

**Report on Trip to Philippines
August 13 - 21, 1997**

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SM-CRSP Project *Decision Aids for Integrated Nutrient Management*

Travel Team:

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Objectives:

- Identify potential intensive testing sites for evaluating the Integrated Nutrient Decision Support System in the wet-dry tropics.
- Explore and develop collaborative relationships with PhilRice, IRRI, SEARCA, PCARRD and UPLB for the purposes of testing the decision-aids both intensively and extensively.

Itinerary:

August 12	Arrival in the Philippines
August 13	Group meetings at IRRI with (a) K. Fischer, C. Piggin & O. Ito; (b) G. Kirk & A. Dobermann; (c) G. Denning, C. Piggin & V. Balasubramanian; and (d) S. Pandey & D. Lowe
August 14	Group meeting at IRRI with R. Roetter & S. Kam; visit to PCARRD % Cris Escano; presentation of proposed integrated decision support system by Deanna Osmond
August 15-17	Visit to PhilRice and Cagayan Valley, Luzon % Santiago Obien
August 18	Visit to SEARCA % Percy Sajise; wrap-up session at IRRI with K. Fischer, A. Piggin & O. Ito; demonstrations of acidity, N and P decision support system prototypes to interested colleagues from UPLB, PCARRD and SEARCA
August 19	Departure of Deanna Osmond and Shaw Reid; Russ Yost remains to work with Phosphorus group
August 21	Departure of Russ Yost

Selection of the intensive site:

The project's intensive testing site location in SE Asia will be located in the Philippines because of excellent working relations with PhilRice (The Philippines Rice Research Institute) and long term association and previous decision-aids work with IRRI (International Rice Research Institute). These working relations have been developing for several years and have

been an outgrowth of the earlier TropSoils experience. While IRRI is our primary host in SE Asia, within the Philippines our most important contact is the PhilRice Institution that has come of age since 1989.

Our primary host for the field visit to select an intensive testing site was Dr. Santiago Obien of PhilRice (former UH student with a Ph.D. in soil science). The field visit began with a visit to the PhilRice main office at Nueva Ecija, Maligaya, Central Luzon. This is an impressive center built with some foreign assistance from Japan and now considerable support from the Philippine Government. The center was created by Ferdinand Marcos in 1985 and operations began in 1987. The full complex was turned over to the Philippine government in 1991. It is attached to and overseen by the Philippine Department of Agriculture. There were recent investments on the order of US\$24 million in the center. The two sections of the institute include:

A) The Research Department comprised of 1) Plant Breeding and Biotechnology, 2) Soils, water management, Agronomy and Plant Physiology (Rolando Cruz, Head), 3) Crop protection, 4) Rice engineering and mechanization, 5) Rice Chemistry and Food Science, and 5) Social Science and Policy Research; and

B) The Technology Promotion Department including 1) Communication, 2) Training, 3) On-farm technology, and 4) Seed production and health.

PhilRice has an extremely active outreach element and has been very successful in bringing farmers in, training them (a new 120 room training facility was being built at the Maligaya station). PhilRice has been conducting extensive farmer training sessions, complete with distribution of new rice varieties, small equipment items, and a color chart to predict N needs. The card has five shades of green and N recommendations associated with each color. The success of the green card is not clear but seems to be undergoing very extensive testing at the present time.

Two potential upland sites were visited, both in Northern Luzon. One location was on the farm of Mr. Romeo Raros, PhilRice and the second was near the Ilagan Experiment Station in the old Hacienda San Antonio.

Site 1: Upland fields of Mr. Romeo Raros. The upland fields of Mr. Romeo Raros did not show enough nutrient/acidity limitations. Although the site was interesting it is not appropriate for an intensive testing site for our project.

Site 2: San Antonio hacienda. This is a 7,000 ha farm, near Ilagan Experimental Station, which seemed to meet our requirements more closely than did the Raros site. During our visit we had access to the data in Table 1. We asked for some supplementary analyses which were quickly provided (Table 2). The soils of this location were series Rugao, which is locally mapped to cover some 14,000 ha. The soil moisture regime probably would be ustic from estimates what were available but perhaps udic at higher elevations to the east in the Sierra Madre mountain range. There seemed to be an argillic horizon on one of the road cuts which may put the soil into a Paleustult great group. A characterization is being sought from the Philippines Soils Bureau.

