

REPORT ON SRI VISIT TO PHILIPPINES, March 19-28,2004 - Norman Uphoff, CIIFAD

This trip was undertaken so that I could participate in two workshops being arranged by Leyte State University, under a grant that CIIFAD has from the Association Liaison Office (ALO) in Washington, D.C. to promote inter-university cooperation for development. My program was set up by Roberto (Obet) Verzola, coordinator for the growing *SRI-Pilipinas* network, established by a number of NGOs to evaluate and disseminate SRI under Philippine conditions. These NGOs include Broad Initiatives for Negros Development (BIND), a farmer NGO known as Pabinhi, the Philippine Greens, and the Philippine Rural Reconstruction Movement (PRRM).

National SRI Workshop, March 19

On Friday, a national SRI workshop was hosted by PRRM in Quezon City, with over 70 persons attending from 12 provinces. This was set up with just two weeks' notice. About 25 farmers who are already practicing SRI came to share their experience with the group and learn more about SRI. The rest were NGO leaders and staff, staff from the Department of Agriculture's Bureau of Plant Industry, several nuns and priests, faculty and students from different colleges and universities, journalists, consultants and private sector representatives, one candidate for mayor, and one self-described 'housewife' who had heard about the workshop on the radio and came to learn about SRI so she could share this knowledge with farmers on her home island of Palawan. This cross-section was an impressive representation of 'civil society' in the Philippines, seldom seen elsewhere coming together on such an amicable and intimate basis.

In his opening remarks, the president of PRRM, Wigberto Tañada, introduced me as a *balikbayan*, the Tagalog word used for Filipinos from abroad who are coming home, noting that this was now the third national SRI workshop hosted by PRRM, preceded by workshops in April 2002 and March 2003, with numbers and interest growing each time. I was given an hour and a half to report on SRI experience in other countries and to offer explanations for SRI success based on what we are finding in the scientific literature or on original research. These can account for how SRI methods produce, counterintuitively, more from less:

- why smaller, younger seedlings become larger, more productive plants;
- why fewer plants per hill and per square meter give higher yield when grown under SRI conditions;
- why applying less water to rice fields results in higher production; and
- why using fewer or no chemical fertilizers and agrochemicals leads to greater output.

There are good reasons for each of these 'anomalous' relationships, which I won't elaborate here. In brief, the explanations include the fact that SRI root systems growing in aerated soil do not degenerate, as happens in continuously flooded fields, and are much larger and function longer and better. Soils that are aerated and well supplied with organic matter can support larger, more diverse populations of soil organisms, including both aerobic and anaerobic microorganisms. The application of various fertilizers and other agrochemicals has inhibiting effects on such populations of soil biota.

The book I was reading during my flight to Manila, *Phytohormones in Soils* by Frankenberger and Arshad (1995), explains, for example how phytohormones produced by bacteria and fungi living in the soil and roots promote root growth and the health of plants. Plants grow in soils

that are continuously flooded lose the benefit of hormones such as auxins and cytokinins otherwise provided by aerobic bacteria and fungi to stimulate larger roots, which in turn provide more exudates, particularly carbohydrates, that give these organisms energy. The scientific foundations for SRI are becoming stronger month by month, and workshop participants were interested to know about them.

The first comment from the floor was from a farmer who said that farmers in the Philippines are "losing confidence in rice production as a source of livelihood." He said that SRI may give them hope again. "Let's not worry about the possibility of getting super-yields of 20 t/ha; let's just make sure we get 10 t/ha." He said it was good to stress the importance of ecological balance in the soils. "In the Philippines, the sale of fertilizers, pesticides and hybrid seeds has become a big business." They will surely challenge SRI, but "we are not afraid of them." I commented that because the advantages of SRI methods are so great and evident by now, we can use the language of U.S. president George Bush and his challenger, Sen. John Kerry: "Bring it on." I said that the attacks on SRI are just now starting to appear in the scientific literature, holding up the page proofs of an article to appear soon in *Field Crops Research*.

Although it claims to be a scientific refutation of SRI, the article is not based on any systematic empirical data that fairly test SRI concepts. Instead a priori arguments and modeling are presented to support the assertion that the top yields reported with SRI are impossible. All of the article's objections can be countered, however, by data from replicated trials or from what is already accepted in the scientific literature. Until now, SRI has been ignored, not taken seriously by most mainstream agricultural interests. Now that SRI is gaining prominence and momentum, we can expect more controversy. We should respond by calling attention to solid field results and to uncontestable scientific evidence and principles, offering to resolve any disagreements by empirical testing. When SRI methods have been used properly, they have shown their superiority 90- 95% of the time. With biological phenomena, nothing comes out the same way 100% of the time. A feature article on SRI scheduled to appear in the March 25 issue of *Nature*, one of the world's leading scientific journals, may help to satisfy some of the skeptics.

Ernie Ordoñez, a former undersecretary of the Department of Agriculture and before that in the Department of Trade and Industry, spoke next, saying that SRI, which he had learned about before the workshop, offers great possibilities for the Philippines. However, most of the Department of Agriculture's resources and extension efforts are currently going into promoting the adoption of hybrid varieties. While these can confer some agronomic benefits, they entail high cost for farmers, and farmers become dependent upon seed supply because they cannot replant hybrid seeds without a loss of hybrid vigor. He noted with regret that a seminar that I was scheduled to give the following Tuesday at the Department of Agriculture's Bureau of Agricultural Research (BAR) to introduce SRI to DA researchers had been summarily cancelled the day before. He said that he would try to get it reinstated. He said that an Assistant Secretary of Agriculture, when informed of the cancellation, had told him it was unfortunate.

A farmer from Pangasinan asked about the application of organic fertilizer: how much is needed? I said that the very highest SRI yields, as high as 21 t/ha, have come with very high and continued application of good-quality compost over a number of years, in this case at a rate of about 40 t/ha. This is a very high rate, but the very yield obtained (after 6 years of SRI

cultivation) more than repaid the effort. On the other hand, we have found that even small amounts of compost can give good results. Replicated trials in Madagascar have shown that 1-2 t/ha of compost when used with SRI methods can give yields 80-90% as high as with applications of 4-8 t/ha of compost. It appears that even a small amount can 'incite' or 'catalyze' biological processes in the soil that support rice growth. We do not want to make any specific recommendations but rather indicate a range of possibilities which farmers should evaluate and can decide on for themselves, considering their production needs, their soil status, labor availability, etc. Smaller farmers who have need to get the highest production from their small amounts of land are in a better position, and have more motivation, to apply large quantities.

The housewife spoke next, saying there was a real 'thirst' in the Philippines for this kind of technology (using a word that we do not). She said that in Palawan, they use very traditional methods, and there are no agricultural technicians to visit farmers, "even though we pay taxes too." She had thought that only imported GMOs (about which there is currently much controversy in the Philippines) could help them, but hearing about SRI she is very hopeful.

A farmer who used organic fertilizer next offered his suggestions about use of chicken manure and other materials, sparking off a lively discussion about use of different kinds and amounts of organic sources, with suggestions made in Tagalog that I could not follow.

The next question was whether SRI is compatible with hybrid rice. The Philippine government has made a decision to devote a large share of its agricultural budget to promotion of hybrids, and this is now controversial, especially among persons in the sustainable agriculture movement which is growing in the country. I explained that Prof. Yuan Longping, 'the father of hybrid rice' in China, has himself evaluated SRI methods and found that they can add 1-3 t/ha to the already higher yield of his varieties. He has been the most important supporter of SRI use in China. We find the two approaches to raising yield compatible, and the much lower seeding rate with SRI greatly reduces the cost for farmers of using hybrid seed, which is a major stumbling block for its adoption. At the same time, farmers with SRI methods can often get yields comparable to those they would get with hybrid seed but using whatever varieties they currently plant, not needing to purchase new seeds, and with fewer costly inputs. SRI is thus an option to use of hybrid seeds.

A farmer said that he supported what had been said about this "Madagascar technology." He had himself tried single seedlings, spaced 25x25 cm, but in a small area, only about 1,000 seeds. He didn't have exact yield results to report but said that the performance was good. He advised others to use their rice straw as compost or mulch. "We should return everything to the soil, not burning straw." He described how a mixture of manure with rice hulls enabled him to get 40 cavans from one-quarter hectare, which would be an 8 ton yield.

Many participants were interested in this matter of how best to improve soil fertility. One farmer told how he had been getting a yield of 70-80 cavans (3.5-4 tons), and when he stopped using chemical fertilizer, his yield dropped, as often happens when soil has had continuous applications of fertilizer for some time. But he kept on putting straw back into the soil, and within three years he was back to 80-cavan yields. "Don't be in a hurry," he advised. "Once you have made the transition, your farming will become much better. If you can't afford to do this all at once, don't start with the whole field, but just on a portion and expand it year by year."

