

TRIP REPORT ON VISITS TO CAMBODIA AND PHILIPPINES FOR SRI REVIEW, MARCH 17-25, 2005 – NORMAN UPHOFF, CIIFAD

During Cornell University's spring semester mid-term recess, I made visits to Cambodia and Philippines to get updated on progress and experience with the System of Rice Intensification (SRI) there. The highlights of the trip are summarized below before presenting the whole report:

1. Spread of SRI in Cambodia and 2004 Results. Yield data are coming in from the 2004 season, when the number of SRI users was at least 16,844, many times more than the 28 farmers four years earlier. The total number including all who had learned about SRI by word of mouth could be twice as much. The number would probably have been considerably higher except for the serious drought that currently besetting Cambodia. For over 5,000 farmers, the average SRI yield was **3.66 t/ha, more than double the average national yield of 1.71 t/ha**. This yield was obtained with usually lower costs of production, raising profitability by even more.

2. Drought-Resistance: The 3.66 t/ha would probably have been higher if there had been no drought. Getting any yield this year was an accomplishment. Many farmers told me how they had lost most or all of their conventionally-planted crop, while their SRI plots did or are doing well. The adverse climate may actually give impetus to the spread of SRI as farmers see that its methods are not more risky and in fact, reduce the risk of crop failure with unfavorable weather.

3. Zero-Tillage SRI and Crop Rotation: Farmers are experimenting with no-till production of SRI and getting yields that justify the innovation because it reduces costs and labor requirements while improving soil quality. Even if there is some yield loss during a transition period, farmers who are pioneering this innovation are pleased with its results. The next step will be to do raised-bed, zero-till SRI. This can include rotation with vegetable crops, further enhancing yields of both the rice and the vegetables, and improving household incomes, nutrition and food security.

4. Donor Interest and Support: Given the documented results, and the excitement of field visits to SRI farmers by donor agency staff, ambassadors and government ministers, international support for SRI evaluation and dissemination is growing. GTZ, Australian aid, JICA, DANIDA, DFID, and French aid, plus Oxfam UK and Oxfam US are all supporting SRI spread or are in discussions about support with CEDAC, the lead NGO promoting SRI in Cambodia.

5. Government Acceptance and Capacity: For the same reasons, the Cambodian government is taking a more positive stance. Farmers are the best 'lobbyists' with politicians. There is still some resistance within the rice research community, but most other government arms are working with NGOs and donors to extend SRI. GTZ, based on an evaluation done in 2004, is funding an SRI Secretariat within the Ministry of Agriculture, Forestry and Fisheries.

6. Farmer-to-Farmer Dissemination: Perhaps the most important thing observed was the number of farmers investing their own time and effort in bringing SRI to others. CEDAC is coordinating this effort so that it can become a national movement. Farmers are showing a lot of commitment to SRI, which will surely lead to widespread adoption and adaptation. Also important, farmers are making their own adjustments and innovations. One impressive invention was a home-made weeder the farmer said cost him \$3 to make and raised yield by 50% (page 9).

7. NGO Leadership in Cambodia and Philippines: In Cambodia, the Center for Studies and Development of Cambodian Agriculture (CEDAC) is playing a key leadership role in SRI dissemination, working closely with farmers and with many agencies, governmental and non-governmental. In the Philippines, NGOs are taking the lead on SRI, though government agencies and universities are now getting geared up to take active roles. The Philippine Rural Reconstruction Movement (PRRM) is providing a base for other organizations and individuals interested in SRI to work from. The Philippine Rice Research Institute (PhilRice) and University of the Philippines College of Agriculture have worked with NGOs in preparing a proposal to the Department of Agriculture for major funding to support SRI diffusion.

8. Cooperation with IRRI: During my short visit to the Philippines, I was able to meet with IRRI's new Director-General, Bob Zeigler, who assured me that IRRI is open to innovations like SRI and will be glad to cooperate in evaluating this methodology and helping to establish explanations for whatever yield differentials it can produce. Other senior IRRI staff with whom I was able to meet (who had not left Los Baños for the Easter holiday) also expressed interest in the possibilities that SRI is offering. IRRI's role is to advance the science as well as practice of rice production, and its concern with improving the scientific understanding of SRI is one that we share. More collegial interaction than previously can thus be anticipated. The attacks made on SRI by a few scientists do not represent the position of IRRI as an institution.

9. Expanding SRI Areas in the Philippines: A growing number of persons and institutions are coming into the SRI network in the Philippines. At a meeting at PRRM, Roberto (Obet) Verzola, national coordinator, reported that there are now SRI experimenters and often promoters in almost all parts of the Philippines. The Eastern Visayas is located has become an area for rapid expansion. Leyte State University (LSU), after hosting a SRI workshop in March 2004, has gotten a program of promotion going for the whole region. Fifteen on-farm trials in June-October 2004 gave *average SRI yields of 9.42 t/ha compared with the controls of 7.61 t/ha*. On two farms, yields of 14 t/ha and 13.58 t/ha were obtained with SRI methods and hybrid varieties. The total area under the June-October trials was 2.44 ha; in the current December-April season, 36 on-farm trials across the Eastern Visayan region total 15.05 ha with official interest and farmer enthusiasm growing. Gross margins with SRI in June-October were calculated as 22,945 pesos/ha with SRI, and 16,680 pesos/ha with conventional methods, a 32% improvement.

10. Rice Biodiversity and Cultural Diversity: In both Cambodia and the Philippines there is interest in using SRI methods with indigenous rice varieties that are well-liked for their taste, texture, etc. but that have been crowded out by 'improved' varieties. If these 'old' varieties are grown with SRI methods, they seldom lodge, despite large panicles, and some give yields up to 12-13 t/ha. During the trip, I learned that CIIFAD has been awarded a grant to promote the 'organic' production of indigenous varieties for domestic consumption and for export. This can raise farmer incomes through more eco-friendly production practices that contribute to better health and nutrition. If growing 'old' varieties becomes more profitable, it should be easier to conserve rice biodiversity. SRI is being introduced to the world-famous Ifugao terraces at Banawi in the northern Philippines, now a UNESCO World Heritage site. Farmers have been moving out of rice production there because it is not remunerative. If SRI can make rice-farming more attractive, there is better chance to keep people in rice farming and willing to invest in maintaining the terraces. So SRI could contribute to the maintenance of cultural diversity as well.

CAMBODIA: Dr. Koma Yang Saing, director of CEDAC, the Centre for Studies and Development of Cambodian Agriculture, the NGO that has been spearheading SRI work in Cambodia, met me at the airport on March 17 when I arrived from Singapore shortly before noon. We stopped by the CEDAC office en route to the hotel, meeting a group of some 15 farmers who were having a monthly training session to improve their knowledge and skills as managers of farmer associations and as SRI farmer-trainers. They are volunteers who want to spread SRI knowledge and use. The first farmer whom I was introduced to, for example, had already taken SRI to 20 villages and is also experimenting with a zero-tillage version of SRI.

Drought-Resistance and Quicker Maturation: The longest conversation was with a woman farmer who told me how important SRI is under drought conditions. During my visit, it became evident how serious is the drought that Cambodia has experienced this year. Little or sometimes no rain had fallen in many areas for the last four months. In her case, this season she harvested 13 thangs of rice from her field using SRI methods (farmers usually report yield in terms of thangs, i.e., baskets; in her area, a thang is about 30 kg.) The previous year, she had gotten 15 thangs of rice from the same field with SRI. This year she had planted an aromatic variety that gives somewhat lower yield but commands a higher price in the market. So, given her change in variety, this was an even better performance than last year -- achieved despite drought conditions. Before she took up SRI, her usual rice yield from the field was just 5 thangs, she said. So she has tripled her rice production with SRI methods.

More important is the fact that this year she got **zero yield** from her rice land that was planted with conventional methods (she did not yet have all of her land under SRI). Thus, SRI has been her economic salvation this year. This helps explain why she had traveled to Phnom Penh to participate in this monthly training session at CEDAC. She had personally gotten significant benefit from SRI, and she wants now to extend this benefit to other farmers. Such a generous spirit is something that SRI cannot take credit for.

I asked her and the farmers standing around us whether they have experienced what is now reported from a number of countries: that SRI rice matures more quickly at the same time it increases yield. When the District Agricultural Development Officer in Morang district of Nepal kept careful records on the 22 farmers using SRI methods on their fields in 2004, he documented an average reduction in the growth cycle by 15 days. The woman farmer said that she harvested her SRI rice about 15 days sooner than usual, and others concurred. Koma and I agreed that CEDAC should document in detail these two effects of SRI production: drought-resistance, and quicker maturing.

Earlier maturation is important because it reduces farmers' chances of crop loss, through insect or disease damage or from late-season weather events. In some places, saving two weeks can enable farmers to plant a successor crop sooner. This quicker maturing, reported from India as well as Cambodia and Nepal, should be of particular interest to rice scientists, to understand how much higher yields (in Nepal the average yield increase was 108%) are achieved in a shorter time, indicating an accelerated rate of photosynthesis in the rice plant.

Controversy: On the way to the hotel, Koma showed me photocopies of a 'debate' raging in *The Cambodia Daily*. On March 11, it had published a letter to the editor titled "Organic Not the

Answer in Cambodia” from Casey Barnett, director for CamEd, an NGO working in Cambodia. This was in response to a previous day’s article on “Govt’t Seeks to Supply Organic Produce to EU.” Barnett claimed that “Organic farming will perpetuate the hunger and poverty of Cambodians ... Organic farming threatens the food security of rural families... Engineered seeds and fertilizer can help insure harvest and increase yields an average of 20 percent... Government officials, donors and economists looking for markets for Cambodian agricultural products should look closer to home and stop gambling with the food security of the poor.”

This elicited a letter in response, March 15, from Jeremy Ironside, agricultural advisor for the Farmer-Led Agricultural Research and Extension Project in Ratanakkiri: “Rice Yields Improving Because of New Farming Principles.” Ironside cited the yield increases using SRI methods that were documented in an evaluation of SRI in Cambodia done for GTZ in 2004. A random survey of 400 SRI farmers in five provinces, compared with 100 randomly-selected non-SRI farmers in the same villages, had showed a 41% average increase with SRI (which is usually, but not necessarily, ‘organic’). This increase was achieved, indeed, by farmers most of whom are not yet using SRI methods fully or correctly. Farmers who had used the methods as recommended had gotten considerably greater increases in yield, sometimes the doubling or tripling that the woman farmer at CEDAC had reported. So with just partial adoption of SRI methods, Cambodian farmers were achieving average increases at least double what Barnett was claiming could be gotten with use of genetically-modified (GM) crops and chemical fertilizer.

