DIVERSIFYING RICE-BASED FARMING SYSTEMS IN THE SOUTHERN PHILIPPINES WITH THE SYSTEM OF RICE INTENSIFICATION

Felipe Rafols Jr., Allan Gayem, Ligaya Belarmino, Flor L. Magbanua, Rene Q. Nombre, Joel A. Basiao, Carlos S. Salazar, Edgar F. Tagarao, Elmer T. Nepa, Pacifico E. Calibayan, and Roger C. Lazaro[1]

Abstract

This paper reports results of techno-demo trials to save water and raise farmer incomes through crop diversification using the System of Rice Intensification (SRI). The Southern Philippines Irrigation Sector Project of the National Irrigation Administration supported these trials in Mindanao and the Visayas, with loan funding from Asian Development Bank.

Mindanao. A SRI yield of 8.9 t.ha^{-1} was obtained in 2003 on a one-hectare plot in Caraga region, with a gross farm income of PhP 72,200 and net income of PhP 41,788, having a 37.4% rate of return on expenditure. For this yield, irrigation water was applied only at 10-day intervals, which represents a water-use reduction of 45% during land soaking and 73% during crop maintenance. The value of the power cost savings if such reduction were extended to the pump-dependent Lower Agusan Development Project (LADP) would be 500,000 Philippine pesos (PhP) for land soaking, and 1.1 million for crop maintenance during the wet season, and up to 2.0 million during the dry season. On farmers' plots in 2004 in the Gibong Subproject, traditionally flooded methods gave a yield of 4.6 t.ha^{-1} from a hybrid rice variety while SRI methods with 35 x 35 cm spacing yielded 7.5 t.ha^{-1} from an inbred variety. The net income per hectare with traditionally flooded methods was PhP 23,532, while with SRI it was PhP 38,482, representing a 64% increase. This enhancement of income should make water saving attractive to farmers. An assessment of grain quality found SRI rice to be considerably higher than that for rice produced with conventional methods.

Visayas. In trials established in 2003 on farmer-managed, pump-irrigated small farm plots in Negros Occidental, inbred rice yield from traditionally flooded rice production with random plant spacing was 2.66 t.ha^{-1}; while SRI methods with 35 x 35 cm spacing produced 7.33 t. ha^{-1}, almost a tripling of yield. Net farm income per hectare from farmers' conventional practice was PhP 7,592, compared to PhP 24,054 with SRI methods, an increase of 215%. Assessment of irrigation cost savings indicated a 67% reduction with SRI practices, with about 160% less for pumping costs. Trials in the following season in Balicotoc area failed because of insufficient rain and supplemental pumping from the river, which affects all rice growing. However, the trials carried out in the Magballo Communal Irrigation System gave impressive results. The yields attained with SRI, 2.83-5.5 t.ha^{-1}, while not as great as seen in the first season, gave farmers an average net income 79.5% higher than with conventional practice. The somewhat lower yields could have been due to the lower quality of seed used, or because of build-up of chemical residues in the soil from a long history of fertilizer and pesticide usage. This would have affected the soil organisms that SRI practices promote and that can contribute to enhanced crop productivity.

---

[1] The authors are, respectively, two pioneering farmers of Barangay Balicotoc, Ilog Municipality, Negros Occidental; Researcher, Institutional Development Officer (IDO), Technical Staff, Provincial Irrigation Engineer (PIE), Regional Irrigation Manager, FIA President, IDO, and PIE-Gibong with Subproject Management Offices; and Monitoring and Evaluation Specialist, SPISP.

DIVERSIFYING RICE-BASED FARMING SYSTEMS IN THE SOUTHERN PHILIPPINES WITH THE SYSTEM OF RICE INTENSIFICATION

I. BACKGROUND

As long as the productivity of irrigated rice production remains low in the Philippines, with average yield of 3.7 $t.ha^{-1}$ (compared with 2.0 $t.ha^{-1}$ from rainfed farms), too large a share of farmers' land, labor, water and capital will go into the production of rice as the main staple for basic sustenance. The System of Rice Intensification (SRI), which is showing that it can raise the productivity of the water resources presently devoted to rice by increasing yields 50-100% or more, has the potential to greatly improve the well-being of producers and consumers at the same time, opening possibilities for the diversification of farming systems.

