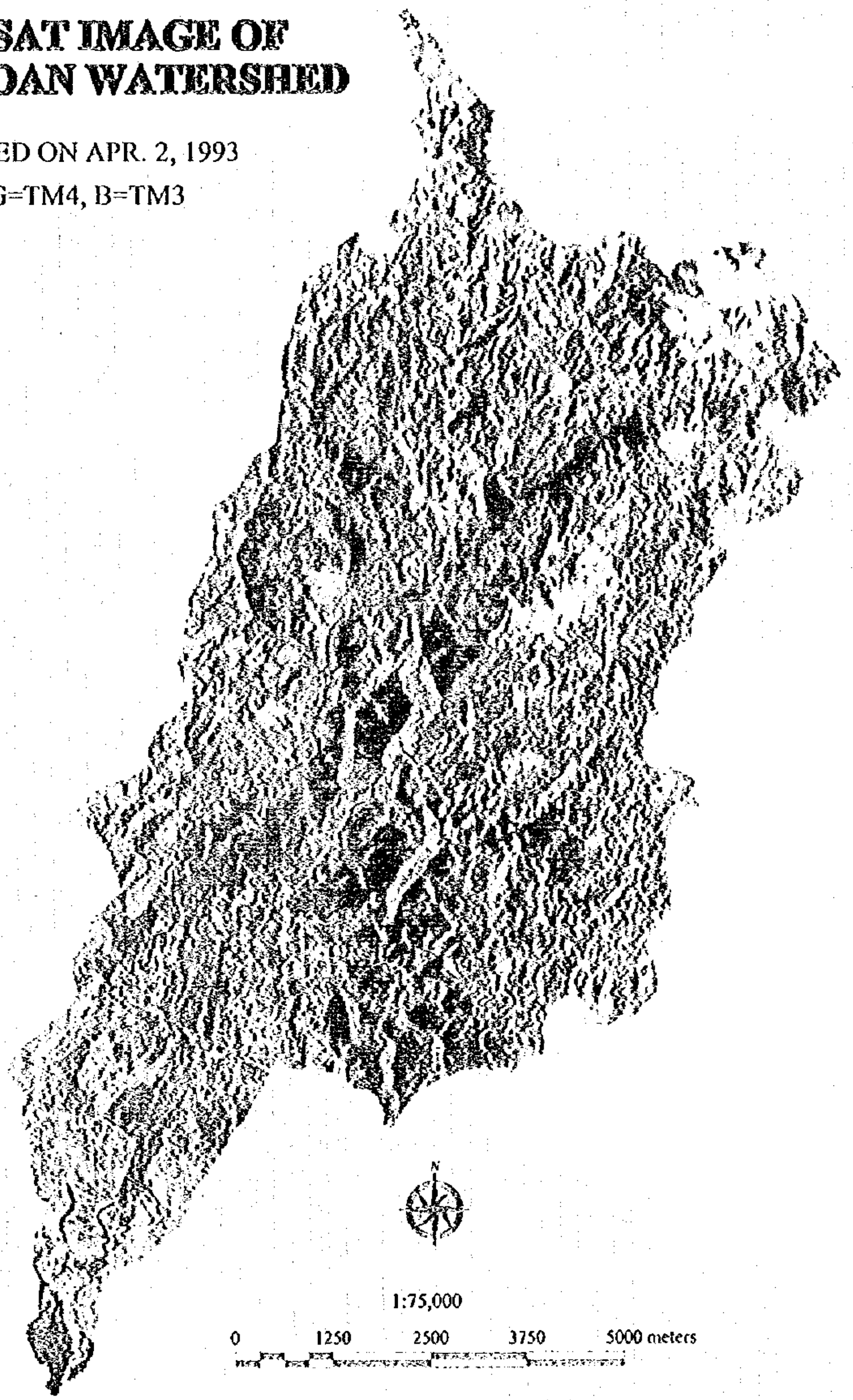
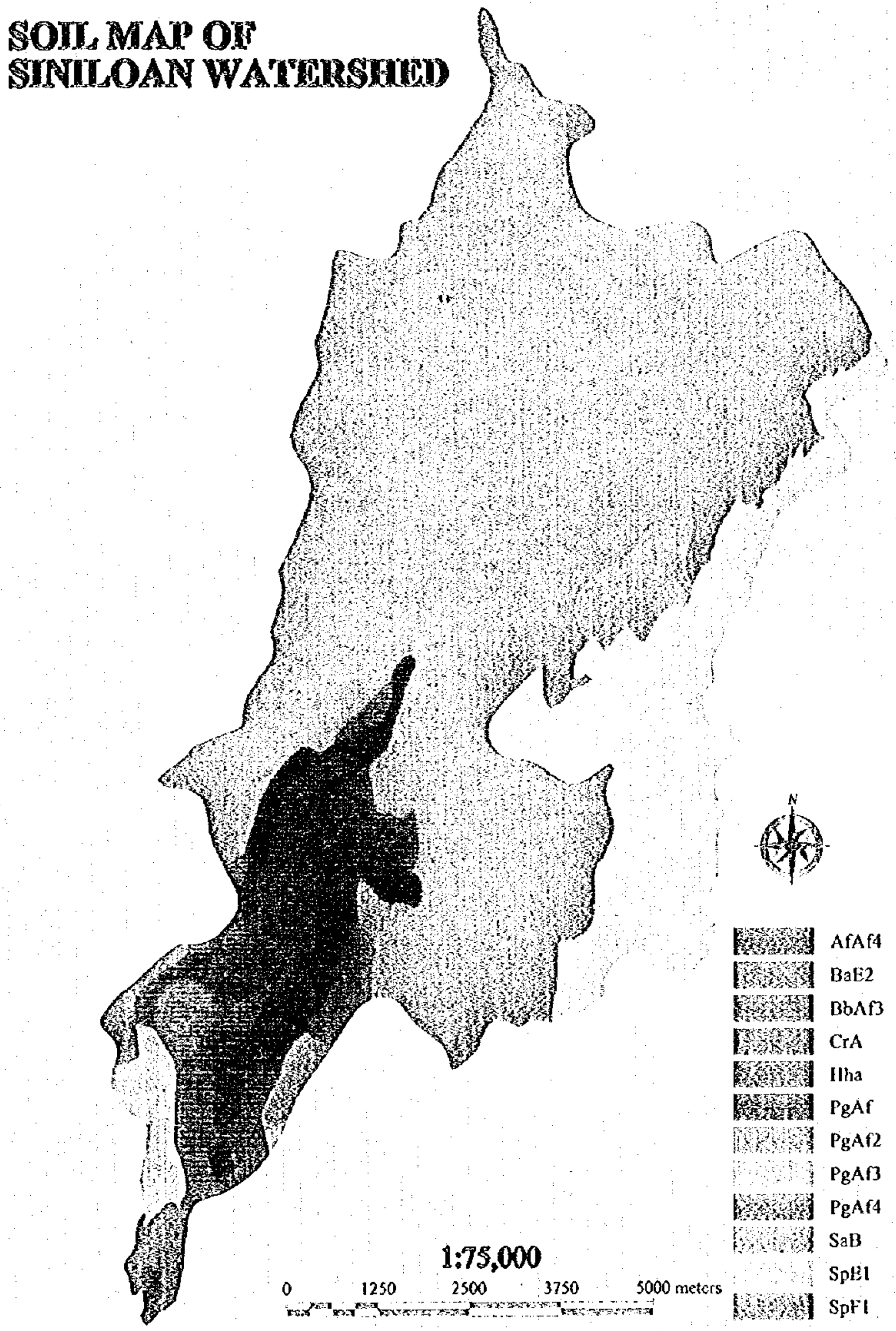
LANDSAT IMAGE OF SINILOAN WATERSHED

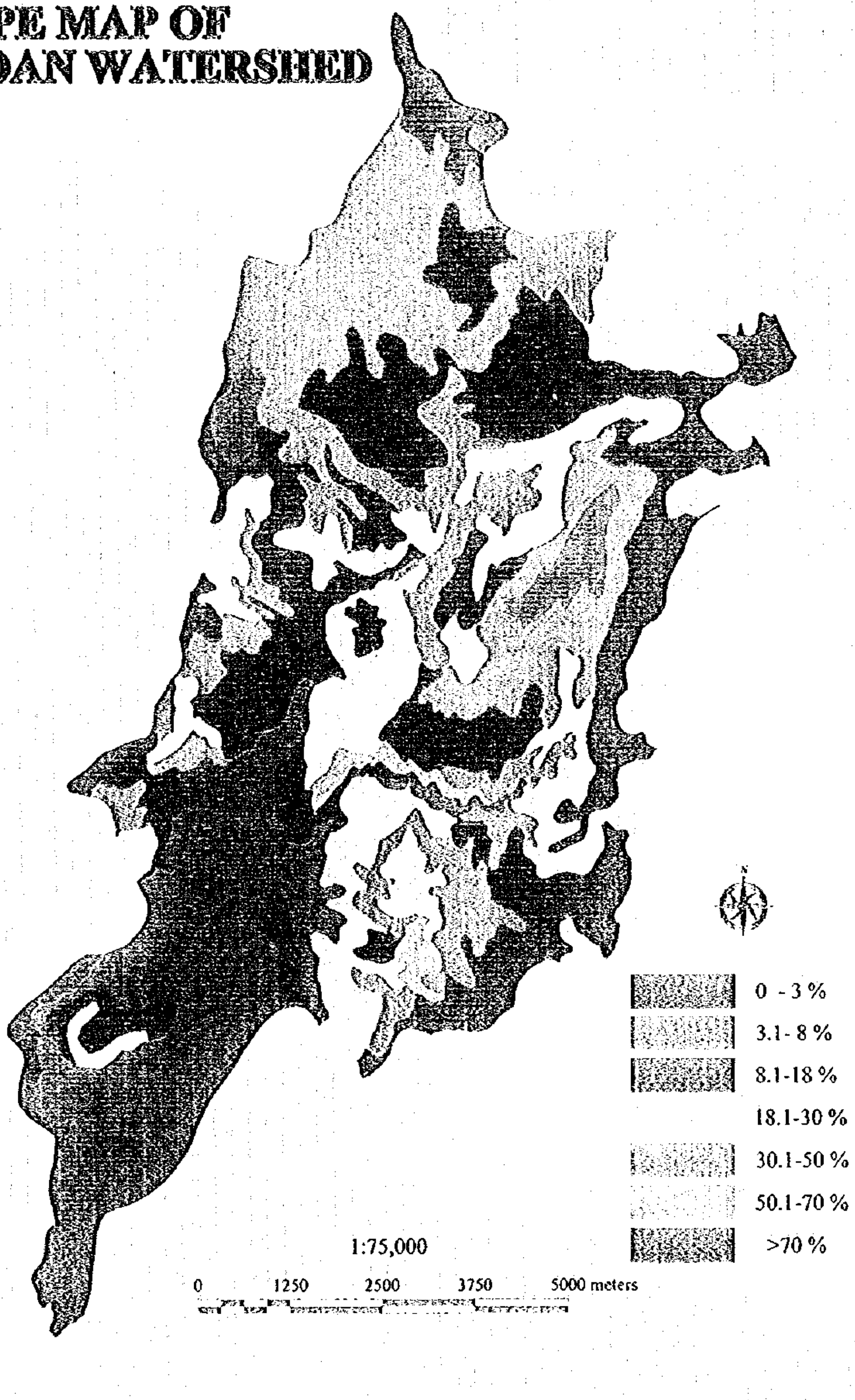
OBSERVED ON APR. 2, 1993

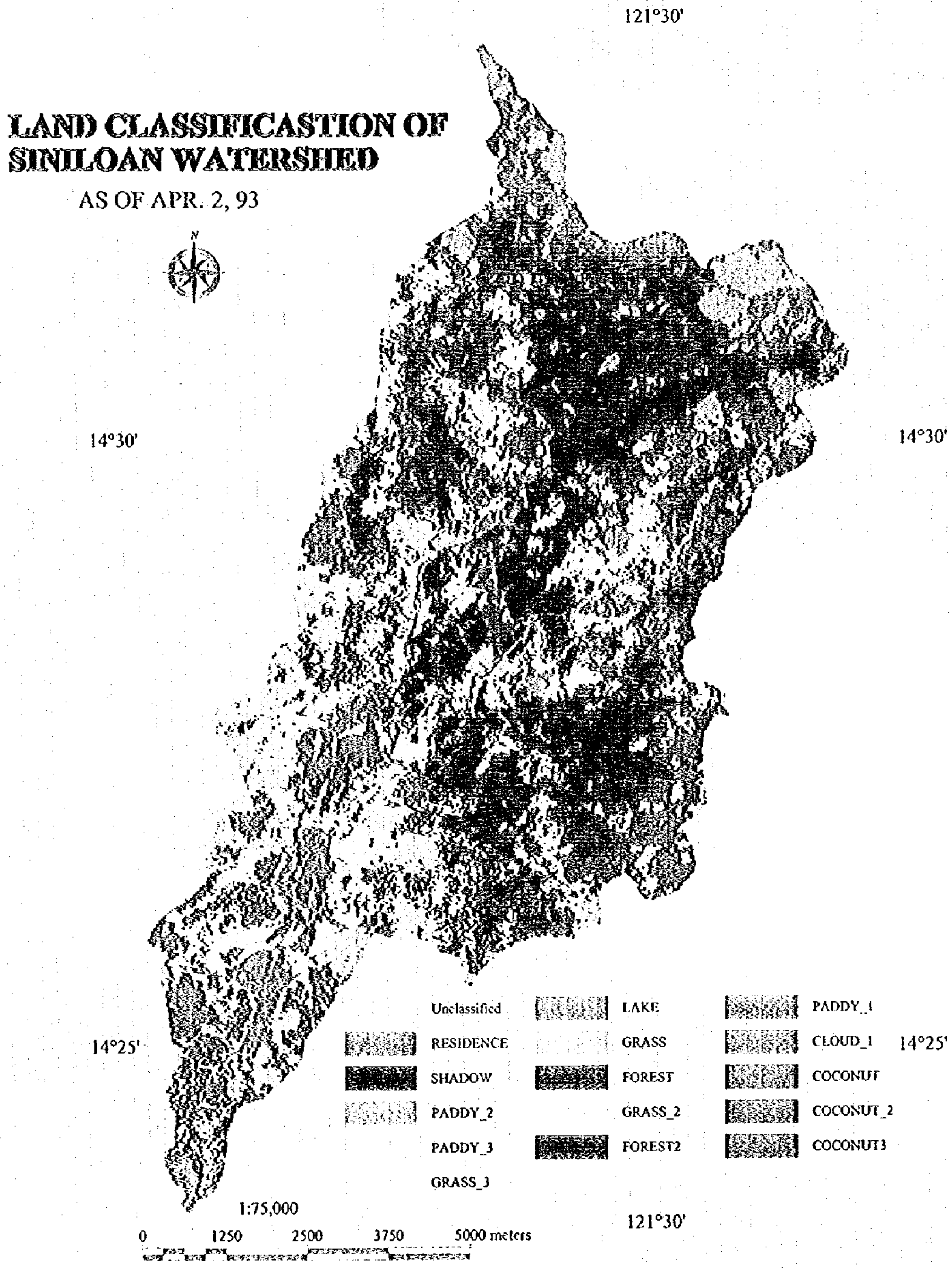
R=TM5, G=TM4, B=TM3




SOIL MAP OF
SINILOAN WATERSHED
N
AfAf4
BaE2
BbAf3
CrA
Hha
PgAf
PgAf2
PgAf3
PgAf4
SaB
SpE1
SpF1
1:75,000
0
1250
2500
3750
5000 meters

SLOPE MAP OF SINILOAN WATERSHED




LAND CLASSIFICASTION OF
SINILOAN WATERSHED
AS OF APR. 2, 93
N
121°30'
14°30'
14°30'
14°25'
14°25'
Unclassified
RESIDENCE
SHADOW
PADDY_2
PADDY_3
GRASS_3
LAKE
GRASS
FOREST
GRASS_2
FOREST2
PADDY_1
CLOUD_1
COCONUT
COCONUT_2
COCONUT3
1:75,000
0
1250
2500
3750
5000 meters
121°30'

7．第3回合同調整委員会資料

THIRD JOINT COORDINATING COMMITTEE MEETING

Soils Research and Development Center (SRDC) Project Phase II

November 4, 1997

INTRODUCTION

Effective soil resource management is critical in any farming system. There is an increasing global concern about soil resources and their degradation under the pressures of rapid population growth, increasing intensity of farming and other development activities aimed at producing enough food, fiber and shelter, sometimes even to the point of harnessing soil resources utilization beyond the land's carrying capacity. To be able to successfully harness the country's soil resources for agricultural development, it is essential to examine the constraints to production and the limitations to agricultural productivity, especially of its problem soils - and develop amelioration technologies to improve crop yield.