Barnett had responded the day that I had arrived with a letter attacking SRI, citing “the scientific establishment” in support of his contentions. “Even researchers at the International Rice Research Institute say there is no evidence to support SRI claims,” referring to an article published in *Field Crops Research* in 2004. It argued that “SRI will make no contribution to increasing rice yield generally. “Accepted scientific journals with anonymous peer review have shown that the rice-growing method SRI has little effect,” Barnett insisted. In fact, that article was based on results from just three small trial plots in China, where the researchers did not follow an acceptable SRI protocol, e.g., they did no active soil aeration, a key element of SRI, and they applied large amounts of N fertilizer so that the SRI crop in one of the trials lodged and this lowered the SRI yield.

Ironically, if this lodging had not occurred, SRI would have given superior results in two of three plots instead of on only one of the three. So by scientific reasoning, this would have qualified SRI as being superior rather than inferior. However, the more important consideration is that the article ignored five years of evaluations of SRI done by leading rice research institutions in China. Scientists at the China National Rice Research Institute, the China National Hybrid Rice Research and Development Center, the Sichuan Academy of Agricultural Sciences, Nanjing Agricultural University, China Agricultural University and other institutions have confirmed the merits of SRI practices.

So this is a case of where part of ‘the scientific establishment’ is ignoring the work of a much larger part of ‘the scientific establishment.’ Sheehy and his colleagues were better able to get their article published in a peer-reviewed journals because it gets reviewed by like-minded peers (who have no empirical knowledge of SRI.) Chinese scientists have published on SRI in the Chinese literature, but the scientists whom Barnett listens to do not read Chinese. The official

position of IRRI, as articulated by its Deputy Director-General at the World Rice Research Conference in Tsukuba, Japan, in November 2004, is that IRRI is quite open to SRI and indeed anxious to cooperate with others on evaluating SRI even if some individual scientists take an antagonistic position toward the new methodology.

Once checked in at the hotel, at Koma's suggestion, I drafted a response to Barnett's attack on SRI. From what I had already heard from farmers and from what I would hear from farmers on my ensuing field visits (a kind of 'peer-review' that Sheehy does not consider valid), SRI offers farmers greater food security, not less. The SRI plants with their larger root systems reduce risk of crop failure, rather than increase it.

Donor Interest: In the afternoon, Koma and I visited Steffan Johnsen, DANIDA staff member working in the rural development sector in Cambodia. He is very interested in SRI and the farmer organization network developing around it. He and Koma have been discussing how this agronomic and social-organizational potential can be incorporated into a large rural development project that DANIDA and DFID are jointly planning to fund next year. After our conversation in Johnsen's office, we had an early dinner at a traditional Khmer restaurant standing on long wooden 'legs' along the river. We were joined by Edwin de Korte, a Dutch agronomist teaching at the Royal University of Agriculture, and Satoko Kono from JICA. Satoko (a good friend of my daughter who lived in Cambodia for four years during the latter 1990s working with NGOs). Satoko has been working as a program formulation advisor and is getting JICA involved in supporting SRI extension. Also with us for the interesting dinner discussion was Khim Sophanna from CEDAC.

There has now been enough accumulation of evidence on SRI's effectiveness, bolstered by several visits to SRI fields by government ministers, other countries' ambassadors, and donor agency representatives, where farmer expressions of support and appreciation for SRI were heard, that there is growing support within the government and donor community. The major institutional change since my visit to Cambodia in January 2003 is that GTZ is now funding a small SRI Secretariat located within the Ministry of Agriculture, Forestry and Fisheries. This was justified by a large-scale evaluation of SRI commissioned by GTZ in 2004 and conducted by Dr. Jürgen Anthofer. It covered 400 SRI farmers and 100 non-SRI farmers in five provinces, randomly selected from villages also randomly selected. The secretariat is headed by the director of MAFF's Department of Agronomy and Agricultural Land Improvement (DAALI), but most of the work is done by Heang Rattana from DAALI and Chey Tech, seconded from CEDAC because of his extensive knowledge of SRI, a good combination.

Visit to Takeo Province: The next morning, March 18, we left at 7 am to drive to Takeo, south of Phnom Penh. This is a very 'old' province in that it was the center of a Khmer kingdom about 1500 years ago. It is an area for very intensive agriculture, but still one of the poorer parts of Cambodia, this year very badly hit by the drought. Once we reached the province, as we drove along the main highway, we went through Koma's home village and saw his sister's house. He said that his mother, still living, is now an SRI farmer. Like so many thousands of families in Cambodia, Koma's family suffered terrible losses during the terrible years 1975-79. His village school superintendent grandfather, his father, and his brother-in-law were all killed by the Khmer Rouge. His sister was widowed only a few months after they were married, so she has lived

alone for 30 years. The resilience and tenacity of the Cambodian people to put such dreadful devastation behind them and to work so hard to make the future better knowing that they cannot remake the past is remarkable. Koma told me that there are 90 villages in the area that we were passing through where SRI is now being used and expanded.

Inter-Provincial Workshop: At the Provincial Department of Agricultural, Forestry and Fisheries (PDAFF), an inter-provincial training program on SRI was being held, organized by the new SRI secretariat. We arrived while the vice-governor of Takeo Province was opening the session, and giving strong endorsement to SRI. He commented on the increasingly unfavorable rainfall trends. He thanks the organizers of the workshop and especially CEDAC for its efforts on behalf of SRI. He said that any way to produce more rice with lower costs of production and less water was very welcome.

During the tea break, Loek Nung from Veah Poh village in Samrung district, was introduced to me as an exemplary SRI farmer. She wanted to tell me about her experience, saying that even in this drought year, her SRI plants had 70-90 tillers, and panicles with 200+ grains. From her rice land of only 12 ares (0.12 ha), she got 660 kg, compared with 288 kg before. (Koma calculated that this represented an increase in yield from 2.3 t/ha to 5.25 t/ha.) She said that her neighbors asked her what kind of fertilizer she was using and she explained that the better results come from changing management methods. She commented that the SRI rice ‘tastes better,’ something that we need to get some objective taste tests done on, since it is fairly often suggested.

After the break, Yi Kimthan, the CEDAC project coordinator based in Takeo province, gave a history of SRI. The name Henri de Laulanié stuck out among the Khmer characters in his powerpoint presentation, and then my name and CIIFAD. Koma commented while the talk went on in Khmer that two of the factors contributing to higher yield among Cambodia farmers is simply getting them to pay more attention to their crop establishment, first, doing better seed selection before they plant their nurseries, and then transplanting carefully and shallow, not putting the plants into the soil more than 1 or 2 cm. When seedlings are stuck into the soil more than this, the lower internodes of the plant do not produce tillers or roots. In fact, just laying seedlings flat on the soil is better than pushing them in more than 1-2 cm. Also, Koma said, farmers are starting to soak their seeds, before sowing in the nursery, in a solution made with neem tree leaves. This gives good results, apparently due to the well-known bactericidal effect of neem.

The number of villages in which SRI is practiced was just 18 in 2000, 122 in 2001, 350 in 2002, 700 in 2003, and 1387 in 2004. This is the number of villages where CEDAC and cooperating NGOs and donor projects are working with SRI; the actual number is probably considerably larger as SRI can spread by word-of-mouth and requires no purchase of any inputs, just changing of practices.

The number of farmers that CEDAC knows were practicing SRI went from 28 the first year to at least 16,884 in 2004, four years later. Again, the actual number was probably considerably higher, but CEDAC could identify this many farmers specifically. An evaluation done by CEDAC in 2004 of 120 farmers who had practiced SRI for at least three years found that each of them had, on average, explained SRI to **35 other farmers** either in or outside their home village.

This kind of voluntary farmer-to-farmer extension is quite unusual. Thirty-two NGOs and donor projects are now cooperating with CEDAC in spreading SRI in Cambodia, Yi Kimthan reported.

CEDAC had expected the number to grow to 40,000-50,000 this past year, but the drought conditions made many farmers hesitant to take up SRI, Yi explained. Planting tiny, single seedlings with reduced water application looked too risky to many farmers. But those who used the new methods have seen that in fact, these help to protect rice plants against the impact of drought, by promoting greater root growth. Data from about 5,000 farmers recently compiled from the 2004 season showed an average SRI yield was 3.66 t/ha despite drought conditions. This is more than double the current average yield of 1.71 t/ha in Cambodia. (Mr. Barnett should have known these numbers before writing his letter to the *Cambodia Daily*.) Yi's powerpoint presentation included some beautiful pictures of smiling farmers and large SRI rice plants with big panicles being held up by strong tillers and root systems so there was no lodging.

My presentation was similar to one that I have made now dozens of times in many countries. Each time I add a few new slides of additional data and new pictures, dropping out some older ones. My main addition this time was an analogy thought of the day before. Conventional rice planting practices are like having your car or truck that is *stuck in first gear*. It cannot go very fast. These practices under Cambodian conditions are giving yields under 2 t/ha average now. With SRI practices – young seedlings, wide spacing, water control, compost, etc. – this 'car or truck' can *shift into second gear* and can go much faster, producing average yields about double.

However, if SRI practices are used very well – especially addition of compost to the soil, soil aeration through frequent rotary weeding, and careful water management to avoid continuous saturation of the soil – and the soil has already a good endowment of soil biota, these can give a vigorous response to the new methods, shifting the car or truck, in effect, *into high gear, even overdrive*, giving yields of 6, 8, 10 t/ha or even more.

In Cambodia, SRI methods have sometimes (in two cases) reached 13 t/ha, which is more than 6 times the national average. The reasons for such success is that by engaging the services of soil biota – nitrogen fixation, phosphorus solubilization, N cycling by protozoa, stimulation of root growth by biotic production of phytohormones, etc. – rice production is shifted into high gear. (I didn't try to explain these services as that would have taken a long time.)

Why Are SRI Yields in Cambodia Lower Than in Other Countries? When questions were invited after my presentation ended, the first was a good one: why are average yields, even with SRI, lower in Cambodia than in some other countries that I had reported on. I said, first, most Cambodian farmers are not yet using all SRI methods, and using them as recommended. So there is a lot of potential for further increases with the methods. However, more important may be that Cambodia, like some other tropical countries, has soils that are saturated for part of the year, rather than being always well-drained. This will affect the kinds and communities of organisms living in the soil. We have seen in the Andhra Pradesh state of India, for example, that the average SRI advantage is about 1.8 t/ha in the low-lying coastal areas, about 2.5 t/ha farther inland, and almost 5 t/ha in some of the dryer interior areas. Moreover, when comparing yields between wet-season and dry-season results, the differences are quite striking. I didn't give the data below, compiled by the Andhra Pradesh extension service, but instead summarized them.