The National Irrigation Administration (NIA) in the Philippines is charged with helping small farmers improve their productivity in irrigated rice farming systems, and like elsewhere, water shortages are a common problem. Raising the productivity of already developed water systems presents a special challenge. The opportunity that the System of Rice Intensification (SRI) offers, to raise rice production as well as net farmer income while using less water, has attracted the interest of NIA administrators and farmers. With increases in net farm income, the capability of farmers to pay their irrigation service fees, and therefore their ability to support the operation and maintenance of irrigation systems could be enhanced, making these more productive and more sustainable.

NIA's revitalized approach to participatory irrigation management and to transfer of responsibility has focused on the Southern Philippines Irrigation Sector Project (SPISP), which has loan funding from the Asian Development Bank (ADB) initially covering over a dozen subprojects in Mindanao and the Visayas. Mindanao has a climate with almost uniformly distributed rainfall throughout the year and very flat terrain that is generally suited for a year-round cultivation of rice crops. There are, however, records of some sustained periods with no rainfall, and therefore other crops can be grown on almost flood-free higher grounds. The Visayas, on the other hand, have distinct wet and dry seasons with soil and topography that are suitable for upland rice and diversified crops.

While the service areas in Mindanao subprojects have predominantly rice-rice cropping patterns, diversified rice-based cropping systems are being piloted with techno-demo evaluation and capability development activities. In the Visayas, a large part of the subprojects' service areas in rice could be replaced with diversified crops. Accordingly, pilot techno-demos are highlighting yield- and net income-increasing as well as water-saving innovations such as the SRI that can support diversified crop cultural practices and also marketing intelligence that enhances capability development.

Two sets of pilot techno-demo trials on SRI methods were established in SPISP in (1) the Caraga region of Mindanao on the farm of the Regional Irrigation Manager (RIM), followed by a group of farmers in an SPISP subproject in the same region, and (2) in smaller-sized farmer plots in the Visayas region in the villages of Magballo, Balicotoc and Canlamay in Negros Occidental. In Caraga, the landowner (RIM) initially assumed the costs and risk. In the Negros site, the risk was assumed by SPISP through provision of seed money to pay for part of the production inputs; the participating farmers provided all the labor required. The seed money became a revolving fund, with an understanding that if the trials failed, it need not be paid back, but if successful, the loan would be repaid in kind so that it would be available for other beneficiaries associated with the farmer groups.

During implementation of SPISP core subprojects and when doing a feasibility study for screened and selected non-core subprojects, the issue arose of how to attain the desired rice yields of 4.0 to 5.0 $t.ha^{-1}$ which could provide a basis for promoting crop diversification. Pilot techno-demo farms were established before the irrigation facilities were completed and before project personnel knew about SRI aiming to upgrade the technical level of production.

This paper will report only on rice production issues, regarding improvement in yield and factor productivity as a requisite for diversification.[2] The two alternative rice production methodologies are considered and compared with present farmer conventional practice. These were the System of Rice Intensification and a system known as Total Quality Production Management (TQPM).[3] The latter was developed and has been advocated by the Agricultural Training Institute (ATI), an arm of the Department of Agriculture (personal communication, Mr. M. Tetangco, agricultural specialist, Hassall and Associates, Inc., 2003). The use of hybrid rice being promoted by the Philippine Rice Research Institute (PhilRice) and the Department of Agriculture, as described by Bayer Crop Science (2003), and other approaches that the farmer-participants would like to try were also assessed.

SRI Practice.[4] First, the seedlings planted are very young, 8-12 days old, rather than the usual age, 20 to 30 days after germination; and they are transplanted singly rather than 2-3 $seedlings.hill^{-1}$. Spacing is much farther apart compared to conventional practice, for example, as much as 50 x 50 cm (if the soil is very fertile) instead of more common 20 x 20 cm. This represents a substantial saving on seeds, up to ten-fold, which is particularly helpful for the adoption of hybrid varieties. Wider spacing has the effect of encouraging more tillers (side shoots) to develop, giving many more rice-forming panicles after flowering.