Next, Ms. Maria Lourdes (Malou) Edaña, assistant professor from the Agronomy Department at the University of the Philippines, Los Baños, reported on dissertation research on SRI done by a UPLB student, Oswald Marbun, who could not be present. This research was done in 2001 comparing three systems of cultivation: conventional management, SRI, and the Masipag system promoted by a farmer NGO. Unfortunately, the SRI spacings he used were 20x20 cm (too close in our experience) and 40x40 and 50x50 cm, which is too wide for best results with SRI methods until soil quality has been built up. He used neither 25x25 nor 30x30 cm which we recommend as the starting distances. The Masipag spacing was 10x40 cm; conventional was 20x20 cm.

SRI methods gave a significant gain in number of tillers per plant and grain yield, but the sparse spacing was not, in my view, a good test of SRI, and gave only a 3 t/ha yield. Also, this was an on-station result, and we often find that yields from such trails, because of soil conditions, are lower than those obtained with SRI methods on farmers' fields. Marbun's results at the UPLB station in Los Baños were surpassed by the 5 t/ha yield on farmers' fields in Laguna that he reported from a second set of SRI trials reported in his thesis, and by the 8 t/ha obtained with SRI methods in subsequent UPLB student research.

Next, Rene Jaranilla, a farmer from Guimaras in the Western Visayas and a member of the Pabinhi board of directors, gave a powerpoint presentation on his experience with SRI. He started with a picture of some of his SRI plants, a traditional variety, towering over his head, 6 feet tall. He used only 6-8 kg of seed/ha, and 8-day seedlings. He showed pictures of how the seedlings were removed carefully from the nursery on pans, inserting the words "with tender, loving care, to avoid damage to the roots" into his Tagalog narrative. Seedlings were laid gently into the ground to keep the root horizontal, not with tip inverted upward. "The root should be like an L, not a J," he said, using one of the expressions found in many of our SRI manuals. He tried 25x25, 30x30 and 40x40 cm spacings, and found that 30x30 cm gave best results. He started weeding with a rotary weeder at 10 days after transplanting, "to oxygenate the roots of the plants," he explained, then doing 3 more weedings, until the canopy closed.

His pictures were graphic and beautiful and the explanation was clear. He included a case study of a neighboring farmer, Dionito Eñano, who had used 11 varieties and staggered planting to optimize labor demands. He had undertaken soil improvement using ash and charcoal, peanut shells and coffee hulls, cow and carabao manure, and rice straw. To facilitate the movement of seedlings to the field for planting without root damage, Dionito used container lids and metal basins, shown in a slide.

Rene reported that his yield with SRI methods was 4.1 t/ha compared with 1.8 t/ha using conventional methods and chemical inputs. He presented detailed figures on costs of production: 12,310 pesos/ha with conventional methods, and 7,510 pesos/ha with SRI. The gross income from conventional production was 9,000 pesos/ha and from SRI, 17,400 pesos/ha. So his net income from conventional methods was a loss of 3,310 pesos/ha, while with SRI he had a profit of 9,890 pesos/ha. He added that these figures were from 2002. In 2003, his SRI yield was higher -- 7 t/ha -- so his profit was now much higher, though he couldn't give us exact figures. However, with 70% more output per hectare, his profit could have even doubled because there would have been a less than proportional rise in his costs of production.

Rene provided detailed data from each of the 28 *kahons* (parcels) that made up his rice farm: on area, the variety planted, dates of planting and harvesting, and yield. His closing slides echoed the theme of my earlier presentation:

Natural Law of Parsimony -- a qualitative maximum from a quantitative minimum: Less = More

Minimum No. of Days after Germination \Rightarrow Maximum of Vitality and of Stalks

Minimum Use of Water \Rightarrow Maximum of Root Oxygenation

Minimum No. of Seed \Rightarrow Maximum of Light and Vital Space

Minimum No. of Weeds \Rightarrow Maximum Nourishment for Rice

Clearly Rene had read carefully our papers on SRI 'theory.' Here he was presenting it to the group in his own words, with impressive productivity and profitability gains to back them up. Hearing a rice farmer who has only 1.5 acres of his own land to cultivate presenting SRI so clearly and persuasively, with both humor and quantification, was quite inspiring. If farmers everywhere in the Philippines could hear Rene present his experience and ideas, SRI would surely spread rapidly. (He gave me his powerpoint presentation to make available upon request.)

Next, Dobeck Mulu, who had recently completed her master's degree in agronomy at the University of the Philippines, Los Baños (UPLB) reported on her thesis research, on Effect of Seedling Age, Spacing and Season on Phyllochrons, Yield and Components of Yield with SRI. It had been supervised by Prof. Oscar Zamora, who had sponsored my talks on SRI at UPLB in February 1999 and again last year. Fortunately, we were holding the workshop before Mulu returned to her home in Ethiopia so we could hear the results of her research on how the length of phyllochron varies according to seedling age and spacing. Phyllochrons are periods during with one or more leaves, together with stalks and roots, emerge in a physiologically regular and mathematically interesting pattern of plan growth.

This particular research has not been done before as far as I know. Mulu considered the influences of both season (wet vs. dry season 2003) and variety (local vs. improved -- specifically, Elon-Elon vs. PSBRc-82) on phyllochron length, tillering, yield, etc. The ages of seedlings evaluated were 8, 15, 20 or 25 days, with 8 and 15 being ages preceding the plants entering its fourth phyllochron of growth. The spacing effects considered were for 20x20, 30x30 and 45x45 cm, with 20x20 cm spacing being closer than recommended with SRI and thus a baseline distance. Mulu's data confirmed much of what we already understand about the effects of seedling age and spacing, but they showed the relationships with a specificity and regularity that has not been known before.

The length of phyllochrons was seen to be definitely shorter for younger plants, 8 days and 15 day days old, than for 20-day or 25-day plants, and shorter in the wet season than in the dry season (Table 1). Mulu noted that the dry season in 2003 was a very water-stressed one, however, the relationship observed would probably hold for a more normal dry season. Table 2 shows that phyllochrons are somewhat shorter for the improved variety (PSBRc-82) than the traditional one (Elon-Elon) in both seasons.

Table 1. Length of phyllochron (days) according to age of seedlings and season

Season	8 days	15 days	20 days	25 days
Dry season	5.3	4.9	6.0	6.5
Wet season	4.7	4.5	5.6	6.2

Table 2. Length of phyllochron (days) according to variety and season

Season	Elon-Elon	PSBR 82
Dry season	5.7	5.5
Wet season	5.5	5.1

Both varieties of rice had more tillering and grain filling when seedlings had been transplanted at 8 days or 15 days, with little difference between these two ages in most comparisons (Tables 3 and 4).

Table 3. Number of tillers per hill according to age of seedling and variety by season

	Season	8 days	15 days	20 days	25 days
Elon-Elon	Dry season	30.5	30.1	29.6	16.6
	Wet season	68.0	68.6	40.4	38.0
PSBRc-82	Dry season	27.0	22.2	21.6	18.2
	Wet season	53.6	49.7	42.4	35.6

Table 4. Filled spikelets (number) according to age of seedling and season

	Season	8 days	15 days	20 days	25 days
Elon-Elon	Dry season	265.7	234.9	233.5	212.9
	Wet season	290.8	288.3	263.4	249.2
PSBR 82	Dry season	98.8	112.8	99.9	94.3
	Wet season	109.2	108.9	107.3	102.4

Then, as seen from Table 5 below, grain weight per panicle and per hectare were higher for 8 or 15-day seedlings than for 20 or 25-day seedlings. Plants from younger vs. older seedlings yielded 4.0 vs. 3.4 grams per panicle, and 5.9 vs. 4.5 tons per hectare, about one-third more.

Table 5. Grain weight per panicle (grams) and yield (t/ha) according to age of seedling and season

	Season	8 days	15 days	20 days	25 days
Grain weight	Dry season	4.0	3.7	3.7	3.4
	Wet season	4.1	4.2	3.5	3.1
Yield	Dry season	3.9	3.8	3.6	2.5
	Wet season	7.8	8.1	6.1	5.9

With regard to spacing, wider distances between plants shortened the length of phyllochrons. As seen in Table 6, there was little difference between 30x30 and 45x45 cm spacing, but close spacing, 20x20 cm, lengthened phyllochrons by 13-17%.

Table 6. Length of phyllochron (days) according to spacing and season

Season	20x20 cm	30x30 cm	45x45 cm
Dry season	6.1	5.5	5.4
Wet season	5.6	4.9	4.8

There was a definite varietal difference in the plants' response to wider spacing. The traditional variety, Elon-Elon, increased its tillering by 83% when spaced 45x45 cm vs. 20x 20 cm, while the improved variety, PBSR 82, had only 45% more tillers at the wider spacing (see Table 7).

Table 7. Tillers per hill according to according to spacing and variety, in wet season

Variety	20x20 cm	30x30 cm	45x45 cm
Elon-Elon	16.2	28.6	29.7
PBSR 82	16.0	21.8	23.3

Filled spikelets went up 20% in the dry season with wider spacing (in a water-stressed season) and 32% in the wet season (Table 8). This is consistent with what we have often observed with SRI, that with the root systems functioning better there can be both more tillers per plant (per hill) and larger panicle size (i.e., filled spikelets), which contributed to higher yield.