The Japanese Consultation Team organized by the Japan International Cooperation Agency headed by Dr. Michio Araragi, visited the Philippines in October 1995 for the the purpose of formulating detailed Tentative Schedule of Implementation (TSI) for the Soils Research and Development Project Phase II.

Productivity improvement of problem soils has been the focus of research under the Soils Research and Development Center Phase II. Three areas of concern were looked into, to wit :

Soil and Fertilizer

The focus is on the analysis of constraints to crop productivity and the development of method for an integrated soil improvement technology.

Soil Conservation

The focus is on improvement of soil erosion control and the development of soil conservation measures.

Soil Productivity Capability Classification

The focus is on development of rating system for soil productivity classification and preparation of soil management guidelines for classified soil units.

This is a progress report on the implementation of the SRDC-JICA Technical Cooperation Project Phase II as of November, 1997.

Members of the Joint Coordinating Committee

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Philippine Side

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Mr. Bonifacio Labiano	Representative, NIA
Mr. Cesario Umali	Representative, ERDB-DENR

Japanese Side

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Mr. Akira Nakamura	Assistant Resident Representative, JICA Philippine Office
Mr. Tetsuji Iida	Assistant Resident Representative, JICA Philippine Office
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Dr. Yoshimi Ueno	JICA Expert, Soil Conservation
Dr. Toshiaki Ohkura	JICA Expert, Soil Productivity Capability Classification

Mission Team

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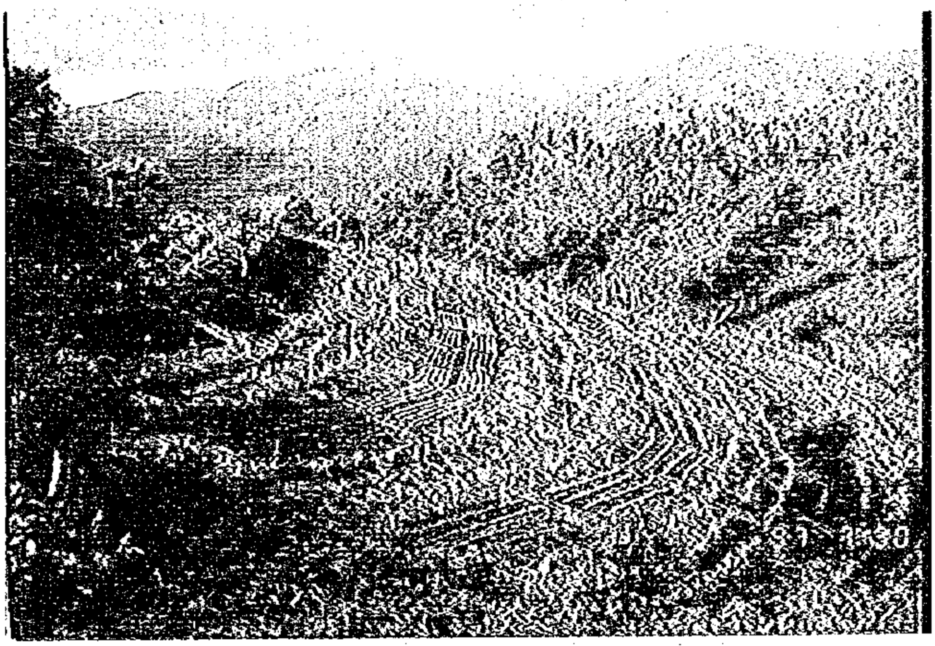
Dr. Kazuo Sugahara	Soil and Fertilizer
Dr. Takashi Kusaba	Productivity Classification Standard
Mr. Takaya Komine	Technical Cooperation

Soils Research and Development Center
Phase II

Soils and Fertilizer Research



Bureau of Soils and Water Management
Quezon City Philippines

1997

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PREFACE

The Soils Research and Development Center Phase II is a five-year cooperation project between the governments of Japan and the Philippines implemented by the Bureau of Soils and Water Management. The project started in 1995 with the overall goal of improving the agricultural productivity in problem soils. The activities of the project include researches on soils and fertilizer, soil conservation and soil productivity capability classification.

Research activities in soils and fertilizer are concentrated on the following areas:

1. Analysis of constraints for crop productivity in problem soils including Ultisols and their improvement

   Response of crops to fertilizers
   Soil improvement on soil organic matter accumulation by legume-grass mixture
   Improvement of soil physical and chemical properties with application of organic matter
   Improvement of physical property with different inorganic amendment

2. Development of methods for integrated soil improvement technology for problem soils including Ultisols

   Selection of adaptable crops
   Standardization of method of fertilizer application for crops
   Setting up of standard application of available organic matter for crops
   Setting up of guideline for integrated soil amendment

The research program on Soils and Fertilizer is both basic and applied. The research staff have access to research stations in Tanay and Bulacan in addition to the facilities and equipment of the Center. Emphasis is geared toward associating field experimentation with laboratory studies. At the same time the researcher recognizes the needs of farmers and industries as a whole by conducting studies in watersheds and regional satellite stations.

The research studies contained in this document were conceived and planned by a team following the multi-disciplinary approach to research. Only the highlights are presented although details of the technical paper can be requested from the individual authors.

This 1997 abstract version of S & F activities covers research works during 1995~1997. Some of the studies have attained their primary objectives and proceeded to the next step. Some are completed while others are continuing. Therefore, attainments are heterogenuous among individual activities.

STAFF

The Soils and Fertilizer Component of the SRDC Project Phase II is implemented by a group of researchers and specialists. A core team has been designated to formulate plans and programs and evaluate the needs of the service group.

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Deputy Executive Director	Alejandrino R. Baloloy, M Sc
Project Manager	Alejandro G. Micosa, M Sc.
JICA Team Leader	Michio Araragi, Ph.D.

RESEARCH FACILITIES

Established in 1989 through the Japanese Technical Cooperation Program, the Soilsearch Center is equipped with modern office and laboratory facilities. The Center has also acquired some of the latest laboratory and field research equipment, including computers.

Equipment:

- Liquid Ion chromatograph
- C-N Analyzer
- Atomic/Flame emission spectrophotometer
- Electrical conductivity meter
- Polarizing/metallurgical/ Flourescent/ Stereo microscopes
- ICP - Spectrophotometer
- UV/VIS spectrophotometer
- Growth chamber
- Microbial assay facilities
- Ion chromatograph
- X-ray diffractometer
- DT/TG analyzer
- Pressure membrane
- Three-phase analyzer
- Leaf area meter
- Light meter
- Chlorophyll meter
- ^{15}N Analyzer
- Seed moisture tester
- Chemical analysis facilities
- Lysimeter
- Freeze dryer

Research Stations

The BSWM operates and maintains two research stations for soil and water resources research. A 27-ha land is situated in Tanay, Rizal for upland (Ultisols) research while a 24-ha Vertisol area is located in San Ildefonso, Bulacan. Soil tanks containing some of the major soil types in the Philippines are also situated in Bulacan station. Both centers are equipped with a modest range of farm machinery including tractors and irrigation facilities. Greenhouses and basic soil and plant analytical equipment are also available.

Additionally, two microwatershed projects have been established in Siniloan Lagun and Inabanga, Bohol where applied researches and development activities on soil conservation will be implemented following a participatory and integrated approach. Soils and fertilizer research may be superimposed in any ongoing activities in these areas.

Matured and promising S & F technologies shall be disseminated in suitable areas through the Soil and Water Access Teams (SWAT) stationed in the country's 15 regions.

Response of white potato to NPK, Ca, Mg, and micronutrients on an isothermic Ultisol

L.C. Agustin, D.R. Allag, C. Lapoot
and P.P. Evangelista

Research Objectives

1. To describe the responses of white potato to fertilizers and lime on an isothermic Ultisol

2. To determine the responses of white potato as in (1) above when intercropped with other high value crops.

Brief Methodology

The field experiment is conducted in Dalwangan, Malaybalay, Bukidnon. Prior to experimentation a uniformity trial was done in the 2,000 m^2 area to describe graphically any soil heterogeneity.

A split-plot design with cropping patterns (pattern A: potato-sweetpea-potato; Pattern B: potato-corn-potato) as main plots and fertilizer treatments (10 combinations of NPK plus and minus lime, macroelements and micronutrients) as subplots were tested. There were four replications.

Standard cultural practices were followed in growing the different crops. Various yield parameters were gathered including specific gravity and tuber periderm analysis for calcium and potassium determinations. Soil analysis before and after each cropping was carried out.

Research Highlights

The uniformity trial showed variation of crop growth throughout the test area suggesting heterogeneity without specific orientation.

Tuber yields ranging from 3.7 to 20.5 t/ha were obtained from the first field trial. Treatment comparisons showed that tuber production significantly decreased when chicken manure was excluded from the combination of NPK, Ca and Mg. The adverse effect of the absence of chicken manure in the fertilizer combination was comparable with the absence of N.

Results of the experiment so far suggest that white potato responds significantly to the application of N, P and chicken manure (Table 1).

Table 1. Total tuber yield (t/ha) of potato under potato-sweetpea-potato cropping pattern.

Treatment	Replication 1	2	3	4	Mean
Control	5.9	7.6	3.1	3.7	3.75
Complete	20.0	28.3	16.8	16.5	19.10
Complete - N	16.2	14.2	14.7	18.2	15.82
Complete - P	19.2	25.2	12.7	19.8	16.95
Complete - K	17.5	27.7	21.4	23.4	22.50
Complete - Ca	18.7	23.3	25.5	22.5	22.50
Complete - Mg	20.3	26.3	15.6	20.6	18.40
Complete - CM	13.0	10.2		6.9	10.03
NPK+ Lime + CM	20.3	26.3	17.3	23.0	21.65
NPK - Lime + CM	18.1	17.6	25.2	20.6	20.37

Response of corn to eroded Ultisols

S. Yamada*, T. Manuel and L.G. Hernandez

Research Objective

To investigate the nutritional properties of Ultisols

Brief Methodology

The experiment was conducted at the greenhouse of the Bureau of Plant Industry in Visayas Avenue, Diliman, Quezon City. A randomized complete block design with two replicates was used. Ultisols (subsoil, surface soil) was transported from Tanay Station and placed in individual 21 cm dia plastic pots. Treatments were 1-1-0.5 (NPK) and 0-0-0 (Control). Corn cv. IPB Var 1 was used as test crop.

Research Highlights

Soil analysis before the experiment showed that water extracted pH was lower than 5 for both subsoil and surface soil, but subsoil has a much lower pH. Likewise, total N, Olsen P, Extractable K, Ca and Mg in the subsoil were lower than those in the surface soil. Similarly, micronutrients such as, Cu, Mn and Zn were lower in the subsoil than in the surface soil (Figures 1). These results indicate that the nutritional status of the subsoil is worse than that of the surface soil.

Extractable Al in the subsoil was higher than that in the surface soil. This could have due to the lower pH in the subsoil that promoted Al elution. When acidity of the subsoil is not corrected too much Al may affect the normal physiological functions of the crop.

Dry matter production and nutrient uptake (Figures 2 and 3) indicated that nutrient contents of the subsoil are lower than the surface soil, resulting to a very low productivity of corn grown in the former. However, higher productivity can be obtained from the subsoil by NPK fertilization.

Liming precluded the deleterious effect of Al toxicity.

* JICA Short Term Expert, Faculty of Agriculture, Tottori University, Minami 4-101, Kosan-Machi, Tottori-Shi, Tottori-Ken 680 Japan

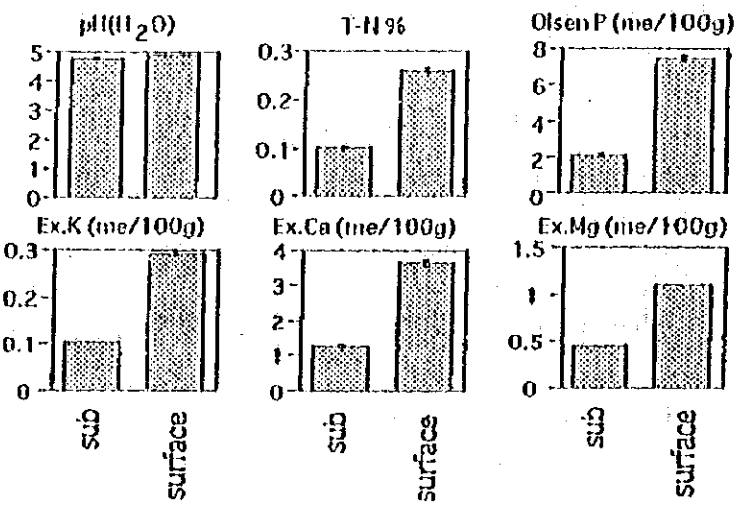

Figure 1. Soil properties before the corn experiment on Ultisols. Bars in figure indicate SE values.