Second, SRI fields are kept moist during all or most of the growing season instead of being flooded continuously. This gives tremendous saving of water, which is particularly important in areas of water scarcity, and it avoids the damages of salinization that can result in some places from over-irrigation. The more aerobic soil conditions encourage vigorous root development, which in turn supports more vigorous growth of the rice plants.

Third, use of herbicides and other chemical biocides is seldom necessary because the plants are more resistant to weeds and pests. Weeding is done with a simple, mechanical, hand-operated rotary hoe, which returns the weeds to the soil as green manure rather than removing them from the field. Mechanical weeding has an added benefit of actively aerating the soil, which improves soil health and fertility and adds to yield. The financial saving from not purchasing agrochemicals and the gain from increased production are offset to some extent by the need for increased labor for weeding. However, this will not be a problem for most farmers in the Third World. While there can be seasonal or locational shortages, labor scarcity in general is limited in time and space.[5]

---

2 A separate paper, Basiao et al. (2004), has described the results of crop diversification capability developed at the pilot techno-demo farms

3 In the latter system, chemical fertilizers are applied initially as a booster, followed by organic fertilizer. This is similar to what is recommended by Yang et al. (2004) regarding the yield increasing advantage of alternate wetting and drying (AWD) versus continuous water logging (CWL) and of using chemical fertilizers in combination with farm manure or wheat straw over four years of trials in China.

4 This is described in Ho (2004); this description draws on a more complete account in ATS/CIIFAD (n.d.).

5 An evaluation of SRI in Cambodia by a consultant for GTZ (Anthofer 2004) found from a random sample of 400 SRI farmers and 100 non-SRI farmers in five provinces that the increased time for weeding was offset by a reduction in the time required for transplanting (10 $days.ha^{-1}$). Farmers preferred this arrangement because transplanting came at a time of peak labor demand, whereas weeding could be done with some flexibility in timing.

Weeding becomes less arduous in successive years as weed populations are reduced and skill in weeding is gained. Also, farmer innovations are finding ways to reduce the labor-intensity of SRI operations. It is noted also that the task of weeding can be even positively viewed as health-improving aerobic exercise. Further, giving up herbicides and other biocides produces health benefits for farm workers, who are not exposed to chemical toxins, and for consumers who no longer need to ingest chemical residues on the final product. Overall, SRI practices reduce or eliminate pollution of the environment and ground water.

Fourth, no mineral fertilizers need to be used, only liberal application of organic matter as compost. This brings a financial saving to small farmers accompanied by an improvement to the quality and fertility of soil, reducing runoff and improving its water-retaining properties. With this change, microorganisms in the soil would also flourish.

The above-described SRI practices were applied on a number of plots in selected subprojects of SPISP in 2003 and then 2004. Various plant spacings, including those desired by the farmer-participants, were set up in a grid pattern, and the crop performance was compared with the results from conventional practices with basin-flooded, randomly transplanted rice seedlings. The typical number of tillers per plant, plant height, grains per panicle and other characteristics were ascertained from sampled plants. Then, the yield, value of production, cost of production, and net income, as well as estimates of any water savings achieved wherever and whenever possible, were calculated and are reported here.

II. MINDANAO EXPERIENCE

In Caraga, on the one-hectare field of the NIA's Regional Irrigation Manager (RIM), the yield from SRI obtained from a mestizo hybrid rice variety (PSBRC 72H) was 8.90 $t.ha^{-1}$ with a plant spacing of 40 x 40 cm, and using organic matter produced from his poultry farm. The production earned a gross income of PhP 72,200, and given gross expenses incurred as well as imputed post-harvest costs totaling PhP 30,372, this gave a net farm income of PhP 41,788 ha^{-1}, and a benefit-cost ratio of 2.42 to 1. Net income was 134% more than the costs of production. A neighboring farm that produced 4.0 $t.ha^{-1}$ from a traditionally-managed flooded field had a gross income per hectare of PhP 32,000 and production costs of PhP 19,770, which gave a net income of PhP 12,230, only 30% as much as from SRI.

Water Management and Savings. Irrigation water was introduced to the field at ten-day intervals, with standing water only for a 2-day period, letting percolation take the water level down. During the other 8 days within the ten-day irrigation/drainage cycle, the water remaining the soil satisfied the plants' evapotranspiration requirement.