Season	No. of Farmers	SRI Yield (t/ha)	Conv. Yield (t/ha)	Difference (t/ha)
Kharif 2003 (summer-wet)	194	7.6	5.9	1.7
Rabi 2003-04 (winter-dry)	94	9.67	7.13	2.54
Kharif 2004 (summer-wet)	476	7.92	5.48	2.44

Further, we see that average SRI yields in Bangladesh are 1-1.5 t/ha lower than average SRI yields in Andhra Pradesh. Quite possibly this is because so much of Bangladesh paddy land is saturated for more of the year than are most soils in Andhra Pradesh. We still do not have a well-established explanation to answer this good question, but it appears that the biological life in the soil deserves more attention, and what we can do to get it to respond well to SRI practices.

This issue has been ignored because almost everybody thinks that rice is an aquatic plant, and that it does best when growing in standing water. However, SRI experience is showing the opposite. There has been little thought given to the kinds of soil organisms associated with rice in its rhizosphere, whether they are aerobic or anaerobic and how soil communities function. I encouraged SRI farmers to do more experimenting with use of the rotary hoe, not just to control weeds but to aerate the soil. Where soil has been saturated, this is more important, though there might not be large and favorable populations of aerobic microbes to respond right away to this practice, so it make take a while to establish more favorable soil ecology.

Feedback on Farmer Practice: A video on SRI was shown, produced by a journalist who is now himself using its practices. Among other things, it suggested growing watermelon or some other horticultural crop before the rice crop. This will give more biomass to work into the soil as well as earn more income. The video showed farmers removing fairly old seedlings from their conventional nurseries and then **kicking the roots** to get all the soil off them for easier transport. This handling causes the roots to desiccate more quickly as well as damages them. SRI theory and practice is making clear that farmers have been transplanting ‘crippled’ seedlings into their fields, and the situation is made worse when fields are kept flooded, suffocating the roots. No wonder that rice yields with conventional cultural methods average only 1.7 t/ha in Cambodia.

One segment of the video showed a farmer talking about how his wife had resisted his trying SRI at first. He told her that if he didn’t get the yield promised (he had obviously become quite convinced about SRI by the CEDAC training), he would stop consuming household rice for 3-4 months and would go and get a laborer’s job elsewhere, so he would not be reducing the household rice supply for which the wife was responsible. The resolution of the disagreement was that “after the harvest, there was no more fighting.” Another segment showed a woman farmer telling how after transplanting her field with SRI methods, at first she “felt ashamed.” She feared she would get nothing and that she was wasting her land for the season. However, her story ended with a big smile. These kinds of stories I have now heard often. Maybe there are some unhappy endings that do not get reported, but time and again, the result once SRI methods have been tried is remarkable satisfaction, and pride.

CEDAC staff explained after the video how there were many initial difficulties in getting SRI accepted. The most useful approach has been to sponsor cross-visits, so that prospective SRI farmers, full of doubts and reservations, can talk with farmers who had made SRI methods work for them. Mey Som, one of the first SRI adopters in Cambodia, was introduced to the group. He has become known, affectionately, as “The Professor” for his earnest promotion of SRI among other farmers, giving ‘lectures’ on it to anyone who will listen. Although his own soil is very poor, he has been able to double his usual yield to 3.5 t/ha.

Mey Som got applause from the group when introduced because he has become one of the ‘stars’ in Cambodia for SRI adoption. He said that his newest innovation is to put rice straw into the paddock where he keeps his cows, for them to enrich this organic material with urine and manure. In his village, hardly any farmers use chemical fertilizer any more, having seen what can be done with (less costly) organic matter. He closed his brief statement by saying that farmers need to learn to manage their rice crops during the growing season, not just planting their rice and then expecting to be able to come back some months later and harvest a good crop. SRI results require good work. He told about one young farmer who is taking SRI seriously now and has gotten a 7 t/ha yield. He encouraged all the farmer there to invest in intensified production.

At lunch, Koma and I sat with Mey Som and two other farmers who have given leadership in spreading SRI. Before he tried SRI, Tuy Phan was getting 100-110 thang from his 1.5 ha paddy field (one thang there weighs 30 kg). His first SRI crop in 2002 was 130 thang, and then in 2003 it was 160 thang. This year, despite the drought, it was 180 thang, and he says it would have reached at least 200 thang with normal weather. Mey Som added that in this drought year, with SRI practices, he got more rice from half his former rice area than he got earlier from the whole area with conventional methods.

Nhu Sum is a woman farmer in Kampong Speu province who has previously won a national prize for her success in vegetable production. She used to produce just 40-50 kg of rice from a small area, as a sideline. But with SRI she has expanded her rice production to 300 kg, though since her paddy area is now larger, no yield comparison was possible from the numbers given. She said she has introduced SRI to 11 villages already. This year’s drought made extension difficult, as people were very apprehensive about taking any risk. Mey Som noted with satisfaction that many of the farmers to whom he has taught SRI are getting now higher yields than his own. This reminds me of the admonition of one of my graduate school teachers, Prof. Marion Levy, that teachers should always hope that they can produce students better and wiser than they are themselves, or otherwise, “the system will grind down to entropy.” The only way systems improve is when students surpass their teachers.

Weeder Innovation: After lunch, we returned to the workshop room where Koma introduced me to Nong Sovann from Kandol village in Kampong Speu province. Nong showed us a very simple weeder that he had designed and built himself, for a cost of just \$3. It is made with heavy nails pounded into a wooden ‘axle’ mounted on a simple metal frame which is pushed like other rotary weeders. Behind the axle, he had mounted five metal ‘teeth’ that dig into the soil when he pulls the weeder backwards while the nails on the axle loosen the soil when he pushes it forward.

He said that because of the drought he was able to do only one weeding this season, instead of the 3-4 he planned, because the soil got too dry to work, and no water was available to moisten it. However even with one weeding, his rice harvest this past season was 15 thang instead of the 10 thang he got the previous year with SRI methods but no soil-aerating weeding. He is persuaded that the 5-thang increment was due to his weeding. This took him only half a day because his SRI field was fairly small. The labor require for this could be valued at 2500 riel (60 cents). So for \$3.60, counting the full cost of his simple 'capital equipment' as expenditure, he produced an additional \$20 worth of rice. This is a benefit-cost ratio of almost 6 to 1.

Before next year, Nong wants to improve the handle of the weeder, to make it sturdier. He has already trained farmers in five other villages about SRI, he said. He was keen to tell me about an experiment he had done where he planted his rows in an east-west direction and got 9 thang (in his area, 1 thang = 26 kg), and when the rows were planted north-south, he got 7 thang. I suggested to him that if he would plant in a square pattern instead of rows, direction would make little difference, and then he could use his weeder in two directions rather than just one, as now with rows. He said he would try this. I took several pictures of the weeder with my digital camera to post on the SRI home page on the internet so others can be informed (inspired) by his innovation.

Visit to Pak Bang Oeun Village: Koma and I excused ourselves from the training session to drive about half an hour west of Takeo, to visit the village of Pak Bang Oeun, where there is an active farmer organization promoting SRI and other innovations. Growing out of the SRI experience, CEDAC is finding greater farmer interest and willingness to form organizations and to try new practices. There is now a '**Farmer and Nature Network**' coming up, and this is one of the pioneer villages. Everything is dusty and dry, reflecting the months without rain. The villagers who assembled were very animated, however. They had recently hosted a visit from the Minister of Agriculture who came to learn about their work on SRI.

The name of the farmer association is Pak Bang Oeun Minchai (Pak Bang Oeun Success). It has 54 household members, with two associated mutual funds (savings and loan schemes) that have 38 and 42 members, respectively (more than one household member can join). Three more new groups are emerging, Koma told me. Many people now want to join, but rather than let any one organization become too big, they think it is best to have a number of groups. This is a good decision in my view, consistent with what our Rural Development Committee at Cornell found two decades ago.

Our analysis of the experience of 150 rural local organizations around the world, published in Esman and Uphoff, *Local Organizations: Intermediaries in Rural Development* (1982), had concluded that having relatively small base-level organizations which were federated them upward into larger umbrella associations was usually more effective than having very large lowest-level organizations. There are also two youth groups in the Pak Bang Oeun area, one for young men and one for young women. In this village, SRI was introduced through a farmer community school that CEDAC had established in the community. The school has now evolved into a farmers' association.

Originally the efforts started with a women's group, but now the organizational structures are multiplying and diversifying. How did this get started? I asked. CEDAC came to the village to introduce SRI in 2003. To begin, only a few were interested, just a man and a woman (from different households), but eventually a third joined, another woman. (All three were present in our circle.) They planted 14, 20 and 10 ares respectively, a total of 0.44 ha and got an average yield of 5.6 t/ha. At first they met with a lot of skepticism from neighbors, but as the season progressed and others saw the SRI fields growing beautifully, more joined.

I asked why these three persons were willing to try out SRI, when others were not? The woman who is organization head said that nobody there was used to transplanting young seedlings or single seedlings. Other farmer said that insects would come and eat up the tiny plants. She attended a CEDAC training session and also visited a farmer who already had some SRI experience. She became satisfied that the methods ought to be tried. She talked with the other two and said these new methods must be giving some good results elsewhere. "Otherwise, why would these people come from outside to tell us?" She said they agreed that to try it to set an example to others. But they also told the CEDAC staff: "If SRI is successful, we will help to disseminate it. But if it is not successful, you cannot enter this village any more."

One of the three 'pioneers' is Mrs. Im Sarim, who arrived a little late. Koma and I told her that the picture he had taken of her last September, standing in the middle of her SRI field holding up a huge rice plant that she had grown from a single seed, was going to be used as the cover picture for a big book on 'food security' being published soon in Germany. She blushed a little upon hearing the news and responded, "If I had only known what use would be made of that picture, I would have selected my bigger plant to hold up." She said the plant displayed had been selected more or less at random. (It is so large that I sometimes hear a gasp when it is flashed upon the screen in my powerpoint presentation on SRI.) She said that in 2003 already she had some SRI panicles with as many as 640 grains. Her soil must be fairly well endowed biologically to get such a good response. The average yield of her 2004 crop was 6.72 t/ha, but one of the crop cuts gave a yield as high as 11 t/ha.

She said that her family is now self-sufficient in rice, thanks to SRI. This year, because of the drought, she got no harvest at all from her remaining rice area planted with conventional methods. She asked us why some parts of her field are more productive than others? I said that the size of root systems can differ according to different soil conditions. There can be differences in the soil structure, the nutrient supply, the aeration of the soil, and the populations of soil organisms. Seeing that they were a little puzzled about the last point, I got my laptop from the car and booted it up to show a segment of a video on 'The Life in the Soil' prepared by the Mikichi Okada Foundation in Japan. This showed greatly magnified pictures of roots growing and sending out root hairs, of protozoa swimming in soil solution and ingesting microbes, etc. The group of 15 farmers stood around fascinated by the images on the screen, straining to comprehend what they were seeing.