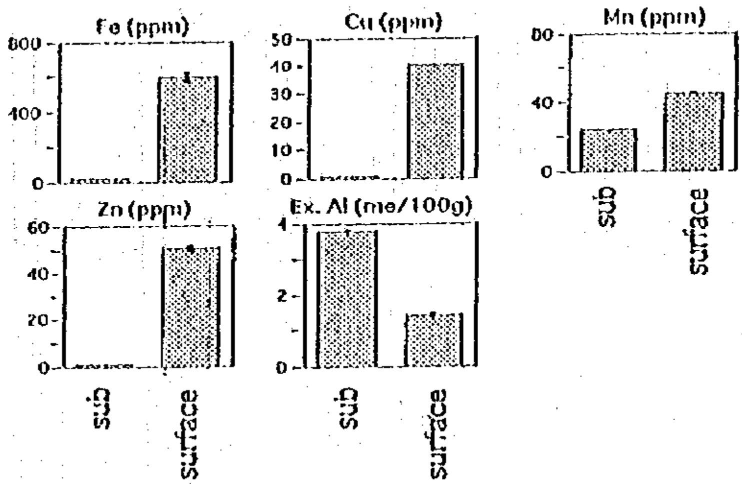

Figure 2. Micronutrient status before the corn experiment on Ultisols. Bars in figure indicate SE values.

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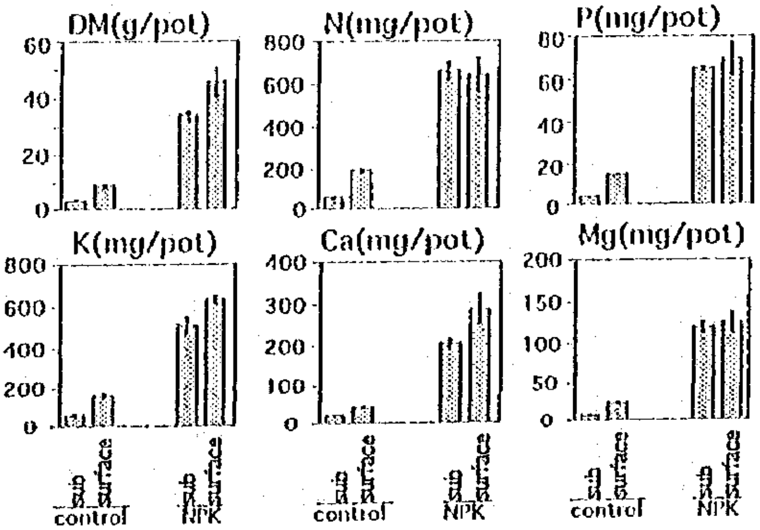

Figure 3. Dry matter production and macronutrient uptake. Bars in figure indicate SE values.

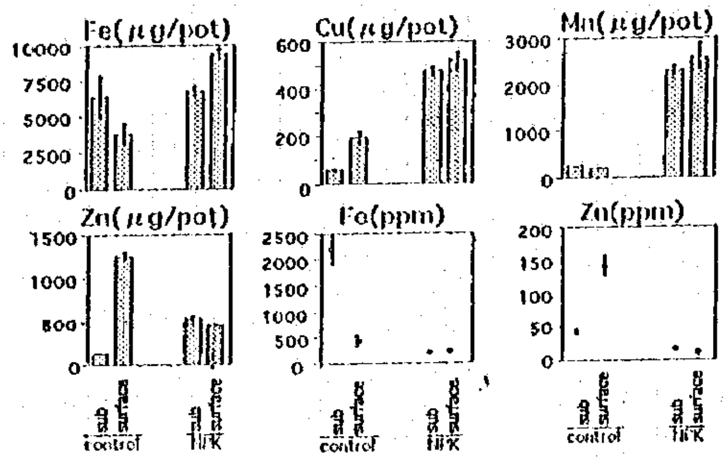

Figure 4. Micronutrient status and concentration of Fe and Zn. Bars in figure indicate SE values.

Evaluation of the potential of chicken manure as nitrogen fertilizer

S. Yamada*, E.V. Dacanay, J. Mercado
and L.G. Hernandez

Research Objective

To evaluate the potential of chicken manure as a nitrogen fertilizer

Brief Methodology

The experiment was conducted at the greenhouse of the Bureau of Plant Industry in Visayas Avenue, Diliman, Quezon City. A randomized complete block design with two replications was used. Ultisols from Tanay Station was transported to the experimental site and lime to increase pH to 6.0 The soil was placed in 35 cm dia plastic pots and treated individually with the following: 1 g Urea, 4 g Urea, 1 g Urea + 3 g controlled release urea, 1 g Urea + 7 g chicken manure and 1 g Urea + 3 g chicken manure.

One-half of Urea plus the chicken manure and controlled release Urea was applied basally in combination with 26 g P_2O_5 and 3 g K_2O. The remaining half was applied 30 days after sowing.

Research Highlights

See production at harvest (Figure 1) showed that plants treated with chicken manure and Urea obtained similar yields which were significantly higher than the rest of the treatments. This indicates the potential of chicken manure as nitrogen fertilizer for corn on Ultisols. However, estimation of nitrogen use efficiency showed that the potential of chicken manure as nitrogen fertilizer is only about 29% of Urea.

The high productivity of corn plants fertilized with Urea and chicken manure was related to the higher net assimilation rate especially during the reproductive stage (Figure 2). Net assimilation rate is the leaf potential for photosynthesis and is directly related to dry matter accumulation.

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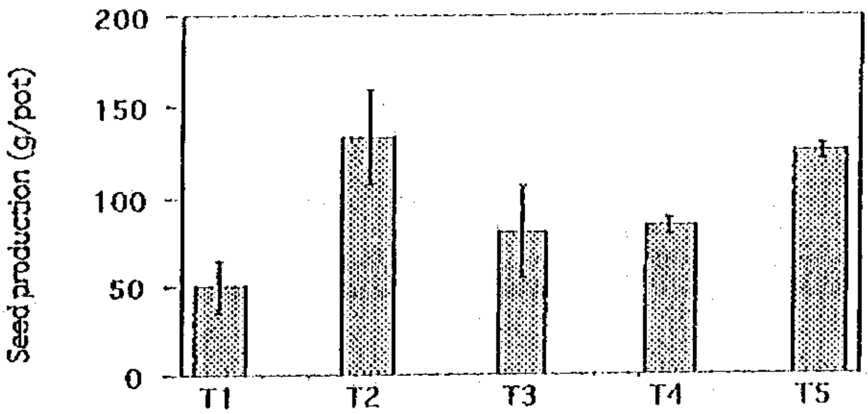

Figure 1. Seed production at harvest. T1 - 1g Urea; T2 - 4g Urea; T3 - 1g Urea + 3g controlled release Urea; T4 - 1g urea + 3g chicken manure; T5 - 1g Urea + 7g chicken manure. Bars in figure indicate SE values.

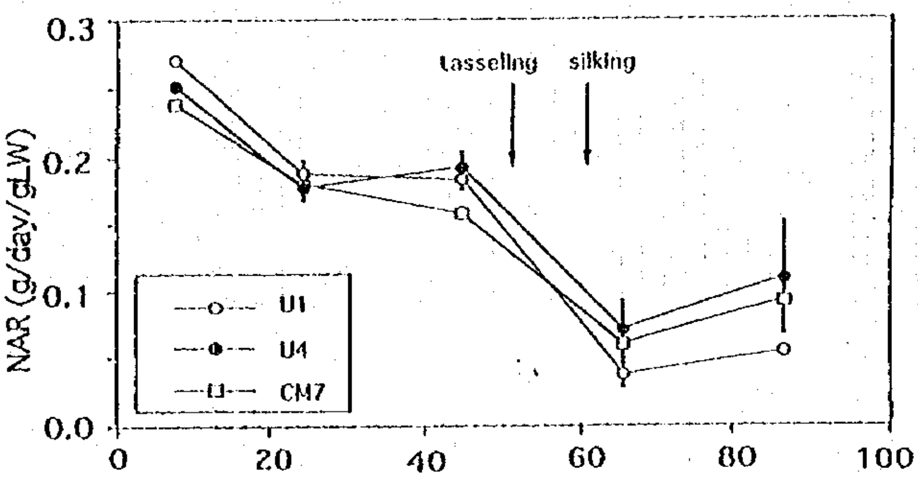

Figure 2 Net assimilation rate in corn as affected by different fertilization treatments. Bars in figure indicate SE values.

Nitrogen uptake of crops on Ultisols

L. G. Hernandez, MJ R. Dela Cruz, F.A. Torres

and

Shoichiro Akao
National Institute of Agrobiological Resources
Kannondai, Tsukuba, Ibaraki, Japan

Research Objectives

1. To determine the nitrogen uptake of crops grown on Ultisols

2. To estimate the efficiency of applied N on Ultisols

3. To determine the effects of increasing levels of N on crop yield.

Brief Methodology

The experiment was conducted at the Tanay Research Station. Four levels of labeled N fertilizer (0, 40, 80 and 120 kg/ha) were split-applied (basal and at 25 days after planting) on corn using ^{15}N. A blanket application of 60 kg/ha P_2O_5 and 40 kg/ha K_2O was made immediately before planting cv. IPB Var 1. Treatment application was made in bands 10 cm deep and 15 cm away from both sides of plant rows.

For peanut, four levels of N (0, 20, 40 and 60 kg/ha) in the form of Urea was applied in combination with 30 kg/ha P_2O_5 and 30 kg/ha K_2O immediately before planting cv. BPI-P9. Calcium sulfate at the rate of 300 kg/ha was applied 25 days after seedling emergence.

The ^{15}N abundance of the corn plants was determined at tasseling and maturity stages. All samples for ^{15}N analysis were sent to the National Institute of Agrobiological Resources, Tsukuba City, Ibaraki, Japan. The Kjeldahl method was used for other N analysis.

Research Highlights

A positive linear response was observed in corn yield while a quadratic trend was noted for peanut (Table 1). Highest grain yield for corn was recorded at 2297 kg/ha at 120 kg N/ha while peanut yield was highest at 1008 kg/ha at 20 kg N/ha.

Nitrogen uptake and utilization efficiency in peanut were highest at 20 kg/ha. In corn however, the rate of N fertilization gave no significant effect on percent N recovery. In both crops, less than half of the amount applied was utilized by the crop (Tables 2 and 3).

Table 1. Grain yield of corn and peanut as affected by increasing levels of nitrogen fertilizer application.

Nitrogen Rate (kg/ha)	Grain Yield (kg/ha)
Corn	
0	1592
40	1728
80	2135
120	2297
Significance	L *
Peanut	
0	842
20	1008
40	924
60	902
Significance	Q *

Table 2. Total recovery of fertilizer N by corn grown on Ultisols.

Treatment (kg N/ha)	Percent ^{15}N recovered	
	Plant	Soil
0	0.0 b *	0.3 b
40	35.4 a	2.3 a
80	39.8 a	2.7 a
120	24.4 a	3.4 a

*Means in one column followed by the same letter are not significantly differ at the 5% level

Table 3. Nitrogen uptake and utilization efficiency of peanut grown on Ultisols.

Treatment (kg N/ha)	Nitrogen Uptake (kg/ha)	Utilization Efficiency (%)
0	38.8 b *	-
20	48.6 a	20.2
40	42.4 ab	8.5
60	43.7 ab	11.2

*Means in one column followed by the same letter are not significantly differ at the 5% level.

Soil fertility management for tomato grown on an Ultisol

I.E. Santos, S. Villarey and A. Carandang

Research Objective

To determine the effect of different levels of lime, organic matter (chicken manure) and NPK on the growth and yield of tomato grown on an Ultisol.

Brief Methodology

Ultisols from Tanay Research Station were collected and air dried then placed in plastic bags arranged in a factorial completely randomized design with two replications. The treatments employed were 0, 5 and 10 t/ha lime, 0 and 10 t/ha chicken manure, 0 and 24 kg/ha nitrogen, 0, 20 and 40 kg/ha P_2O_5 and 0 and 34 kg/ha K_2O.

Lime was applied a week before transplanting while chicken manure was mixed with the soil one month before transplanting. Two-week old seedlings were transplanted late in the afternoon to prevent wilting.

Harvesting was done upon fruit maturity. Only marketable tomatoes were assessed in four primings.

Research Highlights

Four out of the 72 treatment combinations were found to be promising. These are shown in Table 1 with their corresponding yield data. Further tests shall be made during the next season.

Table 1. Yield data from four promising fertilizer treatment combinations for tomato on Ultisol

Treatment	No.of fruits/plant	Average dia. (cm)	Fruit wt/plant (g)
10 t CM/ha	10	11	317
10 t CM/ha + 40 kg P/ha	22	12	368
10 t CM/ha + 24 kg N/ha	23	10	345
10 t CM/ha + 24 kg N + 40 kg P + 34 kg K + 5 t Lime/ha	22	12.2	418

Utilization and efficiency management of N from controlled release fertilizer

R.A. Monte, A.A. Bangalan, J.P. Mercado, D. T. Elicano,
V.G. Estoconing and E.V. Dacanay

Research Objectives

1. To improve the productivity of marginal soils through the use of slow release fertilizer

2. To determine the nitrogen efficiency as affected by different nitrogen supply

Brief Methodology

The experiment was conducted in Bgy Kapatalan, Siniloan, Laguna with soils taxonomically classified as Oxic Dystropepts. Corn was sown in 3 x 6 m plots arranged in strip-split-plot design with three replications. Treatments included two levels of N (50 and 100 kg/ha), three levels of lime (1, 3 and 5 t/ha) and two types of N fertilizer (coated and prilled urea).

The crop was protected from pests and diseases by spraying and applying appropriate insecticides and fungicides. A perimeter fence was also put up to prevent destruction by stray animals.

Research Highlights

Coated urea gave higher yields than prilled urea, indicating higher utilization efficiency of applied nitrogen through controlled release fertilizer. Liming enhanced plant growth. Significant interactions between nitrogen applied and type of fertilizer were also observed, showing that the nitrogen utilization efficiency can be increased using slow releasing type of fertilizer and/or lime.

Crop response to fertilizer application on different soils

V. Naboa, C. Alcalde
and S. Arai

Research Objectives:

1. To determine the effect and efficiency of fertilizer application on different soils in relation to crop growth.

2. To determine the soil-physico chemical and biological properties in relation to crop growth.

Brief Methodology

The study was conducted at NSWRRC in San Ildefonso, Bulacan. Each tank has an area of 200 m^2, with a depth of 50 cm. These eight soil tanks were filled with seven selected types of soils taken from different sites. Each tank was divided into four plots, each representing a fertilizer treatment.

Research Highlights

Mungbean. Naga and Tagaytay soils gave the highest yield in terms of fresh weight and dry weight of leaves, stems and roots. Residual effects of fertilizer applied during the previous experiment affected the crop's growth and yield performance (Table 1).