The data in Table 2 show that Al is quite high in this soil and that the approximate Al saturation is high to very high. This reinforces the Al toxicity symptoms we noticed on upland rice roots. Calcium and Mg levels are not as low as we sometimes see in Sitiung, Indonesia, but probably are similar to those of other sites in the Philippines (Cavinti site which had very high Al

and moderate to low Ca). Generally this indicates the soil has somewhat more active minerals than some of the highly weathered soils in Sitiung, Indonesia, and certainly more clay than we will encounter in West Africa.

Table 1. Soil chemical properties of fields at the San Antonio site (Hacienda San Antonio), Ilagan, Isabela Province.

Field	pH			Available P		Exc h K ^a	Extractable ^b		
	H ₂ O	CaCl ₂	KCl	Bray2	Olsen		Fe	Mn	Al
				-----mg kg ⁻¹ -----			-----g kg ⁻¹ -----		
Brgy Centro 1 (low)	4.45	3.71	3.58	1.24	0.55	0.18	52	1.1	8
Brgy Centro 1 (high)	4.32	3.67	3.61	0.70	0.25	0.20	61	0.7	8
Brgy Centro 2	4.30	3.80	3.57	1.79	1.00	0.22	60	1.1	7
Brgy Kabisera 18	3.88	3.61	3.51	9.21	5.20	0.34	38	1.0	5
Pintor, Gamu, Isabela	5.03	4.75	4.02	0.51	1.49				

^a 1N NH₄OAC-extractable, in cmol_c kg⁻¹ soil

^b Citrate-dithionite extractable

Table 2. Soil acidity measurements of fields at the San Antonio site (Hacienda San Antonio), Ilagan, Isabela Province.

Field	1N KCl Extractable				Al Sat.
	Al	Ca	Mg	Acidity	
	-----cmol _c kg ⁻¹ -----				%
Brgy Centro 1 (low)	2.15	1.21	1.26	13.74	45
Brgy Centro 1 (high)	2.48	1.07	0.94	15.80	53
Brgy Centro 2	5.08	1.66	1.80	17.65	58
Brgy Kabisera 18	4.17	0.46	0.46	11.59	77
Pintor, Gamu, Isabela					

The high Mg to Ca ratio, which exceeds 1 in some cases, is very high. This likely exacerbates the Ca / Al problem if one subscribes to Cochrane's report about Brazilian Cerrado

soils (Cochrane, 1989, SSSAJ 53:139). This would be a good opportunity to obtain some field data on the effects of the Ca/Mg ratio and update our knowledge. The KCl exchangeable acidity, however, seems very high and the analysis needs to be repeated.

Visit to the Ilagan Experiment Station:

We arrived at the Ilagan Experiment Station after leaving Santiago in the morning and visiting the San Mateo Experiment Station for Lowland Rice. We visited the Romeo Raros farm en route to Ilagan. The Ilagan Station would be the closest experiment station to support any work at the San Antonio site. We were greeted by the present director (Danilo B. Tamamao), and the former director (Dr. Perdido) and several agronomists including Mr. Quirino L. Asuncion, the present on-site agronomist/soil scientist who collected the samples for the results in Tables 1 and 2.

The station includes five satellite stations that were combined in 1982. The present station includes programs in a) crop protection (the IPM-CRSP has some studies going on here), b) soil conservation (provides information on water management structures and irrigation support), and c) animal science. Major crops include maize and legumes (especially peanut, soybean, mungbean, cowpea), and vegetables. There is a fruit tree program as well. We did not visit the soils laboratory, but it likely provides only routine analyses.

There had been a couple of soils experiments, which we did not have time to hear about or to investigate, such as 1) an FAO project on P management conducted in association with the Bureau of Soils, and 2) a missing element trial with maize as the test crop. There were estimates of around 800,000 ha in upland soils, most of which fell in three slope classes: 3-8, 8-18, and 18-30%.