Table 8. Filled spikelets (number of grains) according to spacing and season

Season	20x20 cm	30x30 cm	45x45 cm
Dry season	146.6	174.5	176.7
Wet season	178.7	217.0	234.1

The ultimate effect is to have higher grain weight and higher yield, as seen in Table 9. The increases, combining wet and dry seasons, were, respectively, 27% and 61%. No single study of SRI will prove or disprove its merits since specific numbers will always vary according to soil, climate, variety, etc., as well as how adeptly and fully the practices are used. But Mulu's results are consistent with both on-farm and experimental observations. They add to our understanding of the contingent physiological interactions that contribute to higher SRI performance.

Table 9. Grain weight (grams) and yield (t/ha) according to spacing and season

		20x20 cm	30x30cm	45x45cm
Grain weight	Dry season	3.0	3.4	3.6
	Wet season	3.6	4.6	4.8
Yield	Dry season	2.8	3.9	4.4
	Wet season	4.5	6.1	7.3

When Mulu finished, an open forum began. The first to speak was Manny Lahoz, who said that he had been detained during the Marcos repression and then lived in the U.S. for 20 years after his release. "I joined the rat race over there," he said in English. After two decades, he decided to return to the Philippines because he didn't want to retire in the U.S. When he tried to persuade his wife and youngest child to relocate in 2001, they asked: "What will you do?" "Go back to farming," he responded, to which they replied: "But you don't know anything about farming." Shortly after returning, he happened to meet Obet and learned about SRI from a leaflet and then learned more about it from the CIIFAD website on SRI.

His family farm had been neglected for years, so it took a lot of effort to rehabilitate it. Farmers living around him were observing him and asking, what is this guy doing here? "I was perceived like a fool. Everything I did was contrary, almost the opposite, to their own practices: one seedling per hill, tiny seedlings, wide spacing, etc." The laborers he hired didn't like to transplant in the SRI method. "Only one?" they asked. Planting in a square they also didn't like. "I had to pay extra," he said. "They were laughing at me. They could not believe what I was doing."

"But then when the SRI plants started to grow, and produced many more tillers, they became more respectful. And when harvest time came, I had 20 sacks more grain from my half hectare than if I had used conventional means. The other farmers didn't want to believe that this was just due to SRI, however. They said it was 'just luck.' But now that I am in my third cycle, they see that it is more than a matter of luck."

Manny said that the second time he used SRI, it did not perform as well because of a virus attack. The panicles did not fill. He had unfortunately planted a variety that is susceptible to virus. "Others' crops failed too." Last year, he expanded his SRI with the help of his friends. They are collecting rice varieties, particularly native cultivars, and have 500 now, which are available to anyone. He uses both SRI and Masipag methods (the latter method spaces plants 10x40 cm, and aligns the rows east-to-west for best sunlight exposure). He also does some direct seeding. "I have seen for myself that SRI works," he concluded.

The vice-chairman of Pabinhi spoke next, saying that he is also president of a local farmer federation. Formerly he was a chemical farmer, before he found out about organic methods. As pests increased and more chemicals were used, his harvest went down, and he could see that his soil was "getting hardened." He attended a seminar where scientists explained about soil health, and he stopped using chemicals abruptly. His harvest dropped from 80 cavans to 30 the first year. But by the third year, he was back to 80 cavans, and with much less cost of production.

He is now using SRI methods and finds that using one seedling gives more tillering, 60-75 per hill, than using many plants together. Sometimes with chemical methods before he would get no harvest at all because of bad seed or pest attacks. With organic methods the lowest that he has gotten is 35 cavans. When he learned about SRI, from a leaflet from Obet, he got 90 cavans per hectare with SRI, and then up to 130 cavans using the same variety as before. He manages weeds and snails in his field by flooding at particular times. People were amazed to see that he could have no weeds without doing hand weeding. "From what I have heard now from Norman, it is possible to raise my yield still more. This is a challenge to me," he said in closing.

There ensued a long discussion on control of snails, probably the most tangible obstacle to the adoption of SRI in the Philippines, as very young seedlings are easily eaten by the golden apple snail (*kuhol*), an endemic pest. Some farmers at the workshop considered snails a serious barrier to the spread of SRI, while others said that this pest could be controlled by various means: controlled flooding, spreading rice husks on the field, keeping ducks in the field, screening the field's irrigation inflows and outflows, hiring children to remove them, etc.

I suggested that SRI farmers get together to share their methods and to evaluate the effectiveness of these to be able to recommend various practices that can be reasonably effective against this pest. (A successful SRI farmer whom I visited five days later in Bohol smiled when I asked him why he did not remove the many clusters of snail eggs that I saw on his rice plants; snails are no problem, he said -- when the eggs hatch, he collects the snails and feeds them to his ducks, so they have value to him.)

After a lunch break, participants divided into three geographic groups to discuss plans for activities in different regions on behalf of SRI. The group from north of Manila suggested:

1. Get government to adopt SRI as part of a national program.
2. Organize ourselves to promote and advocate SRI, including farmer associations.
3. Provide and disseminate information through the media: press, radio and television.
4. Organize and conduct seminars and training around the region.
5. Connect SRI with the growing movement for organic agriculture.

Participants south of Manila proposed:

1. Organize farmers and advocates for SRI on a regional and a national basis
2. Share experience with SRI among farmers and organizations, spreading this to remote areas.
3. Evaluate the responsiveness of different varieties, local and improved, to SRI practices.
4. Use media to popularize SRI and develop educational materials.
5. Organize cross-visits among farmers doing SRI so they can learn from each other and so new farmers can see SRI for themselves.
6. Link SRI to the fight against poverty.

Those coming from the Visayas and Mindanao suggested:

1. Disseminate information after the workshops planned in the region (one had been set up in northern Mindanao on Saturday and another in the Visayas the following Thursday).
2. Help NGOs and others working on SRI to begin cooperating, because they are fragmented, especially on Mindanao.
3. Provide materials in local languages, although for Visayas and Mindanao, English is better than Tagalog.
4. Make SRI available as an alternative to hybrid rice, because of its economic benefits and it lessens farmers' seed dependency.
5. Support more exchanges among farmers.
6. Document and disseminate innovations being made in SRI, how the principles are being applied in different ways.

Obet discussed how people can get SRI brochures, in several languages, for just 20 pesos. I suggested in closing that they do more systematic evaluations of the economics of using SRI here in the Philippines. Yield is simple and impressive to talk about, but what really counts is the productivity of the resources used in production: land, labor, water and capital. Data on increases in resource productivity and on profitability will be most impressive for policy-makers as well as for farmers. I also commented that attention be paid to varietal differences in response to SRI. Farmers should always know and have access to the best genetic material for their own farm. To use less than the most appropriate planting material means that they will get less return from the other resources they invest in rice production. I also endorsed the idea of farmer-exchanges, because 'seeing is believing,' and systematically disseminating innovations, because SRI is still evolving and we expect it to change and improve as farmers get more experience with it.

Ernie Ordoñez got up and said that farmers have a right to expect that the government will help with the dissemination of SRI, since it is 'our taxes' that are being spent by the Department of Agriculture. He announced that the DA's Bureau of Agricultural Research had agreed to reinstate the SRI seminar previously scheduled for Tuesday morning, and then cancelled. He spoke also about a new organization, The Rice Farmers' Council of the Philippines, which he is working with, and said that it could help to spread SRI.

Sister Aida, who works with farmers on sustainable agriculture as her mission, and who had attended the two previous national workshops, gave a 'vote of thanks' on behalf of workshop participants. Wigberto Tañada as chair commented on how the participation and substance of the three workshops had improved each time, and presented me with a beautiful straw peasant hat brought from northern Luzon. Leopoldo Guilaran, chairman of the farmer organization Pabinhi, was then asked to give the closing remarks.

Leopoldo introduced himself as a farmer in Negros who started organic gardening of vegetables in 1987 but continued using pesticides with his rice production until 1991, when he joined the farmer organization Masipag. (He subsequently served as its president.) After attending a seminar on organic rice farming, he started a sustainable agriculture program in Negros, working with Fr. Brian Gore (who was attending the workshop; at lunch I had talked with Fr. Gore, who is from Australia but has lived in the Philippines for many years, including three years in prison during the Marcos years on bogus charges, because he was working with progressive farmers.)

We need to sustain our land, Leopoldo said, and to have ownership over our land and our seeds. When he shifted to organic farming, he felt free for the first time, with no need to borrow money and able to have control over his own resources. He said that farmers should never say they are "just farmers. We are conditioned to think we don't have a chance to improve our lives because we are 'just farmers'. With these new methods we can have a new freedom, and we are technologically empowered by this new thinking." He added, "However, we could make more progress if this initiative were supported by the government."

