System of Rice Intensification Trial Run in Caraga Region, Mindanao[1]

Introduction

The System of Rice Intensification (SRI) is similar to and an improvement[2] on the Margate System of Rice Production in the Philippines, otherwise known also as intermittent irrigation and drainage. It offers a means for water saving, by about 50%, and attainment of higher yield, with at least twice the current level, plus environmentally friendly benefits.

SRI capitalizes on the observations that rice can tolerate flooded condition but also prefers aeration, through alternate wetting and drying. The process of planting one hill in straight rows both ways encourages the proliferation of microorganism that symbiotically enhances the plants' capability to produce more tillers, with vigorous and healthy growth, and a larger number of panicles heavily laden with grains. With less competition for the nutrients in the soil, with aeration of the soil and surrounding environment, an equitable share of sunshine and elimination ofweeds, as well as less effect of pests and diseases, it is no wonder such high yield could be possible.

Caraga Region is host to the Southern Philippine Irrigation Sector Project (SPISP) and the Lower Agusan Development Project (LADP). It has some seven subprojects, (under SPISP) within the National Irrigation System (NIS) coverage of the National Irrigation Administration (NIA). These are: (1) development of the Gibong Extension Core Subproject, followed by repair, rehabilitation and improvements of (2) Gibong Right (Existing) and Left (Existing) with (Extension), (3) Cantilan RIS and (4) Cabadbaran RIS. SPISP in the Region, likewise it covers the Communal Irrigation Projects, viz. (1) Calayagon Core and two non-core subprojects comprised of (2) Aklan and Amontay and (3) Kanaway-San Roque SPs, being implemented by the Provincial Government of Agusan del Norte (PGAN) in collaboration with the NIA.

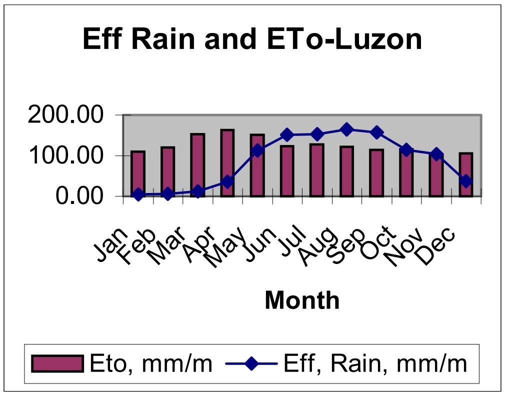
In addition LADP is a large-scale pump irrigation project covering about 2,064 hectares of land within the City of Butuan proper and municipality of Buenavista. The area is generally suitable for rice, known to be requiring a large amount of irrigation water, with limited opportunity for diversified crops of lower water requirement. LADP, with its irrigation component facilities, is substantially complete to date, but being dependent on electrical energy requires innovative approaches to reduce its operation cost.

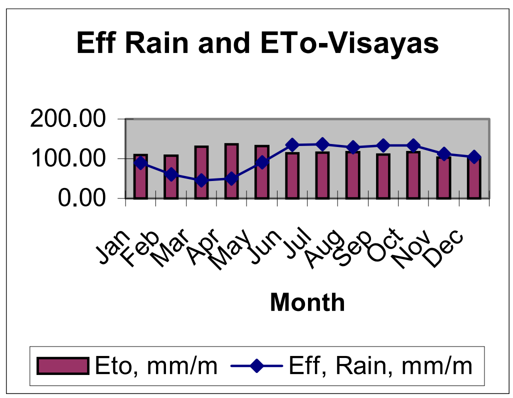
Background

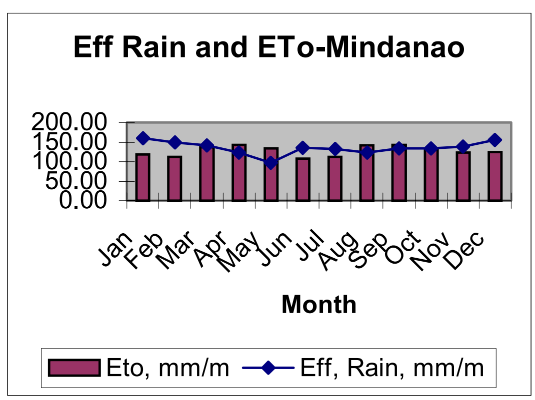
The Southern Philippines comprises of Mindanao and Visayas, both of which have different climatic patterns compared to Luzon (see the typical illustrative charts and comparative differences of Evapotranspiration (Eto) as well as Effective Rainfall[3]). In