An immediate application of these SRI results was planned for the pump-dependent Lower Agusan Development Project (LADP) in the region. Compared with conventional practice, the reduction in water use during land soaking was 45%, and 73% during crop maintenance. Correspondingly, the cost of electrical power for pumping irrigation water based on the volume of diverted water would similarly vary. Cost savings of 0.5 million PhP were estimated for land soaking, and 1.1 million for crop maintenance during the wetter months and even close to 2.0 million during the drier months.

Extension to Farmers' Plots. The Federation of Irrigators' Associations (FIA) of the Gibong Subproject, using organic fertilizers as well as the mechanical rotary weeder brought from the

RIM's farm, established a techno-demo extension at the farm level. Since the organic fertilizers and weeder were delivered late, inorganic fertilizer (16-20-20 N-P-K) was used at first, and manual weeding was done without as much soil aeration as desirable. The reported crop yield was 4.59 $t.ha^{-1}$ for traditional basin-flooded hybrid rice variety PSBRC72H, which contrasted with 7.50 $t.ha^{-1}$ from an inbred IR64 rice variety with (not all) SRI methods at 35x35 cm spacing. Spacings of 25 x 25 and 45 x 45 cm gave 6.50 $t.ha^{-1}$ and 6.80 $t.ha^{-1}$, respectively. Based on SRI experience in other countries, we would expect yields with SRI to have been even higher if all the methods had been used as recommended. Gross value of production was PhP 42,228 from conventional practice, and PhP 63,683 for SRI. Total expenses were PhP 18,695 and PhP 25,200, respectively, giving net incomes of PhP 23,532 from the standard methods, and PhP 38,482 from SRI, which is 64% higher.

The standard agronomic indicators -- the numbers of tillers, panicles and grains per panicle, showing multiple SRI advantages -- are given in Table 1 below.

Table 1: Paddy Rice Plant Characterization, Caraga Region, Mindanao

Plant Spacing	*Sample Size*	*Average number of tillers counted*			*Panicle Length* (cm)	*Number of grains*	
		40 DAT	*80 days after transplanting*			*Unfilled*	*Filled*
			Unproductive	*Productive*			
45 x 45 cm	10	56.5	3.4	53.1	25.6	14.4	146
35 x 35 cm	10	21.1	1.0	20.1	24.4	12.9	123
25 x 25 cm	10	16.0	0.7	15.3	24.6	7.7	138

The odor, texture, taste and keeping quality of the cooked produce were also evaluated and the results are reported in Table 2.

Table 2: Characteristics of Cooked Rice, Comparing Two Cultural Methods, Caraga Region, Mindanao

Characteristic observed	*Production method and variety*	*Observations reported by 7 testers along standard parameters*		
A. Color		White	Dirty White	Brownish
	Std-Hybrid 72 H	0	7	0
	SRI-IR64	7	0	0
B. Texture		Fine	Rough	
	Std-Hybrid 72 H	0	7	
	SRI-IR64	7	0	
C. Odor		Odorless	Mild Odor	Odorous
	Std-Hybrid 72 H	0	4	3
	SRI-IR64	2	5	0
D. Aroma		Therapeutic	Non-Therapeutic	Odorous
	Std-Hybrid 72 H	5	0	2
	SRI-IR64	3	4	0
E. Taste		Tasteless	Sweet	Other
	Std-Hybrid 72 H	2	5	0
	SRI-IR64	1	6	0
F. Expiry Hours: hours before spoilage of cooked rice				
	Std-Hybrid 72 H	38 hours		
	SRI-IR64	40 hours		

Water Management. The SRI crop planted in December 2003 was harvested in May 2004. There were rains up until the 18th day after transplanting, which were considered sufficient to meet water requirements. The first irrigation was 30 mm depth of standing water delivered in

3 hours. A second irrigation occurred 32 days after transplanting, when slight soil cracking was noticed. The third irrigation was provided 65 days after transplanting. Terminal drainage and harvesting were carried out 100 and 110 days after transplanting, respectively. Getting more rice that has higher quality with this reduced input of irrigation water was much appreciated by all who observed the trials.