I explained the strategy long advocated by organic farmers: 'Do not try to feed the plant directly; instead feed the soil and the soil will feed the plant.' How do you feed the soil? was asked. We discussed the application of compost and of manure, but also how the soil can be aerated by using the rotary weeder, thereby stimulating soil biological activity by giving oxygen to the

organisms that need it. They have only one old weeder to share among themselves, so getting more weeders will be important for spreading SRI and getting even better results. The farmers said that they now know the importance of organic matter and carefully collect all the manure and biomass that they can for use on their fields now.

One of the men told us there is a family in the village that had never been self-sufficient in rice before, because it has just 30 ares of land. However, now with SRI, it is able to meet its staple food requirements from just 12 ares.

The group hopes to get all farmers in the village using SRI in 2005. This should be easier now that everyone has seen how well SRI rice stood up under drought conditions. When these organization members went to another part of the village to try to spread their organization, the farmers there wanted to know first about SRI. They have had several requests from villages farther away, but unfortunately they cannot afford the time and cost of travel to go.

We talked about how SRI success should make possible greater diversification of their farming systems. They said they are trying to do this, to grow more vegetables, for example. They are also raising frogs now for food and income. They said that they are applying SRI ideas to chicken raising (a system of chicken intensification?). Before they just let their chickens range freely. Now they keep the birds fenced in and feed them from local materials. They have a compost heap where chickens can scratch and catch insects. They put some traditional medicines in the chickens' water to keep them healthier. Now there is no more mortality among their chickens, which was fairly common before and would have been very great in a drought year without good management. Whenever a chicken is starting to ail, they give it special attention.

The discussion got serious when the association presented plans for rehabilitation of a reservoir that has deteriorated over many years. They had costed the improvement at \$11,280, with a large community labor contribution. Koma explained that CEDAC is not a donor agency and suggested they take this request to the government. With a good plan and good justification, perhaps they get the Minister who has seen their diligent work to support their request.

The villagers want to earn supplementary income by weaving and knitting, but they need the raw materials. One young woman showed a green purse that she was knitting from synthetic yarn, which is expensive, they said. The villagers want to give young people opportunities here so that they do not have to go off to work in factory conditions, which they regard as poor for the health. Young people are now growing vegetables for sale, and so instead of always asking parents for money, sometimes it is the parents who ask their children for money. This got laughter.

Their savings societies are building up assets. They have 1.2 million riels at present, 650,000 riels of which have come from the payment of interest to the fund from loans that members have taken. Their interest rate is 3% per month. While this sounds high (36% per annum), it is lower than they must pay to private moneylenders, and they want to build up their capital fund quickly. (This strategy is similar to what Gal Oya farmer organizations in Sri Lanka did some 20 years ago when they set up such schemes among themselves.) Recently they raised their mandatory savings contribution from 2000 riel per month (50 cents US) to 2500 riel. They are considering setting up a consumer cooperative to reduce their costs of staple commodities, and a marketing

cooperative to get better prices for their produce. Clearly they have ambition and optimism. I asked the ‘secret’ for their greater aspiration? They said that there is unity among the five leaders of the village, three women and two men, who try to lead by example.

After two hours in the village and facing a 2.5-hour drive back to Phnom Penh, Koma and I took our leave from the villagers. Koma said that CEDAC is now working with 140 such villages in Tramkok District of Takeo Province, appreciating that this is one of the most active and ambitious. These villages are organized into 60 farmer associations. Most villages have a number of smaller groups as in Pak Bang Oeun. It was impressive to see such a blend of business sense and idealism.

Presentation at International University: Next morning, Koma had scheduled a special seminar on Community-Based Organization: Development and Management at the International University in Phnom Penh. This private university is the only one with a rural development degree program at master’s level. Koma serves as director for the program, overseeing the curriculum and giving some of the courses. There were about 80 students, CEDAC staff and others ready at 8:30 for a lecture on rural local organization, a subject to which I devoted about 30 years of work as a social scientist before getting involved with SRI. Translation doubled the time for presentation so my hour talk stretched to two hours, but the group remained attentive throughout. In the hour of questions and discussion afterwards, this attention remained impressive, and the questions asked were some of the best I have received on this subject.

During the break, Dr. Yukiko Yonekura, country director in Cambodia for the Japanese International Volunteer Center, an NGO sending young Japanese to work on Cambodian development, introduced herself as a friend of my daughter Elisabeth. Yukiko said that she has been following SRI progress in Cambodia and hopes that her program can also give some support. So the network engaging with SRI is getting broader and more diverse all the time.

Evaluations in an Irrigation Scheme: After lunch in Phnom Penh, Koma and I drove with one of the CEDAC staff 2.5 hours north to Kampong Thom province, where CEDAC is helping to improve the management of the Stung Chinit irrigation scheme. Despite heavy investment in infrastructure, the productivity of its cultivated area (3,000 ha in the rainy season, and 1,200 ha in the dry season) remains very low. En route I saw how badly the drought has been affecting Cambodia. Even cattle walking across fallowed fields kicked up clouds of dust as they went. As we approached the irrigation scheme, however, the brown, dry countryside gradually turned greener given the underground diffusion of water from the canal. When we arrived at the pilot block of the irrigation scheme, the driver produced a set of flip-flops for me to walk on the muddy paddy bunds.

We spent almost an hour walking around the irrigated area, looking at plots. There was a set of trials near the canal where the rice seedlings had been transplanted at 20, 16, 12 or 8 days of age, to test and demonstrate SRI effects. However, the plant spacing was still rather close, often less than 20 cm, and not in a square pattern. Most of the plants looked pretty pitiful, although the 8-day seedlings had better, greener color. Even getting farmers to plant in rows, Koma said, must be considered progress here as the cultural practices are not well developed. The fields were not

well leveled, so often some portions were submerged while other areas were high and dry. Nowhere did I see plots with what I would consider vigorous, healthy plants.

The local head of agricultural extension joined us as we traversed the paddies. The plots that he pointed out as his own did not look better than the others. So he was not yet leading by good example. Koma explained that because this was a settlement scheme, farmers have less sense of ownership. The main canal was built with forced labor during the Khmer Rouge time. Now the government was hoping to get the productivity up and has delegated management to GRET, a French NGO that helped establish CEDAC about 8 years ago, with CEDAC doing most of the field-level training and supervision. Last wet season, the average yield with usual methods was only 1.7 t/ha, pretty poor for irrigated production. It was encouraging, however, to learn that the SRI pilot plots in the scheme had yielded 3.0 t/ha, quite an improvement.

The one bright spot of the field visit was some vegetable plots being grown within the scheme. A few of the plots had grown SRI rice in the preceding wet season, and their tomatoes, eggplants, melons and cucumbers were actually quite impressive. It was evident their populations of soil organisms were more abundant and diverse than in other plots. This irrigation system would probably give better production with rotational cropping, getting away from continuous rice. In Madagascar, farmers have found that alternating their SRI rice with one, two or even three inter-season vegetable crops enhances the yield levels of all the crops grown.

A few of the farmers here had begun making SRI methods work well for them. Koma told me that one farmer group here is supplying organically-grown rice to CEDAC's rice shop in Phnom Penh. Perhaps if we had been able to meet with some of the farmers (it was a Saturday afternoon), the visit would have been more informative and gratifying. From Kampong Thom we drove 2.5 more hours to Siem Riep, the Khmer city near Angkor Wat, arriving well after dark.

The next morning, Sunday, we drove 28 km beyond Angkor Wat, to Banteay Srei, an ancient temple much smaller than Angkor Wat that neither Koma nor I had visited before. It is described in tourist guides as a 'gem,' and indeed it is. We then drove through miles and miles of scrub bush to a little-known temple at Bong Mealea. The area, I was told, had been well forested as recently as 10 years ago. Some of the environmental destruction began when the area was controlled by the Khmer Rouge, giving good cover for them to hide out from government forces, but most of the deforestation has occurred since then. It has been mercilessly logged off with or without government permission, creating dramatic changes in the ecosystem. The few villages that we passed through where the forest has not been removed offered a much more hospitable climate. Bong Mealea is over 1000 years old and mostly collapsed, requiring climbing over and around huge stone ruins, making it in its own way more impressive than Banteay Srei. From there after lunch it was a 2-hour drive back to Kampong Thom province, which is a more settled agricultural area.

SRI with Zero Tillage and Farming System Diversification: When we reached the village of Panha Chi in Shing Sen district, a group of farmers quickly assembled near the home of Oeur Sophorn. He and his older brother, Oeur Ben, were the first SRI farmers in Kampong Thom. They and 11 neighbors formed Kasekor Lutlors Association (Progressing Farmers Association) in March 2002. They now also have a savings association with a current fund of 160,000 riel.

Members put in 1000 riel a month (25 cents) and they have recently raised this to 1500 riel. They have also formed a musical group through which some members are learning to play instruments they have always wanted to be able to play. Also, they are supporting the training in SRI and other methods of agricultural improvement in three nearby villages.

Is spreading SRI difficult? I asked. Yes, the farmers complain a lot, someone said, adding that this is mostly because of the drought. Oeur is young, around 30, but clearly the leading member of the group. He has only 40 ares (0.4 ha = one acre), which was formerly mostly cultivated as rice land. But now with a higher rice yield he is diversifying into other crops, and his rice area is only 26 ares.

In his first year with SRI methods (2001) he got a yield that I calculated to be 7.2 t/ha, excellent. The next year, with a different variety Oeur got a somewhat lower yield, but the higher price received for this variety compensated. In 2003, his yield was about 15% lower, but this was with zero tillage (ZT) and in a drought year, so he was not disappointed. His yield of 4.3 t/ha -- with reduced cost -- was more than double the average yield in Cambodia. He said he knew that the transition to zero tillage could involve some short-term reductions. Oeur pulled out a record book to give me precise figures on his 2004 results. From 15.52 ares with zero tillage, he harvested 691 kg; and from the 10.67 ares with 'normal' SRI practices he got 595 kg. From these numbers, I calculated the yields to be 4.45 and 5.6 t/ha for zero-tillage and 'normal' SRI, respectively.

Oeur said was not disappointed with the lower ZT yield. Instead talked with pride about how much more root mass and humus can be found in the top layers of ZT soil. He expects that this will pay off in higher future yields, with less labor required. He expects to have all of his rice area under ZT in this year, 2005.

I suggested that he continue keeping the detailed he has started, to track the productivity and cost paths of converting to zero-tillage. Oeur responded by asking whether I think he should keep some part of his rice land under conventional tillage, to be able to compare with standard methods. (Such generosity for the sake of generating systematic knowledge.) I said that he should cultivate his land however he thinks is best for his family. But by continuing to keep such detailed records, other farmers will be able to learn from his experience.

I got out my laptop computer to show Oeur and the other farmers a picture of zero-tillage SRI in Sichuan province of China. Liu Zhibing in Meishan has started using ZT with raised beds and had harvested a part of his field just before I visited him in August 2004. The yield had been certified by local officials as 13.4 t/ha, and I took a picture of him standing in his field. The surrounding bountiful unharvested rice testified to his accomplishment.