He said he he has been a farmer-breeder for many years. He has bred 60 varieties and gives them away as a service to other farmers. The Cambodian government has even sent farmers to his farm to learn his methods. He said to the farmers in attendance, "We should 'demystify' science

and do our own breeding, teaching techniques to others." I could see why his remarks had been saved for the valedictory.

He concluded by saying that although farmers are already doing better with their new spirit of independence, SRI is showing them that there are still things to learn. He has been averaging 3 t/ha increase with SRI, but "even 1 t/ha increase will make us self-sufficient." SRI is now a big component in Pabinhi's sustainable agriculture program. "We have seen that it will be useful to farmers. So let's all work with farmer groups." Such closing remarks reflected the kind of civil-society orientation that has taken root in the Philippines since the Marcos years. These comments might make some researchers uncomfortable, but not the ones who came to the workshop, where participatory approaches were strongly supported by a wide variety of persons coming from government, academia, NGOs and farming communities.

Mindanao Visit, March 20

Next morning, Obet, Leopoldo and I took the 9:30 flight from Manila to Cagayan de Oro in northern Mindanao. We were met by Vic Tagupa, head of the Sustainable Agriculture Center at Xavier University. Plans for a regional workshop had only been finalized the previous Monday, but over 100 persons turned out, from all over Mindanao, for a workshop starting at 1:30. This Saturday was graduation day for Xavier University, so Vic had had to get special dispensation from the President to hold this event and skip the graduation ceremonies himself.

Before the program started, I was introduced to Noe Ysulat, supervisor for Agricultural Training Institute (ATI) center of the Department of Agriculture at Cotabato in southern Mindanao. In 2001, the then-director of ATI, Dr. Edwin Acoba, suggested that all training centers give SRI a try. Noe was the only one to take it seriously. He got 7.2 t/ha yield the first season, and 7.6 t/ha the next, about double the usual yields in the area. The third season, the summer season of 2002, he tried three modern varieties and got an average yield of 12 t/ha. He calculated the cost of production as 25,000 pesos/ha against a revenue of 96,000 pesos/ha, almost a 4:1 return.

Noe's data were a strong counterweight to the first results that IRRI got from its SRI trials at Los Baños in 2002: 1.44 t/ha and 3.0 t/ha. He showed that much better SRI results could be gotten in the Philippines, by a neutral institution, than on the IRRI plots. Unfortunately, Dr. Acoba died in 2003, before he could launch an ambitious SRI program within ATI as he had planned, which would have been based on Noe's experience and example.

Rebecca Cagamat, chairman of the Northern Mindanao Consortium for Agricultural Resources, Research and Development, gave the opening remarks. She commented on the lack of research to support organic agricultural production, especially for rice, and spoke about the problems that rice farmers are presently facing in the region. Then the regional supervisor for the ATI center in Cagayan de Oro, Leonardo Madumma, spoke, referring to a system of Total Quality and Productivity Management (TQPM) for rice that he had developed 13 years ago with many similarities to SRI. It could double yield, from 75 to 150 cavans per hectare, he said, adding an acerbic comment that "foreign knowledge is easier to spread in the Philippines." This seemed to be a jab at SRI and it probably was, since he left halfway through my presentation, perhaps being unhappy that SRI was getting more attention than his TQPM had been able to attract. I think this is not because of its 'foreign origin,' however, but because of farmers' results.

After my presentation, a farmer who had attended the workshop in Quezon City spoke, saying that he had applied SRI methods on his farm and had observed very good improvement. It was difficult because to get the full effect from SRI because a lot of chemicals are being used in his area, and he has had problems with golden snails when he used very young seedlings. Another farmer said that he has had problems with cricket damage. What to do about that?

I said that pest control is essential, of course, and there may be some farms where SRI cannot be used because of pest problems. I recounted, however, that several newly-planted SRI fields in Madagascar that had been eaten completely by locusts during the periodic outbreaks of this terrible pest had regrown from the surviving root systems to give normal crops eventually. We need to deal with whatever pest problems arise through farmer experimentation and sharing of experience and remedies. A number of Philippine farmers think that they can cope with golden snail by various management practices.

A staff member from the Department of Agrarian Reform said that it is working with Central Mindanao University in three municipalities, using no sprays and wider spacing (25x25 cm or more), with water control (partly to control golden snails), and applying organic materials. They were getting 6-8 t/ha yields, up 1-2 t/ha over usual yields. Usually farmers plant 6-8 seedlings per hill, and resist reducing this to even 2-3 plants per hill. They also resist planting in a square pattern using strings. They also don't believe in using organic fertilizer, preferring to use chemical fertilizer from a bag. So some of the practices for SRI are not easily accepted by farmers in the region, he said. It will take some special efforts and good strategy to persuade them to try SRI.

A fourth speaker said it was "an accident" that he and others from the Brotherhood of Christian Businessmen were there. But they were requested by their bishop to attend, as he knew they were interested in "natural farming." He asked how to get access to more information on SRI, and I gave everyone the SRI web homepage (<http://ciifad.cornell.edu/sri/>). He said that they are already using microorganism soil amendments for their horticultural production.

A faculty member from the Capital University said they had tried sustainable or organic agriculture for six years now. The first three years had not given good results, but now they are doing well. With organic methods, "Don't expect to get rich immediately," was his advice. I commented, however, that with SRI, we usually see increased yields starting the first year.

Someone who described himself as a 'real farmer' said that he had gotten some training on SRI only last September. He had observed from his own trials how single seedlings can give much more tillering. His SRI plants have reached 62-67 tillers per plant (per hill). However, once the plants flowered, they could not escape the effects of blackbugs and rice bugs. Therefore, he got only a small harvest. But other SRI trials 3 km away were just harvested last month, with 17 varieties giving the same vigorous tillering response. They had long, heavy panicles, so there was a good harvest. He did not have exact figures, but said the results were very encouraging.

Nicasio Engallado, who introduced himself as the first farmer in Mindanao to use SRI, suggested that golden snail can be controlled by water management methods and described what he does.

He advocated integrating SRI into whole farming systems and said he is now promoting "SRII" meaning "SRI integration."

Another farmer said that he had SRI experience over three cropping seasons and had observed positive impacts in tillering and also in the root system. Unfortunately, the crop often became infected with tungro virus and was set back. This is not unique to SRI rice, he said. But he and others are now experimenting with direct-seeded rice as this seems less easily affected by the virus (for some reason). They will try to adapt SRI to direct seeding.

The first farmer who had spoken got up again to say that he had started SRI in 2002. One reason he got higher yield was that he did careful land preparation. He was impressed that when using wider spacing and younger seedlings, he did not see any yellowing of the plants after they were transplanted. He understood that with a good root system it is possible to get more tillering and higher yield. Stalks are stronger, all spikelets get filled, and the panicles are heavier. He encouraged others to experiment with different spacings to see what works best for their soil conditions. A good root system is essential for the plant to get more nutrients, he said. Compost of course helps. "Use your rice straw. Let it decompose. There should be no burning."

Someone proposed that they should convene a symposium on SRI every 3-4 months to share information, with an annual SRI conference for the region. Rebecca Cagamat said that the Northern Mindanao Consortium would help with dissemination of SRI information. Someone from the Philippines Watershed Management Coalition said that it could help to establish SRI linkages because resource-conserving methods were within its mandate.

Leopoldo was then asked to comment, as chair of Pabinhi. He said that when he had tested SRI himself, he had gotten even higher yield with these methods than with the Masipag system. He briefly described his own work on rice breeding and said that his varieties grown with SRI have more potential than HYVs used with conventional methods. Even in his breeding work, he is now using SRI practices to grow the seedlings, appreciating for example the capacity for biological nitrogen fixation. He said that he has had panicles with 400 grains, concluding with the statement: "We farmers should be scientists too."

Vic as convenor of the symposium described how SRI can be advanced through parallel efforts within the scientific community, to advance formal knowledge, and within the farming community "at the grassroots," to improve and spread practice. The meeting adjourned about 5:30, with a lot of camaraderie. Xavier University provided a very good venue for this event, but it was good to see other institutions, including Central Mindanao University and ATI, willing to give support.

That evening, there was a graduation ceremony for farmers who had attended a short course put on by the Sustainable Agriculture Center. When the karaoke singing began after dinner, Obet and I went upstairs to talk with Nicasio. I was interested to hear more from the first SRI farmer in Mindanao. He said that he had had no particular difficulties adopting SRI once he learned about it from Obet, Vic and Masipag. At first his neighbors had thought that he was a 'madman.' But once they saw his resulting crop, there were no more insults.

Nicasio gave me a copy of a paper that he had written with Vic Tagupa and two others evaluating his SRI trials during the 2002 wet and dry seasons. They tested several different ways of supplementing crop nutrients on 100 m² plots:

- Organic fertilizer (OF) -- application 40 kg of natural compost made from different kinds of farm wastes, decomposed 4-5 months, and applied 10 and 30 DAT;
- Organic liquid fertilizer (OLF) -- a decoction prepared from seaweed and sprayed on the plants 10 and 30 DAT;
- Azolla (A) -- spreading inoculum on the field 10 DAT; and
- Ducks (D) -- maintaining these (15-20) on the field from 10 DAT, assuming that they add some manure to the soil while controlling insect populations.