III. VISAYAS EXPERIENCE

SRI Trials on Rainfed-Pump Irrigated Farms. The farmer-participants in three Farmer Field Schools sponsored by NIA in the villages of Magballo, Balicotoc and Canlamay, after hearing a personal presentation of SRI from Dr. Norman Uphoff from CIIFAD in March 2003, agreed to experiment with SRI and evaluate different plant spacings. SPISP offered to cover any losses incurred. The farmers managed pump-irrigated small pilot techno-demo farm plots and obtained the following results from parallel trials: (1) inbred C64 rice yield from traditionally flooded farmers' conventional practice with random spacing produced 2.66 $t.ha^{-1}$; (2) the Total Quality Production Management (TQPM) system developed at one regional center of the Agricultural Training Institute (ATI) of the Department of Agriculture, using chemical fertilizer as a booster and 10 x 30 cm spacing, produced 3.66 $tons.ha^{-1}$; while the SRI method at 35 x 35 cm spacing yielded 7.33 $t.ha^{-1}$.

For the different trials, gross revenue and recorded expenditures on a per-hectare basis were (with net income shown in parentheses):

- with farmers' conventional practices: PhP 18,540 and 10,948 (PhP 7,592);
- with TQPM: PhP 27,450 and 16, 320 (PhP 11,130); and
- with SRI: PhP 54,999 and 30, 945 (PhP 24,054).

Net income from SRI was thus 126% greater than with TQPM, i.e., more than double; and 215% more than the farmer's conventional practice, i.e., more than triple.[6]

Water Savings and Extrapolation. The amount and timing of irrigation water application was initially programmed so as to maintain 20-30 mm of standing water for the first two days of the planned 15-day interval with no more application the rest of the days. Within the latter part of the period, plants utilized the remaining soil moisture until some cracking of the surface soil was noticed. Since the study period coincided with the summer months, rainfall interfered with this irrigation schedule. The extrapolated results indicated that about a 67% reduction in irrigation water delivery was achieved with SRI, with a possible pumping cost saving of about 160% being calculated.

Extension of SRI Trials in Communal Irrigated Area. The Balicotoc rainfed farmers volunteered to undertake extension-expansion efforts in the following season. However, rainfall and river flow during the crop season were insufficient. The Federated Irrigators Associations thus deemed it wise to pursue the 3rd evaluation of SRI on techno-demo farms within the service area of the Magballo Communal Irrigation System, where three farmers with six plots of varying sizes and a total area of 2.0 ha agreed to participate. Failing to secure the hybrid seeds promised, they settled for using a certified inbred C64 rice variety that was unfortunately infected with weed seeds and off-variety mix. Even so, the SRI yield results were still acceptable.

[6] This appeared as a preliminary report on SRI trials for Negros Occidental in <http://ciifad.cornell.edu/sri>.

The yields reported in Table 3, obtained from a registered PSBRC 18 rice variety in an area with some history of irrigation and rice cropping, were lower than those obtained with SRI methods in the first season, when soil that was formerly rainfed was brought under irrigated production for the first time. The yield range of 2.83-5.50 $t.ha^{-1}$ obtained at Magballo (the highest yield being from a plot with 40 x 40 cm plant spacing) were well below the maximum of 7.88 $t.ha^{-1}$ obtained the season before (with 35 x 35 cm spacing) having access to supplemental pumped irrigation water. Even so, as seen in Table 3, the net farm income from all five SRI plots was well above that from the plot cultivated with conventional practices. Soil samples were obtained for testing and the results are being awaited. Our initial thinking, still to be confirmed by soil test reports, is that the soil in the Magballo trials had some toxicity build-up from long-term use of chemical fertilizers and pesticides.

Table 3: Crop Yields, Expenses and Net Incomes in On-Farm Trials, Magballo, Visayas

Cooperator	*Practice and Plant Spacing (cm x cm)*	*Yields ($t.ha^{-1}$)*	*Expenses (PhP)*	*NetIncomes ($PhP.ha^{-1}$)*
Anselma Colendres	*SRI: 30 x 30*	*4.73*	*30,565*	*10,757*
	SRI: 40 x 40	*5.54*	*29,270*	*15,931*
Hernanie Domingo	*Conventional: flooded and random spacing*	*2.70*	*17,017*	*6,443*
	SRI: 35 x 35	*3.04*	*19,540*	*7,521*
	SRI: 35 x 17.5	*2.83*	*18,601*	*6,641*
Jose Erol Caldito	*SRI: 35 x 35*	*4.30*	*22,288*	*15,972*

Additional information on numbers of tillers, spikelets per panicle, and grain weights were recorded and are reported in Table 4.

