Report on Travel to the Philippines
July 27 - August 5, 1998
USAID Grant No. LAG-G-00-97-00002-00
SM-CRSP Project *Decision Aids for Integrated Nutrient Management*

Traveler: Russell Yost, University of Hawaii

Objectives:
- Assist in installing core and on-farm experiments at the San Antonio, Isabela, Philippines, experimental site.
- Discuss and develop collaborative testing relationships with PhilRice (Philippine Rice Research Insititute), IRRI (International Rice Research Institute), University of Los Banos, Philippines (UPLB), and PCARRD (Philippine Council for Agricultural Research and Development).

Itinerary:

Tuesday, July 28	Arrive in Manila
Wednesday, July 29	Manila to Cauyan City, Isabela (via Asian Spirit airline), PhilRice bus to Ilagan
Thursday - Friday, July 30-31	In Ilagan
Saturday, August 1	Ilagan to Nueva Ecija (PhilRice)
Sunday, August 2	In Nueva Ecija
Monday, August 3	Nueva Ecija to Los Banos (IRRI)
Tuesday, August 4	In Los Banos
Wednesday, August 5	Depart from Manila

Installation of Core Experiment at Ilagan:

Preparations were well underway for the installation of the experiment. Grid sample data (sampled at the intersection of an 8 m grid) had been taken and analyzed (results shown in figures in Appendix 3). In general there was the usual spatial variability in soil chemical properties. Site 1 (with two blocks) was near the market and was a sort of saddle topology. The blocks were placed side-by-side as the estimate of the best stratification of variability in the grid data and characteristics of the field (Appendix 2). Site 2 (with two blocks) was similarly blocked side-by-side looking at the plot from the road, perhaps 1/2 to 3/4 of a kilometer from the first site. Site 2 varied more between blocks than Site1, with the side closest to Site 1 of a somewhat grayer, slightly less well-drained than the left-hand side (facing the plot from the road).

Treatments, described in the core experiment description circulated among project personnel (Appendix 1), were allocated to the experimental blocks, the experiment marked and staked in

the field. Treatments receiving agricultural lime and phosphogypsum were identified and the respective materials were added. The agricultural lime application was adjusted for measured particle size and expected calcium carbonate equivalency of 90%. The actual calcium carbonate equivalent of the lime and phosphogypsum will be determined. Calcium and P content of the phosphogypsum will also be determined but, according to the package labeling, should be close to that of gypsum. We were fortunate that Thomas George had already imported a substantial supply of TSP, as it was not to be found in the commercial market in the Philippines.

The lime was purchased in Manila and shipped before hand to Ilagan, as there was no lime to be found in the local market. The phosphogypsum was brought from Leyte, where it is a by-product of the ordinary superphosphate production industry. The lot was donated by PhilPhos for use in experimentation.

The plot layout was based on a plot size of 5 x 9 m, which fit the area required for four blocks for each of two cropping areas (rice and peanut). Because peanut is not planted until approximately October or November, it was not prepared at this time. These plots will be prepared at a later time in a manner similar to that established for the rice (and later maize) plots.

Incorporation of the limestone and phosphogypsum proved to be a complication, as has occurred often in the past. A suitable rototiller was not available, so the lime was initially incorporated by hand hoe. This required considerable effort and approximately 12 local laborers were hired for the first of two hand tillings. Laborers had no previous experience incorporating limestone, although one retired tobacco agronomist, Miguel Rodriguez, had once tried applying lime to tobacco many years before.

The lime will be allowed to equilibrate approximately three weeks before the rice will be seeded. Another set of surface soil samples will be collected immediately before the crop is planted. Depth samples have already been collected but the results are not yet available.

A separate field had been planted to cowpea to grow the green manure for the GM treatments 13 and 14 of the rice and 14 and 15 of the peanut experiment.