A fifth source of nutrients, Fish, was also evaluated as tilapia were maintained on all of the plots, together with the other methods, or by themselves as a control, from 10 DAT.

This was a very ambitious and systematic evaluation because it tested these five treatments with four different Masipag varieties: Matatag 3, UL 11, M69, and V 10. The data collected from each plot, on a sampling basis, were: number of tillers, number of productive tillers, plant height, panicle length, weight of 1000 grains, grains per panicle, and days to maturity, as well as yield.

The paper said that they kept no standing water on the plots, but it was not clear how then they maintained fish on such fields. Quite possibly the soil was less aerobic than desirable. Also, since no pest control measures were undertaken (apart from the ducks on one plot), there was no weeding done which can aerate the soil and promote microbial activity. Thus the soil conditions may have been suboptimal from an SRI point of view.

As in Mulu's data, crop performance was usually better in the wet season than in the dry season. There were varietal differences in response, but these were not consistent between seasons; some did better in the wet season and others in the dry season. The highest yield was 6 t/ha in the wet season with V10, using organic liquid fertilizer with fish, an increase of 1.6 t/ha over fish alone. The average yield for all trials was 3.6 t/ha, however, higher than the average for the area, with much lower cost of production and thus higher profit, but this is lower than we see with SRI methods elsewhere. It would be interesting to see some evaluation of soil microbial populations with these treatments and to compare them with plots having more soil aeration through mechanical weeding and different water management methods.

That evening we also spoke at more length that evening with Noe, the ATI supervisor from Cotabato, to learn more about his work with SRI. His own personal experiences, he told us, had made him very committed to understanding and promoting it.

The next morning, Sunday, after breakfast, Obet, Leopoldo and I flew back to Manila, where we were met at the airport by a driver from PhilRice, the Philippine Rice Research Institute in Nueva Ecija. We picked up Lucy Fisher, CIIFAD's outreach coordinator, at a nearby hotel, so she could accompany us, having arrived in the Philippines the night before to visit Leyte State University later in the week. Lucy manages the SRI homepage on the internet and wanted to interact with various SRI partners to get a better idea of their information needs.

Before leaving Manila, we spent an hour at the broadcast studio of Radio Veritas for a talk-show program moderated by Fr. Robert Reyes, an activist priest who has become interested in sustainable agriculture. He interviewed us about SRI and took a number of calls from listeners, with the hour on air passing quickly. We got to PhilRice's headquarters in Muñoz that evening a little before 8.

PhilRice and Central Luzon State University, March 22

After breakfast in the PhilRice cafeteria, we met with Dr. Leo Sebastian, PhilRice Director (and a Cornell alumnus), whom I had recently seen again at the international conference on rice at FAO headquarters in Rome, which he chaired. He welcomed us but could not attend our seminar in the afternoon because he had to leave for a meeting with the Secretary of Agriculture in Ilo-Ilo. He assured us that PhilRice is now interested in SRI, having seen some good results with it, though more from some of the farmers working with NGOs that are cooperating with PhilRice than from its own SRI trial plots.

I had seen these plots myself during an early morning walk around the experiment station and had noted that they were not looking very promising. It is often the case that SRI methods perform better on farmers' fields than in on-station evaluations. We think this is because there are different soil microbiological populations in experiment station soils, and somewhat depressed levels of biological activity, due to monocropping and the continuous use of chemicals. This hypothesis remains to be evaluated systematically, however. (At the national SRI workshop in Bangladesh in December, participants polarized in their assessment of SRI between researchers, who were mostly unpersuaded, and farmers and extension personnel who strongly approved of SRI.)

When we got to Central Luzon State University (CLSU) shortly after 9, we were met by the Director of the Institute of Graduate Studies, Dr. Cynthia Divina, and she introduced us to the Dean of the College of Agriculture, Dr. Federico Perez, and the President, Rodolfo Undan, who had come for our SRI seminar. The visit, organized by Dr. Tito Canare, who heads up CLSU's sustainable agriculture activities, was obviously being taken very seriously, and we had about 50 faculty and students in attendance.

At the end of my presentation, the head of the university's rice program (I didn't get his name) said that what I had presented was very interesting, quite surprising in many ways, but CLSU was willing to try SRI in its rice program. This was very encouraging since this is a major university in the center of a large rice-growing region.

When the discussion finished, we were given a nice lunch by the Dean and Director and then hurried back to PhilRice, where another lunch was waiting for us, to be finished quickly for what we thought was a 1 o'clock presentation. It turned out that many of the senior staff of PhilRice had to attend a previously scheduled meeting until 3, so they wanted the SRI presentation to be delayed until that time so they could join us, a welcome suggestion.

Before we made a quick visit to PhilRice's experimental plots, a farmer from Tarlac who had been at the CLSU presentation and came along for the next one told me about his experience with SRI. He had learned about it from his brother who had brought information on SRI back

from Thailand. This past season, he had gotten 42 cavans from one-quarter hectare (8.2 t/ha) and he then got a ratoon harvest of 38 cavans (7.6 t/ha) from the same plants after regrowth. Most farmers in the Philippines would be very pleased just with the latter harvest, let alone both.

PhilRice scientist Hermenegildo Gines showed us the SRI trial plots being evaluated along with plots cultivated with Site-Specific Nutrient Management, a technology being developed by IRRI, and Critical-Stage Nutrient Management, a PhilRice variant. All three methods were being used with two different varieties. The two SRI plots were clearly behind the others. In the previous season the respective yields were 4.2 t/ha from SRI and 6.1 and 5.7 t/ha from the other two treatments. The SRI plots had not even given a break-even yield in the wet season of 2003.

Why the SRI plots should be doing so poorly here could be attributed to several reasons, though there are no data to prove or disprove the explanations. I suspect that as we have often seen, SRI does poorly on experiment stations where there has been monocropping and heavy applications of agrochemicals for many years, affecting soil microbial populations. Gines acknowledged that they have a hard time draining the plots so that the soil would be aerated because these, like all others on the station, are low-lying. Soils are mostly continuously saturated, which is adverse for SRI both in theory and in practice. But these questions should be pursued with appropriate data.

The deputy director for research and development, Ed Redoña, opened the seminar a little after 3, giving a formal welcome. The presentation seemed to be received with less skepticism than a year ago, though that does not mean all the researchers were satisfied. Shubert Ciencia, the Nueva Ecija manager for the Philippine Rural Reconstruction Movement (PRRM), gave a report on SRI evaluations being overseen by PRRM in five provinces. These are supported by PhilRice. PRRM and cooperating organizations started with 100 farmer-cooperators, 20 in each province, but only 40 stuck with the program to get some results this past season.

Various problems were reported as to why the number of evaluations was reduced: late arrival of seeds or weeders; hybrid seed varieties were not adapted to the locality; inadequate irrigation control; tungro virus; a "wait and see" attitude; too much labor required; rats attacked the seedbeds; a demand by local technicians to be paid honoraria, etc. Shubert reported that most of the farmers who stuck with their SRI trials in Bataan were satisfied, and one Mindanao farmer who is in his third season with SRI got 80 cavans/ha (4 tons), the highest he had gotten in his life, so he was very pleased. Joselito Tambalo, chairperson of Kalikasan-NE, an NGO in Nueva Ecija affiliated with PRRM, said that he had planted his SRI late, so the field was ravaged by rats. But he hoped for a better result next season. All in all, the report was not very satisfying or conclusive.

A young farmer named Junior Eulogia living in Nueva Ecija came forward said that he had tried SRI "as a favor." He had used two different varieties, PSP 82 and PSP 60. He had some problems with the first one, which was planted beside a creek and snails became a problem. He got only 4 cavans from that 500 m². On the other 500 m², with PSP 60, he had good results. The yield he could not report because he planned to harvest it the next day, but the panicles have 200-260 grains, he said, with very few unfilled grains. "The panicles are hanging down to the ground, but there is no lodging."

Because he couldn't get enough organic matter in time, Junior said he had applied cow manure just before planting, even though he knew that this is not the best practice. He said also that he used a rotary weeder to control weeds. Was weeding difficult? someone asked. No, and there was no need for herbicides. What about water control? He said he planted his SRI on the highest plot so that the soil would be well-drained. He said he might get an even better yield next time because by then the manure should have decomposed more.

Gines reported on the PhilRice experience with SRI. They used 10-day-old seedlings, 1 per hill, with fields leveled, but he acknowledged that drainage of the plots was not very good. Water seeped back in, especially on weekends. Snails destroyed some plants and these were replaced. They started using the rotary weeder at 14 days (we recommend starting at 10 days). He said that they had a low SRI yield last time partly because the variety used was susceptible to leaf blight, getting only 2.5-3.5 t/ha, compared to 5 t/ha with a different variety. He said, though, that he was very interested in what he had heard about SRI and wanted to learn more about it.

