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The Institute of Agriculture and Animal Sciences

of Tribhuvan University

Rampur, Nepal

End of Tour Report

IAAS - MUCIA Project

Henry D. Foth

Professor, Soil Science

Michigan State University

East Lansing, Michigan 48824

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INTRODUCTION

I was recruited in June, 1980, for the Chief of Party opening to replace Dr. Rex Ray. On July 7 the campus coordinator asked me to serve as the Plant Science Advisor to replace Dr. H. C. Bittenbender and I accepted the requested change. The objective of the tour was to further the development of the teaching, research and extension activities of the Plant Science Division of the Institute of Agriculture and Animal Science at Rampur, Nepal. The curriculum had been quite well established and efforts were under way to develop detailed outlines of the courses when I arrived on January 10, 1981.

During the month of January, I used considerable time for one to two hour interviews with members of the Plant Science Division (PSD) staff and getting acquainted with IAAS. The Summer Crops Workshop was held in Rampur in late January and this resulted in an early acquaintance with agronomic research programs and personnel in Nepal. Several weeks were spent on language and cultural training in February and, on March 8, I taught my first class-a two hour practical in Soil Science 406.

College students all over Nepal started striking on March 28, 1981. This was followed by a strike of the IAAS teaching staff. Classes resumed on August 21 for about two weeks and then exams were given. During the strike period, time was devoted to setting up the research lab and doing research and language training at Rampur with local Nepali teachers. I became quite proficient in the language with a limited vocabulary by the time my tour ended.

In September the soil science group organized the new annual system course outline and assigned teachers. My assignment was for the first two to three weeks of lectures and one of the first practicals. Most of

October was spent developing the content, typed handouts for the classes and other materials. After the staff returned on November 1, my time was taken up helping them with the teaching, extension and research activities. The remainder of this report details the most significant activities, accomplishments and failures.

TEACHING

Teaching is central to the "development of an institution which will prepare professional agriculturists." I found students anxious and willing to learn. As I was making final arrangements to teach my first practical in March 1981, a student (S. P. Katel) came to me and asked "What can I do to Help?". There couldn't have been a better introduction to my teaching at Rampur.

Teaching Activities

The student strike started in late March and I arranged with the academic dean to give a seminar "Organizing for Effective Teaching and Learning" to interest the staff in course improvement during the strike period (see appendix 1). As far as I could tell, the seminar was unsuccessful in interesting teachers in course improvement.

Effort to improve courses was first directed to the soils courses. This led me to discover on May 4 that for the introductory course, recently converted to annual basis, there wasn't a single sheet of paper in Rampur dealing with scheduling, lecture outlines, or practicals, and virtually no equipment for teaching practicals. One was hard pressed to find a balance to weigh a soil sample. In fact when I taught the bulk density practical in November, I had to arrange with the assistant dean for academic affairs the night before class to make sure a balance would be available for the first hour the next morning.

Correspondence with participant trainees in the United States failed to uncover any written course material. However, in the Schulte end of term report it was reported that "Good handouts are being prepared by the teaching staff for student use, with an eventual goal of having a complete set of handouts for the course..". The Schulte reference was in regard to

a course in soil fertility and fertilizers that had been incorporated into the new annual course. I think this experience points out a major problem that has plagued the development of IAAS and, that is, the highly mobile staff make it difficult for a staff member to establish a long time commitment to any particular activity. Perhaps, there are other reasons. This has resulted in courses taught and course outlines prepared by persons not trained in the subject. Good course development requires some assurance for the teacher that effort expended in course development will pay off because he will be teaching the course in the future.

Before the soils staff went on dasain vacation in October, a schedule of all lectures and practicals was developed by the IAAS soils staff and teachers assigned (see appendix 2). While the teachers were on vacation, I developed the content for about eight lecture periods and one practical. When I had major responsibility for the annual soils course for the first few weeks of the term, I became intimately acquainted with the operation of the instructional program at IAAS. Classes couldn't start on November 1 as scheduled because the annual students hadn't been informed that the term was starting November 1. Some students, however, were in attendance and lecture sections A and B were combined for most of the first week. During the second week sections A and B were reformed. I made changes in the lecture schedule to accommodate this change in scheduling and two extra classes were held after 5 pm on the Sunday and Monday of the third week. An extra optional slide lecture was given on Tuesday at 5 pm and there was good attendance at all three of these extra scheduled classes at 5 pm. Thus, all lectures originally scheduled for the first three weeks were given or made up, good practicals were given and, for all practical purposes, the course was comparable to some in the United States. I spent

a lot of time on the soils course at the beginning of the term because I thought that if one course could be well organized and taught that it would have an influence on other courses in PSD.