Many thanks are due to Teodula for coordinating the acquisition of the land, purchase of the experimental materials, and hiring of a research assistant (Josephina Lasquite) and a field supervisor (Mauricio Paludipan). The local contact with the Ilagan Experimental Station was Mr. Quirino Asuncion. Thomas George's experience in laying out and installing field experiments in the Philippines was quite useful and facilitated the process.

As indicated in the participatory rural appraisal (PRA)(Corton et al., 1998), the barangay is very enthusiastic and supportive. Many people stopped by the plots to ask what was going on and to marvel at the white plots after the lime was applied. A few people volunteered to help with the work. As indicated before, the experimental plot is close to the barangay market so it is sure to be scrutinized during the next few years and results will be highly visible.

The barangay chairperson was not available, although we did meet her briefly. She was quite busy buying and selling tobacco. She is clearly a very impressive person guiding the barangay in establishing an impressive array of local services and facilities with little or almost no resources As indicated in the PRA (Corton et al., 1998), this barangay was designated as the best barangay in the Philippines and won the honor for the entire province of Isabela just prior to that.

In the course of explaining the project and contributions of the core and on-farm experiments, I emphasized that the core-experiment was designed to test the *prediction* part of IntNDSS, while

the on-farm research was particularly useful in testing the *diagnostic* portion of IntNDSS. Actually both activities have greater utility than this relatively narrow purpose. For example, there are many opportunities to test diagnostic methods on the core experiment. One example to be proposed to the N group will include the possibility of testing the leaf color chart, already in production for paddy rice, on upland rice. One of the difficulties using this technology for upland rice is the interrelation between drought stress and N stress, which may invalidate the procedure. Other types of diagnostic evidence will be sought.

On-farm Experiments:

The farmers participating in the on-farm experiments had largely already been determined and their fields sampled and analyzed. The goal was to identify 10 farmers that initially planned on planting rice and 10 that planned to plant maize. Four farmers were visited the first day and three of the fields were visited and initial diagnoses of nutrient limitations were made. The criteria for the on-farm tests were initial crop planted. Although this was likely to change through the duration of the project, these farmers would be, if they wished, part of the on-farm testing for the duration of the overall project. Farms were also grouped into the 0-8% and 8-16% slopes, with or without external income and above or below soil pH 5.25.

Ten farms had been selected, fields sampled, and initial soil pH determined. Upon further discussion it was determined that, in some cases, land that was not part of the experiment was also sampled and composited in the sample, so these fields will be re-sampled and re-analyzed. Additional farms need to be located as well. The research assistant, Josephine, will proceed with this task immediately after the limestone and phosphogypsum have been incorporated.

No particular distinctive weed or plant has been identified so far in the on-farm experiments, but the process is just beginning. As indicated in the PRA, many of the fields have small, round, blackish nodules on the soil surface. An initial test with hydrogen peroxide indicates that these nodules probably contain manganese. Further tests will be conducted on samples brought back to the University of Hawaii.

In an interesting development, Dr. Corton, with the support of Dr. Santi Obien, drafted a letter to the Soil Bureau of the Philippines, requesting a soil survey of the barangay, offering to determine the chemical analyses of the soil if the Soil Bureau would locate the pits and collect the samples and make the survey. This proposition was agreed to by the Soil Bureau and the initial report is due July 31, 1998. Because the Soil Bureau doesn't have ready access to quantitative XRD, i.e. Rietveld analysis of soil clay mineralogy, samples were brought to Hawaii for mineralogical analysis in support of the survey. One of the working hypotheses that this survey will help address is that there might be a zone of soils with properties similar to those of the San Antonio site along the Sierra Madre of the entire Eastern side of the island of Luzon. The highly acid, high Al soils of Cavinti may be an example of another soil in this position in the southern part of the island. This hypothesis could reveal a pattern in the occurrence of acid soil that has not been apparent heretofore. Existing soil surveys have concentrated on the paddy soils and have not surveyed the uplands in sufficient detail to test this hypothesis. If true, awareness of this occurrence of acid soils will improve management of upland soils in the country and illustrate the need for both the PhilRice uplands effort and the IRRI uplands program.