Dr. Perdido mentioned that a maize-rice rotation was prevalent in the uplands, but yields were very low. Upland rice often yielded less than 1 ton ha⁻¹ and the soil pH was often 4.5 or so. For rapid access to the region there are flights from San Mateo once or twice a week, and daily flights to Manila from Tuguegarao.

Discussion notes during visits:

Director of Research, IRRI (Dr. Ken Fischer):

Two ways were suggested that the SM-CRSP might collaborate with IRRI:

1. Work with the cross-ecosystems work group, coordinated by Paul Teng, with regard to the increased use of decision-aids to complement the systems work that is in place with SYSNET (Wageningen). IRRI is interested in the possibilities of decision-aids to assist in getting information to the users so that yields can be increased through better use of existing technology. Apparently there are efforts underway to develop management decision-aids for paddy systems, and Ken Fischer was interested in the jointly working with the INDSS group in that effort.
2. Work through the consortium linkages with the various country and NARES programs so that they are more effective. There also was interest on the part of the IRRI Uplands Program in using decision-aids to increase the use of research information by Consortium collaborators.

Upland and Rainfed rice systems (Colin Piggin):

The objectives of this program are to increase the productivity and sustainability of food production in rice-based systems. The upland systems considered are quite broad, including not only rice but also trees and livestock. Constraints identified by the consortium scientists include drought, nutrients / soil acidity, weeds, pests (nematodes are high on the list), and social

economic constraints. This program has the following research projects:

- 1) Germplasm;
- 2) Production / Sustainability including Agronomy, Soils, Crop improvement; and
- 3) Uplands consortium (including 8 partners: India, Indonesia, Thailand, Philippines, Vietnam, Laos, Brazil and IRRI). Funding is by GTZ. Associate members (those receiving no funds) include: Myanmar, Bangladesh and China. Some of the experiments are to go on for 8 years or so. Presently the Consortium supplies equipment, students, some training.

The SM-CRSP work is viewed as addressing some of the major constraints that have been identified in the uplands consortium as limiting the achievement of potential yields.

Dr. Kondo, supported by a Japanese program (not JICA, but a more research-oriented program), also working in the uplands program, has been conducting experiments with nitrogen on IRRI Consortium sites. We met briefly with him to identify possibilities of collaboration with NDSS. He has been conducting N x P experiments at several of the consortium sites, including India and Thailand in addition to the Philippines sites. He now has a network of about 8 sites, expanding somewhat on the Consortium sites. At some sites he has 2 years of data on the N x P factorial experiments. He often does not find P response on the upland rice, pretty much as expected. Rice yields vary from 1.5 to 2.5 ton ha⁻¹. He is interested in working with his data in a modeling approach and is open to working with decision-aids as one way to summarize and transfer his information.

Soils and Water Division for Paddy and Rainfed Systems (Guy Kirk and Achim Doberman):

These people have been involved with PDSS development and will continue to work on the lime leaching phase of ADSS. Achim has been working with a student from Germany on testing resin capsules for use with his adaptation of the Wolf et al., QUEFTS approach to nutrient management. They have some interesting ideas some of which are published very recently in SSSAJ together with Earl Skogley, Montana. They have measured resin capsule desorption at 1 day and 14 days in the field at the consortium sites where Thomas has conducted his P experiments. The data is being assembled as part of a German student's thesis. That information will be available to test and, possibly, add another P soil test method to PDSS. The PDSS project supported some of the student's work.

The QUEFTS approach that Achim is working on may be an alternative approach to the critical level, linear response plateau, buffer coefficient approach that is being used in PDSS, but there are several disadvantages that are yet to be worked out. One of the major disadvantages are that the approach doesn't provide easy-to-use diagnostic methods (analogous to our soil test as a diagnostic tool). Their approach seems to jump right into prediction and provides no assistance to improve diagnosis, which our work with PDSS suggests is often haphazard in many current nutrient management programs.