Several things happened before the term started that are relevant to the developments in the annual soils course. In the fall, 1979, B. R. Khakural enrolled for an MS in soil science in my department at Michigan State University. His office was near mine and we visited with each other frequently. BR audited my introductory course and enrolled in Soil Geography and Land Use for credit. I helped BR and his major professor collect the soil samples used in his thesis research. In September, 1980, I interviewed at Rampur and, shortly, thereafter, in Madison, I met J. R. Joshi who was working on an MS in soils at the University of Wisconsin. While in Nepal, I corresponded with BR and JR concerning the important work that must be done at Rampur and encouraged them to return anxious to help. These two people took the major initiative to get the new annual soils course in operation. When I finished the first segment, they took over and the course was well handled. Classes were met as scheduled, good material was presented and students in small groups were involved in practicals. I am greatly indebted to BR and JR for the initiative and dedication they showed upon returning to Rampur. S. C. Sah contributed greatly to the teaching of the soil fertility sections and P. P. Sharma (academic dean) the physics and conservation sections. Students in groups of four were determining pH, bulk density, carbonates, organic matter, etc. and good field trips were organized. I helped BR select field trip sites and develop the field trip activities. On the field trip to the Narayani River to study the alluvial soils, we used the IAAS bus and each of us taught half of the class (see photo section). My experiences with teaching

were rewarding and good and students began to come to me with problems unrelated to the course. I regretted that after the first month of nearly complete involvement in teaching, I became so busy working with others that I wasn't able to contribute very much anymore to the annual soils course.

At the beginning of the term in November 1981, T. P. Nepal took a temporary assignment to work on an irrigation survey in the Rapti zone. The agronomy course was without a teacher and Mr. S. P. Katel and Mr. Rabi Poudel were put on a temporary basis to teach agronomy. Both were recent graduates of IAAS. Mr. Katel was the student who had offered to help me teach my first practical in March 1981. In the meantime, we had come to know each other very well. I had visited his home several times and had tea and met his family. I took my daughter to his home and she got acquainted with S. P. and his sister. We had visited several farms to inspect crop problems. When he joined the staff, we were mutual friends. SP is intelligent, hard working, and full of practical farm knowledge and his farm is only 15 minutes "on-foot" from the campus. He had convinced his father to adopt one new practice a year and had great interest in the improvement of farming. So, when SP joined the staff, we were mutual friends with great respect and admiration for each other. I audited his first lectures, gave critiques and furnished him with pamphlets on teaching that had been prepared by personnel of the Educational Development Program at MSU. I had a "petty cash fund" and bought him badly needed supplies that were difficult or time consuming to get through IAAS. SP had good lecturing ability and worked hard to prepare material. Good student projects were given for sugar cane and wheat (see photo section).

In introduced SP to Dr. Kenneth Sayre of the Integrated Cereals Project (ICP) through visits to the Ratna Nagar cropping systems site and

visits at Rampur campus. These visits resulted in development of several research proposals for farmers fields that were related to the work of the cropping systems program of ICP. It was a joy to have had the opportunity to help so much in getting this young man started on the staff and in return he taught me much about farming near Rampur.

Mr. Rabi Poudel was a new acquaintance when he joined the staff and in time I also helped him but to a lesser extent. I was involved with many other staff including Rishi Adhikari in horticulture, M. H. Khan in botany, K. P. Sharma in genetics and plant breeding and J. Prasad in chemistry. Rishi had developed a good food science laboratory where students had an opportunity to work in small groups.

M. H. Khan was a capable and dedicated teacher of botany. I audited some of his classes, provided him with microscope slides, colored slides and materials to preserve specimens in plastic. Last, but not least, I provided a lot of encouragement and moral support.