Institutions for Integrated Decision-aid Testing:

Discussions continued with UPLB, PCARRD, and SEARCA regarding testing of the prototype decision-aids. Dr. Ed Paningbaten, UPLB, will assemble data that he has that could be used to test system performance. Ed is interested in adapting the system for use in the UPLB soils and plant laboratory for making nutrient management recommendations. He has been involved in software development and is in charge of the computer applications for the Soil and Water Department. His expertise includes soil conservation and soil-plant nutrition. Ed has recently completed several projects with the IBSRAM acid uplands network. Some of which might be suitable to field testing predictions of IntNDSS.

Ed will work with Christy Clavero, the PCARRD Science Research Specialist in charge of database management and computer systems. Christy has specific interest in adapting the system for use in the PCARRD information transfer responsibilities. She has been involved in commercial software development and thus has some expertise in developing user-oriented software and computer system interfaces. One of her questions was how adaptable the IntNDSS would be. She obviously is capable of adapting the system to fit PCARRD goals and objectives. She will, as part of her database system responsibilities and access, identify PCARRD experiments that have been conducted during the last decades that could contribute to the testing and experimental verification of IntNDSS predictions.

Art Gomez, SEARCA, will do some evaluation of PDSS in his ACIAR project's sites and locations. He is not interested in the details of the system, but will provide reactions from the point of view of simple utility and usefulness.

Several scientists at IRRI (International Rice Research Institute) continue to be interested in project work. Dr. Guy Kirk continues to be interested in the calcium and magnesium movement work. Work continues on the paddy rice nutrient management decision-aid by Dr. A. Doberman. An interesting recent result of that work was the establishment of a consistent grain yield-nutrient uptake relationship that seems to hold for quite a few countries and paddy rice systems in SE Asia. Dr. P. Teng and Mark Bell are continuing decision-aids development on specific topics. They are finding, as the PDSS group has been finding, that there is a need for improved diagnostic methods as the first line in the perception and identification of a yield constraining situation. They have developed a rice blast kit that facilitates the quantitative identification of rice blast.

During the last day discussions continued with phosphorus buffer coefficient research being conducted by Thomas George. Work by two of Thomas' research associates was reviewed and will directly assist the improved testing and development of the integrated nutrient management decision aid.

Reports Cited:

Corton, T., T. George and J.B. Friday. 1998. Exploratory rapid appraisal of Barangay Centro San Antonio, Ilagan, Isabela, Philippines. August 1998. 14p. (http://intdss.soil.ncsu.edu/sm-crsp/Download/Documents/Philipp_Base_Survey.pdf)

List of Constacts:
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Appendix 1. Description of core experiment treatments for San Antonio Rice experiment -

TREATMENT	N	P	LIME	COMPARISONS
1	N0	P0	L0	Complete check
2	N2	P2	L0	Lime check
3	N0	P2	L2	N check
4	N2	P0	L2	P check
5	N1	P2	L2	N resp. 3,5,7
6	N2	P2	L2	3,5,6,7–N; 4,8,6–P; 2,11,6 –Lime
7	N3	P2	L2	N extra, 6,7
8	N2	P1	L2	P resp. 4,8,6,9?
9	N3	P3	L2	P extra 7,9
10	N1	P1	L2	Low N & P; 5vs10; 8vs10
11	N2	P2	L1	Lime resp.: 2,11,6
12	N2	P2	see –>	Gypsum effects, L2 but 50%Ca as $CaCO_3$ +50%Ca as $CaSO_4$
13	N2	P2	L0+5t GM[§]	GM Lime effect 13,14 vs 2,
14	N2	P2	L1+5t GM	GM Lime effect 13,14 vs 2.

[§] GM = green manure

(1) *Nitrogen*: check, 50% NDSS, NDSS predicted optimum, 150% of NDSS (4 treatments)

(a) The check plot with non-limiting amounts of lime, phosphorus and other nutrients will ensure the estimate of N contribution potential from the existing soil (tmt 3).