Upland Rice. The highest treatment yield was obtained from the Naga soil, ranging from 3.78 t/ha for the control plot to 6.95 t/ha for highest treatment plot. Yield (Table 2) was markedly low for Atimonan soil. It ranged from 0.54 t/ha from the no fertilizer plot to 3.04 t/ha from the plot with highest fertilizer rate applied. It was observed that, generally, there was a corresponding increase in rice yield with the increase of fertilizer application in all soil types.

Soybean. Cabanatuan, Naga and San Rafael soils tended to give generally higher yields (Table 3) than Tanay soil. It was evident, however, that yield in Tanay soil could be increased through proper fertilization.

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Table 1. Relative yield in mungbean (dry weight of stem and leaves, g/15 plants).

Soils	Treatment* 1	2	3	4
Atimonan	80.0	85.6	92.0	97.9
Cabanatuan	102.6	91.0	64.7	117.6
Famy	82.9	93.4	100.9	107.0
San Ildefonso	22.9	73.9	50.1	92.2
Tanay	40.9	38.7	55.0	65.7
Naga	113.6	142.1	109.0	116.6
Tagaytay	116.6	108.8	82.2	109.5
San Rafael	78.7	79.4	72.9	73.4

Table 2. Upland rice yield (palay dry weight t/ha).

Soils	Treatment* 1	2	3	4
Atimonan	0.54	2.65	2.23	3.04
Cabanatuan	0.74	2.95	5.19	6.27
Famy	1.30	2.25	4.18	5.09
San Ildefonso	0.03	1.70	4.37	4.82
Tanay	0.01	1.73	3.2	4.43
Naga	3.78	5.96	6.34	6.95
Tagaytay	1.20	2.54	2.83	3.85
San Rafael	1.63	2.05	6.15	7.09

Table 3. Soybean yield (grain weight, t/ha).

Soils	Treatment* 1	2	3	4
Atimonan	0.94	1.85	1.71	1.85
Cabanatuan	0.99	1.90	2.36	2.37
Famy	0.56	1.47	1.25	1.97
San Ildefonso	0.33	0.84	1.21	2.03
Tanay	0.13	0.93	1.56	1.81
Naga	2.16	3.04	2.42	3.30
Tagaytay	0.96	1.37	1.43	1.25
San Rafael	1.58	1.36	1.56	1.70

*Treatment (N-P_2O_5-K_2O):

1 0-0-0
2 20-20-20
3 40-20-20
4 60-60-20

Effect of fused phosphate and sulfur-coated urea on corn in lahar

T. Manuel and T. Yasuda

Research Objective

To determine the effect of fused magnesium phosphate and sulfur-coated urea on corn in Pinatubo lahar.

Brief Methodology

The experiment was conducted in soil tank constructed att he Bulacan Research Station. Lahar from Pampanga was transported in soil tank and was used in the experiment. Corn cv. IPB Var 1 was used as test crop. Treatment combinations in kg/ha were as follows:

Treatment	Prilled Urea	S-coated Urea	Solophos (P_2O_5)	F-Mg Used	Potash (K_2O)	Red soil (t/ha)
T1	90	0	60	0	60	0
T2	0	90	60	0	60	0
T3	90	0	0	60	60	0
T4	0	90	0	60	60	0
T5	90	0	60	0	60	100 t
T6	90	0	0	60	60	100 t

Research Highlights

1. Grain yield data (Table 1) suggests that application of phosphate and addition of red soil in lahar increases grain yield.

2. Application of sulfur-coated urea in lahar may also contribute to the grain yield of corn.

3. Fused phosphate application (T4) was less effective than solophos (T2) without soil addition, however, both phosphates were of similar effects.

It may be concluded from this work that application of phosphate and sulfur-coated urea can increase grain yield of corn grown in lahar. Addition of red soil in lahar can also contribute to the increase in grain yield.

Table 1. Total dry matter yield (t/ha) of corn as affected by phosphate and Sulfur - coated urea.

Treatment	Grain	Cob	Stem & Leaves	Root	Total
T1	0.23	0.29	3.26	0.45	4.23
T2	1.79	0.51	3.74	0.82	6.86
T3	-	-	2.62	0.13	2.78
T4	1.06	0.38	2.68	0.41	4.53
T5	1.91	0.64	3.16	0.87	6.58
T6	1.95	0.73	3.46	0.35	6.49

Status of Mg, S and micronutrients in an Ultisol

T. Manuel, V. Naboa, C. Alcalde
and S. Arai

Research Objective

To determine the magnesium, sulfur and micronutrient status of an Ultisol.

Brief Methodology

Two pot experiments were set up at the Bulacan Research Station using Tanay Ultisol. For the first set, 12 kg of soil were placed in each of the 64 pots and given a blanket application of N, P, K and Calcium. One-half of the pots were treated with Zn, Cu, Mo, B, Mg and S.

The second set of treatments include Control, Highgreen and NPgreen. Ten grams each of the two micronutrients were applied per pot. Blanket application of 22 g/pot of complete fertilizer (14-14-14), and 30 g/pot of dolomite was made.

Preliminary Results

The experiments are currently ongoing. Crop maturity is expected in four weeks.

Table 1. Total dry matter yield (t/ha) of groundnut as affected by calcium and phosphate fertilizer.

Treatment	Rep	Grain	Shell	Stem & Leaves	Root	Total	G/T
T1	1	0.06	0.10	0.86	0.07	1.09	0.06
	2	0.16	0.14	1.02	0.07	1.39	0.12
T2	1	0.37	0.17	1.18	0.07	1.79	0.21
	2	0.57	0.30	1.79	0.09	2.75	0.21
T3	1	1.15	0.42	3.52	0.14	5.23	0.22
	2	1.00	0.41	3.49	0.13	5.03	0.20
T4	1	0.71	0.33	2.63	0.12	3.79	0.19
	2	1.22	0.50	3.63	0.15	5.50	0.22
T5	1	2.35	0.65	5.14	0.18	8.32	0.28
	2	2.21	0.67	4.72	0.13	7.73	0.29
T6	1	0.49	0.24	1.79	0.07	2.55	0.19
	2	0.60	0.27	2.12	0.08	3.07	0.20

Soil amendments and micronutrient management for peanuts on an Ultisols

Elisa D. Ayo

Research Objective

To determine the effect of foliar micronutrient application on the growth and yield of peanut. with or without liming or manuring improvement on an Ultisol

Brief Methodology

The field experiment was conducted in an Ultisol in Pantay, Tanay. It followed a split-split plot design in 3 replications. Liming (with and without) was the main plot, manuring (with and without) was the subplot and foliar micronutrients application (control, B, Mo, B+Mo) were the sub-subplots. Complete fertilizer (10-40-30) was applied basally, lime was at 9 t/ha and chicken manure at 5 t/ha.

Boron was sprayed as boric acid at 300 g/ha as boric acid and molybdenum at 300 g/ha as sodium molybdate dihydrate.

Research Highlights

The effect of lime and manure on soil chemical properties showed among others the increase in pH and decrease in aluminum content of the soil. This could be a consequence of the added lime. On the other hand, there was also a marked reduction in manganese content due perhaps to the application of chicken manure.

Manure and boron application gave significant effect on pod yield (Table 1). A significant interaction between lime and manure was observed during the wet cropping season.

Table 1. Fresh pod weight of peanut as affected by lime, manure and micronutrient application (dry season 1995-96).

Lime / Micronutrient	Pod weight (t/ha) Without Manure	With Manure
Without Lime		
Control	1.65	2.62
Boron	2.16	2.87
Molybdenum	1.66	2.71
Boron+Molybdenum	2.09	2.97
With Lime		
Control	1.97	2.60
Boron	2.69	2.90
Molybdenum	2.42	2.66
Boron+Molybdenum	2.52	3.12

Effect of mycorrhizal fungi on the utilization of P by maize on an Ultisol

Celia C. Grospe

Research Objective

To determine the optimum combination of P fertilizer and mycorrhiza that would affect plant growth, P concentration in the tissue and grain yield.

Brief Methodology

A pot experiment was conducted using two sources of P (ordinary superphosphate and rock phosphate) at five levels of fertilization (0, 30, 60, 120, 240 kg P_2O_5/ha) with and without mycorrhiza and micronutrient supplements. A total of 120 pots (three replications) were considered during this experimentation.

In addition, two field trials were conducted in Siniloan, Laguna during the period July 1996 to March 1997 using similar treatments. The soil was amended with lime at the rate of 5 t/ha during the second field trial.

Research Highlights

Data obtained from the pot experiment showed that mycorrhizal inoculation has a depressive effect on the vegetative growth of maize. Mycorrhizal infection was also high on plants not inoculated with mycorrhiza indicating that indigenous mycorrhiza are present in the soil used. Addition of micronutrients improved the growth of maize plants. Ordinary superphosphate proved to be a better source of phosphorous for maize planted on acid soils (Table 1).

The two field trials did not produce a good crop stand due to the occurrence of drought during the early vegetative stage of plant growth.

Table 1. Dry matter yield of corn planted on Tanay soil.

Treatments	Dry matter (g/plt) at 30 days after sowing		Dry matter (g/plt) at tasseling stage	
	W/o Micro-n	W/micro-n	W/o Micro-n	W/micro-n
W/o VAM				
OSP 0	1.6	1.6	20.5	18.6
30	2.2	3.0	21.0	30.9
60	2.6	2.2	26.8	25.6
120	3.6	4.5	30.6	32.6
240	3.3	5.6	24.9	34.3
RP 0	1.6	1.3	24.7	20.3
30	2.2	2.1	30.0	28.7
60	1.8	1.7	25.0	26.4
120	1.5	2.7	27.2	26.6
240	2.1	2.3	30.0	36.1
W/o VAM				
OSP 0	1.7	1.6	24.9	20.2
30	2.3	2.6	23.6	26.9
60	2.0	2.7	21.9	31.6
120	2.2	2.6	32.4	25.4
240	2.9	3.8	22.7	30.5
RP 0	1.7	1.8	24.1	25.7
30	11.9	1.8	24.1	27.8
60	2.4	1.6	24.4	27.9
120	2.2	2.1	22.6	32.6
240	2.3	2.3	24.5	31.6

Effectiveness of Vesicular-Arbuscular (VA) mycorrhizal fungi for sustainable crop production in an Ultisol

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Research Objectives

1. To conduct investigation on indigenous VA mycorrhizal fungi in an Ultisol.

2. To examine the effectiveness of commercial inoculation in an Ultisol.

3. To transfer the experimental methodology of mycorrhizal research to Filipino counterparts.

Brief Methodology

The investigation on indigenous VA mycorrhizal fungi in Tanay soils was carried out through wet-sieving and morphological examination under dissecting and compound microscopy. Plant samples included stargrass, talahib, cogon, pigeon pea, mucuna, tomato and cassava.

On the other hand, the field trial set up to evaluate the effectiveness of commercial mycorrhizal inoculation involved two levels of phosphorus application and two rates of inoculation on two crops: peanut and corn.

Research Highlights

All experiments were conducted in collaboration with the staff of the Soil Biology Section of the Research Division. Thus transfer of research methodology was effectively carried out.

Initial results of the field trial suggest a better crop performance with the application of P fertilizer with or without mycorrhizal inoculation. However, biomass data gathered indicated that for peanut, mycorrhizal inoculation tend to depress both fresh and dry weight of P fertilized plants (Table 1). On the other hand, inoculation of mycorrhiza improved the fresh and dry matter production of P treated corn plants (Table 2). Observations are ongoing.

Table 1. Biomass production in peanut as affected by phosphorus application and mycorrhizal inoculation in Tanay soil.

Treatment	Fresh weight (g/plant)	Dry weight (g/plant)
Without P application		
Uninoculated	22.8	5.5
Inoculated	28.1	6.4
With P application		
Uninoculated	39.5	9.0
Inoculated	34.2	7.9

Table 2. Biomass production in corn as affected by phosphorus application and mycorrhizal inoculation in Tanay soil.

Treatment	Fresh weight (g/plant)	Dry weight (g/plant)
Without P application		
Uninoculated	35.2	5.4
Inoculated	32.2	4.6
With P application		
Uninoculated	78.9	18.2
Inoculated	108.5	20.5

Lime, phosphorus and micronutrient application for increased legume production in acid upland soils

M.J. Palis, C.C. Grospe, A.O. Yambot, L.T. Rubite
and J.S. Rojales

Research Objectives

1. To determine the response of peanut and mungbean to the application of lime, phosphorus and micronutrient in acid upland soils.

2. To devise management strategies to improve the productivity of acid upland soils.

3. To determine leguminous species that may show tolerance to acid upland soil condintions

Brief Methodology

The experiment was conducted in Bgy Kapatalan, Siniloan, Laguna on soil classified as Oxic Dystropepts. A split-split-plot design was used with liming (0,5 t/ha) as the main plots; micronutrient (with and without) as the subplots; and phosphorus levels (0, 40, 80, 120, 160 kg/ha) as the sub-sub-plots. The treatments were replicated three times.

Research Highlights

Application of lime at the rate of 5 t $CaCO_3$/ha markedly increased the growth, nitrogenase activity, nodule weight, and pod and seed weight of peanut and mungbeans (Tables 1 and 2). Phosphorus application likewise increased the growth, nitrogen fixation and yield of peanut, but the increase was not as pronounced as when compared to the effect of lime. Micronutrient application gave no effect on the growth N_2 fixation and yield of test crops.

Based on simple cost and return analysis, growing of mungbean in acid soils is not advisable to farmers. A net income of P21,563/ha can be obtained from planting peanut in acid soils. Peanut appears to be more tolerant to soil acidity than mungbean.

The yield potential of the crop has not yet been reached even with the application of lime, phosphorus and micronutrients. Thus there is a need to include other inputs such as organic matter to improve the fertility and productivity of the soil.

Table 1. Dry matter yield, acetylene reduction activity, nodule weight, chlorophyll content, pod yield and seed yield of mungbeans cv. MG 50-L Yellow as affected by lime, micronutrients and phosphate fertilizer.

P Levels (kg/ha)	Without Lime		Without Lime	
	w/o mn	w/ mn	w/o mn	w/ mn
Dry matter yield (t/ha)				
0	0.02	0.12	1.07	0.81
40	0.18	0.14	1.17	1.04
80	0.27	0.21	1.55	1.57
120	0.21	0.26	1.65	1.04
160	0.36	0.32	1.49	1.04
Acetylene reduction activity (μ mole/plant/hour)				
0	0.0019	0.0036	0.0043	0.0021
40	0.0034	0.0067	0.0251	0.0081
80	0.0324	0.0113	0.0131	0.0240
120	0.0166	0.0090	0.0265	0.0485
160	0.0267	0.0376	0.0388	0.0286
Nodule weight (mg/plant)				
0	0.00	6.66	3.33	0.66
40	3.33	6.66	1.33	8.66
80	4.00	10.00	8.00	11.33
120	3.33	4.66	10.66	24.00
160	12.00	8.66	10.66	42.00
Chlorophyll content (mg/dm^2)				
0	23.41	22.36	50.82	48.32
40	24.02	26.28	49.95	43.35
80	28.36	24.68	46.95	49.11
120	22.17	25.73	46.81	47.24
160	25.31	27.95	50.76	46.04
Pod yield (t/ha)				
0	0.004	0.017	0.274	0.324
40	0.033	0.016	0.392	0.466
80	0.032	0.020	0.467	0.577
120	0.014	0.024	0.537	0.488
160	0.044	0.028	0.496	0.511
Seed yield (t/ha)				
0	0.0026	0.0114	0.1824	0.2238
40	0.0216	0.0102	0.2625	0.3172
80	0.0207	0.0131	0.3003	0.3819
120	0.0086	0.0155	0.3524	0.3306
160	0.0264	0.0182	0.3287	0.3460

Table 2. Dry matter yield, acetylene reduction activity, nodule weight, chlorophyll content, pod yield and seed yield of peanut as affected by lime, micronutrients and phosphate fertilizer.