During my first month I helped interview seven candidates for teaching chemistry. Mr. Prasad from India was hired on contract. The chem lab had no water or gas and the lab room had two rows of chairs arranged in front of the blackboard. I tried to improve the content, especially the practicals, but with little success. Mr. P. Prasad was never able to show me any lecture notes or lab exercises and always referred to the IAAS Bulletin for answers regarding course content. There was few "hands on" practicals. The practical on atomic structure was a lecture with no opportunity for students to see or construct atomic models. I was working to get a chem lab that would prepare students for courses in animal and plant science. Major progress was to get some badly needed equipment. I requested materials from two year agriculture technology teachers in the United States

for use to orient chemistry, botany and math to content more appropriate for agriculture students (see appendix 3).

The basic lecture technique at IAAS is for teachers to make statements and have the students write them down. This requires frequent repeating of statements and sometimes repeating it in both Nepali and English. The instruction has been in English but more and more lecturing is in Nepali because new students entering college have poor English ability due to decline in quality of English instruction in Nepali schools. Some teachers sit on a chair and read from a book while students write down the content. I think it is difficult to conceive of a more inefficient system for transfer of knowledge. Improvements in teaching have just begun. Part of the problem is related to staff mobility that was mentioned earlier. During my tour two teachers in PSD showed colored slides on their own initiative. The most urgent lecturing needs are:

1. Handout materials for students to reduce writing time.
2. Use of overhead projectors for visual material.
3. Greater access to textbooks by students.

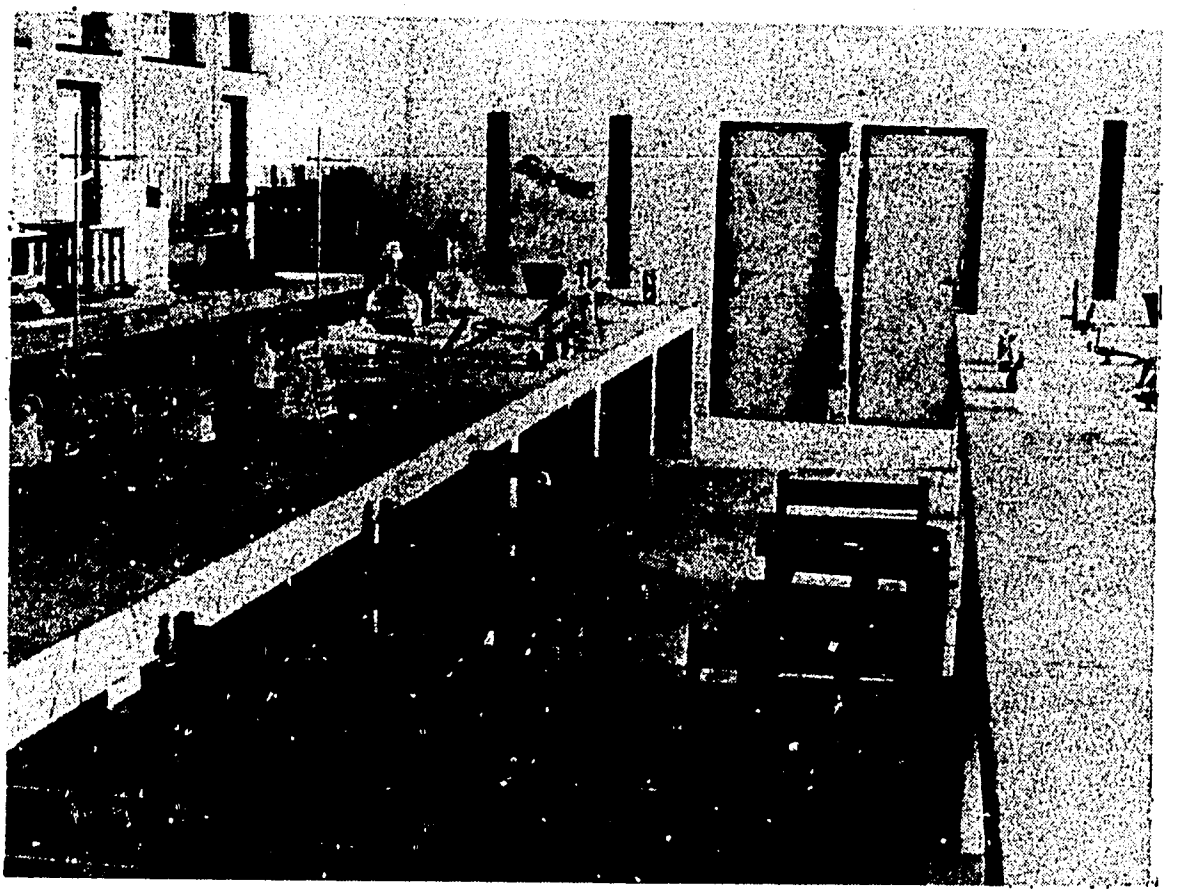
Perhaps, the least cost method to increase learning is the purchase of text books. In this regard I'd like to relate some information about books and teaching methods. Several years ago researchers in Oregon reviewed about all the research on teaching methods for the past 40 years. The general conclusion was "the method makes no difference." One plausible explanation given was that since the students had books and were required to learn the material to achieve a particular grade, the students learned the material regardless of the method. The results of this study have elevated the value of books for learning in schools.