(b) Nitrogen levels-

(i) A level of N will be supplied to the rice that is estimated to provide non-limiting amounts of N throughout the growth period. This will use some of IRRI and PhilRice's recent results suggesting multiple applications associated with crop requirements

(ii) Necessary coefficients would be obtained from appropriately chosen sampling times and locations. Those will be specified by either the NDSS or from Stanford model predictions.

(2) *Lime*

(a) L0: (No lime), L1 (ADSS prediction for 40% Al sat.), L2 (ADSS prediction for 0% Al sat.) – three treatments, but with an extra to test gypsum effects.

(b) This combination will help determine whether existing information predicts sufficient lime to meet the neutralization requirements and whether it will meet the recent estimates that lime response occurs well beyond the level estimated from Al alone.

(c) We'll include a gypsum treatment with the same amount of lime as required for 0% Al. Sat, but 50%Ca as $CaCO_3$ +50%Ca as $CaSO_4$. While phosphogypsum is likely to be the material used in practice, it is probably best to include gypsum in the core experiment and add a comparison treatment of phosphogypsum as an additional treatment or to on-farm experiments.

PhilPhos (Philippines Phosphorus industry) produces, as many other phosphate plants, a waste by-product of phosphogypsum. PhilRice has obtained some of this material and is willing to assist in providing experimental quantities for research in San Antonio. This is heavily used in Brazil and most research shows that there is considerable benefit to soils with acid subsoils, crops with moderate tolerance to acidity, and in regions with uncertain rainfall. All of these conditions apply in San Antonio. Auxilliary experiments would be beneficial to suggest a proper proportion of gypsum in the lime mixture. Literature data from Brazil and other locations where gypsum is used is needed to propose some criteria for this factor.

(3) *Phosphorus*

(a) Treatments: P0 (0 P), P1 (50% of PDSS rec.), P2 (100% of PDSS rec.), P3 (200% of PDSS rec.).

(b) The current PDSS coefficients should be relatively well adapted to the soils of the region – clayey, acid, probably kaolinitic, Ultisols.

(c) With initial soil measurements, in addition to those already obtained and with incubation estimates of buffer coefficients, initial estimates of P requirement should be near to appropriate levels.

(d) Local phosphorus material is ordinary superphosphate, which contains relatively large amounts of gypsum, which is expected to be of considerable benefit. We presently will seek to use super triple for most core treatments and likely ordinary super for the on-farm testing if the gypsum has the expected benefit.

Peanut experiment -

TREATMENT	N	P	LIME	COMPARISONS
1	N0	P0	L0	Complete check
2	N0	P1	L1	Adequate lime, no N, low P
3	N0	P2	L1	Adequate lime, no N, adequate P
4	N0	P3	L1	Adequate lime, no N, high P
5	N0	P1	L2	High lime, no N, some P
6	N0	P2	L2	High Lime, no N, adequate P
7	N0	P3	L2	High lime, no N, high P
8	N1	P0	L1	Adequate lime, low N, no P
9	N1	P1	L1	Adequate lime, low N, some P;
10	N1	P2	L1	Adequate lime, low N, adequate P
11	N1	P3	L1	Adequate lime, low N, high P
12	N3[†]	P2	L2	Potential yield without BNF
13	N0	P2	L2	Gypsum effects, L2 but 50%Ca as $CaCO_3$ +50%Ca as $CaSO_4$; 4,
14	N0	P2	L0 + 5t GM[§]	GM effects 14,15 vs 3,6
15	N0	P2	L1 + 5t GM	GM effects 14, 15 vs 3,6

[†] Treatment designed to provide all N as combined N (T. George)
[§] GM = green manure

Appendix 2. Plot layout of the core experiment.