P Levels (kg/ha)	Without Lime w/o mn	Without Lime w/ mn	Without Lime w/o mn	Without Lime w/ mn
Dry matter yield (t/ha)				
0	1.08	0.68	2.40	1.92
40	1.11	1.16	2.04	2.11
80	1.25	1.57	1.99	2.26
120	1.37	1.20	2.51	2.36
160	1.38	1.53	2.45	2.64
Acetylene reduction activity (μ mole/plant/hour)				
0	0.42	0.34	1.82	1.97
40	0.71	0.79	2.19	1.74
80	1.02	0.30	2.17	1.66
120	1.13	0.88	2.33	1.70
160	1.19	0.77	2.09	1.39
Nodule weight (mg/plant)				
0	25.33	16.66	56.66	50.00
40	36.66	33.33	54.33	65.33
80	57.66	33.33	48.66	60.00
120	43.33	55.33	58.66	58.66
160	37.66	41.00	46.66	58.66
Chlorophyll content (mg/dm^2)				
0	38.18	37.03	39.56	39.68
40	38.42	39.70	39.66	40.54
80	39.07	39.11	38.59	40.13
120	37.66	37.84	41.11	42.30
160	38.47	37.73	39.84	39.49
Pod yield (t/ha)				
0	0.58	0.48	1.05	1.22
40	0.67	0.66	1.23	1.45
80	0.84	0.82	1.32	1.49
120	1.10	1.21	1.58	1.56
160	1.12	1.02	1.79	1.69
Kernel yield (t/ha)				
0	0.261	0.195	0.463	0.539
40	0.367	0.300	0.550	0.704
80	0.404	0.447	0.687	0.645
120	0.510	0.432	0.708	0.714
160	0.509	0.529	0.759	0.745

Trends in the biological, physical and chemical characteristics of Ultisols with the application of organic materials on legume and non-legume crops

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and S. Arai

Research Objectives

1. To determine the changes in the biological, physical and chemical characteristics of Ultisols with the application of organic materials.

2. To determine the yield response of legume and non-legume crops with continuous application of organic materials.

Brief Methodology

The Soil and Water Resources Research Center in Tanay, Rizal is the site for this five-year experiment. A split-plot trial has already been laid out with 3 replicates using peanut cv. BPI-P9 as test crop. Treatments consist of lime (0, 5 t/ha dolomite) as main plots and fertilizers (control, chicken manure (10 t/ha), inorganic (20-60-60) and combined organic-inorganic) as the sub-plots. Lime and chicken manure were applied one month before planting. Inoculation was done immediately before planting.

Initial soil physical, chemical and microbiological analyses are underway.

Research Highlights

The field trial has just been established.

Cropping systems and agricultural residue management and their effects on the fertility status and productivity of Ultisols

J.S. Rojales and M.J. Palis

Research Objectives

1. To determine the effects of cropping systems and agricultural residue management on the fertility status of Ultisols

2. To determine crop response with variations in cropping systems and agricultural residue management in Ultisol.

Brief Methodology

Cowpea, peanut, sweet potato and maize were randomly planted in plots at the National Soil and Water Resources Research Center in Tanay, Rizal during the last quarter of 1996. Some plots were also designated as fallow. At the onset of the experiment, soil samples were collected from the experimental area for initial soil chemical, physical and microbiological characteristics. The treatments (cropping systems) were replicated three (3) times. One (1) month before planting, lime was applied at 5 t/ha (blanket application).

Crops were harvested during the first quarter of 1997. All residues were collected and weighed and incorporated in half of the plots at the start of the second cropping. Soil samples were later collected from these plots for chemical, physical and microbiological assay and for the determination of N-mineralization potential after residue incorporation.

Upland rice cv. RI-5 was planted in all plots except the fallow plots on July 23, 1997 for the second cropping. The rice plants are now in their maximum tillering stage. At harvest, yield and yield components of the plants will be compared in plots where residues were removed and incorporated. Rice residues will again be incorporated in half of the plots and chemical, physical and microbiological characteristics of the soil will be monitored after incorporation.

Preliminary Results

Soil chemical, physical and microbiological analyses are still on-going, hence, data could not be presented in this report.

Efficient use of rhizobia in an Ultisol in the Philippines

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Research Objectives

1. To compare the effectiveness of rhizobial inoculation under two types of soil.

2. To evaluate the effects of inoculation of rhizobia on the nodulation and growth of soybean under natural conditions.

Brief Methodology

A pot experiment was set up in a screenhouse of the Bureau of Plant Industry using Ultisol and Andisol from Tanay and Bicol, respectively. Dolomite (10 g), Solophos (3 g) and Potash (3 g) were applied in each 10-kg pot. No nitrogen was added. Soybean cv CL Soy2 was used as a test crop.

Pots were grouped into uninoculated and inoculated for each soil. Inoculation involved the use of a mixture of soybean rhizobia. There were two replications. Characterization of rhizobial strains was done by intrinsic antibiotic resistance (IAR).

Research Highlights

Both experiments were set up in August 1997. Initial observations showed active nodulation in the crown parts of the roots of plants grown in both Tanay and Naga soils.

Table 1 shows that overall nodule occupancy was higher in Naga compared with Tanay soils. On the other hand, it appears that indigenous rhizobia in Tanay soil can compete better than those in Naga soils. In both sites, double infection was higher than single infection.

Table 1. Nodule occupancy in soybeans grown in Tanay and Naga soils

Rhizobium strain	Nodule occupancy (%) Tanay	Naga
IRj 2101 spc	20.0	20.0
IRj 2114 str	26.6	10.0
A1017 kas.spc	3.0	3.0
Native strains	20.0	6.0
IRj 2114 str+IRj 2101 spc	26.7	23.3
A1017 kas.spc+IRj 2101 spc	3.3	30.0
A1017 kas.spc+IRj 2101 str	-	6.0
Overall	80.0	93.3

Structure and species diversity of cogon grasslands on Ultisols in Luzon Island

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Objective

To conduct a vegetational survey on Ultisol areas in Central Luzon.

Methodology

Observations on the vegetational survey were classified into four types of vegetation structures: (1) abandoned crop field, (2) marginal site of foot path, (3) orchard grass structure, and (4) rangeland or pasture vegetation.

The structure and plant diversity in cogon communities were determined by "gap space diversity", i.e. growth characteristics of dominant species, interference by man and herbivores and edaphic/topographic factors.

Highlights

Cogon grass is not necessarily a troublesome plant on Ultisols in Luzon. It is a suitable forage grass for traditional domestic animals such as the buffalo. Hence it should be effectively used for grazing. Several native leguminous species co-exist with cogon grass and these too should be utilized for forage. Additionally, the cogon grass can be utilized in the production of thatch, rope and brooms.

Cogon grass becomes dominant only after abandoning a cultivated area for several years. Its dominance may not persist as it can be altered by invasion or introduction of other plant species. However, cogon grass can dominate in areas where grass fires occur frequently or even in orchard where cutting is done once or twice a year. When cut leaves are left on the ground, cogon grass makes almost a pure stand. As a result, cogon grass becomes dominant on Ultisols only under specific conditions.

For future land use and development of Ultisol areas dominated by cogon grass, the following suggestions are given:

- conduct of experiments to determine the fertilizer response of native species.
- examination of the regrowth rate and trampling resistance of plant species for rangeland improvement.
- determination of the "gap" characteristics of new species to be introduced into the cogon community.

Effects of inorganic and organic amendments on crops grown on marginal soils

V. Naboa, W. Peralta, C. Alcalde and S. Arai

Research Objective

To evaluate the effects of inorganic and organic amendments on the performance of corn and peanut grown on lahar and acid soils.

Brief Methodology

The study was conducted in Soil Tank Nos. 9 and 10 at the NSWRRC in San Ildefonso, Bulacan. Each tank has an area of 200 m^2 with a depth of 50 cm. These tanks were filled with lahar and acid soils from Pampanga and Tanay, respectively.

The lahar tank was planted to corn and amended with inorganic fertilizer alone and in combination with chicken manure and soil. On the other hand, the acid soil tank was planted to peanut with nitrogen and nitrogen+carbonized rice hull as treatments.

Currently, both tanks are grown to gabi with organic and inorganic fertilizer treatments.

Preliminary Results

Corn on lahar. The effect of chicken manure on the yield of corn grown on lahar was significantly higher than those obtained from pure inorganic fertilization and inorganic plus soil combination (Table 1).

Peanut on acid soil. The effect of the application of carbonized rice hull in combination with nitrogen on peanut yield was negligible when compared to the yield obtained from inorganic nitrogen fertilized plants. The residual effect of chicken manure applied during the previous cropping showed on one of the N treated plots and masked the yield results (Table 2).

The current crop of gabi shows significant positive effects of chicken manure in both lahar and acid soil tanks.

Table 1. Total dry matter yield of corn grown on lahar (Oct 1996-February 1997).

Treatment	Yield t/ha				
	Grain	Stem and Leaves	Cob	Top	Gr/Tp
1	0.22 0.35	2.35 2.66	0.09 0.16	2.66 2.66	0.08 0.11
2	0.01 0.09	1.45 1.41	0.03 0.01	1.45 1.41	0.03 0.05
3	0.14 0.05	2.61 2.14	0.07 0.04	2.61 2.14	0.05 0.02
4	0.91 1.22	5.15 4.85	0.34 0.42	5.15 4.85	0.14 0.19
5	1.00 1.03	4.95 5.20	0.30 0.30	4.95 5.20	0.16 0.16
6	0.16 0.06	1.91 2.72	0.01 0.02	1.91 2.72	0.08 0.02

1. Effects of chickenmanure were clear on lahar, but not so significand as in #10 (Tanay, 1996).
2. Mixing other soil into lahar affected less than peanut (Lahar 1996)

Table 2. Total dry matter yield of peanut grown on Tanay soil (Oct 1996-feb 1997).

Treatment			Yield (t/ha)						
Name	N	CRH	Name	Grain	Shell	St Lv	Root	Total	Gr/Total
1	22	--	T1P1	0.68	0.15	0.42	0.05	0.70	0.11
			T1P2	0.02	0.15	0.51	0.07	0.75	0.03
2	22	--	T2P1	0.23	0.31	0.40	0.03	0.97	0.24
			T2P2	0.35	0.46	0.55	0.05	1.41	0.24
3	22	--	T3P1	0.91	1.20	1.10	1.20	4.44	0.21
			T3P2	0.75	0.93	0.96	0.93	3.57	0.21
4	22	--	T4P1	1.48	1.91	1.64	1.94	7.00	0.21
			T4P2	1.57	1.98	1.57	1.98	7.10	0.22
5	22	--	T5P1	0.96	1.25	1.36	1.25	4.82	020
			T5P2	1.17	1.52	1.17	1.52	5.38	022
6	22	--	T6P1	0.26	0.41	0.52	0.44	1.66	016
			T6Pa	0.39	0.58	0.71	0.58	2.29	017

1 Residual effects of chicken manure applied at the previous cropping for corn were still significantly recognized in T.4
2 Effects of CRH on peanut yields were negligible as shown between T2 and T6, or T3 and T5.

Use of Inorganic soil amendments for Ultisols

I.E. Santos, P.Pajaro, E. Loberiza and V. Babiera

Research Objective

To evaluate the effect of four (4) selected inorganic soil amendments on the physical properties of an ultisol planted to a selected Solanaceous plant (bell pepper).

Brief Methodology

This field trial is established in Tanay Station on a randomized complete block design with 3 replications. Treatments are as follows: Control, 90-60-30, 90-60-30 + 5 t lime/ha, 90-60-30 + 5 t lime/ha + 4 t zeolite/ha, 90-60-30 + 4 t zeolite/ha, 90-60-30 + 2 t scoria/ha and 90-60-30 + 4 t Carbonized rice hull/ha.

Preliminary Results

Survival rate of transplanted bell pepper ranged from 78 to 95% and was highest in CRH treated plots. Zeolite treatment appeared to have suppressed seedling establishment.

Lime application increased soil pH from 4.8 to 6.5.

Lahar as ameliorant to heavy cracking clay soils

L.M. de Leon, W.C. Peralta and C. B. Alcalde

Research Objectives

1. To determine the effect of lahar incorporation on the physico-chemical properties of heavy craking clay soil.

2. To evaluate the response of wet season lowland rice and mungbean as second crop on clay soil ameliorated with lahar.

3. To determine the economics of using lahar as ameliorant to heavy cracking clay soil.

Brief Methodology

Seven levels of lahar amelioration will be tested on a Vertisol at the Bulacan Research Station following a randomized complete block design with four replications. Response of rice cv. IR 64 will be evaluated and changes in soil chemico-physical properties will be monitored.

After the wet season rice crop, two methods of land preparation will be superimposed for mungbean as a second crop. These will serve as subplots in an RCB split plot design.

Soil factors to be studied include soil strength, texture, consistency, bulk density, particle density, porosity, cracking pattern, moisture retention and macro and micronutrient contents.

Standard growth and yield data will be collected for both crops.

Preliminary Results

Lahar materials have been transported to the station.

Integrated field experiments for fertility improvement of Ultisols

R. Ulibas, E. Bautista and S. Arai

Research Objective

To determine the best combination of organic and chemical fertilizers for increased crop production in Ultisols.

Brief Methodology

Thid field experiment has been set up at the NSWRR Station in Tanay, Rizal. Using corn as a test crop, the following treatments were combined to provide some answers to the research objective: two levels of nitrogen as Urea (20 and 40 kg/ha), two levels of phosphate as Solophos (55 and 110 kg/ha), two levels of potassium (20 and 40 kg/ha) and two levels of chicken dung (2 and 10 t/ha). A blanket basal application of dolomite (Calcium magnesium carbonate)shall be done at the rate of 3 t/ha.

All fertilizers shall be applied basally except one-half of Urea which shall be sidedressed 30 days after sowing.

Preliminary Results

Land preparation and experimental lay out have been completed. Treatment application and sowing shall be done as soon as favorable weather and soil conditions prevail.