The content of the lectures and practicals needs to be more oriented to Nepal. A hard job when teachers are on vacation when there are no classes and have no time when classes are in session.

Most practicals are one hour lectures with only one-half as many students and offered in a lab instead of a lecture room. Real practicals require more work to organize and teach than lectures. It will take a lot to turn this around but a start has been made in courses taught by Khan, Rishi Adhikari and in the soils course.

Schulte made some good suggestions to integrate basic science teachers in the agricultural courses and programs (see report page 5). M. H. Khan, botany teacher, is involved with several faculty in research projects and has received approval of the research committee to do a root-knot nematode survey of the Chitwan. Other basic science teachers should be encouraged to become involved as a means to develop more relevant teaching material.

Teaching Photo Section



Soil Science teaching lab organized by B. R. Khakural and J. R. Joshi.

Students pose by the bus used for distant field trips, in this case. to

Students determining properties of alluvial soils. Note that the class was divided into two groups for instruction.

S. P. Katel teaching agronomy practical class on how to plant sugar cane.

Students laying out the area to determine yield of wheat supervised by S. P. Katel.

Students threshing and weighing wheat to determine yield supervised by Rabi Poudel.

Teaching Improvement Projects

A major limitation for improved teaching methods has been the rapidly changing personnel. Now, participatant training opportunities are tapering off and the teaching staff should become more permanent. The major need beyond the development of more and better content and some curricular change is the use of more visual aids and teaching models. Some charts have been prepared in soil science and plastic models of plant parts are widely used in botany and plant protection. Many overhead transparencies have been requested and I have requested that these be ordered. A high priority should be given to the purchase of more overhead projectors and equipping several rooms with the projectors. The projectors are relatively trouble free and rooms do not need to be darkened. For the foreseeable future, colored slide projection should be available in one or two rooms, including the auditorium. For teaching as well as general meetings, the auditorium should be equipped with a large screen made of plywood painted white, with wooden deflectors along the top and sides to deflect stray light and mounted on standards like a blackboard so it is always readily available. Such a large screen would be suitable for very large audiences.

Several faculty teaching improvement projects should be followed up. A Wards Biological Bio-Plastic kit was given to M. H. Khan to take the lead in mounting teaching specimens in plastic. Examples for preservation include type of leaf, seed grades, nutrient deficiency symptoms, rust symptoms on leaves, soil structure, insects, soil animals, etc. The kit produces teaching aids that resist attack by fungi and insects and are unbreakable.

Plastic balls of various sizes and colors were purchased from Ace Plastic Company, 9136 Van Wyck Expressway, Jamaica, New York. Mr. J. R.

Joshi took the lead to construct models of soil minerals. These materials should also be used by the chemistry teacher to construct models showing the atomic arrangement or bonding in simple ions and compounds.

Vinyl chloride acetate resin dissolved in acetone has been used in soil science to prepare and preserve three soil monoliths. Plans were being made to collect and prepare a monolith of the Fluvent at the Narayani River field trip site. The method and materials are adaptable for other uses besides soil preservation.

The project has a 35 mm single-lens camera with close-up lens and a light meter. A class of five staff in March 1982 were given instruction in camera use and a roll of 36 exposure black and white film was loaded in the camera. Each staff member took seven pictures. After the film was exposed, the class met and developed the film. Strip prints of the negatives were made in Naranyghat and the negatives were evaluated and critiqued. This is an important project to enable the staff to get materials for teaching and journal articles. There is interest for additional classes and these classes need to be held until the demand is exhausted. (I used my own tank and chemicals, developed and fixer, so a repeat of this project will require the purchase of these materials.) I photographed numerous things in color and black and white for staff members. They need to become independent photographically by the time the project ends. To complete their minimal needs a tripod and copy stand should be purchased.