Site 1 (Blocks I & II) near market

========== Road ==========

(Rice)

Block I		Block II	
5	8	13	14
12	7	10	11
9	3	7	1
13	6	4	6
10	1	2	5
2	4	3	8
11	14	12	9

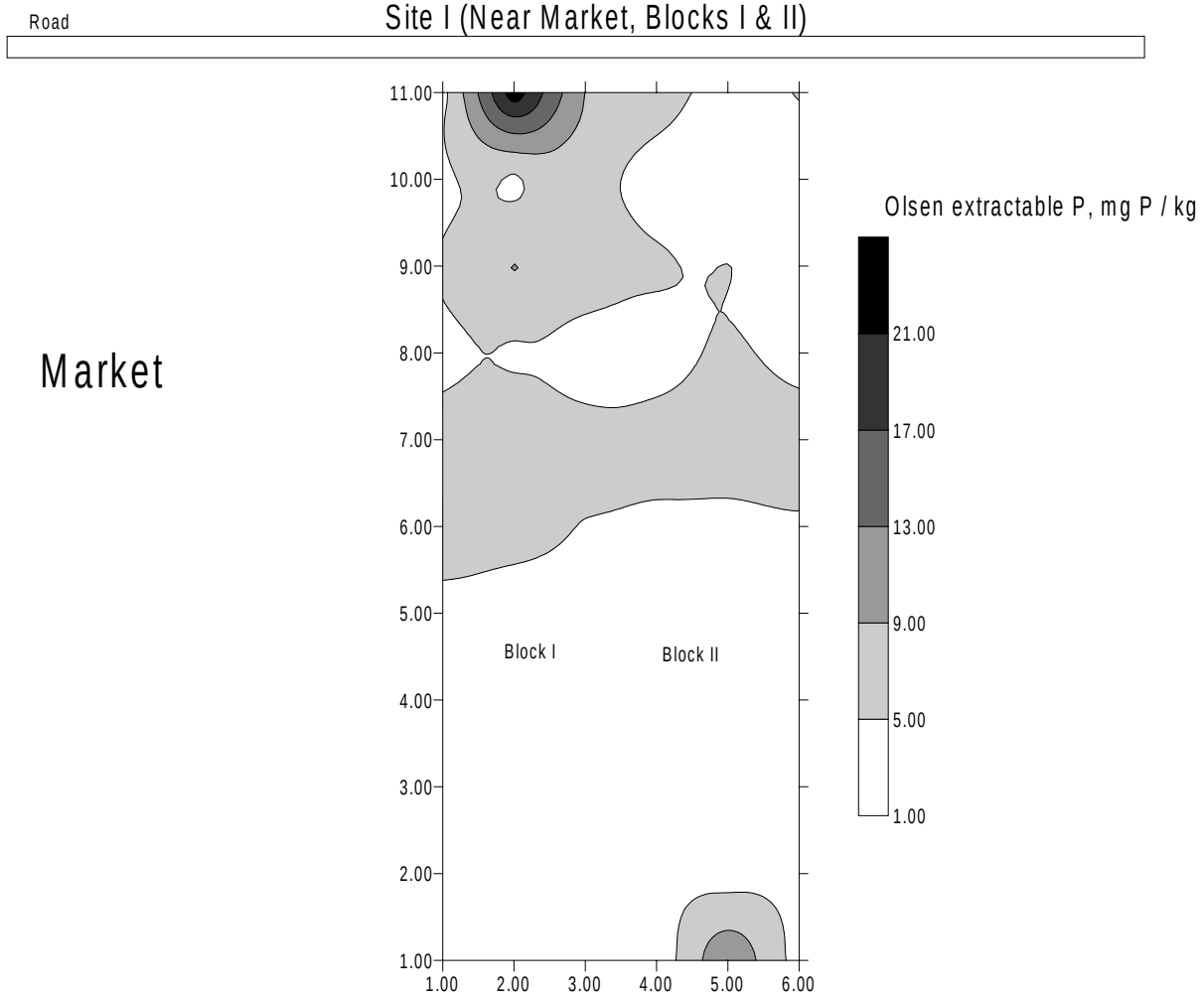
Site 2 (Blocks III & IV), Mr. Colunas farm

========== Road ==========

(Rice)

Block III		Block IV	
10	2	5	12
6	12	7	9
3	9	14	1
4	13	2	4
11	7	3	11
5	1	8	10
8	14	13	6

Appendix 3 Results of grid sampling of core experiment site.