Evaluation of alternative crops for Ultisols

L.G. Hernandez, MJ R. Dela Cruz, F.A. Torres
and J.B. Rojales

Research Objectives

1. To evaluate the adaptability potentials of various crops to Ultisols.

2. To determine the response of crops to fertilizer application.

Brief Methodology

This study was set up at the Soils Research Station in Tanay Rizal although some crops were also tested in Siniloan, Laguna. Soils are Typic Kandiudults in Tanay and Oxic Dystropepts in Siniloan. Test crops include sorghum, wheat, soybean, mungbean, sweet potato, yambean, rambutan and lanzones. Fertilizer treatments consisted of the control, organic + inorganic and organic + inorganic + lime. Recommended cultural practices were followed for each crop.

Research Highlights

Preliminary data and observations showed that soybean and sorghum may be adapted to Ultisols, more especially when fertilized (Table 1). Wheat germinated but dried up shortly after two weeks due to soil moisture stress. Similar thing happened to mungbean. Yambean produced some underground yield but significantly smaller than those sold in the market.

One year after crop establishment, the growth performance of rambutan and lanzones is far from excellent. The long dry season from January to May put a heavy toll on the seedlings such that by the time rainy season came, only about 52% of the total number of seedlings survived. Of this number, growth increments after one year were not considerable except for the increase in height of rambutan. Fertilized rambutan grew by 17.3 cm compared to only 10 cm in unfertilized seedlings (Table 2). Monitoring continues.

During the current (1997) rainy season, the following crops are being evaluated: pineapple, chickpea, soybean, mungbean, cowpea, bush sitao, pole sitao, winged bean, eggplant, okra, radish, carrot, sweet potato, gabi and papaya.

Table 1. Yield performance of some crops evaluated on problem soils including Ultisols

Season/Crop	Yield (kg/ha) Control	Fertilized
Wet Season		
Soybean	498	549
Sorghum	443	1333
Wheat	-	-
Dry Season		
Soybean	194	531
Sorghum	120	515
Mungbean	-	-
Yambean	288	460

Table 2. Growth performance of some fruit trees evaluated on Ultisols

Crop	Growth increment after 1 year (cm) Plant height		Girth size	
	Control	Fertilized	Control	Fertilized
Rambutan	9.9	17.3	1.0	0.7
Lanzones	7.0	6.8	-0.17	0.3

Assessment of allelopathic activity of cogon grass and its control strategies

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JICA Short Term Expert
National Institute of Agro-Environmental Sciences
Tsukuba, Ibaraki 305 Japan

Research Objectives

1. To evaluate the allelopathic activity of cogon grass.

2. To screen plants for allelopathic potentials to suppress cogon growth in Ultisol areas.

Brief Methodology

The plant box method of assessing allelopathic activity was the main strategy used in this study. Cogon root and rhizome extracts were dried at 60 °C, then extracted with Ethanol/water (80:20) three times, and concentrated by rotary evaporator. The final concentration of the test solution was diluted again to 25 mg (d.w.) cogon/ml. This extract is inhibitory to Polygonaceae and Amaranthaceae family but has little effect on other weeds and vegetables in the Philippines.

The effects of nutrient, water and light competition were also considered in the assessment. Lettuce was used as acceptor plant in measuring the effect of root exudates.

Research Highlights

The allelopathic potential of cogon is not significantly high, usually not inhibitory to succeeding vegetables and crops as can be seen in Table 1. *Mucuna pruriens* shows some potentials in the suppression of cogon grass vegetation (Table 2).

Gliricidia sepium (kakawate) contains allelochemicals such as coumarin that can resist insects and weeds. Its use as a hedgerow crop in Ultisol area is recommended.

Table 1. Effect of cogon root extract on the growth of some selected vegetables.

Vegetable	Scientific name	R (%)	G (%)
Lettuce	*Lactuca sativa*	66	98
Tomato	*Lycopersicum esculentum*	70	100
Carrot	*Daucus carota*	49	100
Pechay	*Brassica chinensis*	57	57
Kangkong	*Ipomoea aquatica*	57	57
Katuray	*Sesbania grandiflora*	89	89

Table 2. Assessment of allelopathic potential of some cover crops in the Philippines

Cover crop	Scientific name	Radicle (%)	Root dw (mg)
Brachiaria	*Brachiaria dictyoneura*	70.7	434
Brachiaria	*Brachiaria humidicola*	31.7	283
Tropical Kuzu	*Pueraria phaseoloides*	42.8	258
Calopogonio	*Calopogonium mucunoides*	34.8	165
Gedaizu	*Glycine max*	31.8	246
Stylo	*Stylosanthes hamata*	46.0	83
Stylo	*Stylosanthes guianensis*	26.9	110
Crotalaria	*Crotalaria juncea*	31.4	108
Makahiya	*Mimosa pudica*	22.3	118
Mucuna cv hassjo	*Mucuna pruriens* cv utilis	4.8	197
Mucuna cv ana	*Mucuna pruriens* cv utilis	13.6	131
Mucuna capitata	*Mucuna pruriens* cv utilis	9.7	197
Mucuna cv florida	*Mucuna pruriens* cv utilis	12.4	146
Mucuna cv cinza	*Mucuna pruriens* cv utilis	26.9	134

Identification of suitable forage/pasture grasses and legume species for Ultisol

E.V. Dacanay, R.A. Monte, A.A. Bangalan, J.P. Mercado, D.T. Elicano and V.G. Estoconing

Research Objectives

1. To identify suitable and well adapted legumes and pasture grasses for Ultisols

2. To determine the influence of liming, manuring and organic amendments on the growth of some forage/pasture grasses and leguminous crops grown on Ultisols.

Brief Methodology

A pot experiment was set up in San Ildefonso, Bulacan to determine the suitablility of various grass and legume species to Ultisols. These species were grown with and without lime, chicken manure and carbonized rice hull. Leguminous species tested were *Sesbania rostrata, Indigofera tinctoria, Siratro, Stylosanthes and Crotolaria juncea.* Grasses were *Napier, Brachiaria, Paspalum, Setaria and Andropogon.* Observations were made on: germination rate, number of tillers, plant height, yield and effect of liming and soil amendments on chemical and physical properties of Ultisols used in the experiment.

Preliminary Results

Among the different leguminous species tested, siratro, indigofera , kudzu and stylosanthes showed high percentage of germination (Figure 1). On the other hand, setaria, napier and paspalum produced higher number of tillers than andropogon and brachiaria (Figure 2).

Liming increased total dry matter yield of the species tested. Combining organic fertilizer and carbonized rice hull with lime improved total dry matter yield of sesbania and andropogon.

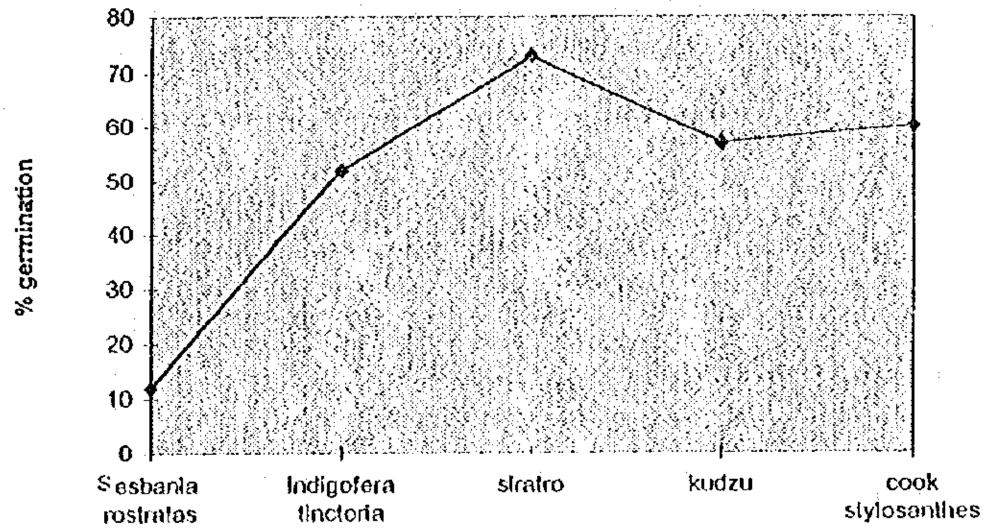


Figure 1. Percent germination of leguminous species tested in the experiment.

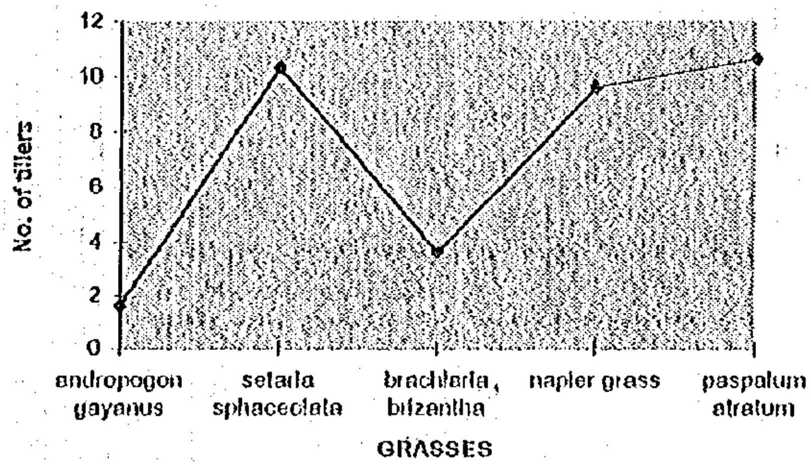


Figure 2. Tiller production of grass species tested in the xeperiment.

Competitive potential of *Mucuna* against cogon and talahib vegetation

J.P. Mercado, R.A. Monte, A.A. Bangalan, D.T. Elicano
and V.G. Estoconing

Research Objective

To determine the competitive potential of Mucuna as a cover crop to suppress cogon and talahib on Ultisols.

Brief Methodology

Mucuna seeds were grown in San Ildefonso, Bulacan to multiply the number of seeds. Thereafter, seeds were sown in talahib and cogon grasslands treated with lime and fertilizers. Data and information gathered included the vegetation change, growth dominance and biomass.

Preliminary Results

Mucuna takes longer time to get established in cogon and talahib grassland. However, after five months from sowing mukuna began to suppress the growth of cogon and talahib. Lime and fertilizer particularly P appeared to be important for mucuna to have rapid growth and suppress grass growth (Figure 1).

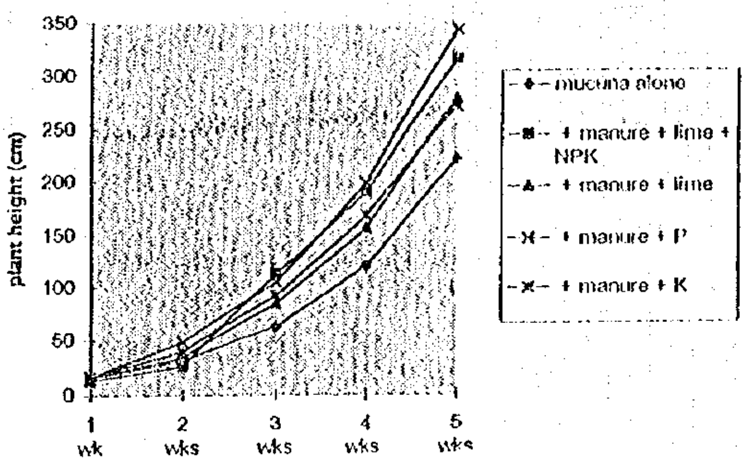


Figure 1. Growth performance of *Mucuna pruriens* as affected by different fertilizer treatments.

Evaluation of analytical methods for soil solutions of Ultisols

E. M. Bautista, B.C. Magno and R.B. Grifal

Research Objectives

1. To determine/develop analytical methods appropriate for Ultisols.

2. To provide analytical procedures for characterizing variable charge soil material.

Brief Methodology

Soil samples to be used in this study shall come from an ongoing study in Tanay station, *i.e.* Integrated fied experiment for fertilizing improvement on an Ultisol. Suction pipes shall be installed in each plot at 20 cm depth in order to sample the soil solution around the root system. Surface soil samples shall also be collected and analyzed as benchmark information.

Various parameters will be measured using various methods, *e.g.*:

NH_4-N and NO_3-N
Phosphate
Ca and Mg
Na and K
Metals
Other anions by HPLC

Preliminary Results

The chemical analysis of the surface soil samples collected from the study site in Tanay showed the following values: pH 5.24, O.M. 0.59%, N 0.03%, Olsen P 0.0 ppm, K 2600 ppm. Exchangeable bases in meq/100 g soil: Ca 0.95, Mg 0.26, Na 0.07, and K 0.05. Trace elements in ppm: Zn 0.0, Cu 0.04, Fe 0.02 and Mn 0.03.

B.C. Magno, E.M. Bautista and R.B. Grifal

Research Objective

To identify analytical methods suited for Ultisols

Brief Methodology

Soils and plant samples to be used in this study shall be collected from an ongoing study in Tanay station, *i.e.* Integrated field experiment for fertilizing improvement on an Ultisol. Laboratory measurements and analysis will include the following: Available P - by chemical extraction such as Olsen Method or biological test such as Neubauer culture. Characterization of P due to fractionation.

Other measurements will include: Soil - pH, OM content, Ca, Mg, Na and K. Micronutrients like Zn, Cu, Fe and Mn shall be analyzed using AAS and ICP-AES. Plant tissue: N, P, K, Ca, Mg, Na, Fe, Zn, Cu and Mn.

Preliminary Results

Benchmark information on surface and subsurface soils of the Tanay experimental site, including the sand are shown below.

Analysis	Tanay Soils Surface	Tanay Soils Subsurface	Sand
pH	5.32	4.60	5.19
OM (%)	4.56	1.24	0.28
N(%)	0.23	0.02	0.01
Available P (ppm)			
Olsen	1.04	T	T
Bray	0.48	0.13	0.14
Exchangeable Bases (meq/100g)			
K	0.20	0.10	0.01
Na	0.11	0.07	0.03
Ca	4.25	0.25	0.05
Mg	1.12	0.38	0.02
Trace Elements (ppm)			
Zn	4.16	T	1.16
Cu	2.68	0.06	0.02
Fe	24.00	0.08	5.2
Mn	0.94	0.94	0.52

Transfer of technology for the improvement of problem soils (Ultisols) and unproductive grasslands

Rungsun Im-erb
JICA Third Country Expert
Bangkok, Thailand

Objectives

1. To review the research and development activities carried out in the Philippines and Thailand on problem soils and unproductive grasslands.

2. To make recommendations on how to effectively transfer technology on the improvement of problem soils and unproductive grasslands.

Methodology

Both countries, the Philippines and Thailand were described geographically. Climate and soils were compared and socio-economic conditions were considered. Component technologies in soil and crop management were reviewed while the strategies of implementation were outlined and presented.