Table 4: Agronomic Plant Characteristics in On-Farm Trials, Barangay Magballo, Visayas

Cooperator	*Plot area (m^2)*	*Planting distance (cm x cm)*	*Tillers/ plant*	*Spikelets/ panicle*	*Length of panicle (cm)*	*Grain weight (grams/m^2)#*
Anselma	*200*	*40 x 40*	*23.8*	*113.0*	*21.2*	*390*
Colendres	*280*	*30 x 30*	*28.2*	*123.6*	*20.8*	*500*
Hermanie	*185*	*Random*	*10.2*	*83.6*	*19.2*	*322*
Domingo	*328*	*35 x 17.5*	*22.2*	*90.4*	*19.4*	*345*
	3,167	*35 x 35*	*30.4*	*100.0*	*20.6*	*402*
Jose Erol Caldito	*2,500*	*35 x 35*	*23.4*	*133.4*	*20.6*	*455*

This measurement of weight is the common practice suggested by the Agricultural Training Institute (ATI).

4th and 5th Trials in Communal Irrigated Areas. The subproject area in Magballo is noted for its extensive and intensive rice cropping of up to five rice crops within two years, or even three crops within one year. The farmer-participants are bolder now regarding SRI using expanded areas of a thousand square meters instead of mere hundreds at the start.

The 4th set of trials was carried out from June to October 2004 with three new farmer-participants following the previous experiences of the initial farmer-participants in SRI pilot techno-demo farm.

Farmer-participants who earlier carried out the 3rd set of trials also conducted a 5th set, from March to June 2004. Note that all three decided to use the same plant spacing of 25 x 25 cm, thinking perhaps that having more plants would give them more yield. In additional, they all agreed to use the same amount of organic fertilizer, similar to that used in Balicotoc, thinking perhaps that they can get as much as the highest yield there. Table 5 presents the results.

Table 5: 4th and 5th Trials on SRI at the Magballo Communal Irrigation System

Subproject Area	Season/Cooperator	Spacing cm x cm	Yield Tons.ha^{-1}	Net P/ha Income
4th Trial: Wet Season, May to June 2004				
Barangay Magballo	Jeffrey Tubola	35 x 35	3.46	12,705
	Rolando Abelida	35 x 35	4.76	21,286
	Arcadio Gilvero	30 x 30	5.60	27,286
Range			3.46 – 5.60	12.7 – 27.2
5th Trial: Dry Season, June to October 2004				
Barangay Magballo	Jose Erol Caldito	25 x 25	4.92	13,369
	Anselma Collendres	25 x 25	4.81	14,531
	Hernanie Domingo	25 x 25	3.54	6,157
Range			3.54 - 4.92	6.1 – 14.5

Among the farmers in the 4th set of trials, Mr. A. Gilvero established a new record for Magballo with a higher yield of 5.60 t.ha^{-1} from 30 x 30 cm plant spacing, and net farm income of PhP 27,286.

Those who believed that more plants with closer spacing would give more yield, and hence higher net farm income found that they were wrong. Messrs. Caldito and Domingo did increase their yield, but only slightly, while Ms. Collendres fell short of the 5.54 t.ha^{-1} and net farm income of PhP 15, 931 that she achieved with 40 x 40cm plant spacing.

In an extended study pursued in October 2004 through small focus-group discussions with the farmer-participants and subproject staff, it was agreed that a wider scale application of SRI should be pursued. The System Management and Agricultural Development operation and cropping plans to begin this upcoming season from November 2004-February 2005 would be based on the review of what have been achieved from the pilot techno-demo farms so far and a campaign strategy would also be evolved.

