an audible gasp, as did the picture of vigorous, widely spaced rice plants at 30 days, and one of an individual plant with 133 tillers at 72 days. The picture of a farmer accompanying an NGO technician on an SRI field visit, having an AK47 weapon hung over his shoulder also got some chuckles and comments. The pictures of farmers growing nurseries and transplanting 8-day seedlings near Timbuktu in Mali, on the edge of the Sahara Desert also evoked very evident interest.

Seeing finger millet, wheat, tef and sugarcane plants that were larger and more productive just from using adapted SRI methods was also of much interest to the farmers. I hoped that some or many of them would start doing their own experimentation with other crops. I presented some data from Nepal and Madagascar that showed them how much additional paddy yield could be achieved by doing more mechanical weeding beyond the usual minimum of two. Doing more soil aeration can add 2 or more tons/ha by stimulating crops' root growth and health and by enhancing the populations of beneficial soil organisms.

I closed with a slide that addressed the question: **How are these changes made possible?**

- A. By ROOT system growth and health, and**
- B. By greater abundance, activity and diversity of SOIL ORGANISMS**

SRI nurtures the LIFE IN THE SOIL, which in turn can nurture us!

Two concluding words of advice for farmers:

- **Try to grow good, strong ROOTS, and the roots will grow the PLANT**
- **Don't feed the plant -- feed the SOIL, and the soil will feed the PLANT**

There were a number of questions, about the record yield in India, about soil organisms, about how Cambodian experience compares with other countries, and other subjects. After half a dozen, the session adjourned for lunch.

Lunch Discussion with Farmers: Koma invited several of the farmers who had spoken and several CEDAC staff to sit together with us at lunch in a nearby restaurant. The farmers seemed at first hesitant to talk more about their experiences, so I asked them what from my presentation that morning had surprised them most. One said: how much I had traveled around the world. Another said: the emphasis on growing healthy roots. Then a third said: the data from experiments in so many countries. Then: the benefits from organic methods; and the way that SRI methods are used 'not only for rice.'

They discussed how they could see SRI methods improving their soil, something they paid close attention to now. Another commented on the yield bonuses from doing additional weeding. The woman farmer with us said that she likes doing weeding with the mechanical weeder very much; it is much easier than doing hand weeding. A male farmer said he was impressed with the SRI crops' resistance to lodging. (I had shown pictures from Vietnam and Indonesia of SRI rice standing upright next to fields of conventionally-grown rice that had succumbed to storms which passed over their villages.)

We discussed how SRI offers an alternative vision for agriculture, different from the currently promoted input-dependent practices known as 'modern agriculture.' Adapting a phrase from E.F. Schumacher's book *Small is Beautiful* on 'Buddhist economics,' I suggested that SRI could be seen as something like 'Buddhist agriculture,' a concept meaningful in Cambodia. CEDAC has been promoting such reorientation of smallholder agriculture for a number of years, and not only for rice.

We discussed the strategy of 'multi-purpose farming,' which builds on the productivity gains from SRI management, taking as much as half of a farmer's paddy land out of rice production to undertake complementary production of fish, vegetables, fruits, even frogs. We talked about how frog populations have been increasing with organic SRI production. There is a good market demand for frogs, paying \$2-3 per kilogram. Also, some farmers are experimenting with adapting their field configurations so they can do fish production concurrently with rice cultivation, by having small refuges to which the fish can return when their field is not flooded.

What will it take for the Farmer-Nature-Network to expand? I asked. It is at 40,000 members now, but it should be building to 400,000. The president said that there is need for more funding, and perhaps donors will become more supportive; but there is still the main problem of getting farmers to change their thinking, not an easy task. FNN is gaining reputation and respect with its savings and loan groups complementing the agricultural improvements. The benefits that farmers can get doing their own rice milling will be a further attraction (although I

can imagine this will also attract resistance from some powerful economic interests which currently benefit from their control over the rice trade and from rice milling).