A dark room exists on the MUCIA compound. See Bittenbender report pages 18 and 19 for details. There is no need to have printing facilities because good black and white prints can be made locally and in Kathmandu.

The walls, floors and ceilings of the rooms in the new classroom building have hard surfaces. There is much echoing and locally made and

inexpensive wall hangings should be considered as a means to improve acoustics. The blackboards have a poor surface and the chalk used is very soft so that it is difficult to use the blackboards for teaching.

Some tape players and English language programs could be installed in the new library to give interested students (and IAAS staff) an opportunity to improve their English language proficiency. This would be especially important for persons preparing for study programs outside Nepal.

Curriculum

In designing a curriculum in agriculture it is always a problem to know whether or not the basic science courses should be used as "building blocks" for the agricultural science courses. Courses in the PSD in agronomy, horticulture, plant protection and soil science are applied science courses that logically build on basic science courses. Statistics, for example, is needed for genetics and plant breeding. The necessary statistics could be taught in the genetics and plant breeding course, however, if a course in statistics is taught, it makes sense to teach it as a prerequisite for other courses. Botany is a natural prerequisite for horticulture and agronomy. Chemistry is needed for soil science and nearly all other PSD courses. Physics is important for agricultural engineering and mathematics is very useful in nearly all courses. In the United States, limited math knowledge is the most serious handicap for agriculture science students.

Many agricultural science curricula opt for a reasonable balance where some introductory agriculture is given early in the program. By the time students, however, take the second, third or fourth course in a given major, horticulture for example, students have picked up the remaining necessary basic science courses. The IAAS curriculum does a reasonable job with sequencing courses during the first two years considering the need to prepare JTA's and JT's. This is true where Agronomy 11B is a broad introductory course covering both crops and soils and, then, is followed by Agronomy 31B and Soil Science 31B. There is, however, great overlap between Agronomy 11B and Agronomy 31B. Course outlines for Horticulture 11B and Horticulture 31B are nearly identical in the IAAS Bulletin, 1981. Some overlap cannot be avoided and some is not harmful but the overlap in the

agronomy and horticulture courses is very great for the first year certificate and the first year diploma. Since the first year certificate courses are taught at the branch campuses at Paklihawa and Lamjung and there is little interaction with Rampur, the elimination of excessive duplication is a problem.

In Plant Science curricula there is a tendency for certain "popular or favored" topics to be taught in a wide variety of courses. Functions, uptake and deficiency symptoms of essential plant nutrients are taught in Agronomy 11B, Soil Science 31B and Plant Physiology and Biochemistry 31B. Many topics covered in Botany 21B and Plant Physiology and Biochemistry 31B include absorption processes of water and nutrients, translocation, germination, photosynthesis, and photoperiodism. Since Botany 21B is taught to prepare JT's to work in the field there is a natural tendency to include much applied plant biology that is more logically the domain of PPB 31B. Again, the coordination problem is difficult since Botany 21B is taught at both Paklihawa and Rampur. Material on the nature, use and application of fertilizers and manure is covered in Agronomy 11B and 31B and in Soil Science 31B. The annual system makes the sequencing of courses somewhat difficult because nearly all the subject matter of an area is taught in about one course.

Classroom hours per week for students are excessive as shown by the following table.

Year	Class hours per week			
	lecture	practical	total	%*
1st certificate	15	10	25	60
2nd certificate	23	12	35	83
1st diploma	19	16	35	83
2nd diploma	19	14	33	79
3rd diploma	11	12	23	55

*Based on six 7 hour days.

Over 80% of the 42 hour class week is scheduled for courses during the middle three years. At Michigan State University an average load is 15 credit hours. If all the credit is in lecture courses there would be 15 scheduled class hours per week or 37 1/2% of a 40 hour week. Each week would also have two days in seven for rest and additional study. To have 50% of the hours scheduled for classes would be unusual even when some lab courses are taken. If all the classes are taught, IAAS students spend so much time in class there is little time to read textbooks, use the library, write papers or even study class notes.

The entire system is "one-ball of wax" and to change one thing would necessitate changing nearly everything. For example, what would happen if all classes met (doubling instruction hours) and if more efficient methods increased knowledge transfer 100%. The result would be 400% more subject matter content. Thus, the content becomes too large for only two exams per year. It is a basic tenet of teaching-learning that more frequent exams produce more learning. Exams per se are a powerful learning device. The system as it is now is operable but if it were changed very much it would require many far-reaching changes. So, inefficient knowledge transfer, many missed classes, infrequent exams and limited use of books and library form a coherent system.