Dr. Rolando Cruz, a crop physiologist who directs PhilRice's irrigated rice program and who was overseeing the SRI evaluations, commented that with PSP 82, which is resistant to leaf blight, they has gotten up to 3.9 t/ha with SRI, but 7.9 t/ha with SSNM. They had not found any significant difference in yield attributable to alternate wetting and drying of plots. For him, it was difficult to see any improvement with SRI. He was skeptical of some of the claims for SRI yield, noting that one farmer who had reported a 220-cavan yield had only 140 cavans when they went out and actually measured it. He said that PhilRice will continue with SRI evaluations, however, doing careful controls for comparison purposes.

Fortunately, Rolando was able to join us for dinner in the PhilRice cafeteria before we headed back to Manila. I think that our more extended and detailed discussion over dinner satisfied him that what he had seen so far from SRI on-station is not necessarily representative of what can be achieved with SRI methods on farmers' fields, and that there are some sound scientifically based explanations for the improvements that farmers such as the Tarlac farmer and Junior Eulogia are getting with the new methods. Rolando assured us that he is indeed interested in pursuing SRI evaluation, and he is the key person at PhilRice to have engaged in such issues.

Bureau of Agricultural Research, Department of Agriculture, March 23

At 7:30 the next morning back in Quezon City, Angel Morcozo, head of the Knowledge Products and Services Division of the Bureau of Agricultural Research, picked us up at our hotel for an 8 o'clock seminar at BAR headquarters in Quezon City. He told us on the way that a Sustainable Agriculture desk was established in the Bureau last year, and SRI is a component in that program, to be promoted through its Community-Based Participatory Action Research program.

This meeting had been initially set up by Steeve Godilano, a former staff member of IRRI who had done his PhD in crop and soil sciences at Cornell under CIIFAD sponsorship, but who moved to BAR after returning to the Philippines because he wanted to put his training on integrated natural resource management to best use. There had been some confusion about whether the seminar would be held, but we had a good turnout and a gracious reception.

Roberto Masbang, chief of the Extension Communication Division of ATI, which is promoting SRI in many parts of the Philippines, was there, as was Rodelio Carating from the Department of Agriculture's Bureau of Soils and Water Management, who had attended the SRI workshop in Mindanao three days earlier. There were good questions after the presentation and lively discussion went on until 12:45 when we absolutely had to leave for the airport in order to catch the 3 o'clock flight to Bohol.

Bohol Province Activities, March 23-24

At Tagbilaran City airport, we were met by Salvio Makinano, program officer for the Provincial Department of Agriculture's Sustainable and Organic Agricultural Program. As a former agrochemical salesman, he brings both energy and conviction to his task. The province has been declared a 'GM-free zone' by the provincial legislature, and there is strong support for less chemical-dependent approaches to agricultural production. This was indicated by the Provincial Government's sponsorship of a symposium on SRI, arranged through the Office of the Provincial Agriculturalist. The Agriculture Office provided us with accommodations overnight in its guest house.

That evening at the Metro Center Hotel, one of the nicest in Tagbilaran, there were 30 "civil society partners," as the Provincial Agriculturalist Liza Quiros put it, present -- farmers, NGOs, researchers and others. The Governor had agreed to attend but sent a message instead saying that his plans had had to change. Liza recounted to the group how in 1992, a group of professionals from various government and civil society organizations ("middle level management") had begun meeting together. They formulated the Bicol Initiative for Sustainable Agriculture and Development (BISAD), which seeks to reorient the province toward organic agriculture. BISAD recently got the Provincial Assembly to ban GMOs from Bohol for environmental reasons. During the dinner, I sat next to BISAD's vice-president, Zen Badunday, who got her master's degree from the University of Wisconsin. We shared reminiscences of Madison since I grew up on a dairy farm about 7 miles south of the UW campus.

As there was no LCD projector, I had to improvise a talk without visual support. There was, however, great interest among the participants, so holding their attention was no problem. Zen chaired the open forum that followed. Some of those in attendance were already using SRI, so they could comment on questions like how to control golden snail or deal with water control problems. One participant from the NGO known as SEARICE, operating in Bohol and Cotabato, said that they had worked with SRI since 1999, having read the ILEIA article that appeared after Justin Rabenandrasana from Association Tefy Saina in Madagascar participated in a Philippine national NGO forum on rice. She offered her advice on methods to control snails, including catching and fermenting snails to make a protein enrichment for the rice field, rather than using fermented fish to augment amino acids in the soil.

The closing remarks were made by the ATI center superintendant for Bohol, Carolyn Daquio. She spoke about the introduction of SRI here, noting that ATI's former national director, Edwin Acoba, had gotten SRI started in Cotabato, with just "ten disciples" there. Next season there were 10 more, she said, all getting 6 t/ha or more where they had gotten 3.8 t/ha before. She expressed confidence that SRI would spread much more in the future.

Next morning after breakfast Salvio drove us to the farm of Florencio Gantallan, who has used SRI for several seasons in the village of San Roque near Antiquera. There was a sign at the intersection where we turned off the main road announcing SRI trials. Florencio has one of the best landscaped farms I have ever seen, with bamboo guides along the paths, sodded banks of irrigation canals, flowers, etc. He was previously a barangay (locality) captain and a member of the municipal council for a while. But he didn't like 'politics' and returned to full-time farming.

Florencio had made his fields available as a 'field laboratory' for the farmer field school operated by ATI. In this program, farmers learned experimentally about integrated pest management and also SRI. (I referred above to Florencio's positive attitude toward golden snails: for him they are good duck feed.) When we got talking about the importance of roots in SRI performance, he pulled up an SRI plant and had his son get a comparison plant from his plot cultivated with conventional methods, to assess the differences in size and color. These were striking. The latter plant even though one week younger, given its later date of transplanting, already had a darker base (culm), indicating the onset of necrosis from hypoxia. We took the plants with us in the trunk of Salvio's car to show at the FFS graduation ceremony to which we were heading.

At the barangay hall in Antiquera, about 20 farmers were already assembled though we had arrived a little early. There were illustrated posters all around on the walls showing different insect pests and beneficials and their life cycles. It was decided we should not wait for the mayor to arrive because dignitaries' arrival is unpredictable, and we needed to leave by 11:30 to be sure of catching the ferry to Cebu at 1:30. There was no LCD projector, but farmers could view the screen of my laptop computer to see the effects of SRI practices I was talking about.

On Florencio's farm, using SRI methods, farmer field school participants had gotten yields of 6.0 and 6.3 t/ha. They had calculated the benefit-cost ratio to be 1.73-1.83 to 1.0. When I spoke about SRI, there was particular interest in how they could adapt SRI ideas to upland (rainfed) rice production, which is common in this part of Bohol as there is not a lot of irrigated land available. I noticed some of the farmers wearing SRI T-shirts, and the number increased every few minutes as more and more slipped away to pull their newly-printed T-shirts on. There was a lot of interest also in intercropping SRI rice with other crops after I mentioned that the highest yields with SRI (21 t/ha in Madagascar and 16 t/ha in China) have been with rotating rice with white potatoes.

Various questions were raised about water management, spacing, age of seedlings, etc., asking what one should do. I responded that SRI includes a variety of practices for each of these things, and I could only tell them what I would do, starting out, if I were an SRI farmer knowing what I now know about others' practices and results. When I talked about the effect of continuous flooding on rice roots, we brought out the plants from Florencio's farm, which made the case. The conventional rice plant had roots only about one-quarter as much as the SRI plant. Florencio amplified my remarks by explaining how plant roots seek water, and giving them less makes them expand their systems.

In closing, I said that SRI information is free to anybody in the world, with no intellectual property rights, no licenses, patents, or any other restriction. But I was telling farmers everywhere that we had two requests in return: (1) Do not take what we say about SRI as

instructions and simply implement them. We are providing new ideas. Think about them. Understand them, and when applying them make any adjustments thought beneficial. We expect SRI to be improved further by farmers as it is not a finished 'technology.' (2) if the methods are beneficial, please share them with other farmers, who could also benefit from them.

Salvio drove us back to Tagbilaran City, stopping for a quick lunch, with wonderful fresh fruit, at the home of Zen Badunday. We got to the catamaran ferry with enough time, and by that evening, traveling via Cebu City, we arrived at Ormoc on the island of Leyte, traveling via Cebu City. We were met there at the pier by the dean of the College of Agriculture of Leyte State University, Oscar Posas, and the director of LSU's Farm and Resource Management Institute (FARMI), Edwin Balbarino. They would be our hosts for the next two days. After dinner in Ormoc, they drove Obet, Leopoldo and me to the LSU campus in Baybay, a 45-minute trip. There we were met at the LSU hostel by Terry Tucky, associate director of CIIFAD, who was already there. This was home to him, having lived for a year on the campus while doing Cornell PhD thesis on farmer-centered research and extension experience in the surrounding rural areas.