The farmers were curious to know about the expansion of demand for organic foods in other countries. I said that in the US, the organic agriculture sector is the fastest-growing part of American agriculture, and in Europe, consumer demand for organic product is also growing. They saw this as a good sign for them having export possibilities (it was quite something to hear smallholders thinking and talking about export markets). But there was also interest expressed in growing food that is better for their own health and for the health of their environment.

Planning Ahead: After lunch, the farmers reconvened in small groups, province by province, to work out plans for the coming season and in the years ahead, for expanding their organic rice production, and for expanding their own milling facilities as rapidly as these can be established. The capital for this is being raised in part by farmers buying shares in milling cooperatives, but it will also depend upon attracting support from social-venture capitalists who want to put money into productive social uses having some economic return but not necessarily for maximizing investor returns.

This kind of 'social capitalism' is gaining credence and support in the US, Europe and Japan, and CEDAC and FNN are looking for partners who can help achieve their goal of making agricultural production more economically beneficial to farmers as well as more protective of natural resources and the environment.

Friday, April 5: National Farmers' Conference

The next afternoon, Koma and I joined in the closing session of the 4th annual National Farmers' Conference being held at the Royal University of Agriculture. The Minister of Agriculture, Dr. Chan Sarun, was there to preside over the session after two days of seminars, presentations, and group work involving farmers, researchers, extension staff, and students at RUA. There were about 450 persons assembled in the university's great hall when the Minister arrived.

The General Director of Agriculture announced the winners of six competitions – general agriculture, agricultural mechanization, aquaculture, community-managed forestry, etc. – with five winners in each category. Farmers (including one young Buddhist monk) stood up to applause.

I was invited to make a presentation on SRI for the group, following an introduction by the General Director on the spread of SRI in Cambodia. As there were no powerpoint facilities for projection, I gave an extemporaneous talk paralleling that to the farmer-promoters the day before, with Ngim Chhay, head of the SRI Secretariat, giving a very good translation into Khmer. I gave more remarks on the importance of soil biology for agriculture than the day before, and presented the Minister, as a personal gift, with a T-shirt that I had had made which proclaimed in large letters, above a picture of a fierce-looking tardigrade (water bear): SOIL BIOLOGY MILITANT, which he said he appreciated.

The Minister gave a fairly lengthy speech, often departing from the prepared text, which focused on accomplishments of the Cambodia agricultural sector. Recorded paddy yields had

risen between 2008 and 2012 from 2.74 tons/ha to 3.13 tons/ha, some part of this contributed by the spread of SRI management methods.

The Minister spoke about the growing number of farmers using SRI methods, reaching 101,719 hectares according to latest data. He said that at least 150,000 families were using the methods, but given the size of paddy holdings, most less than half a hectare, this number was more likely over 200,000. He said that SRI yields were 3.2 to 3.94 tons/ha, and thanked me for my support of the promotion of SRI in Cambodia.

In impromptu remarks, he commented on how when he first took an interest in SRI, in 2001-02, "nobody would believe SRI," even his own people in the Ministry, particularly the chief of the Agronomy Department in Stung Treng Province. He said he did his own research, and recalled a joint visit that we made in Takeo province in 2006, where we discussed about the methods and the reasons for their effect. The Minister said that he reported on SRI to the Prime Minister, Hun Sen, and got his support. An SRI Secretariat was established in the Ministry in 2005, and SRI was included in the National Development Plan in 2006. "So, we have expanded on SRI." He credited Koma as president of CEDAC with also contributing a lot to this expansion, a well-intended understatement. "Everywhere we go, we disseminate information on SRI."

Picking up on my suggestion that SRI ideas and methods be extended to other crops, the Minister said that they have already started this with two crops, with good results: bakka grass, which is an important fodder source for animals, and sugarcane. They found that by starting grass stands with single young seedlings, for example, the growth was much better. They are now doing more experiments, and will see what can be done with other crops.