There are too many practicals scheduled in Agronomy 31B and Soil Science 31B. In Agronomy 31B a teacher with 100 students would have eight lecture hours and 16 practical hours per week. This is excessive and would require two full time teachers. Much of the practical time is now used as lecture. I suggest no more than one practical a week that lasts two hours and is a real "hands-on" practical. The large number of scheduled hours per week also makes it difficult for teachers to improve courses or engage

in research and extension. There is also limited lab space for practicals and to eliminate using labs for "lectures" would alleviate the pressure on scheduling "real" practicals. Present labs should be used more efficiently before additional lab rooms are constructed. Then, there would be space for agronomy labs (see JAR 1981, page 84).

The curriculum as presented in the IAAS Bulletin, 1981, is good as far as it goes. The major problem is duplication and a teaching-learning system that results in too little knowledge transfer. More basic science courses are needed to prepare IAAS students for graduate programs planned for about five years from now.

The duplication in agricultural science courses reduces depth of coverage and reduces time available for basic sciences (and humanities?). Adding one more year at this time, I feel is a poor solution. Some specific suggestions for immediate implementation are:

1. Plant Physiology and Biochemistry 31B contains very little that is biochemistry. Change the title to "Plant Physiology."
2. Develop two chemistry courses. The first to cover inorganic, qualitative and quantitative. The second to cover organic and biochemistry and schedule these before courses like Plant Physiology.
3. Add a section to Agricultural Engineering 31B on animal power.
4. Add sections to Soil Science 31B on nutrient cycling and ecology of soil animals.
5. Develop an agricultural engineering course that concentrates on the engineering aspects of erosion, irrigation and drainage.

Critique of Soil Science Courses

In the Tribhuvan University IAAS Bulletin, 2038(1981) two annual soils courses are listed. The first is Soil Science 31B, the basic course with three lectures and two-2 hour practicals per week for 100 full marks, and Soil and Water Management 41B, with two lectures and one 2 hour practical per week for 50 full marks.

Soil Science 31B

The practicals should be reduced to one per week and involve "hands on" activities. As indicated earlier this will alleviate scheduling problems and result in better use of laboratory facilities with little loss in teaching quality. The following is a suggested series of lectures and accompanying practicals for the course with the number of lectures for each major part of the course remaining the same. A section entitled "Soil Biology and Organic Matter" has been separated out as a unit.

Lectures	Practicals
Soil Pedology	
1. Vocabulary and History of Soil Science 2. Rocks and minerals of Earths Crust 3. " " of Nepal	Mineral identification
4. Mineral weathering and clay formation 5. Soils and weathering stages (Jackson) 6. Dominant soil clays and properties	Rocks and weathering
7. Soil formation process (Simonson's concept) 8. Soil formation factor time 9. " " " climate	Upland soil profile field study
10. " " " " , emphasis on Nepal 11. " " " biotic 12. " " " parent material	Paddy soil profile field study
13. " " " " ", emphasis on Nepal 14. " " " topography 15. " " " human activities	Muck soil profile field study

Lectures	Practicals
Soil Pedology (continued)	
16. Diagnostic soil horizons - epipedons 17. " " " - Subsurface horizons 18. Soil taxonomy	Alluvial soil profile field study
19. Soil taponomy 20. FAO soil classification 21. Land classification	Field soil mapping
22. Soil survey and mapping 23. " " " 24. " " "	Field soil mapping
25. Soils of Nepal 26. World soils and food supply	Field soil mapping
Soil Biology and Organic matter 27. Nutrient Cycling	
28. Consumers and Decomposers 29. Nitrogen fixation - Rhizobium 30. " " - Azolla	Soil organic matter content
31. Soil animals and earth moving activities 32. Organic matter accumulation in soils 33. Manure and composts	Nitrate determination
34. " " " 35. " " " 36. Biogas generation	Ammonium determination
37. Soil borne plant pathogens	Tour of local biogas plants
Soil Chemistry Fertility and Fertilizers 38. Historical development of soil fertility 39. Cation exchange in soils	
40. " " " 41. " " " 42. " " "	Cation flocculation efficiency of clays