Oeur and the rest of the farmers were fascinated by the raised-bed idea. They were also interested to hear about a SRI rice-mushroom farming system now spreading in Sichuan province. Farmers plant their rice seedlings with 40x45 cm spacing on permanent beds that have been used to grow mushrooms between October and April over the winter. The soil quality is good enough to support this wide spacing and give a yield of 9-10 t/ha. Because SRI produces much more rice straw, the substrate for mushroom growing, it doubles the amount of mushrooms

that farmers can grow. The increased root exudation with SRI in turn enhances soil quality for mushroom production. The farmers talked excitedly among themselves about trying this method.

One farmer told about how with their diversification of production, their household incomes and well-being are improving. Before, his household spent 5000 riels per day on vegetables, about \$450 a year. Now they meet all of their own vegetable needs and even have some left over to sell, earning another \$100 a year. The households in the association do a lot of exchanging of vegetables among themselves in order to diversify their diets. The farmer concluded, “We feel more secure now that we are producing our own vegetables.”

Another farmer reported on his ZT experience. Last season, he changed the variety used so the yield declined, he cautioned me, but that was okay. His first year with SRI on 20 ares he got 1000 kg of rice, a yield of 5 t/ha, a very respectable yield in Cambodia. The next year, the yield was about the same, he said. The third year, with an aromatic variety and zero-tillage, his yield was 720 kg (3.5 t/ha). I asked about the price. This variety sells for one-third higher price so the farmer acknowledged that in terms of income, there was not much difference.

How about costs of production? Before, with 40-45 day-old seedlings, he had to hire labor to help transplant his whole field at the right time. Now when using 10-day seedlings, he can plant a series of small nurseries, and he then does the transplanting over several days with family labor, saving a lot of money. Before he used 2-3 bags of fertilizer whereas now he uses only compost, making another financial saving. So his net income per hectare has gone up even with lower yield. I suggested that they all calculate their costs of production and figure out what is their cost per kilogram of rice produced. They should see that SRI gives them great economic advantages which should be of interest to other farmers. Researchers usually focus just on yield, but since CEDAC and CIIFAD are concerned with farmers’ income, we should all think and talk more in terms of profitability.

Oeur Sophorn pulled out a large color picture, protected with plasticene, of his ZT SRI rice field. It showed huge panicles and no lodging. They had not counted the grains per panicle, but said that some panicles reached 30 cm in length. What kind of mulch do they use? Rice straw, of course, and also coconut leaves. Some used aquatic plants (water hyacinth, etc.). Oeur said that he grows a crop of red cowpea, a legume, to produce high-quality biomass before the rice season begins. He said his rice results this year were not as good as expected because he was away doing training of other farmers for two weeks during a critical time, and nobody watered his field, so his crop had more unfilled grains than usual. (This means that the yield he reported could have been considerably higher if there had been no lapse in its management. Oeur showed no sign of bitterness over this loss, which was connected with his own altruism.)

The farmers all expressed satisfaction with their zero-tillage experience. Oeur’s neighbor said that they can see that when the field gets flooded, the water recedes more quickly, being quickly absorbed by the soil, and the plants grow better. Someone said that also with zero tillage and SRI, they no longer have trouble with crabs. These thrive in continuously flooded paddies and eat rice plant roots.

What did their neighbors think about their first experiments with SRI? I asked. There were chuckles and sideways glances. Finally, one old farmer said, “They just said, ‘Shit!’ when they saw the fields. But after two weeks, they were surprised.” An older farmer said that he was now recommending SRI ideas for his friends. He found that by planting fewer seeds and giving the plants more space his yield is increasing. They were very interested to hear about how some Indian SRI farmers have adapted SRI concepts to triple their sugar cane production, and about how a Madagascar farmer has increased his maize production with some clever innovations of his own.

We then walked around the farm, seeing first a fish pond constructed where rice was formerly grown. Koma pointed out an open space that Oeur Sophorn wants to use to build a school for training other farmers in these new methods. When we reached the ZT plot, Oeur dug up some soil to show us the density of root material in the upper layers. He said that they also now see many more earthworms. He showed us another former rice plot that now has mangoes, bananas, and king grass (for fodder) growing on it. Oeur’s farm has several cattle, a few pigs, and numerous chickens and geese, all supported on a well-managed land base of 0.8 ha.

Oeur is a member of the executive committee of a new national committee of farmer and nature networks set up in 2003. This network grew out of the SRI movement, Koma said in the car, as we drove back to Phnom Penh. The spread of SRI is awakening farmer interest in innovation and cooperation. Oeur and others have a vision of agriculture for the future that is quite different from the one promoted as ‘modern’ agriculture – mechanized, large-scale monoculture, with heavy reliance on external inputs. When there is enough water (and this must always be remembered as a possible constraint on the applicability of biological strategies), multiple biological and crop cycles can be managed to produce improved household incomes. This community had the advantage of being located not far from a river, so its watertable is more favorable than many other villages.

Oeur’s household income is supplemented by his wife’s operating a small boutique that sells various staples and frivolities. This is enough to support an attractive homestead and an impressive farming operation, and to enable him to spend part of his time in farmer organizational matters, spreading to other communities knowledge of these emerging options for satisfying households’ needs. The farmers in Panha Chi village radiated what the economist Albert Hirschman has labeled ‘social energy.’ There was an evident high level of satisfaction among them, coupled with (and perhaps due to) a strong desire for innovation and self-improvement. Hirschman’s book that introduced the concept of ‘social energy’ was titled: *Getting Ahead Collectively*, and that seems to be motto of this community, like the one I visited two days before in Takeo province.

“National Debate’ on SRI: Monday morning, March 21, at the Ministry of Agriculture, Forestry and Fisheries in Phnom Penh there was what was announced as ‘a national debate’ on SRI. Agricultural scientists, administrators, donor representatives and anyone interested were invited. It was hoped that skeptics would come and consider evidence from Cambodia and other countries. The event was organized by the new SRI secretariat within MAFF.

The MAFF Undersecretary of State who was scheduled to open the event at 8:30 could not attend, having been called upon to travel upcountry, so his role was filled by the director of the Department of Agronomy and Agricultural Land Improvement (DAALI) who after a brief welcome excused himself because of his own schedule conflict, turning the chair over to his deputy. Ngin Chhay capably chaired the session which lasted until 12:30, an hour beyond the announced adjournment time. Ngin, who is also deputy director of Cambodia's national IPM program, has taken an active interest in SRI, Koma said.

Before we started, I was able to talk with Georg Deichert from GTZ, who I met and introduced to SRI at an international forum in Chiangmai, Thailand, January 2002. He has given significant support to getting SRI evaluated and established in Cambodia. Peter Kaufmann, team leader for GTZ's food security and nutrition policy support project, who got GTZ to sponsor an evaluation of SRI last April, was also there, as was Wolfram Jaeckel, rural development specialist seconded from GTZ to the Asian Development Bank mission in Cambodia. From Australian Aid, Dr. Kep Coughlan, leader of the team giving assistance to the Cambodian Agricultural Research and Development Institute (CARDI), attended with a number of his Australian team members. Dr. Tokida Kunihiro and Satoko Kono were there from JICA, as was Julien Calas, Chargé de Mission for the French Development Agency in Phnom Penh. The Cambodian participants were more hesitant to introduce themselves and give me business cards, but they numbered about 15 from various parts of the government. (Mr. Barnett unfortunately did not come.)

Ngin said that the event would not exactly be a debate because there was nobody present to speak against SRI. However, we were gathered to 'discuss concerns and issues about SRI among key stakeholders,' and they were well-represented. My presentation took about 45 minutes with translation interspersed. I discussed SRI experience around the world and reasons why we think, or know, that it gives remarkable results, such as greater drought resistance and shorter periods for maturation.

Koma gave a brief report on SRI in Cambodia, and I learned that the first use of SRI was in 1999, by Catholic Relief Services in on-station trials that failed, so CRS did not continue with the methods. Koma himself tried out SRI in 1999 after reading about it in the ILEIA newsletter from the Netherlands. He was skeptical at first, he said, but he saw good results. So he tried to get farmers to try out the methods on their own fields.

On May 30, 2000, Mey Som (reported on in the section above on my visit to Takeo) was the first farmer in Cambodia to plant SRI. He appreciated the better growth and brought in farmers to see this. That first year, just 28 farmers were willing to try out SRI methods in 18 villages. The expansion was as follows: 122 villages in 2001 (500 farmers), 350 villages in 2002 (3,000 farmers), 700 villages in 2003 (10,000 farmers), and 1,387 villages in 2004 (16,884 farmers). CEDAC and its partners had hoped to have 50,000 farmers using SRI last year, but the drought had slowed the pace of expansion.

The average SRI yield in 2004 was 3.66 t/ha, more than double the national average (1.71 t/ha). This higher production was achieved with reduced costs of production for seeds and fertilizer, so farmers' incomes were increased by more than this. Perhaps more important, during this past drought year, farmers were able to get a decent harvest from their SRI rice, while their other rice

fields were badly affected or lost. Moreover, SRI ripens 1-2 weeks earlier, reducing farmers' risks. All these features of SRI, Koma concluded, contribute to both food security and farmers' income.

He then added these points: (1) CEDAC is finding that the introduction of SRI with farmers is making its extension work in general easier. Farmers who see the benefits of SRI become more open to other innovations and also undertake to promote it themselves. "SRI is an innovation with legs," he said, as it can spread itself through farmer-to-farmer extension.

(2) There is still a lot of potential from SRI not yet realized. These results achieved come from only partial use of the methods so far. We see year-to-year improvements on most farmers' fields as they gain know in knowledge and skill and as their soil improves; yields go up and costs come down. Many SRI farmers have become interested in diversification of their farming systems, converting part of their paddy land into fish farming, fruits, vegetables, etc. Several hundred Cambodian farmers have started making such conversions.

(3) With SRI there is an increase in farmers' self-confidence. It is easier to discuss other changes with them and to get them to form groups or associations. Already there are more than 200 farmer associations set up from the SRI base, forming a national Farmer-Nature Network.

(4) Farmers have themselves begun making improvements in the system, with new methods and better implements like weeders. One thing Koma has learned from farmers is the importance of not only handling seedlings carefully but of grasping them, when transplanting them, above or below the culm, so as not to bruise the plants' growth organs (in the meristematic tissue, though farmers do not know this term). Farmers have told him that when tiny seedlings are squeezed where their roots and tillers emerge from, these will not grow from the first internode. Koma said that SRI is still being developed and improved in Cambodia.