"Now we are seeing a lot of results." He commented on learning from the internet about a new world-record yield of paddy in India, more than 20 tons/ha. He could hardly believe this. He copied the news to Ngim Chhay and to CARDI, the government's agricultural R&D center, and they hadn't heard of this. Once he learned that I had done my own checking on this report and had written a paper on this, he was ready to accept this. (I sent him the articles subsequently.)

"Farmers are now very satisfied with SRI," he said. Before they were losing money from their rice production. Now farmers can make money from rice, using less seed, and needing to buy fewer inputs. "I would like all our Directors to pay more attention to SRI, and to understand better the conditions for promoting SRI."

"As Professor Uphoff said, we need to pay attention to the roots. Here in Cambodia, I have referred to SRI as 'the root revolution.' Roots should be strong, white, healthy." He recalled a field visit with some of the Ministry officials in the audience a few years ago, after there had been serious flooding of rice paddies. "Do you remember when we walked through some flooded areas, and we pulled up some rice plants? Do you remember the bad smell of the roots? That was because they were rotting, from lack of oxygen."

He also urged everyone, farmers, technicians, researchers, to stop the burning off the rice stubble in the fields. "This kills the microbes in the soil. In the soil there is, or should be, lots of life." What a wonderful exclamation point to follow up my remarks. The Minister really earned his 'Soil Biology Militant' T-shirt. In concluding his remarks on SRI, he asked all the Ministry staff

to promote SRI in their own provinces, adapting methods to local conditions. "This will improve the soil," he said, returning to the prepared script.

The rest of the remarks focused on recommendations coming out of the conference, most not very surprising, although Koma and I appreciated the endorsement of farmer cooperatives, and having a 'competition' in this category, with substantial prizes for best performance to be awarded at the conference next year.

It was good to hear some attention given to rice biodiversity. "There are 1,000 varieties of rice in Cambodia." Some of them could become very profitable for farmers and for the country, the Minister said. The price for these can be very high. Cambodian exports are increasing, with 100,000 tons shipped abroad in the last three months. The Prime Minister has several times referred to rice as 'white gold' for Cambodia.

One recommendation concerned identifying and bringing out local knowledge. "This is a source that never dries up," the Minister commented. Community experts in different agricultural subjects should be identified and given support to share their knowledge. MAFF should provide more opportunities for 'key farmers' to meet, and it should support meetings among SRI farmers to exchange ideas and improve practices, for example.

There were also recommendations for more use of renewable energy such as biogas and use of rice husks, and for more diversification of production. It will be important for Cambodian agriculture to improve its ability to adapt to climate change, the Minister said, noting that SRI can be useful for this. "This is important especially for poor farmers who need to reduce their exposure to risks." That SRI was woven throughout most of the recommendations was very encouraging.

After the speech, I presented the Minister with a certificate, brought from Cornell, expressing "appreciation for his leadership in the promotion and understanding of the System of Rice Intensification (SRI) in Cambodia," and he in turn gave me an elegant, framed 'letter of appreciation' for my "support and good cooperation in the development and implementation of System of Rice Intensification (SRI) with fruitful results in Cambodia." He also presented me with a fancy silver rice-harvesting sickle, very appropriate symbolically if not very functional.

All of the prize-winning farmers were called up on the stage to receive their certificates and prize money, and afterwards we all went outside to have pictures taken with them, and with the two-wheeled tractors or irrigation pumps that were given as awards. I had no idea when I planned the trip that it would coincide with this national event, and I was obviously very pleased to have a part in this, learning how thoroughly SRI has 'taken root' in the thinking and practice of agriculture in Cambodia. Hopefully, this start will progress further throughout the whole sector, raising the output of many crops, benefiting practically all if not all farmers, and making Cambodia's agriculture more sustainable as well as more productive, with the quality and integrity of its environmental resources assured for future generations.