Lectures	Practicals
Soil Chemistry, Fertility and Fertilizers (continued)	
43. Anion exchange in soils 44. Soil pH 45. " "	Cation exchange capacity
46. Calcareous, alkali and saline soils 47. Management of soil pH 48. Soil nitrogen	pH using water and KCl (delta pH)
49. " " 50. Soil phosphorus 51. " "	Properties calcareous, alkali and saline soils
52. Soil potassium 53. " " 54. Soil sulfur	Lime requirement of acid soils
55. Soil calcium and magnesium 56. Soil boron and zinc 57. Soil molybendum, iron, chlorine, manganese	Gypsum requirement of alkali soils
58. Oxidation and reduction 59. Effects of flooding on chemical properties 60. Nutrient uptake process	Water saturated soil incubation study
61. Soil test for fertilizer recommendations 62. " " " 63. " " "	Determination of available phosphorus
64. Nitrogen fertilizers and use 65. " " " 66. Phosphorus fertilizer and use	Determination of available potassium
67. " " " " 68. Potassium fertilizer and use 69. Sulfur and nicronutrient fertilizers	Determination of available boron
70. Using soils tests to make recommendations 71. " " " "	Determination of available zinc

Lectures	Practicals
Soil Physics	
72. Introduction and volume composition	
73. Texture 74. Structure 75. Consistence	Texture by field method
76. Porosity 77. Dynamics of air movement 78. " " "	Hydrometer particle size analysis
79. Bulk density and weight 80. Color of soils 81. Energy budget	Consistence
82. Soil temperature 83. Soil temperature regimes 84. Soil water energy concept	Bulk density
85. " " " " 86. " " " " 87. Soil water movement	Porosity
88. Soil water movement 89. " " " 90. Soil water-plant relations	Water content of soil
91. " " " " 92. " " " " 93. Soil moisture regimes	Water content of soil
94. Effect of flooding paddy on physical properties 95. " " " " " 96. Surface crusting	Water movement versus texture
97. " " 98. " " 99. Engineering uses of soil 100. " " "	Dispersion Ratio

Soil Science 41B

Soil and water management, SWM 41B, has a well organized set of lectures relating to erosion, irrigation and drainage. The major problem is repetition in part 2 "water conservation and management" with 31B. The weakness of the course is mainly in the practical. Some are duplicates of 31B such as lecture by field method and capillary water movement. Many practicals appear unsuited for "hands on" work and seem to be lectures.

There should be more emphasis on estimating water erosion losses on different kinds of soils and cropping conditions or patterns.

A basic question is raised by 41B as to why there is a special soil management course that selectively treats soil and water management. A better approach would be to remove all management (such as fertility) from the basic course and have the second course cover all soil management. This could result in a strong, practical program in the management course. Consideration should be given to an agricultural engineering course that covers erosion, irrigation and drainage that emphasizes engineering aspects.

RESEARCH

During the long strike period from March to August, 1981, I worked independently a lot because few staff were available for work. It was during this time that I set up the research lab and did some research.

Setting up the Research Laboratory

My first major project during the strike period was making the research lab equipment operational. The only item oeprating was the Wiley mill for grinding plant samples. One by one the following became operational:

1. Orion pH meter,
2. Ainsworth analytical balance,
3. Klett-Summerson colorimeter,
4. Spectrophotometer,
5. Kjeldahl digestion unit,
6. Kjeldahl distillation unit, and,
7. Stokes water still.

The Stokes water still was mounted in room 202 on the south wall where 30 ampere lines were located (15 ampere lines on north wall). The water intake line was modified to work with low water pressure and the still has been routinely used the past year to make distilled water for the institute.

An electrical outlet was installed in the hall area near room 202 and the research lab area to use when requiring a hood to dispose of toxic fumes. Some of the outside and protected area near the lab should be equipped with work tables and used for preparation of plant and soil samples (see Schulte report page 6).

In April 1982 a hood arrived and it was decided that the hood should be installed in the office-lab at the east end of room 202. This room has some lab benches, water, gas and electricity and the hood could be installed on the east wall without eliminating any window or bench space. This room should be used for all work requiring a hood and for all nitrogen determinations (plant, animal or soil). All departments should mutually share the equipment and space. Only after the demand exceeds facilities should any duplicating equipment be installed at any other location at IAAS. There is a tendency for the staff to want more equipment and facilities even though the present equipment and facilities are seldom or only partially used.