[1] Derived and reformatted from the write-ups by Engr. Carlos S. Salazar, Regional Irrigation Manager, Butuan, Agusan del Norte, and Mr. Roger C. Lazaro, Ph.D., Monitoring and Evaluation Specialist, Consortium of Consultants, Hassall & Associates, International-Schema Konsult, Southern Philippines Irrigation Sector Project of the National Irrigation Administration with loan fund from the Asian Development Bank.
[2] SRI was developed in Madagascar and is being promoted extensively throughout Asian by Dr. Norman Uphoff of Cornell University.
[3] Determined from historical climatological records from PAGASA and CLIMWAT and evaluated using the CROPWAT computer software from the Food and Agriculture Organization (FAO) of the United Nations (UN).

Mindanao particularly, the rainfall is almost evenly distributed with the wetter months starting in November, which is the dry season or opposite with those occurring in Luzon. With some of the watershed being affected by serious logging, which is true also throughout the Philippines, water harvesting during the wetter months are overly excessive causing flooding and drainage problems. Therefore drainage improvement considerations, other than flood control, together with irrigation development must be taken into account.







To avail of the SRI opportunities an initial trial run, using the previously recorded applied research results within Mindanao[4] and the Visayas[5], was carried out in the farm of the Caraga (Region 13) - Regional Irrigation Manager, Engr. Carlos S. Salazar[6]. Here full attention was provided immediately and directly to a large-scale, one-hectare area, wherein the full risk can be absorbed as well as take advantage of the farm's poultry-chicken dung as the main soil amendment in the organic fertilizers.

The SRI trial one-hectare farm located in Salvacion, Bayugan, Agusan del Sur, was open as a demo farm, to the public as well as to SPISP and other projects being pursued by the region. This essentially opened up interest to similarly pursue the same in the respective areas of responsibilities within the region[7]. Thus, to date with the completion of the initial run during the 2003 drier months, some of the subprojects of SPISP included SRI in the establishment of pilot techno-demo farms under their action plan for 2004. Likewise, a similar plan has been built in within LADP, as will be shown at the end of the presentation of the initial experiences.

Crop Cultural Practices with the SRI

A separate Power Point Presentation series is prepared following the sequence of the presentation made herein that should be referred to while reading the following.

Land Soaking and Land Preparation

The field was soaked and thoroughly prepared using a small rotary hand-operated farm machine. Very careful land leveling, using a tooth-peg harrow with banana trunk pulled by a 'carabao', was carried out to prevent uneven irrigation water depth and spot-flooded portions.

Production and Application of Organic Fertilizer

Organic fertilizers were produced from the farm's poultry wastes and applied on the seedbed, on the field immediately before transplanting, and subsequently 3 days after transplantation. See the accompanying power point presentation on the organic fertilizer production process adopted and carried out beside the poultry farm.

A full-scale production is now in-progress triggered by growing demand and request from those who visited the SRI trial demonstration plot and encouragement brought about with the high yield achievement from the trial plots.

[4] By the Consortium for Development of Southern Mindanao Cooperatives (CDSMC), as reported by N. Uphoff (2000).

[5] Small plot pilot techno-demo trials on SRI and Total Quality Production Management (TQPM), utilizing a booster chemical fertilizer initially, were initiated and completed in the Magballo-Balicotoc-Canlamay Integrated Irrigation Subproject of SPISP in Negros Occidental after Dr. N. Uphoff visited the site and made a formal on-site presentation of SRI in 2003. Yield (t/ha) and net income (PhP/ha) from Farmer's Practice, TQPM and SRI were respectively, 2.65, 3.66, and 7.33; and 7,592, 11,130, and 24,053. A separate report is being produced on trials on farmers' field in the irrigated area of the Magballo Communal Irrigation System (CIS) which are currently on-going.