IRRI Social Sciences Division (S. Pandey and David Dawe):

S. Pandey has been continuing some of the work that Sam Fujisaka, social scientist, began while at IRRI. Pandey seems to have an active research program and may be someone who can assist in the baseline assessment and in providing input into the integrated decision-aid. Most of his research has been with lowland farmers, however. He will likely be involved in the Consortium work in the uplands, especially in the uplands work in the Arakan Valley, Mindanao. We will need to coordinate the baseline assessments with that of other sites.

The SYSNET Program under Paul Teng (Reimond Roetter):

This program is supported by the Dutch and is the revision of the 1985-1995 SARP (Systems and Simulation for Rice Production) program from Wageningen. The program also has staff and work in West Africa (Mali in particular). Herman van Keulen is the principal contact person for the project. Roetter stated that this project will emphasize the involvement of people more than the tools, perhaps the achilles heel of the SARP program. It seems that there are quite a few similarities in goals and some objectives between this program and ours except that it appears highly focused on paddy rice rather than on the uplands.

PCARRD - DOST visit with Cris Escano and associates:

This was a very short discussion that included an introduction to PCARRD and the research program. This is the largest single agricultural research organization in the country. Dr. Uehara's former student Cris Escano is head of the research unit. Cris was quite enthusiastic about cooperating with us and specifically in testing the software, much as he has done with the DSSAT software (maize and soybean?).

PCARRD has a web site at <http://www.dost.gov.ph/DOST/PCARRD/PCARRD.html>. The contact person is Andrew Valdeavilla. He is involved in the DOST web development and seems to play a key role in the software development/testing work carried out by PCARRD. His presence and involvement exemplifies the relatively heavy investment of PCARRD in information technology.

The PCARRD program includes mung bean, cassava, peanut, and soybean as well as both upland and lowland rice. Cris mentioned that many experienced farmers complaining about low crop yields. Cris thinks that the problem is probably due to the non-replacement of nutrients and possibly micronutrients. He is interested in the decision-aids, as they might assist his staff to identify (diagnose) nutrient deficiencies. Cris also pointed out that one of the roles his institution plays is in providing advice to the central government regarding agricultural policy. It was clear that this institution has a major role in fertilizer policy guidance.

UPLB visit with Ed Paningbatan:

Ed teaches soil physics and soil conservation at UPLB. The visit with Ed was quite interesting. Ed was the MS advisor of Martinus Pandutama, one of our recent UH Ph.D. grads in soil science. Ed does software development and is in charge of much of the UPLB agronomy computer laboratory. He was quite interested in the programming details of the software and expressed a lot of interest in doing extensive testing for us. Ed has several international linkages. He is the IBSRAM Philippines cooperator for the Acid Soils Network and oversees several of the network's sites in the Philippines: Kaliraya, with a degraded Ultisol, Tanay, Rizal; Bukidnon, Mindanao. We did not have time to look at the data but several of these sites have pH's of 4.5 or so. These clearly would be an excellent site for testing the integrated decision support system.

SEARCA visit with Percy Sajise, Gil C. Saguiguit Jr. and later with Arturo Gomez:

Meeting with the SEARCA group (Southeast Asia Regional Centre for Research on Agriculture) was intended to investigate the possibility of their interest in working with us regarding the extensive evaluation of the decision-aids and possible sharing of social data from their sites. This group is expected to be particularly strong in the social and policy work. That seemed to be the case as they described one of their projects with ACIAR ("Development of Sustainable Production Systems for Steep Lands"), which had three sites: 1) Slope land in Isabela

Province, agroforestry; 2) Nueva Ecija regarding fire prevention; and 3) Jala jala in an upland settlement site. The ACIAR project has a consortium of universities: University of the Philippines at Los Banos (UPLB); Kasetsart University, Thailand; Institut Pertanian Bogor (IPB, Bogor, Indonesia); Gadjja Mada University, Yogyakarta, Indonesia; Universitat Pertanian Malaya, Kuala Lumpur, Malaysia (UPM). Percy and Gil indicated that Arturo Gomez, Leader of the Philippine component of the ACIAR Project would be the key contact person for our project.