IV. DISCUSSION

This report gives an idea of the kind of irrigated rice yields, net farm income improvements, as well as concurrent water savings that can be achieved with SRI methods under field conditions. This it is hoped can pave the way for farming systems diversification in southern Philippines. The rice yields obtained by farmer-participants with SRI methods are impressively higher than with conventional practice and far exceed the subproject Feasibility Study projections. In most cases they were at least double the existing levels, with positive impacts on net farm income that could help alleviate the incidence of poverty. Also, the yield and net farm income often improve over time.

Similar yield improvements have been previously reported by NGOs introducing SRI methods in the region. The Consortium for the Development of Southern Mindanao Cooperatives (CDSMC) documented SRI yields of 4.28-4.95 $t.ha^{-1}$ in 2000, which represented a 100-150% increase over conventional practice in the area where on-farm trials were conducted. Broader Initiatives for Negros Development (BIND) obtained an average lowland yield of 5.1 $t.ha^{-1}$ (and a maximum of 7.4 $t.ha^{-1}$) in 2001 (Gasparillo, 2002; see Table 6 below). Water savings with reduced irrigation duration were also achieved with the methods. Subsequent BIND adaptations of SRI concepts and practices to upland rice production produced an average yield of 7.2 $t.ha^{-1}$ for rainfed rice with the traditional variety *Azucaena* on an area of 4,000 m^{-2} (Gasparillo et. al., 2003).

Table 6. Comparison of SRI vs. Non-SRI Methods on Sandy Clay Loam in Lowland Cultivation, Visayas, July-November 2001

Yield ($t.ha^{-1}$)					
Minimum		Maximum		Average	
SRI	Non-SRI	SRI	Non-SRI	SRI	Non-SRI
3.8	3.0	7.4	5.6	5.1	3.1

Source: Gasparillo (2002). Area = 3,044 m^2; variety M-44.

Unit Costs of Paddy Rice Production. The cost to produce a kilogram of paddy rice using SRI methods was always lower compared to conventional practice. In Mindanao, the range was PhP 3.30-3.36 per kg with SRI, and PhP 4.07-4.94 with conventional practice. In the Visayas, the corresponding figures were PhP 4.23 – 6.47 (25 x 25 cm spacing at Barangay Magballo) and PhP 5.52 (at Barangay Magballo) – 10.00 (at Barangay Balicotoc), respectively. The average cost of production was about 27% lower in Mindanao and about 10% lower in Visayas. This will be one of the things that makes SRI attractive to farmers, while giving incentive to reduce water use.

Future Expectations. SRI is still a relatively new set of production methods in the Philippines, so final evaluations are not yet possible. Evaluations of the data coming in from NIA and its farmer-associates thus far indicate that SRI is a very promising methodology that rice scientists and policy makers as well as farmers should be interested in knowing about and carrying out assessments for themselves. A main constraint on utilization of SRI is having good water control. Farmers often keep their fields flooded continuously not only to curb weed growth but as a hedge against future water shortage when they feel water-insecure (Namara et al. 2004). When the subproject facilities in SPISP are completed and the proportional weir is in place to assure equitable water distribution, farmers should feel no need to continue taking as much water as possible into their fields as a buffer against possible future shortages. Also, as experience is gained with SRI and the productivity gains documented by Barrett et al. (2004) become better known, farmers should be more willing to commit their whole paddy area to use of these methods. Once they see that production increases are sustainable, collective decisions can follow that will economize on water by coordinating reduced SRI water issues or by beginning to substitute other crops for rice.

NIA's foremost interest is on increasing irrigation water saving because the Philippines faces growing water shortage due growing demands (including non-agricultural uses) and vagaries of climate. If water requirements for rice could be reduced to half the level traditionally used, which seems feasible with SRI, the irrigable service area could be doubled. If enough rice can be produced for domestic consumption from less cropped area, this opens the door for crop diversification that will improve nutrition and alleviate poverty. Also, increases in net farm income would enhance irrigators' capability to pay the irrigation service fees that are needed to guarantee an adequate level of operation and maintenance that will perpetuate the life of NIA irrigation systems as well as the benefits therefrom. This will avert the dreaded vicious cycle of operational dysfunction and physical deterioration that degrades irrigation systems and contributes to poverty and hunger, rather than alleviating these debilitations.

REFERENCES

Anthofer, Jürgen et al. (2004). Evaluation of the System of Rice Intensification (SRI) in Cambodia, February-April 2004. Report prepared for GTZ, Phnom Penh.