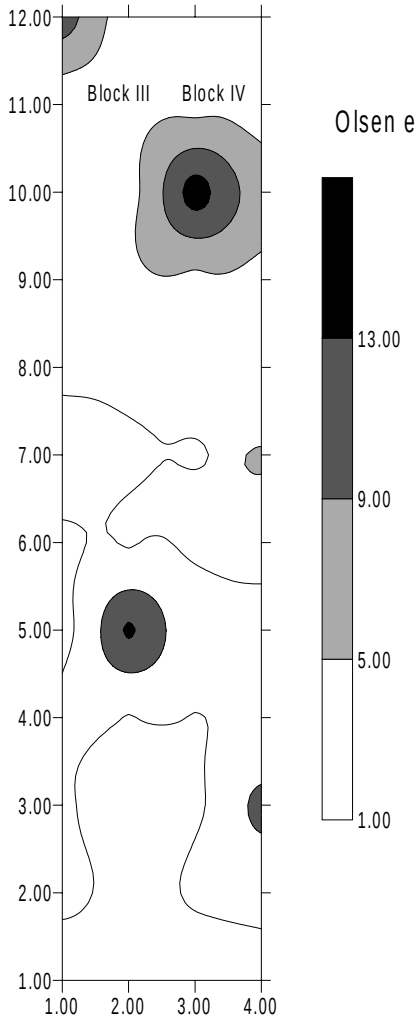


Road

Site II (Near Hospital, Blocks III & IV)

<-- Site I and blocks I & II

Barangay Hospital

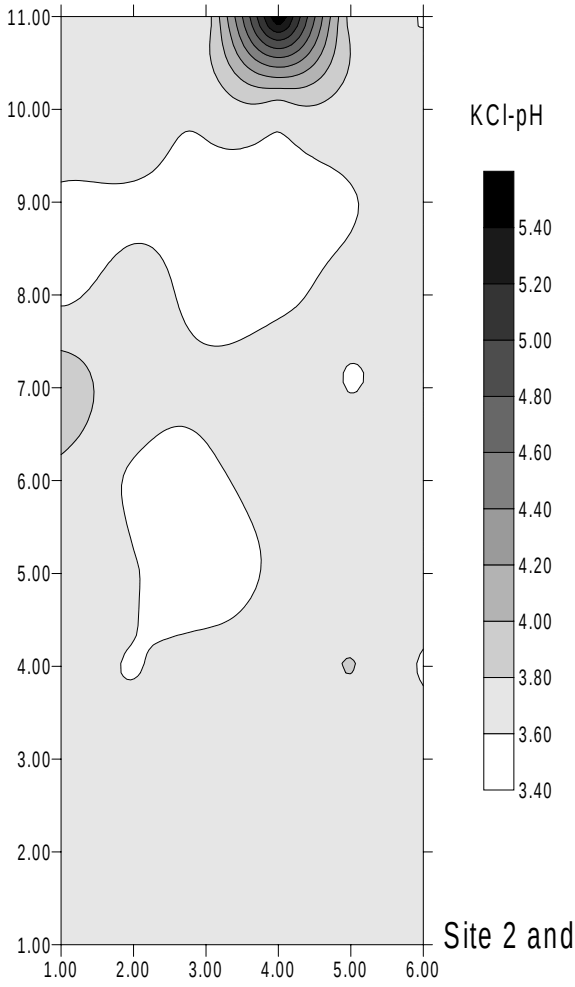


Olsen extractable P, mg P / kg

Road

Site I (Near Market, Blocks I & II)

Market



Site 2 and blocks III & IV -->

Road

Site II (Near Hospital, Blocks III & IV)

<-- Site I and blocks I & II

Barangay Hospital