An Australian advisor with the CARDI Assistance Project raised questions about maintaining nutrient balances in the soil if increased yields are taken off the field, removing nutrients. I responded with our expectation that most if not all of these can be replaced by nutrients mobilized from the organic matter put back on the soil or from previously 'unavailable' nutrients in the soil's reserves. These can be mobilized through processes mediated by soil organisms. I said that SRI is not necessarily or ideologically 'organic.' Where nutrient shortages develop, these can and should be corrected. What SRI does not do is try to drive yields up through external nutrients. Instead, it seeks to maximize what can be accomplished endogenously. Where exogenous nutrients are needed, there is no reason not to make up for any deficiencies.

Wolfram Jaeckel from ADB said that his view on SRI is neither pro nor con. He asked what I thought about some disturbing reports of disadoption of SRI in Madagascar and Laos. I commented that the much-cited study by Moser and Barrett (2003) was in fact supported by CIIFAD, my institute, and was probably correct in what it reported. It had usefully called attention to the constraint on adoption of SRI that can arise from its initial increase in labor requirements. Really poor households might not be able to afford to invest their labor to get greater rewards some months later because they lead a daily hand-to-mouth existence. However, these results did no appear to be representative of the overall situation in Madagascar, and they

certainly were not representative of what is being seen in other countries, where farmers are less traditional and more open to trying out innovations. I have asked about disadoption in India, and it has not been happening there.

The problem of low SRI yields in Laos is one we have thought about and been following. It may be due to increases in soil nematode populations when there is no continuous flooding. This is something we have identified as a constraint for SRI in Thailand, which may have soil conditions similar to Laos.

I suggested that one should not judge SRI just by its performance in Madagascar any more than it would be correct to judge the success and merits of Christianity by looking only at how widely it has been adopted in Palestine, the land of its origin. I noted that SRI now (finally) has support from the government in Madagascar, not the case for most of the past 20 years. Koma added that the SRI trials could be done without proper water control. It is predictable that if young seedlings are used and they are flooded, the results will be poorer than otherwise. He said that in Cambodia, when the methods are used properly, they see a lot of evidence of earthworm activity in the soil which is beneficial to plants.

Koma commented on how SRI principles are being modified in Cambodia to apply them to upland rice production, particularly among the ethnic minorities in the north. Instead of putting 20, 30, even 40 seeds in a hill, as has done for a long time, farmers can be up to 50% more yield if they just reduce seed number to 5-7. However, this has to be done carefully because as in Madagascar, farmers in these traditional societies are not supposed to offend the spirits of their ancestors by deviating from past practices. If done tactfully, changes can be made.

I suggested that the limitations we see on yield in lowland plots attributable to saturated soil and its effect on soil microbial populations might be offset by more use of the rotating weeder and by experimenting with raised beds. These would be worth evaluating systematically in Cambodia.

An advisor with the Agricultural Equity and Productivity project said that this was his first exposure to SRI, but he saw some similarities in objectives with his project, aiming to improve food security and farmers' incomes. His concern is that Khmer farmers are using low-quality seed; 80% do not assess their seed and are really using "grain instead of seed." He discussed how their project is improving farmers' access to good quality seed, which can add 350 kg/ha to wet-season yields, and as much as 1,200 kg/ha in the dry season. They recommend 40 kg/ha of seed with transplanting, and 60-70 kg/ha with direct seeding (both higher rates than with SRI). He asked the SRI Secretariat if a trip could be organized to see some SRI rice in the field.

Georg Deichert pointed out that there are many kinds and degrees of 'SRI farmers.' We discussed the importance, when assessing SRI results, of differentiating between those who are using SRI methods only partially, or not correctly, compared with those who utilize all the practices well. Koma said that just reducing the number of seedlings per hill, with shallow transplanting, put in a row or square pattern -- even without using compost or good water management -- is giving yield increases of 30%. This is a greater gain than usually achieved by changing varieties but not practices.

After coffee break, Graham Hunter from Australian Aid announced that his agency and GTZ have agreed to jointly fund research in Cambodia on SRI. This is a new initiative with new money, the news of which was received with much appreciation.

Dr. Seng Var from CARDI and head of soil management research in Cambodia next raised a number of questions, or objections, about SRI, reflecting some of the skepticism that remains within the official rice research community in the country. He noted that rice has a long history in Cambodia and that “rice grows best under flooded conditions.” (This is a common conception, but it is factually incorrect.) He noted that much of Cambodia’s rice land is very flat, and that most of the soil used for rice is not well-drained. (Correct.) So he was skeptical whether SRI could be made to work on a very large scale in Cambodia.

He noted further that water scarcities are growing in the world, and many are trying to save water, by planting ‘aerobic rice varieties,’ using alternate wetting and drying of paddies, etc. He asserted that rice under flooded conditions is more sustainable. (Also a contestible statement.) He noted that historically rice has had shallow rather than deep rooting and has nevertheless given favorable yields. He was concerned that “imposing a deeper rooting system” with SRI may not be advantageous. (Shallow rooting is directly attributable directly to the flooded soil conditions, and Cambodia’s yields average less than half the world’s level.)

Rice grown with a long aerobic phase causes rapid mineralization of crop residues, and SRI stimulates soil organic matter mineralization as well as crop nutrient extraction. (This is presumably desirable.) We need replenishment of soil nutrients, otherwise soil fertility will decrease in the long run. (True, though this does not necessarily mean exogenous replenishment.) Promoting a big root system will lead to greater soil nutrient extraction. (So, it is accepted that SRI is more productive, but it is to be rejected because it is too productive.) The long-term consequences of SRI are not known. (True.) We should do research on SRI first before promoting its use. (How long, 30 years? This is the implication of recommending that researchers first to long-term evaluations.)

I responded that while there is a lot that we do not know about SRI, there are no good reasons evident so far for now making it available to farmers. If there are eventual nutrient depletions, these can be offset by exogenous amendments, since SRI does not reject these. It does suggest that these are less necessary than previously thought by soil scientists who neglect the biological processes and potentials in the soil. Already we know that in irrigated rice that is grown with chemical fertilizer, still 60-70% of the nitrogen taken up by the plant comes from endogenous soil processes rather than the exogenous supply of N provided. Rice plants only take up 20-30% of the N fertilizer added to their soil, as most is lost through volatilization or leaching. There is no reason to deny farmers the opportunity to improve their yields and incomes with SRI. This will give them the resources they may need at some time in the future, maybe several decades, to afford investments in soil nutrient improvement.

Dr. Seng Var then raised concern about the adoption of SRI in Cambodia, whether it could succeed given that so many farmers are poor and poorly educated. Also, there are insufficient extension workers to disseminate the technology. He was also concerned about possible disadoption rates. I noted that the number of SRI users had gone from 28 to 16,884 in just four

years' time, with relatively little expenditure because this has been mostly an NGO activity, assisted by a number of donor projects, but with no project support of its own. While there may have been disadoption reported in other countries, little has been seen in Cambodia. Perhaps this is because Khmer farmers are more willing to work hard than Malagasy farmers. What has impressed me is how willing Khmer farmers are to themselves spread SRI to other farmers like themselves. This is quite remarkable and could give optimism about SRI extension in Cambodia.

Jerry Sullivan with the Cambodian-Australian extension project raised questions about the SRI results that IRRI has gotten, only 2.1 t/ha yields on its research farm at Los Baños. We discussed how much organic matter may have been added to their soils, and the effects of long-term rice monoculture, along with heavy chemical applications, on soil biodiversity.

Julien Calas from the French aid agency said that he has served in Madagascar from 1998 to 2002, and had learned about SRI there. He was interested to see the uptake of SRI in Cambodia, more rapid than in Madagascar. He asked why I thought that SRI trials which the French supported at Marovoay, a rice-growing area in Madagascar, had not been successful. He confirmed that the government had not really been interested in SRI, but SRI had been promoted through a World Bank-funded program called PNVA that was very top-down.

Julien noted that there was a lot of controversy whether SRI was good only on small, garden-size plots. (On this point, I cited a case in India, where one farmer who planted 100 contiguous acres to SRI in the winter season 2003-2004 and had averaged 11.15 t/ha for the whole extent; another Indian farmer had a harvested yield of 17.25 t/ha from his 9-acre rice farm.) The data generated in Madagascar had been mostly inconclusive, Julien said. There was slow uptake in most places, though also some evident successes. Donors have not been involved there in a serious, sustained way, so they had not been much help. He raised many good points which I tried to respond to with wherever data we now have. Probably I satisfied most if not all of his concerns, but we should have had an hour or two to discuss them all.

Peter Kaufmann from GTZ noted that the evaluation of SRI by a team led by Dr. Jürgen Anthonfer had satisfied most of the doubts and questions about SRI in Cambodia, and these results had been shared in a national workshop that GTZ supported, and then GTZ had begun funding an SRI secretariat in the Ministry of Agriculture, Forestry and Fisheries. We do not know exactly all the details of how it works, but it evidently works, and we should be doing some research to "reveal what is in the black box." That is why GTZ is cooperating with AusAid (and another donors are welcome to join) in pursuing this matter. Meantime, there is good reason to make SRI available more widely.

GTZ wants to work at the policy level, Peter said. It is important that SRI move beyond NGO and donor project sponsorship, to have government understanding and support. For this it is important to have a national strategy, based on good analysis that identifies which zones, which methods, etc. can be most successful. Also, social issues have to be addressed; how best can SRI be brought to the poor. This is a big challenge to the extension service. SRI will be most successful if farmers are closely involved in the dissemination process, also if SRI is integrated within improved farming systems rather than being promoted by itself.

Jim Gullen, agricultural advisor for the United Methodist Church program in Cambodia, asked about the role of compost in SRI, and whether there was enough biomass material available for large-scale applications. Will this be a limiting factor? I responded that it could be, but that we have just begun to apply our best thinking and imagination to finding ways that biomass can be produced and acquired from non-arable areas and can be processed and applied on fields. For this, we should be developing more efficient cutters, shredders, wheelbarrows, etc. to raise labor productivity in this process. The higher yields that are possible with SRI when compost is added will make such efforts and modest capital investments very profitable.

The chairman Ngin Chhay invited the farmers present to share some of their experience. A woman farmer, Phin Rann, spoke first. In her first year with SRI, she tried it on just 5 ares (500 m²) and got 8 baskets where she had gotten 4 baskets before. Now she uses SRI on all 50 areas (0.5 ha) and gets a yield of 3.5 t/ha, compared with the maximum she had gotten before of 2 t/ha. Actually, she got 1-2 t/ha before, depending on weather conditions. Before her family did not have enough to eat, but now they have a surplus. She uses this surplus to feed their pigs and improve this supplementary line of production.

Phin said that she strongly believes that with SRI it is possible to get more from less. (She had picked up our concepts adeptly.) Hers is a small household, she said. With SRI it is no longer necessary to hire any labor for the rice production, so this saves them money. Also, she added, “SRI rice tastes better, it is more delicious.” She has no difficulty finding enough plant material in her village to make the compost needed for SRI. She requested everyone present to help support farmers to further refine, spread and improve SRI methods in order to reduce poverty. What a spokesperson for SRI!