Leyte State University, March 25-26

Next morning at 9, there was a regional workshop sponsored by FARMI on SRI with a good representation of LSU faculty, staff and students, and also farmers, representatives of local government units (from provincial, city and municipality levels), and NGO staff. After I finished my presentation, Jill Almendras, the only microbiologist on the faculty, said she supported what I had said. She has been doing research on compost improvement and soil inoculations and has a lot of data to show the importance of the soil biological processes that I had discussed. Other comments focused on the control of golden snail and the making and use of compost. Edwin acknowledge that he felt "a little embarrassed" that this event had not been held a year or two earlier, since he had learning about the new system during a visit to Cornell several years ago under CIIFAD auspices. He invited Leopoldo to speak as a farmer who has worked with SRI and with compost, which Leopoldo did with concrete information from his own experience.

Meroy de la Rosa, previously director of FARMI before Edwin, commented that in years gone by, one crop of rice a year had been sufficient, but now with two crops and greatly increased inputs, the Philippines was no longer self-sufficient. He felt that SRI had a lot to offer Philippine farmers and declared himself a supporter of SRI. One farmer commented that it is easy to control golden snails by planting the rice on raised beds. The snails stay in the furrows and can be easily removed.

Vic Asio, head of the ecology program at LSU, said that he first heard about SRI two years earlier, when he met me at an international meeting on sustainable agriculture in Chiangmai, Thailand. He got interested in it than and thinkgs that other academics should share this interest because SRI opens up such a wide range of worthwhile and researchable areas. He echoed what I had said, that most of soil science has focused on chemical and physical factors and gives biological ones little attention. That so many soil analyses have been done under 'axenic' conditions, i.e., on soil that has been sterilized or fumigated to destroy all living organisms (since they could affect measurements and make these less exact or less replicable), means that we have a distorted understanding of how soil systems actually function in situ. I reinforced this by

suggesting that soil research done under such artificial conditions is "like removing the heart and then studying carefully the cadaver."

In closing remarks before lunch, the vice-president of LSU for research and extension, Joe _____, said that the SRI presentation had forced them all to reexamine things that have been taken for granted for some time. The evidence presented of phenotypic variation was very strong. "It makes us want and need to look more closely again at management practices. In recent years, plant breeders have been regarded as the chosen people of God." (He could say this with less reaction because he is a plant breeder himself, for root crops.) We need to focus not just on genetics, he said, but also on the environmental factors in the GxE equation that everyone learns: $P = G \times E$ (phenotype = genetic potential times environment; or E can stand for 'everything else'). The representative from the Department of Agriculture for Region VIII, which includes the province of Leyte, when asked by Joe about his reaction to the morning's discussion, said that his program is prepared to try out SRI in all parts of the region.

That afternoon, the group reconvened to discuss "what next?" How to follow up on what had been learned? After an hour-long plenary discussion, a steering committee for the region was agreed on, and it spent two more hours planning research and extension initiatives that will involve government, NGO, university and farmer organizations. Given that the Philippine system of government has been substantially decentralized over the past decade, as we saw in Bohol, it was important that a good representative of local government units (LGUs) were involved in the discussion and planning.

That evening, the President of LSU, Dr. Paciencia Milan, hosted a dinner for the Cornell visitors. She had also attended the Chiangmai conference in January 2002, and she had expressed interest in SRI when we talked then. On Friday, there was a seminar on the afternoon at which I made a presentation on the need for what I referred to as 'post-modern agriculture.' Given the declining availability of land and water per capita, the diminishing returns to and rising costs of production inputs dependent on fossil fuel, the plateauing and even decline of agricultural productivity gains (at least for staple cereal crops), the world needs to consider alternatives to the high-input strategy that was successful in the Green Revolution, but is losing momentum since the mid-90s.

This is a more complex issue than can be properly addressed here. But the challenge can be summarized in the statement I cited from a 1998 article by Ken Cassman et al. Given the present and declining productivity of N fertilizer, in order to achieve the needed 60% increase in rice production that is needed over the next 25-30 years, we would have to *triple* N fertilizer applications if we rely on this means to achieve the increase. The world can hardly afford, either economically or environmentally, to increase its fertilizer use by three times.

Fortunately, what we are learning from SRI indicates that quite a different kind of agricultural development strategy is feasible, and even profitable. It is one that reduces external inputs and gives higher returns to land, labor, water and capital, using methods that are environmentally-friendly and likely to contribute directly to food security and poverty reduction. SRI is not a final or full answer, partly because we still have many questions to answer about why it achieves the remarkable results increasingly and widely reported. A number of faculty at LSU said that they share these concerns. Jill Almendaras in particular said that my presentations had made her work

as a microbiologist there more acceptable to colleagues who have mostly regarded this subject as pretty peripheral. In my view, it must become central in any 'post-modern' agriculture.

NATURE Journal Article, March 25

Thursday afternoon I was able to access on through the internet a feature article on 'the SRI controversy' that *Nature's* senior editor, Chris Surridge, had researched and written over the past few weeks. By phone from London he had interviewed me, Koma Yang Saing in Cambodia, and T. M. Thiyagarajan in Tamil Nadu, India, and many others to get a grasp of the issues at stake.

The article itself was written very even-handedly, taking no position on the merits of either side, but giving SRI proponents their first opportunity to report on SRI results and concepts in a highly-respected international forum. Unfortunately, in my view, the article's subheading read: "Proponents call it a miracle. Detractors call it smoke and mirrors." While the latter part is correct, proponents have never considered SRI "a miracle" nor have the spoken of it this way. We know and insist that SRI is based on solid evidence and scientific principles, nothing magic.

The detractors quoted in the article were unequivocal in their dismissal of SRI. The most off-the-wall statement was by Achim Dobermann, soil scientist at the University of Nebraska.

According to him, "Under SRI, rice takes about two weeks longer to mature for harvest than rice grown in conventional systems, by which time the grain has taken up much more water. Unless the grain is carefully dried, the SRI field will seem to have yielded more rice, when in fact the increase could be water."

This is simply untrue, and if Dobermann had made any effort to inform himself, he would know this. It is a surprisingly uninformed and even reckless statement for someone who has set himself up as the guardian of scientific method and scientific truth. There is no evidence that SRI takes "two weeks longer to mature."; And even if that were true, the statement makes no sense physiologically. Added water could not account for a doubling and even sometimes a tripling of yield, which the critics want to show is impossible. At most, excess moisture could add another 20-30%. We have always used the same methods for measuring both SRI and conventional yield so there should be no bias in the numbers reported even if absolute levels can contain some error in measurement.

Information from the Indian state of Andhra Pradesh, where SRI is spreading rapidly, provided by Dr. A. Satyanarayana, director of extension for the state agricultural university (ANGRAU), is that this season, the SRI crop there is maturing about *10 days earlier* than rice crops grown conventionally. By Dobermann's logic, the productivity of SRI in Andhra Pradesh should be even higher than measured because it would have less water in the grains.

In the summer season of 2003, Satyanarayana reports that SRI added about 2 t/ha across 300 on-farm trials in the 22 districts of Andhra Pradesh; in the Rayalseema region, the SRI 'premium' was almost 5 t/ha. The first 12 trials that he reported were 4.3-6.3 t/ha with conventional methods and 8.5-12.2 t/ha with SRI methods. Such differences cannot be explained by moisture content when in fact the maturation period was more often shorter than longer than usual.

Such baseless efforts to refute SRI will only make such scientists look more foolish as evidence of SRI's advantages accumulates. The *Nature* article cited an article soon to appear in *Field Crops Research* written by John Sheehy and Shaobing Peng from IRRI, Doberman and others. They claim that their analysis based on comparison trials in China and on modeling discredits SRI completely. The data they cite are inconclusive, however, because the SRI protocol followed did not assure soil aeration for root growth and aerobic microbial activity which we specify as critical for SRI results. Even so, SRI gave better results in one of the three locations. Their modeling is based on data that were derived from rice plants grown under flooded conditions and thus having impaired roots. There is no evidence to show that these coefficients apply for plants that have full and functioning root systems.

There is now considerable evidence on SRI available from leading Chinese institutions that have no interest in promoting SRI if its results are not indeed better. The 2003 SRI trials by the Sichuan Academy of Agricultural Sciences found that SRI methods produced on average 13 t/ha with hybrid varieties. Sheehy et al. only consider their own selected trial results, not a large body of evidence. The latter is what we have been considering all along, knowing that *no single evaluation*, no matter how carefully done, can ever either prove or disprove SRI. Biological outcomes always contain considerable variation depending on soil, temperature, previous land use and other factors. One needs to look for patterns and relationships, not a few measurements.

The article also ignores roots and soil biota, indeed all underground processes, even though we have said for years, with good scientific justification, that these are essential parts of SRI. One cannot understand or dismiss SRI by considering only above-ground elements and relationships. Further, the article takes no account of costs of production or the differences in profitability between practices. We have never claimed, as alleged, that SRI is the only way to achieve very high yields. We know that in Australia, yields in the 13-14 t/ha range are achieved -- but with heavy and costly use of fertilizer, water and agrochemicals. However, our contention has been that SRI methods raise *productivity* and give greater returns per unit of land, labor, water and capital invested. When critics choose to think only as agronomists, and as rather narrow ones at that, and make attacks on SRI that are empirically unsupported and untenable, it makes their arguments against SRI even weaker. The detailed data that I was given from NIA when we got to Manila on Saturday made the statement of critics cited in the *Nature* article all the more irrelevant.