[6] Utilizing the information and documented materials brought by Dr. Roger C. Lazaro, Monitoring and Evaluation Specialist (MES) of the SPISP's Consortium of Consultant from a conference that was, similarly attended by Dr. N. Uphoff, who visited and personally presented SRI in the Magballo-Balicotoc-Canlamay SP in 2003.

[7] A similar pilot techno-demo, on much smaller plots, was pursued at Magballo-Balicotoc-Canlamay Integrated Scheme non-core subproject of SPISP right after the field visit of Dr. N. Uphoff (subsequently a larger area, of one hectare, were also pursued this cropping year.

Seedbed Preparation

Modified 'dapog'[8] was used in growing the seedlings using about 200 grams of Hybrid Mestizo (PSBRC 72H) variety (instead of the usual traditional practice of sowing a cavan or cavan-a-half, 50-75 kgs). The seedlings were grown on organic-soil mix about 2.0 cm thick laid on plastic canvas.

Transplanting and Plant Growth Stages

Seedings 8 to 10 days old were transplanted on 18 June 2003 in straight rows 40 cm. x 40 cm. with only one plant per hill. Water application was intermittent, with standing water maintained only for two days; in the remaining eight days of the 10-day interval, part the applied water percolates and is lost, with the balance satisfying the rice crop evapotranspiration requirements. In-between irrigation intervals, weeds were controlled by means of a versatile rotary mechanical weeder that incorporates weeds into the soil, while turning the soil at the same time to allow aeration.

Additional organic fertilizer was selectively applied before panicle initiation to hills or to plants observed to be in relatively poor condition.

Up to 25 days, the field appears to be sparsely populated. Subsequently, however, the prolific tillers begin to fill in the space.

Panicle Initiation and Flowering Stage

Longer panicles and bigger grains were observed compared with the other rice grown in the traditional way, i.e., with random plant spacing in the nearby lot within the whole farm. The highest number of tillers counted from one sample hill in the SRI plot is 104.

Ripening Stage

The highest number of spikelets observed in the SRI plot was 14 with about 305 grains counted in one panicle. There was no lodging observed despite the heavy grains in the panicle.

Harvesting

The Undersecretary of the Department of Agriculture, Mr. Edmund J. Sana, visited the trial-demo farm during harvest time.[9] Mr. Sana personally carried out the crop cut sampling to determine the expected yield. The crop cut projected yield was 200 bags of 50 kg each per hectare; the actual harvest was 178 bags[10] (8.9 tons/ha) with the difference of 22 bags (11% of extra weight) comprised of initial water content as well as losses in the transport and threshing process. Harvesting was carried out in 30 September 2003.

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[8] Almost dry-bed preparation and raising of seedlings on transportable bed.

[9] A photo-record, other than the signed guest book kept on file, of the visitors is shown in a separate power point presentation.

[10] One sack or bag of palay or paddy rice in this area weighs 50 kgs.

The NIA Administrator, Mr. Jesus Emmanuel M. Paras, also visited the trial-demo plot and was similarly impressed by the standing crop. Mr. Paras expressed a personal desire that the feat be replicated in other national and communal irrigation systems nationwide.

Above special guests and others who visited the trial demonstration plots were recorded in a separate power point presentation slides.

Water Management Practice

To achieve aeration in the rice crop's root zone and allow the microorganisms to thrive, the application of irrigation water was made intermittently. Standing water was allowed to percolate and the balance remaining in the root zone was gradually used up by the plant.

Intermittent Irrigation and Drainage

Thus irrigation water was introduced on a ten-day interval, with standing water only for a two-day period, wherein percolation losses occurred. The rest of the eight days in the ten-day interval the water within the soil satisfied the evapotranspiration requirement. Where standing water, from irrigation or rainfall, still remained, rill-like channels further aided removal of any excess water.

Integrated Water Distribution, Farming Activities, and Crop Growth Stages

The water distribution interval and water elevation for SRI and the Common Practice are as shown in a separate power point presentation. Similarly the associated farming activities from May through September are similarly shown below. Finally the crop growth stages are shown concurrently.

Cost of Production and Returns

With the final harvested rice crop yield valued at the prevailing market price and accounting for the cash expenses as well as imputed post-harvest costs, the net farm income was PhP 40,828. Note that the tax paid, return to management and/or capital have not been included.