Phim Sophai spoke next, from Tropaing Khon village in Tramkok district of Takeo province. He reported that using conventional methods, and 4 bags of fertilizer, he had gotten 2080 kg of rice from his 2 hectares of riceland in 2001, a little over 1 t/ha. In 2002, he tried SRI methods on 15 ares and got 325 kg, or 2.166 t/ha, more than double his usual yield.

In 2003, he used SRI on all 2 hectares and got 3,587 kg (almost 1.8 t/ha) using 4 oxcarts of compost. In 2004, despite the drought, he got 5,900 kg on this same area (minus 200 m²), with 6 oxcarts of compost. This was a yield of 2.95 t/ha, with a compost rate of about 600 kg/ha. In 2003, he had not done a raised-bed nursery and he used 20-30 day seedlings, with weeding 1-2 times. In 2004, he went to 10-12 day seedlings, as recommended, and did 2-3 weedings. He could see the difference. In 2003 he used just 2 bags of fertilizer, reducing his cash costs, and in 2004, he cut back to just 1 bag. In 2003 he transplanted in late July-early August, whereas in 2004, he advanced this by about a month. All of these changes boosted his yield by over 1 t/ha.

The chairman said it was time to bring the session to a close and warmly thanked all the participants, and especially the donors “who have been supporting and who are going to support” the Ministry’s efforts on SRI. He said there are pros and cons still to be sorted out with SRI. In general, they need to build on the positive aspects and investigate any negative ones, finding solutions. From the MAFF point of view, he said that they are agreed in principle to support SRI work in Cambodia. They want to apply SRI carefully recognizing the need for location-specific and condition-specific adaptations, and they will continue to do research and evaluation. His

Department, he said, is keen to work with the new SRI Secretariat, and it looks forward to further cooperation and development, to reduce poverty and improve livelihoods.

Koma and I had lunch with Phin and Phim after the 'debate' adjourned. I asked what would be their next experiments with SRI. Phin said that she wants to combine fish-farming with SRI and started to dig a canal around the edge of her rice field, making it deep enough to keep fish even when the paddy field has been drained. She said it would be 150 meters long and 1 meter wide, also 1 meter deep. Phin said that she wants to grow organic vegetables for home consumption and sale in alternation with her rice.

Phim said that he was the first SRI user in his village, starting in 2002. In 2003 there were 10 farmers using SRI, and last year, there were 29 -- out of a total of 72 households. In 2005 he expects still more will use SRI methods. His younger brother, he said, is getting even better SRI yields than he, i.e., 6 t/ha. The brother has more compost to apply, having 10 pigs from which to collect manure and urine; he only has 4 pigs.

Phin said that she first learned about SRI from CEDAC field staff and from hearing Koma speak about it on the radio. This morning was the first time she had actually met him. In 2003, she and her brother started SRI with advice from CEDAC field staff. This past year, there were 20 farmers in her village using SRI methods, and others are using some of the practices that they can see are good even if they do not practice full SRI.

I asked if there was any traditional belief that rice needs standing water? Phin said people know that rice needs water, but now they know that too much is not good. Phim said that before, people all thought that rice needs a lot of water. Phin said that before they always planted at least 5-6 seedlings together in a hill, and put them into the soil to about a thumb's depth. "They didn't care where the root was." Water was kept on the field continuously. "Now we understand that the roots get suffocated." Also, she said, "Before we didn't know that there is life in the soil. We didn't care about this and used a lot of fertilizer." Now when she uses compost, she sees a lot of earthworms and knows that they are "friends."

With fertilizer, soil organisms get suppressed and the soil becomes hard, she commented. When using compost, "You can feel the difference under your foot, and the color becomes black." There are also more animals in the field, toads, frogs, etc. and various insects. "It is good to have them." I commented that one of our leading SRI farmers in Sri Lanka observed that with wider plant spacing of SRI, there are fewer rats (who don't like the openness) and more birds (who do). Phin said that in her field, more birds come before panicle initiation and up to ripening, but they are not much of a problem around harvest time. She has obviously been paying very close attention to what CEDAC staff have been telling her about SRI, not just what to do but what to look for. She can surely be a very effective communicator on behalf of SRI. If there are many more like her (and like Phim), SRI dissemination should become very effective.

In the afternoon, I spent two hours meeting and talking with CEDAC staff who are involved not just in SRI but also in strengthening farmer organizations at village level, a subject that I have worked on for many years, before getting drawn into agronomic concerns through SRI. Then that evening, Koma hosted a dinner that involved representatives from GTZ, JICA, French aid, and

both Oxfam US and UK. More than SRI was discussed, but it was clearly on everyone's minds. In five "short" years, SRI has gone from something that Koma had satisfied himself could work under Cambodian conditions to something that is used and appreciated, or at least known about, by several tens of thousands of farmers. Government and donor support is following suit after CEDAC, Oxfam and several other international and local NGOs took the lead. Their combined efforts, bearing fruit on farmers' fields, have made Cambodia the leading country for SRI use, although India is rapidly catching up and operating on a much larger scale, and other countries are starting to move ahead more quickly: Bangladesh, Cuba, China, Nepal and Philippines to mention the most evident ones. From Cambodia, I moved on to the Philippines on March 22.

PHILIPPINES: Because of Easter week holiday traffic, it took a long time to get from the Manila airport to the headquarters of the Philippine Rural Reconstruction Movement (PRRM) in Quezon City where an informal review meeting was planned. When I arrived about 8:45, a dozen persons were finishing a light supper, having come about 7 pm and waiting for me to arrive. Gani Serrano of PRRM served a chair for this get-together on SRI. The group included Jaime Tadeo from the National Rice Farmers Council; Lourdes Garches from WomenHealth, an NGO working with SRI in Isabela Province in the north; Manny Lahoz, a farmer from Zambales in his fifth season with SRI; Nonoy Torrijos who plans to use SRI on a small farm near Manila; Adriano Adriatico with the Nueva Ecija Provincial Federation of Sustainable Agriculture Farmers, which is cooperating with PRRM on its SRI work in that province; Lito Tambalo, chairman of the National Federation of Sustainable Agriculture Farmers; Shubert Ciencia, a PRRM staff member working on SRI in Nueva Ecija with other NGOs and the Philippine Rice Research Institute (Phil Rice); Trygve Bolante, director of field operations for PRRM, and other staff from his department.

Roberto (Obet) Verzola, a leader of the Philippine Greens and informal coordinator for the SRI network in the Philippines since 2002, started off with an overview of the Philippine situation. He showed a powerpoint presentation that he had given recently to the National Agricultural and Fishery Council to explain SRI progress in the Philippines. With inputs from other NGOs, the College of Agriculture of the University of the Philippines, and Philrice, he had prepared and submitted a funding proposal to the Department of Agriculture (DA) for nationwide SRI trials. This would expand SRI extension work in seven pilot provinces where successful SRI trials had been conducted earlier. Much of the data that Obet presented had been assembled at a national SRI workshop held at the UP College of Agriculture last October.

Obet showed results from most of the provinces in the Philippines. The yields reported were highly varied, but most quite positive. One farmer in Ilocos had gone from 2.2 t/ha to 4 t/ha with SRI, and the mayor of Pangasinan had held a big public meeting there to promote SRI. In Central Luzon, PRRM trials and demonstrations had gotten 6-7.5 t/ha, while in Zambales, SRI yields are 4-5 t/ha. In Southern Luzon (Laguna), yields were reported in the 4.6-7.6 t/ha range, while in Cavite, SRI plots in front of the governor's office produced 4-6 t/ha, with one as high as 7.6 t/ha. In Western Visayas, the range was 3 to 8.65 t/ha, with the low yield coming from an aromatic rice that normally yields much less and has a high market price. In Negros Occidental, results from evaluations by the National Irrigation Administration (NIA) were from 3.97 to 7.7 t/ha, while the NGO BIND had upland SRI yields of 3.3-4.0 t/ha.

In Bohol province, the average for a large number of trials was 5.84 t/ha, while in the Eastern Visayas, the range of SRI results was 4.280-6.16 t/ha. One NGO, ABRAMS, harvested a 7.39 t/ha yield from a 7 ha farm. In Mindanao, one NIA trial produced 8.9 t/ha. The Agricultural Training Institute at Cotobato got 7.6 t/ha in 2001 and had a 12 t/ha average (for three different varieties) in 2002. Its 2003 yields were lower because of weather problems, 7.2-7.6 t/ha, but in 2004, one of its trial plots gave 16 t/ha on an area of 550 m². This avalanche of data showed wide variation, not surprising for an innovation that is biologically-based and biologically-driven.

Taking all of these results together, Obet reported an average of 6.16 t/ha for SRI measures on a total area of 47.7 ha. This compares with a national average of 3.3 t/ha, and 3.5 t/ha for irrigated production. The yield achieved with hybrid rice varieties, using more expensive inputs, is reported by the DA to be 6-7 t/ha. However, a recent survey by the DA's Bureau of Agricultural Statistics of the hybrid rice yields being attained on farmer's fields, across 18 provinces, was considerably lower, <4.5 t/ha.

The government is currently providing a subsidy of 4000-6000 pesos/ha according to one calculation, so this could be counted also as cost of production. SRI is seen by many NGOs as a good alternative, at least a cost-effective one, to the use of hybrid varieties which the Department of Agriculture is promoting. The position which the SRI network (SRI-Pilipinas) has articulated is that Philippine farmers should have alternative ways to increase yield and profitability, not only hybrid rice with its high input requirements which are difficult for smaller and poorer farmers to acquire. The Department of Agriculture has budgeted P525 million (\$10 million) for promotion of hybrid rice this year. The SRI-Pilipinas request was for 10% of this 54 million pesos (\$1 million) to promote SRI island-wide through NGOs and local government bodies, which now have official responsibility for agricultural extension. Even if half this amount gets approved, this could do a lot to spread SRI.

I commented that given the generally tropical and humid climates in the Philippines, so that soil conditions would tend to be anaerobic, I would not expect SRI yields to match those in more temperate areas that have better-drained soils, although a few results in the Philippines have approached the best elsewhere. Shubert from PRRM said that after four seasons of work with SRI in Nueva Ecija, they are seeing that net incomes from SRI can be as much as 9 times higher than with conventional methods. If after getting higher yields from SRI, farmers are diversifying into other crops, in particular, rice-based products that give them greater value-added.