Highlights

For the transfer of technologies to be effective, it must be based on similar soils, climate and environmental factors. Some of the recommendations are:

1. Soil amelioration should be done in areas characterized with low pH and nutrient deficiency particularly phosphorus and micronutrients.

2. Crop rotation and relay cropping must be practiced in conjunction with screening of crop varieties tolerant to acid soils.

3. Adoption of organic fertilization, including compost making, green manuring and live mulch cropping.

4. Development of appropriate fertilization and liming recommendations to farmers.

5. Conduct of further studies to understand more of the infertility in acid soils and their improvement.

6. Promotion of technology demonstration as a tool in technology transfer with the farmer playing a vital role.

7. Exploration of marl deposits for use as ameliorant in acid soils.

Installation of the ICP Atomic Emission Spectrometer

T. Tozawa
Instrument Division Hitachi, Ltd.
882 Ichige, Hitachinaka City,
Ibaraki prf., 312 Japan

Objectives:

1. To install the inductively-coupled plasma atomic emission spectrometer (ICP-AES) at the Soilsearch Center.

2. To train analysts in the proper use of the ICP-AES.

Methodology:

As part of the commitment of the Japanese government to the SRDC Phase II project, the ICP Atomic Emission Spectrometer Model P-4000 was provided to the Center through the Team Leader Dr Michio Araragi.

The ICP Atomic Emission Spectrometer is a laboratory instrument that analyzes elements like K, Mg, Pb, Sn, Ti and many others. Installation was made on February 21, 1997.

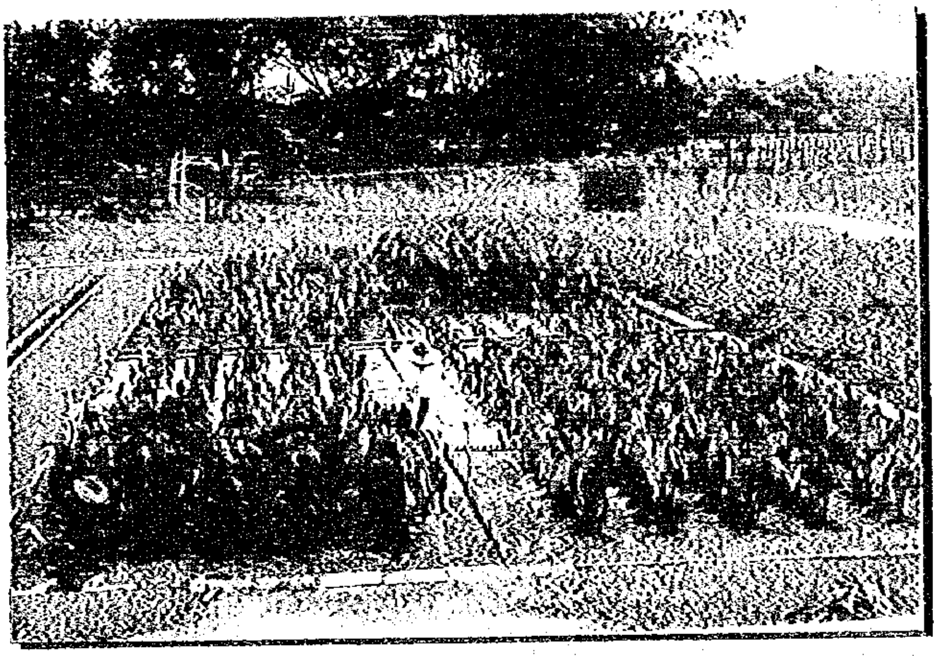
Highlights

Immediately after the ICP-AES was installed, a lesson on the usage of the apparatus was held with the following BSWM staff as trainees:

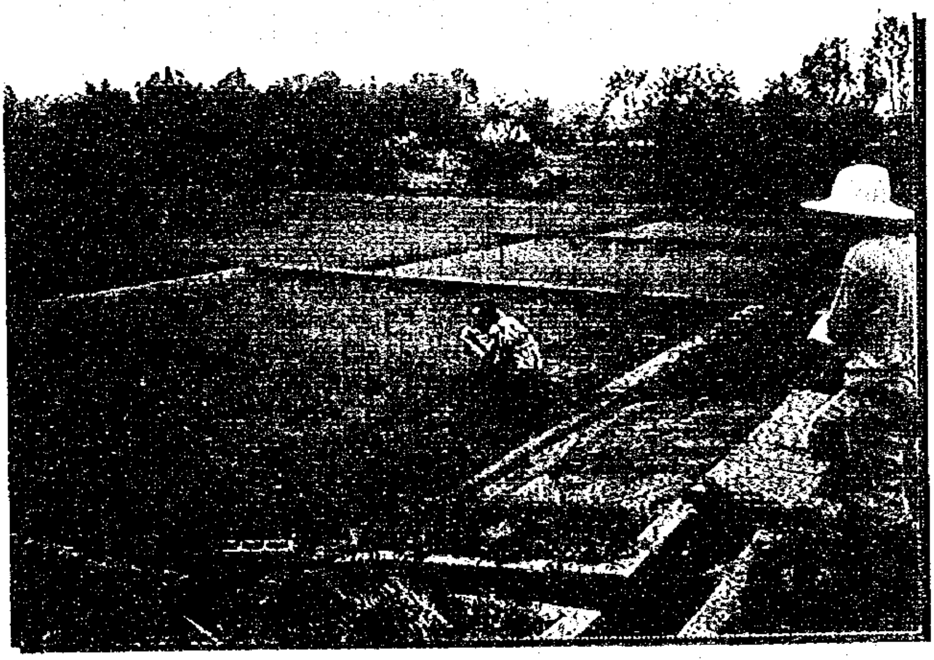
C.G. Mangao	Laboratory Services Division
V.M. Quimzon	Laboratory Services Division
R.C. Vera Cruz	Laboratory Services Division
E.D. Ayo	Research Division
E.M. Bautista	Research Division
C.C. Grospe	Research Division

This state-of-the-art facility is now serving the analytical needs of the SRDC project as well as the local clienteles of the bureau.

The technical service instruction was given to the 'Microlabo' company engineers.

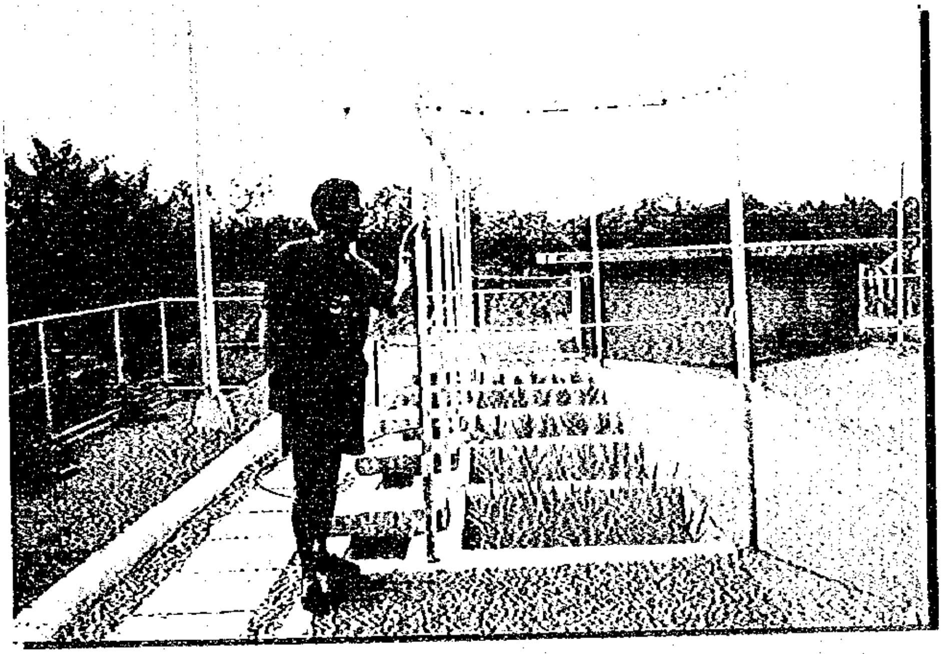


Mr Vener Naboa observing the growth performance of gabi crops in the soil tanks.

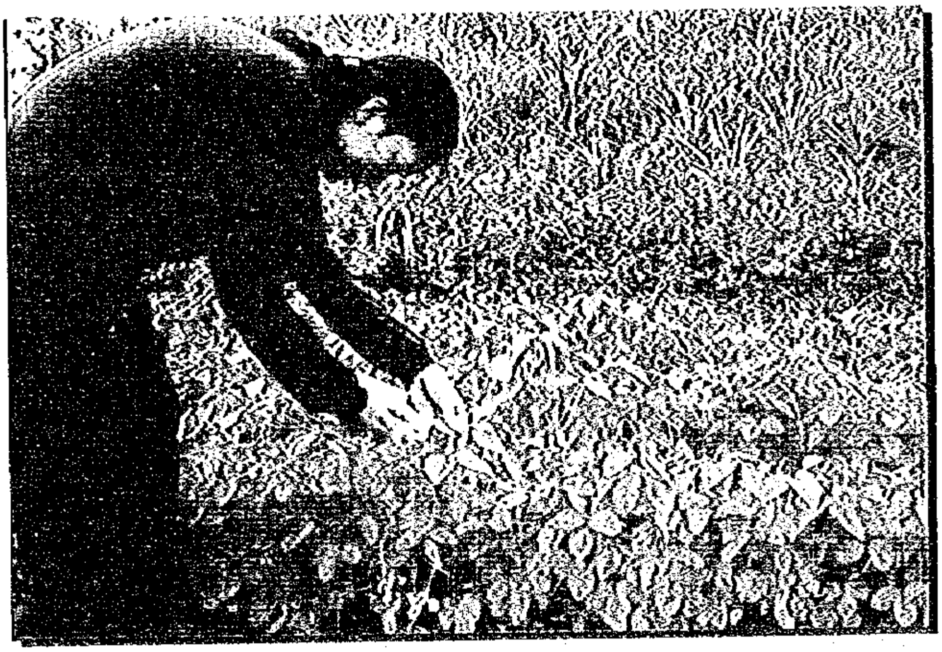


Dr Tamaki Yasuda, the erstwhile JICA Team Leader conducting an investigation on Ultisols in one of the soil tanks.

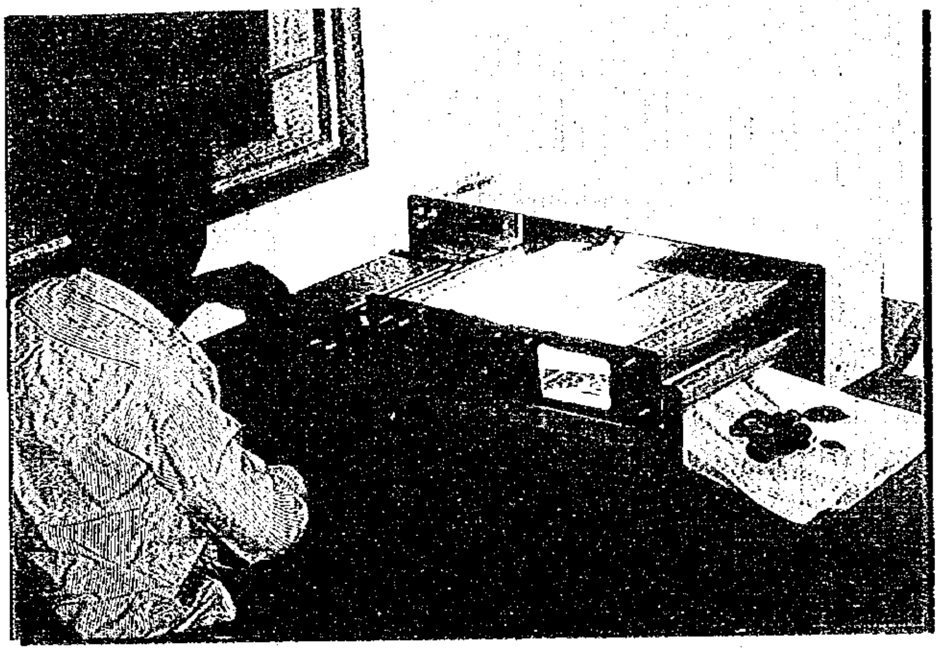
Dr Shigemitsu Arai, JICA Expert on Soils and Fertilizer and Dr Perfecto Evangelista, BSWM counterpart overseeing the field trial of Ms Palis on legumes.



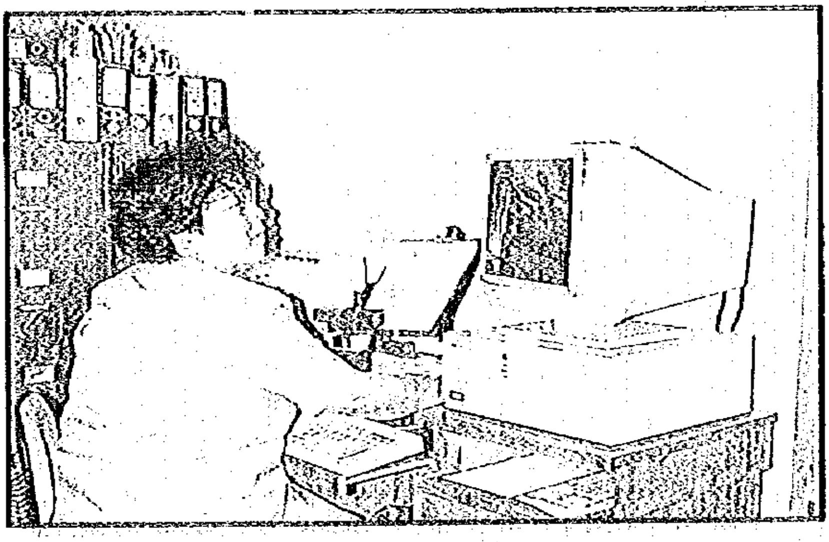
Mr Cris Alcalde conducting an inspection of the initial trial on the lysimeter at the Bulacan Research Station.



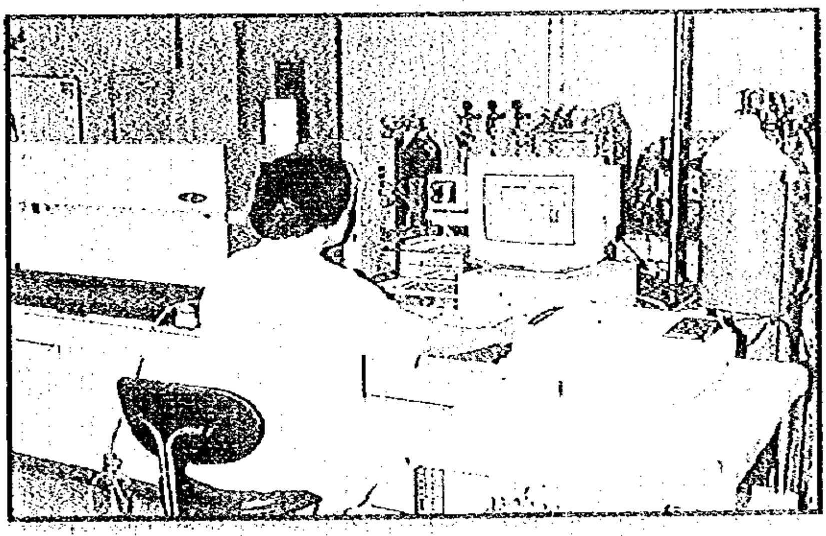
Ms Jane dela Cruz measuring the chlorophyll content of soybeans grown on Ultisols



Mr Francis Torres measuring the leaf area of groundnuts treated with various levels of nitrogen fertilizer.