ATS/CIIFAD (n.d.) How to Help Rice Plants Grow Better and Produce More: Teach Yourself and Others. Manual prepared and reproduced by Association Tefy Saina, Antananarivo, Madagascar, and CIIFAD, Ithaca, NY.

Basiao, J. A., Magbanua, F., Belarmino, L., Satoradina, E., Villanueva, P. V., Mohammed, R. A., Tetangco, M., Lazaro, R. C. and Eleazar, L. P. (2004). Self-Generating Marketing Intelligence Pooling: The Magballo-Balicotoc-Canlamay Experience. Paper prepared for the Regional Seminar on Farmer-Managed Irrigation Systems and Governance Alternatives, Kathmandu, Nepal, 9-10 September.

Bayer Crop Science (2003) *BIGANTE Hybrid Rice Seeds: Recommended Production Practices*. Promotional leaflet.

Barrett, C. B., Moser, C. M., Barison, J., and McHugh, O. V. (2004) Better technology, better plots or better farmers? Identifying changes in productivity and risk among Malagasy rice farmers. *American Journal of Agricultural Economics* 86: 869-888.

Gasparillo, R. (2002). SRI experience in the Philippines. In: Uphoff, N., Fernandes, E.C.M., Yuan L.P., Peng J., Rafaralahy, S., and Rabenandrasana, J, eds., *Assessments of the System of Rice Intensification: Proceedings of an International Conference, Sanya, China, April 1-4, 2002*, pp. 00-00. Ithaca, NY: Cornell International Institute for Food, Agriculture and Development. <http://ciifad.cornell.edu/sri/proceedings>

Gasparillo, R. et al. (2003). Growth and yield response of traditional upland rice on different distances of planting, using Azucaena variety. Report for Broader Initiatives for Negros Development (BIND), Bacolod City, Philippines.

Ho, M. W. (2004) Fantastic Rice Yields: Fact or Fallacy? Institute of Science in Society (ISIS) press release 02/07/04. <http://www.i-sis.org.uk>

Namara, R. E., Weligamage, P., and Barker, R. (2004) *Prospects for Adopting System of Rice Intensification in Sri Lanka: A Socioeconomic Assessment*. Research Report No. 75. International Water Management Institute, Colombo, Sri Lanka.

Personal communication (2003) Information provided by Mr. M. Tetangco, Agricultural Specialist, Hassall and Associates Inc., Consortium of Consultants for SPISP.

Uphoff, N. (2003). Trip Report from SRI Visit to the Philippines, March 12-19, 2003. CIIFAD, Ithaca, NY. <http://ciifad.cornell.edu/sri/>

Yang, C., Yang, L., Yang, Y., and Ouyang, Z. (2004) Rice root growth and nutrient uptake as influenced by organic manure in continuously and alternately flooded paddy soils. *Agricultural Water Management* 70: 67-81 <http://www.elsevier.com/locate/agwat>

Acknowledgement

Many persons, particularly farmer-cooperators, helped produce the information shared in this report. Those persons most directly involved are the co-authors of this paper. Persons who assisted behind the scenes include the Team Leader of the Consortium of Consultants for SPISP, Dr. Robert Mohamed, and Project Manager of the SPISP Central Project Management Office, Engr. Clemente T. Alanano. They approved Dr. Lazaro's participation in a training seminar in Thailand in April 2002 where he first met Dr. Norman Uphoff from Cornell University and learned about SRI. Subsequently, they agreed to bring Dr. Uphoff to one of the subproject sites in March 2003 where he participated in discussions with the Magballo-Balicotoc-Canlamay subproject stakeholders organized in Farmer Field Schools. Special mention is due to Engr. Carlos Salazar, NIA Regional Irrigation Manager in Caraga, Mindanao, who readily agreed to try SRI first and on a fairly large scale with only words and pictures to convince him. The Cornell International Institute for Food, Agriculture and Development (CIIFAD) including its director, Dr. Uphoff, has been an endless source of information and inspiration as well as giving support for Dr. Lazaro's attendance of the World Rice Research Congress in Tokyo and Tsukuba, Japan, 4-7 November 2004.