Lourdes from WomenHealth said that she had learned SRI is being introduced on the Ifugao terraces in Northern Luzon, now a "world heritage site" officially recognized by UNESCO. These engineering marvels are world-famous for their beauty as well as ingenuity. However, as rice production has become less and less profitable in the Philippines, farmers have been abandoning these terraces, and they have begun deteriorating for lack of maintenance. Lourdes said that she had not been able to visit the Ifugao SRI trials but had heard that they are doing well. If SRI can make rice-growing profitable again, it can help preserve this cultural treasure.

Later we were joined by Ernesto Ordoñez, a former Undersecretary in the Department of Agriculture, now working with the National Rice Farmers Council, who has become one of the most active proponents for SRI within government circles. We had a good discussion that went

on until midnight, an indication of how much interest and dedication there is among a core group of NGO and farmer supporters of SRI in the Philippines.

Visit to the International Rice Research Institute (IRRI): On Wednesday, March 23, a driver from IRRI picked me up at my hotel and drove me to Los Baños to meet staff there. Despite past efforts to get cooperation in evaluating SRI scientifically, there has been little ‘meeting of minds’ on SRI, as some senior IRRI scientists have been openly attacking SRI, while others have quietly begun giving some support. IRRI’s programs in Laos and Bangladesh have both been supportive of field evaluations since 2002. I was anxious to meet the new Director-General Bob Zeigler, who had just arrived two days earlier to take up his responsibilities.

After a long and substantive lunch-time discussion with Dr. Mahabub Hossain, head of IRRI’s Social Sciences Division, I had an introductory session with Dr. Zeigler, who gave me more than the hour scheduled. He had seen some SRI plots when visiting Madagascar in 1993 and had not been impressed by what he saw. So he acknowledged that his own experience was not favorable. But these were trials being done by government researchers, he recognized. SRI is an agricultural innovation that has usually performed better on farmers’ fields than on research station plots, reversing the usual problem that farmers found it difficult to replicate researchers’ results. At IRRI, the average SRI trial yields have been only 2.1 t/ha, we think because the biota in on-station soils are likely to be less abundant and diverse because of years of monocropping and fertilizer and agrochemical applications. IRRI no longer has any soil biologist or ecologist working at Los Baños, so there is little knowledge of what is going on in its soils.

Dr. Zeigler as a plant pathologist by training is very knowledgeable about such matters and indicated that IRRI is open to beneficial innovations in rice production no matter where they come from, mentioning as one possible source “a Jesuit priest,” courteously referring to Fr. Henri de Laulanié, the developer of SRI in Madagascar. We discussed many technical issues with SRI, and I think he was satisfied that we have been serious in seeking scientific evaluations and explanations, and that a preponderance of evidence is building up confirming the initial SRI results. I left with him a 2-inch thick notebook of evaluations, pictures and newspaper reports, many taken off the Web. The notebook led off with Bangladesh, including an evaluation of SRI done by four organizations with funding from IRRI’s program in that country. There were over 1,200 farmers participating, and even with less than complete adoption of the recommended methods, average yields increased by 26% and profitability by 59% in the two seasons evaluated.

That afternoon, I met also with Dr. Shaobing Peng, senior crop physiologist, and Dr. Ren Wang, deputy director-general of IRRI. These discussions continued into the evening as Dr. Wang had invited me to his home for dinner with Dr. Peng. Because this was Easter week, almost all other IRRI staff were away from Los Baños. But these colleagues and Dr. Hosain were three of the persons I most wanted to bring up to date on SRI as they have been following its progress for several years with constructive interest and useful critical feedback. IRRI provided wonderful hospitality for the visit, including a room overnight in its guest house. This suggested that we can look forward to more cooperative relationships with IRRI in the future. SRI should be accepted, or rejected, based on empirical results, not on preconceptions or antagonisms. The SRI network has never regarded itself as competing with IRRI but rather as a potential partner in advancing rice production and resource productivity.

Report on SRI Results in Eastern Visayas: The next day, Maundy Thursday, an IRRI driver brought me back to Manila where I worked on a report summarizing what is known about SRI from experience around the world. Ernie Ordoñez wanted something like this to use in a meeting set for Monday with the Department of Agriculture's main rice expert, Dr. Frisco Malabanan. Approval of the SRI-Pilipinas funding proposal would probably hinge on Dr. Malabanan's agreement. Then the next morning, I went to Manila airport very early for a 6:50 am departure to return to the U.S. on Good Friday. [I learned later that Dr. Malabanan declined to support any direct support from the DA at national level, but he encouraged groups working with SRI to seek funding at the regional level, with budget meetings occurring in the next few weeks.]

As planned, I met Terry Tucker, associate director of CIIFAD, who was returning from his visit to Leyte State University in the Eastern Visayas, working with colleagues at LSU to wind up a two-year collaborative program that had USAID funding to strengthen knowledge and practice for natural resource management in watersheds in that region. He and I had visited LSU a year previously to introduce SRI to faculty there. They had made it part of their resource management program, given the need to reduce demands on agricultural lands in upland areas and agricultural sector demands for irrigation water.

Terry shared with me a Progress Report on the SRI component of the program's Community-Based Watershed Management Support Project. In June-October 2004, the first 15 farmers did on-farm trials on an area of 2.44 ha. This number expanded to 15.05 ha in 36 on-farm trials in the December-April 2005 season. Average SRI yields the first season were 9.42 t/ha, compared with 7.61 in the control plots with standard methods, a 1.81 t/ha differential. Yields as high as 13.58 and 14 t/ha were achieved on two plots with hybrid varieties NISC 110 and Bigante. The profit margins calculated were 22,945 pesos/ha with SRI vs. 16,680 pesos/ha with standard methods, a difference of 32%. These results are fueling growing interest within the Eastern Visayas region.

Terry was able to visit three SRI farmers, and during our stopover in the Nagoya airport he told me what he had observed and heard. Nito Poloquit, a farmer near the LSU campus in Bay-Bay, reported using previously seedlings 18-21 days old, 5 to 8 per hill, with 18x18 cm spacing. His rice crop easily lodged when heavy rains came. With SRI methods, using single seedlings, 10 days old, spaced 25 x 25 cm, his plants had 35-38 tillers each at 50 days. He had no problem with *kuhol*, the Pilipino name for the Golden Apple Snail that can be a devastating pest for young seedlings, because he managed the *kuhol* by water control and physical removal.

The persons doing the transplanting said that SRI was more laborious for them until they became comfortable with the methods, but there was a significant (80%) saving of seed. The extra weeding with a rotary weeding cost Nito 800 pesos, but offsetting this he saved 2,000-3,000 pesos on seed (a 20-kg bag costs 1,000 pesos) because his seeding rate was cut by 40-60 kg. Also, his labor costs for transplanting were less because fewer plants to be put into the field. With SRI, his yield, calculated at 10% moisture content, was 6.3 t/ha, compared with his previous yield, with higher costs of production, of 4 t/ha.

He used compost with SRI instead of fertilizer and liked this change. He mixes together 12 sacks of chicken manure, 12 sacks of sawdust and 20 sacks of composted rice straw. He traps *kuhol* by

putting a ditch around his field which is kept flooded most of the time. He puts gabi and papaya leaves into the water in the ditch to attract the *kuhol* and then he finds it easy to collect them and feed them to his animals, he said. The ‘bottom line,’ Terry reported, was that Nito now plans to put his whole paddy area under SRI in the next season.

Terry visited a second SRI farmer north of Bay-Bay, Angelino Cano, together with the local director of extension and a staff member. The first season Angelino got a 10.7 t/ha yield with SRI methods on an area of 5 ares, which was much higher than his usual yield of 4 t/ha. He has expanded his SRI area to 75 ares this season, and he now plans to put his whole 1.25 ha under SRI next season. He did not have enough money to fertilize his current crop as much as he wanted to (he is still using chemical fertilizer), so he has lower expectations for it.

Angelino’s neighbors at first thought that he was “crazy.” But after three weeks they began asking him what variety he had used. “They wouldn’t believe it was the same variety as in the adjacent field,” he reported. A neighbor who took up SRI this season by mistake made his ‘rake’ for marking out the plant spacing on his plot too wide – with 30 cm spacing instead of 25 cm. He crop looks even better than Angelino’s, Terry reported.

A third farmer whom Terry visited, Edilberto Magalyano, used a hybrid variety known as Bigante, which grows really tall with SRI practices. It has given a yield as high as 12.5 t/ha in Southern Leyte with conventional methods and high fertilizer application. Edilberto reached 13.58 t/ha with SRI methods using this variety. Using conventional methods with this variety, he got 11.08 t/ha, a difference of 2.5 t/ha.

The local Department of Agriculture staff member with Terry estimated that Edilberto’s yield this season, which will be harvested April 8-10, to be at least 8-10 t/ha. Edilberto used seedlings 14-16 days old. He complained that he has difficulty keeping his field well-drained because it is perennially wet. Still, a yield of 13.58 t/ha is spectacular. He synchronizes his planting with his neighbors to reduce pest pressure. He uses ducks in his field to control *kuhol*. In his area, there are a lot of chicken farms, so dried poultry manure is easily available and costs only 50 pesos for a bag of 50 kg. This has been used for vegetable production, but now is being used also for rice.

Terry said that there are a lot of groups now participating in the SRI evaluation and extension in Leyte and Samar, with a lot of municipality agricultural extension officers getting excited about SRI. The farmer network known as MASIPAG which is strong in Leyte is actively involved, as are a number of NGOs. Now many different groups are contributing to training and extension. A year ago there was little SRI activity in the Eastern Visayas, so we are seeing a tremendous acceleration since last March.

Reflections: In the Philippines there is a less ‘orderly’ process of SRI diffusion underway than in Cambodia. This reflects a greater institutional pluralism in the Philippines and its larger size, which is accentuated by its being an archipelago with many centers of activity. There is a large and effective NGO movement in the Philippines, able to work with government administrative and research institutions. Also, there are farmer NGOs working actively for ‘sustainable agriculture’ and on preservation of rice biodiversity. So SRI can move on many fronts. However, in Cambodia, there is a widely shared sense of urgency to improve rice production, especially in

the face of unfavorable climatic conditions, and thanks to CEDAC leadership, there is coherence in the effort, backed by widespread donor interest.

Each country has approached SRI differently, having its particular needs and its own set of natural and institutional conditions that confer a unique mix of assets and liabilities. It will be interesting to compare where SRI stands in these two countries two years from now. Both are racing forward with SRI. CEDAC has already begun considering what kind of time line could make Cambodia the first 'all-SRI' rice economy. This is harder to imagine in the Philippines.

Farmers in both countries are taking up SRI with enthusiasm and are making important modifications and innovations. Much will depend now on how much support government and donor agencies decide to give to NGO and farmer efforts. In neither country have universities played such a prominent role as in Andhra Pradesh and Tamil Nadu states of India. However, Leyte State University is picking up the pace in the Philippines. The countries are not really competing with each other since the institutions and individuals in both countries are trying to accomplish what will be best for their respective farming communities, especially the more disadvantaged ones.