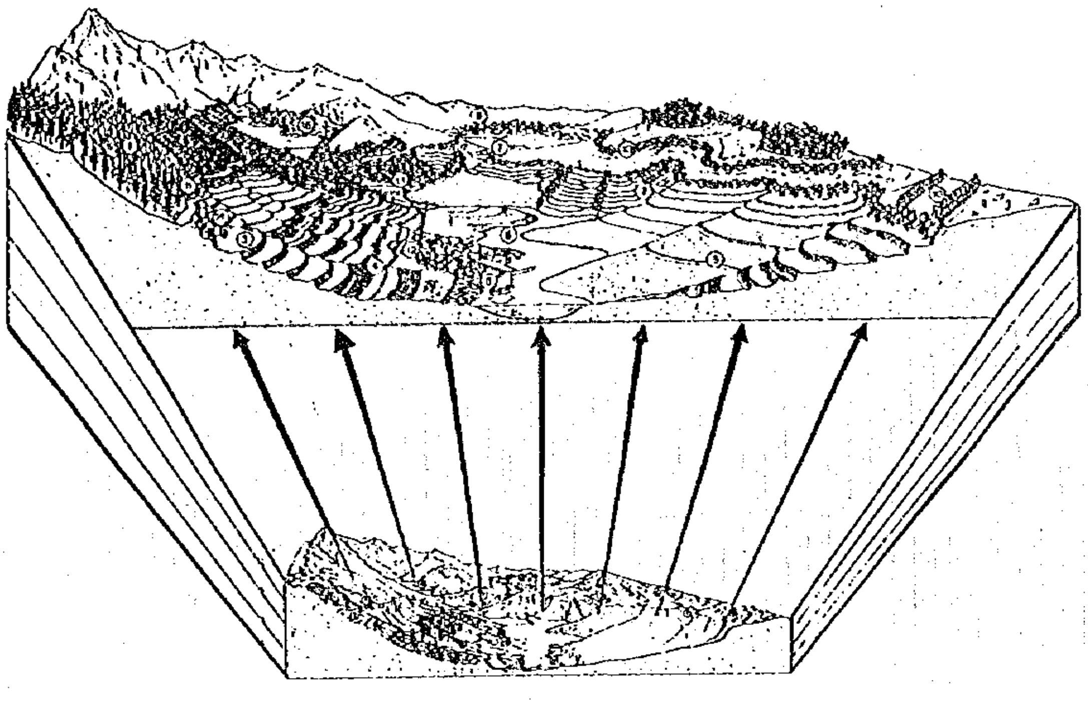
Ms Celia Grospe running an statistical data analysis in the computer.



Ms Vilma Quimzon running a series of test on the ICP-AES, a state of the art apparatus in chemical analysis.

Soils Research and Development Center
Phase II

Soil Conservation Research



Bureau of Soils and Water Management
Diliman, Quezon City
Philippines

1997

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PREFACE

The activities of the five-year project between the government of Japan and the Philippines, SRDC Phase II being implemented by the BSWM includes among others research on soil conservation. It is expected to contribute to the attainment of the projects' overall goal of improving and developing technologies that would mitigate soil loss/soil erosion and subsequently prevent land degradation.

The research activities in Soil Conservation are focused on the following area of concerns:

A. Improvement of Technology for Soil Erosion Control for Problem Soils Including Ultisols

I. Assessment of Soil Erodibility and Rainfall Erosivity

- Relationship between various detachability indices and erodibility of soils and rainfall erosivity.
- Measurements of Raindrop Size and Energy Using Disdrometer

II. Assessment of Soil Properties and Erosion Occurrence on Sloping Land

- Soil physical, chemical properties and erosion affected by land use and topographic features.

III. Assessment of Soil Productivity Decline Associated with Soil Erosion

- Effect of soil surface removal (desurfacing) and fertilization in crop yield and soil properties.

IV. Assessment of Ability of Various Tropical Plants on Erosion Control and Fertility

- Evaluation of some leguminous and grass species for soil and water conservation.
- Biomass production and performance of some leguminous tree crop species.

V. Improvement of Erosion Control Farming Practices

- Mulching practices
- Hedgerows practices
- Deep plowing practices
- Tillage and plant residue management
- High density mango planting practice
- Agro-forestry

B. Development of Methods for Soil Conservation Including Ultisols

I. Preparation of Technical Manual for Soil Conservation.

II. Development of Method for Soil Loss Prediction on Sloping Land.

The research program on Soil Conservation covers both basic and applied. The basic research lined up (component I to IV) are meant to come up with a development of method for soil loss prediction on sloping upland field; while the expected output of the improvement of technologies for soil erosion control (component V) will be an input into the preparation of technical manual for soil conservation practices.

The researches are conducted at the Tanay National Soil and Water Research and Development Center and have access to the support facilities and equipment of the SRDC center. Studies have been started at staggered dates from 1995 and 1996, but mostly are recently conducted during the year in review of 1997, hence this report of the Soil Conservation captures the research activities of 1995 to 1997. There are some completed and the rest are on-going/newly started.

Tentative Schedule of Implementation
Soil Conservation Research

Project/Activity	Year				
	1	2	3	4	5
	1995	1996	1997	1998	1999
A. Improvement of Technology for Soil Erosion Control for Problem Soils Including Ultisols					
I. Assessment of Soil Properties and Rainfall Erosivity.	■	■	■	■	
II. Assessment of Soil Properties and Erosion Occurrence on Sloping Lands.	■	■	■		
III. Assessment of Soil Productivity Decline Associated with Soil Erosion.	■	■	■	■	
IV. Assessment of the Ability of Various Tropical Plants on Soil Erosion Control and Fertility.	■	■	■	■	
V. Improvement of Erosion Control Farming Practices.		■	■	■	■
B. Development of Methods for Soil Conservation for Problem Soils Including Ultisols					
I. Preparation of Technical Manual for Soil Conservation Practices			■	■	■
II. Development of Method for Soil Loss Prediction on Sloping Land.			■	■	■

v

Tentative Schedule of Implementation
Soil Conservation Research

Project/Activity	Year 1 1995	2 1996	3 1997	4 1998	5 1999
A. Improvement of Technology for Soil Erosion Control for Problem Soils Including Ultisols					
I. Assessment of Soil Properties and Rainfall Erosivity.	■	■	■	■	
II. Assessment of Soil Properties and Erosion Occurrence on Sloping Lands.	■	■	■		
III. Assessment of Soil Productivity Decline Associated with Soil Erosion.	■	■	■	■	
IV. Assessment of the Ability of Various Tropical Plants on Soil Erosion Control and Fertility.	■	■	■	■	
V. Improvement of Erosion Control Farming Practices.		■	■	■	■
B. Development of Methods for Soil Conservation for Problem Soils Including Ultisols					
I. Preparation of Technical Manual for Soil Conservation Practices			■	■	■
II. Development of Method for Soil Loss Prediction on Sloping Land.			■	■	■

STAFF

The Soil Conservation component of the SRDC Project Phase II is being implemented by researchers/subject matter specialists from the various Division of the BSWM but generally from the Soil Conservation and Management Division in collaboration with the research staff of Tanay National Soil and Water Research and Development Center. Plans and programs of the service group is formulated by the Core Team in consultation with the consultants, advisers and the research implementors.

Core Team

Chairman	:	Reynaldo Palis (Jan-June), Ph.D.
		Redia N. Atienza (July-date), M. Sc.
Co-Chairman	:	Florencio G. Mananghaya, BSA
Members	:	Rodolfo P. Lucas, RPAE-M. Sc.
		Wilfredo Cabezon, M. Sc.
		Manuel Sta. Ana, BSA
		Eugenia Briones

Subject Matter Specialists

Arnulfo B. Gesite, RPAE
Pablo Montalla, RPAE
Salvador Balading, BSA
Roosebelt Creencia, BSAE
Marina Marges, AB Eco.
Ireneo B. Ramat, Ph. D.
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Rogelio Creencia, BSA
Florentino Agustin, BSA
Danilo Adriatico, RPAE
Jose Bura, BSA
Aida Latoza, BSC
Reynaldo Peregrino, RPAE
Edgar Reyes, BSA
Leonardo Semana
Filipina Z. Ventigan, AB Eco.

Consultants

Long-Term Expert	:	Yoshimi Ueno, Ph. D.
Short-Term Experts	:	Ichiro Taniyama, Ph. D.
		Seishi Isobe, Ph. D.
		Kenji Banzai, Ph. D.

Advisers

Executive Director	:	Rogelio N. Concepcion, Ph. D.
Deputy Exec. Director	:	Alejandrino R. Baloloy, M Sc.
Project Manager	:	Alejandro G. Micosa, M Sc.
JICA Team Leader	:	Michio Araragi, Ph. D.

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ASSESSMENT OF SOIL ERODIBILITY AND RAINFALL EROSIVITY

A. B. Gesite, P. M. Montalla
and J. B. Rojales

Research Objectives

1. To determine soil detachment and transport by raindrops impact.
2. To relate detachment rates to soil physico-chemical characteristics, slope, rainfall energy and vegetative cover.
3. To determine the influence of erosion pavement (mulch) on soil detachment rates.

Brief Methodology

The focus of this study is to assess the soil erodibility, rainfall erosivity with respect to its measured soil and rainfall characteristics using rainfall simulator (See Photo # 1 & 2).

The rainfall simulator is equipped with its nozzles, flumes and adjustable erosion boxes to load the soil samples. This rainfall simulator is installed in 4th floor SRDC Bldg, and the experimental station of which will start as soon as the needed materials completed i.e. soil samples that will be gathered at Tanay National Soil and Water Research and Development Center (Photo # 3). The expected output of this is soil erodibility map (1:1,000 scale) and which will be categorize as none to slight, moderate and severely eroded.

MEASUREMENTS OF RAINDROPS SIZE AND ENERGY USING DISDROMETER

A.B. Gesite, P.M. Montalla
and J.B. Rojales

Research Objective

To measure raindrops size and energy load rainstorm to evaluate rainfall erosivities.

Brief Methodology

In this study the device called disdrometer will be used to evaluate the kinetic energy of the raindrops which is the basis in studying soil erosion. It measures raindrops size and distribution continuosly and automatically. Acoustic vibration caused by impacts of raindrops on the sensor are transformed into electric pulse and recorded on a pulse time scale. Thus energy load of rainstorm is calculated by a summations of products of drop size terminal velocity values for individual raindrops.

The disdrometer (Photo 2) has been installed in the 4th floor SRDC Bldg. and will be handle by the Soil Conservation SRDC-JICA counterparts with the supervision of Dr. Kenji Banzai, a JICA short-term expert (Hydrologist) who had just arrived from the NIAES, Tsukuba, Japan, and will be working/assisting for researches from October 6-24, 1997.

ASSESSMENT OF SOIL PROPERTIES AND EROSION OCCURRENCE ON SLOPING LAND

R. Palis, Ph.D.

Research Objectives

To determine the rate of soil erosion using Cessium 137.

Brief Methodology

The focus of this study is to evaluate the rate of soil erosion by using Cessium 137 distribution. Soil samples of this study were gathered at various land uses and topography at Tanay National Soil and Water Research and Development Center and Siniloan watershed (Photo 3). Due to lack of equipment, the samples were sent to Japan for analysis.

3

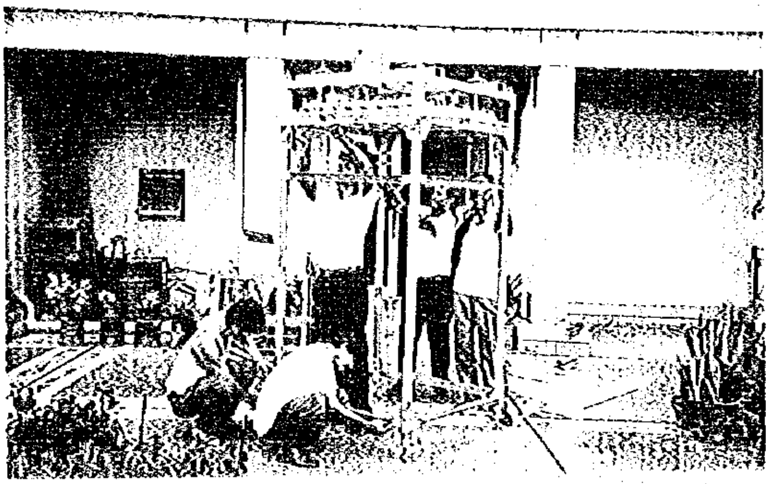

Photo 1. Soil conservation group installing rainfall simulator

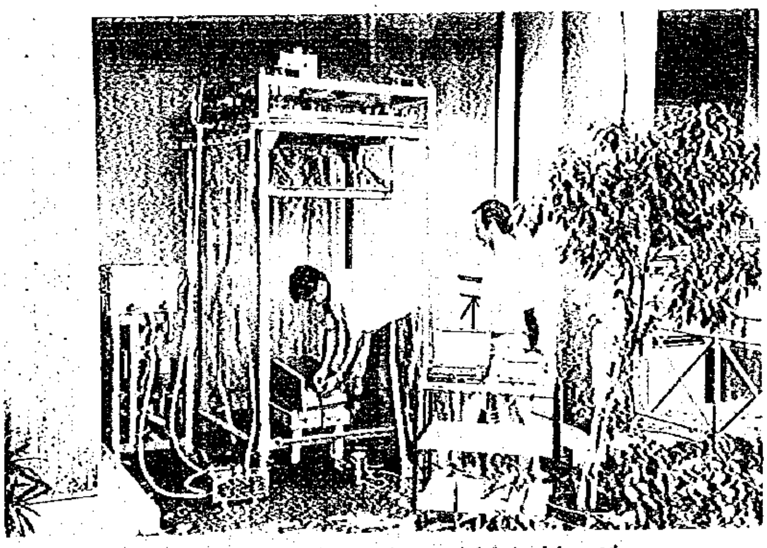

Photo 2. Dr. Banzai and Engr. Montaña testing rainfall simulator and distrometer

Photo 3. JICA Experts and Filipino counterparts doing soil investigation and collecting soil sample for Cessium analysis