National Irrigation Administration Trial Results, March 27

Saturday morning, Obet, Leopoldo, Lucy and I were driven to Ormoc after breakfast to catch the 8:30 catamaran ferry to Cebu, from where we caught a noon plane back to Manila. At 3 o'clock, Bob Mohamed and Roger Lazaro working with the National Irrigation Administration (NIA) came to meet us at the hotel where I was staying overnight. Bob is an American engineer serving as a consultant to NIA for its ADB-funded Southern Philippine Irrigation Sector Project, and Roger is a monitoring and evaluation specialist working with the project. In April 2002, Roger attended a conference on irrigation management in Bangkok where I made a presentation on SRI, and he brought materials and ideas back to NIA.

Roger and Bob have a particular interest in the water-saving aspects of SRI since most of the irrigation systems that NIA operates or services are facing increasing water shortages. In March

2003, Roger and Bob organized a two-day trip for me to the province of Negros Occidental. They wanted now to update me on SRI experience since that visit a year ago. I spoke about SRI then to a large assembly of over 600 representatives of farmer irrigation associations from all over the region who were attending an annual meeting in Baco City. Then I visited three villages with FIAs interested in water saving, about 120 km south of the provincial capital, Bacalod City.

Roger and Bob brought a CD with powerpoint presentations and a report with color pictures and tables. In the Caraga region of Mindanao, NIA's regional irrigation manager, Carlos S. Salazar, had literally appropriated SRI, developing his own variant of it and naming it the Salazar System of Rice Intensification (SSRI). Such personalization has not been common with SRI, but Carlos' results are excellent, and he is actively promoting the methods with local government units and farmers in his area, so his initiative is a plus for SRI progress and dissemination.

On a one-hectare plot, Salazar got a yield of 8.9 tons in his first attempt. His costs of production were 30,372 pesos and the gross income was 71,200 pesos, so this gave him a net income of 40,828 pesos/hectare. This represents a benefit:cost ratio of 2.34 to 1.00. The paper on this experience prepared by Salazar and Lazaro considered also how much more profitable SRI could be where pump irrigation is used and water supply has high costs compared to gravity systems. Water requirements with SRI were reduced by 37%, they figured, which would amount to an additional 2,000 pesos/ha saving where fuel costs must be paid. Also, they noted that SRI would be more valuable economically in dry season production than in the wet season.

Salazar also had made a powerpoint presentation on ratooning with his SRI crop. He cut the stalks 10 cm above the ground and let the plants, with their deep root systems, regrow. Within 45 days, he had a second crop with no replanting or other field operations, just organic fertilizer application and weeding. The yield of 50 bags, 2.5 t/ha, was a kind of 'bonus' with SRI. Letting a second crop regrow may not always be the best use of land and labor resources; this depends on their opportunity costs, because a replanted SRI rice crop or some other crop might be more remunerative in the following season. But this may become an attractive option to many farmers giving them even more benefit from SRI. If they could get a ratoon crop of 90%, as reported to me on Monday by the farmer from Tarlac, rather than a 28% regrowth as in this case, indeed SRI ratooning would be hard to surpass with any other crop since the costs of production are so low. (Salazar's powerpoint presentations are available upon request.)

The second set of reports, from the barangays of Magballo, Balicotoc and Canlamay, were the most gratifying because I knew from my visit there the year before how poor these households are. I was impressed at the time with their seriousness about improving agriculture, but I did not anticipate how systematic and ambitious their subsequent use of SRI ideas would be.

Farmers there have Turnout Service Area Groups at field level with 25-50 members each. These TSAGs are grouped into Integrated Farmer Irrigators Associations, one in each barangay, which in turn are combined into a Federation of Farmer Irrigators Associations that serves the three communities. The organizations set up trials to compare SRI with farmer practices and the Total Quality Production Management (TPQM) system that I had heard about in Mindanao at Xavier University. They tried out three SRI spacings -- 25x25, 35x35 and 45x45 cm -- and two TPQM spacings -- 10x30 and 10x40 cm. From the report, I could see that SRI methods were well

understood and applied, with careful transplanting, four weedings, good water management, etc. It was pleasing to see that they observed no pest infestation of the crop. This is something often but not always reported about SRI crops. Their results were as follows:

Methods	Spacing	Expenditure/ ha	Gross Income/ ha	Net Income/ ha	Yield (t/ha)
Farmer Practice	random	10,948	18,540	7,592	2.65
TQPM	10x30	16,320	27,450	11,130	3.66
	10x40	15,435	22,500	7,065	3.00
SRI	25x25	29,865	37,500	7,635	5.00
	35x35	30,945	54,999	24,054	7.33
	45x45	30,735	46,254	15,518	6.17

The best SRI spacing, 35x35 cm, yielded 85-172% more than farmers' practice, and 37-100% more than TQPM. It more than tripled their net income per hectare! The reduction in water use was estimated as 67% under these field conditions. If they had been paying the cost of pumping water to irrigate their rice crop, the cost saving for power was calculated at 160%. The farmer groups are quite enthused about these results and are expanding their trials and demonstrations, planning to do more, and more precise, calculations in future seasons. They also think that they can get even better SRI results now that they have become better acquainted with the techniques and concepts. (Powerpoint presentations from Magballo-Balicotoc-Canlamay are available upon request.)

Roger and Bob were obviously pleased that their initiative to get the trials started is giving such remarkable results -- agronomically, economically, and hydrologically. SRI is now attracting attention from higher levels in the organization and from government personnel. NIA works with a country-wide network of irrigators' organizations that could spread SRI quite quickly once farmers are persuaded of its benefits and there is supportive institutional infrastructure.

Media Attention, March 25-27

Also joining us for a while on Saturday afternoon was Pabinhi vice-president, Rene Jaranilla, the farmer who had made a fine powerpoint presentation on his SRI experience at the national workshop a week earlier. He was coming from a radio interview, with Maloo Edaño from UPLB, on station DWIC, which has a wide audience. He said that the time had passed much too fast and they have invited him to come back. Obet had been telling me that in the Philippines, radio is a good way to reach a wide audience, particularly farmers. He has gotten many requests for the simple SRI manual in response to his appearances on radio.

Obet gave me a copy of a very positive article "More Rice with SRI," appearing in the *Philippine Daily Inquirer* on March 25, written by well-known columnist, Ma. Ceres P. Doyo, who had attended the March 19 national workshop. Vic Tagupa and Noe Ysulat had already sent him text messages on his cell phone saying that they were already getting calls about SRI because their names and phone numbers were listed in the column. CIIFAD's email address was also given, so I expect requests for information from the Philippines when I get back to Cornell.

Sunday morning, at 5:30 before I boarded the plane to return to Ithaca, I had a half-hour radio interview on station DZMM interview. It has had Obet on for interviews several times previously and had organized a workshop from 9 to 12 that morning, with Obet as a resource person. This early-morning conversation was publicizing the event, which required 150 peso admission. We have had qualms about this since SRI information has always been given free, but the charge is nominal and covers costs. Something for which people pay is also often regarded as more valuable.

Closing Comments

This report reflects the efforts and results to date of the diverse partners who are engaging in SRI evaluation and dissemination in the Philippines. Each country's approach to SRI has been different, reflecting its agricultural situation, its national culture, its institutional configurations, etc. I have often described SRI as a 'civil society' innovation. Nowhere is its spread proceeding more as a result civil society activity (civil society including those in government service who identify with and want to promote the aspirations of the public) than in the Philippines.

The increase in activity since a year ago is remarkable, proportionally akin to the increase between my 2002 and 2003 visits, something on the order of five-fold. A similar increase by 2005 should make SRI well established throughout the country. Because it can spread with no purchases and very simple training -- anyone who knows how to grow rice and who is motivate to try SRI can learn what is necessary in an hour or two -- there are few constraints except mental ones.

Uptake of SRI will be facilitated by having powerpoint presentations, such as prepared by Bong Salazar and the three barangays in Negros Occidental who have done systematic evaluations, and by having rotating weeders available for purchase. (In India, they cost about 300 pesos, and in Sri Lanka, about 500 pesos only.) It appears that all major national institutions concerned with rice in the Philippines are now 'on board,' at least for evaluation (PhilRice, DA/BAR) and some for extension already (ATI, NIA). They are complemented by a wide variety of NGOs involved with sustainable and/or organic agriculture and by journalists interested in promoting new ideas. So Philippines is joining the ranks of Cambodia, China, Cuba, Sri Lanka, India and Bangladesh where SRI is moving ahead rapidly with a strong institutional base. Happily, the Philippines institutional base for SRI is the most farflung and diversified.