The details of gross income, expenses and net farm income are provided below. With gross expenses of 30,372 pesos set against gross income of 71,200 pesos, the benefit-cost ratio ws 2.34 to 1, with net income 134% greater than the costs of production.

COST AND RETURN ANALYSIS

TRIAL DEMONSTRATION OF SYSTEM OF RICE INTENSIFICATION (SRI)
(Area - 1.0 Ha. Personal Farm of Caraga Regional Irrigation Manager)

Items		Quantity	Unit	Unit Cost	Unit	PhP
GROSS INCOME HARVEST		178	CAVANS	8.00	per kg	71,200.00
CASH EXPENSES						
Items		Quantity	Unit	Unit Cost	Unit	PhP
A. Land Preparation						
a.1	Plowing	5	man-animal days	220.00	per man-d	1,100.00
a.2	Rotavation (Power Tiller)	2	passing	600.00	per pass	1,200.00
a.3	Harrowing	3	man-animal days	220.00	per man-d	660.00
a.4	Leveling	1	man-animal day	220.00	per man-d	220.00
B. Seedbed Preparation						
b.1	Plotting	1	man-day	120.00	per man-d	120.00
b.2	Laying of Plastic canvas and placement of organic fertilizer	1	man-day	120.00	per man-d	120.00
b.3	Seed sowing and care of seedling	3	man-days	120.00	per man-d	360.00
C. Repair of Dikes		2	man-days	120.00	per man-d	240.00
D. Transplanting		15	man-days	120.00	per man-d	1,800.00
E. Mechanical Weeding/Cultivation		12	man-days	120.00	per man-d	1,440.00
F. Organic Fertilizer Application		4	man-days	120.00	per man-d	480.00
G. Chemical Application		2	man-days	120.00	per man-d	240.00
H. Agricultural Inputs						
h.1	Hybrid Seeds	1	bag	1200.00	per bag	1,200.00
h.2	Organic Seeds	30	bags	250.00	per bag	7,500.00
h.3	Insecticides (Contact)	1	quart	650.00	per quart	650.00
h.4	Rodenticides	1	pack	150.00	per pack	150.00
I. Irrigation Service Fee (ISF)		3	cavans	10.00	per kg	1,500.00
Total Expenses					PhP =	18,980.00
POST-HARVEST EXPENSES						
A. Harvester's Share (8 % of Total Harvest)		14.24	cavans	8	per kg	5,696.00
B. Thresher's Share (8 % of Total Harvest)		14.24	cavans	8	per kg	5,696.00
	Total	28.48	cavans			
GROSS EXPENSES (II + III)						30,372.00
NET INCOME (Income Less Expenses)					PhP =	40,828.00

Possible Applications

Two immediate further applications subsequently followed. The first is the consideration of ratooning the previous SRI crop. This eliminated the need for seeds, labor and cost for land preparation, as well as reduced crop duration in the field. A second application was possible extension of SRI to the Lower Agusan Development Project's Irrigation Component. Here the water from Agusan River is pumped using electrical energy at great cost. Any savings in the amount of water pumped would reduce the cost of energy, making SRI relatively more profitable than calculated above..

A third consideration was the pursuit of similar establishment of a pilot techno-demo farm in the core and non-core subprojects of SPISP within the Caraga Region. Action plans drawn during the January 2004 Annual Review and Planning Workshop, held in Bacolod City, are currently being implemented.

Minimization of Power Cost for LADP

As was mentioned earlier the possible application-implication of SRI within LADP was planned and similarly illustrated in the table given below, again showing the common practice compared with SRI. Note that the variance under each farming operations varied by 45% during land soaking and 73% during crop maintenance. In both, the relatively wetter (more rainfall) months are compared with the relatively drier months. Correspondingly, therefore the power cost based on volume of diverted water would similarly vary with cost variances (which can be interpreted as savings) of half a million for land soaking, and 1.1 million for crop maintenance during the wetter months and 0.54 million and even close to 2.0 million during the drier months.

For another illustration, the case of the Traditional Practice at a reasonably improved farm and practices at Bit-os within LADP is shown. A separate power point presentation on the comparison describes this application in detail.

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LADP-IC Staff for the adoption of the technology based on observations made from the SRI Trial Demonstration Plots in their Project Operation Plan to reduce the Pumping Operation Cost.