Arturo Gomez is co-author of the Agricultural Statistics book Gomez and Gomez. Art was very interested in using our software to complement their project work. They are not doing anything similar to this for their project and he was quite excited about testing our predictions and their observations with assurance that they would provide feedback to us. He probably understands our objectives in developing the software as well as anyone. He suggested that they test the software at the Jala Jala site as probably one of the first. Based on Mike Robotham's data from Jala Jala it will not have an acidity problem but may have a problem with N and P. Art appears to be an excellent person for some particularly insightful testing of our software.

During the final discussion with IRRI directors we agreed on the following actions as a result of the visit:

1. Preparation of a Memorandum of Understanding to more explicitly document the collaboration;
2. Develop a matrix showing the relationships between their Consortium, and our project's intensive testing sites and extensive evaluation network for the collaborative work; and
3. Detail Thomas George's responsibilities vis-a-vis our project and IRRI's consortium work.

IRRI explicitly invited graduate students and research associates that would be able to guide and assist in the decision-aids and technology dissemination by means of decision-aids. I believe Ken Fischer understands that we are involved in doing a number of things that are very different from the usual soil science research.

List of Contacts:

PhilRice

Santiago Obien, Director
Teodula Corton, Soil Chemist, Nueva Ecija
Roland Cruz, Agronomist, Nueva Ecija

PCARRD, Philippine Council of Agriculture and Environmental Research

Crisanto Escano, Director of Crops Research
Andrew de Valdeavilla, Computer Specialist

SEARCA, SouthEast Asia Regional Centre for Research on Agriculture.

Percy Sajise, Director
Gil Saguiguit, Jr., Director of Research
Arturo Gomez, Program Leader, Joint faculty with UPLB

IRRI

Ken Fischer, Deputy Director General for Research
Colin Piggitt, Program Leader, Upland and Rainfed Lowland Rice Programs

Osamu Ito, Head, Agronomy, Plant Physiology, Agroecology Division
Paul Teng, Program Leader, Cross-Ecosystems Program
S. Pandey, Agricultural Economist, Social Sciences Division
M. Kondo, Agronomist, Agronomy, Plant Physiology, Agroecology Division
R. Roetter, Systems Network Coordinator, Agronomy, Plant Physiology, Agroecology Division
Thomas George, Agronomist
Roger Magbanua, Assistant Scientist

Appendix 1. Literature identified for future use.

- Panday, S. 1997. Socioeconomic context and priorities for strategic research on Asian upland rice ecosystems. *In* Piggin, C. Courtois, B., and Schmit, V. (Eds.) Upland Rice Research Partnerships. IRRI Discussion Paper Series No. 16, International Rice Research Institute, Philippines, 103-124.
- Pandey, S. 1997. Adoption of nutrient management technologies for rice production: economic and institutional constraints and opportunities.
- Gomez, A. A., D.E.S. Kelly, J.K. Syers, and K.J. Coughlan. 1996. Measuring sustainability of agricultural systems at the farm level. *In* Methods for Assessing Soil Quality, Soil Science Society of America Special Publication No. 49. Madison, Wisconsin.
- Books were purchase with project funds with the following titles:
- Pingali, P.L., M. Hossain, and R.V. Gerpacio. 1997. Asian Rice Bowls: The Returning Crisis? CAB International and International Rice Research Institute.
- Vergara, B.S. 1992. A Farmer's Primer on Growing Rice. International Rice Research Institute.
- Ingraham, K.T. 1995. Rainfed lowland rice: Agricultural Research for High-Risk Environments. International Rice Research Institute.

Publications of possible general interest included the following:

- Piggin, C., B. Courtois, and V. Schmit. 1996. Upland Rice Research in Partnership: Proceedings of the Upland Rice Consortium Workshop, 4-13 January, 1996, Padang, Indonesia. IRRI.

Appendix 2. Prototype overview of the integrated Nutrient Management Decision Support System (9/97).

INTEGRATED NUTRIENT DECISION SUPPORT SYSTEM