Soil Characterization

The first research effort was directed toward the characterization of the major soils of the IAAS farm and nearby region. Pits were dug, soil profiles described and bulk samples of soil horizons collected for analysis. A soil monolith sample was also collected and prepared using plastics for use in teaching and extension. Three soils were collected and monoliths made with the cooperation of P. P. Sharma and S. C. Sah. Mr. Sharma determined the particle size analysis of the horizons of a soil collected on a high terrace. Determination of base saturation is needed before this soil can be properly classified as an Ultisol or Alfisol. The soil profiles are displayed in the teaching lab and are routinely used for teaching practicals and lectures. Plans have been made by B. R. Khakural to collect a Fluvent near the Narayani River and other soils as the soil survey program progresses.

Mapping and Characterization of the Major Soils of IAAS Farm

Mr. B. R. Khakural arrived from Michigan State University in late summer, 1981, and developed a proposal to map and characterize the major soils of the IAAS farm in December, 1981. The proposal has Mr. J. R. Joshi and myself as collaborators and was approved by the research committee in January, 1981, and mapping was immediately begun, Aerial photographs have been ordered from the Topographic Survey in Kathmandu for making the soil maps. Samples of two soils previously collected can be used for characterization. Mr. Brian Carson, CIDA, is doing excellent work in geomorphology and soils, including, work in the Chitwan. He gave a seminar at Rampur and has met B. R. Khakural. The work at IAAS should be closely coordinated with CIDA and, fortunately, this Canadian group is using Soil Taxonomy for soil classification, the system used in the United States.

Soil Survey News, October 1981, contains information about The Soil Support Services of the Soil Management Support Services of USDA. These services for overseas projects are cooperative with AID and information to secure free services for analysis of soil samples in the United States should be sent to:

Dr. T. S. Gill, Project Monitor (SMMS)
Office of Agriculture Services
Bureau of Science and Technology Services
AID
Washington, D.C. 20523

One of the major limitations in the transfer of field research data from experimental fields to farmer's fields in Nepal is that little if any soils information exists on either experimental or farmer fields. Since the data from a field experiment can be validly applied only to fields with similar soils (and climate), it is easy to see the limited effectiveness of much of the field crop research that has been done in Nepal. I determined

the texture and pH of the dominant horizons of soils on some research plots of Dr. Kenneth Sayre of ICP in the Chitwan. This information has appeared in publications of ICP. The work on characterization and mapping is a very important project that must be supported by the next PSD advisor. For information on agro-technology transfer in the tropics, the Benchmark Soils Project at the University of Hawaii should be contacted.

Maize Research on Cut and Fill Soil Areas

In the spring of 1981, Dr. D. Finfrock began to level land on the National Maize Development Program farm in Rampur. Maize growth on the cut and fill areas showed large differences. Earlier work on IAAS farm indicated soil pH near neutral at the surface and increasing pH (alkalinity) with increasing soil depth. Work at Pantnagar University on somewhat similar Terai soils showed that the pH and base saturation were also high. Zinc has reduced availability in high pH soils and it was hypothesized that the poorer maize growth on the cut areas was due to high soil pH. On May 17 bulk soil samples were collected with the help of S. C. Sah and P. P. Sharma. On June 11, S. C. Sah set up a pot experiment with three replications using Khumal yellow variety and various doses of $ZnSO_4$. A basal dose of 80-80-0 kilos per hectare was applied to each pot. Four seeds were planted in each pot and watered and covered with a plastic sheet until seedlings emerged. The two best plants were allowed to grow and the pots moved to the horticulture garden area and watered as needed.

On July 9 the plant height was measured to the tip of the longest leaf of each plant. No differences were observed due to zinc treatment on the two soils. Plants were on the average taller on the fill soil likely due to greater available nitrogen. On July 13 the plants were harvested, oven dried and weighed. Four soils cores from each pot were collected and

allowed to air dry in the lab. Soil pH was determined on the soil using a 1:2 1/2 soil-water ratio after samples had been stirred every five minutes over a 30 minute period. See the following table for results.

Treatment, kilos $ZnSO_4$ per hectare	Fill soil			Cut soil		
	height, cm*	weight, grams**	soil pH	height, cm	weight, grams	soil pH
0	78	14.2	5.6	68	6.53	5.7
25	90	13.9	5.6	70	7.07	5.8
50	83	12.0	5.5	75	7.47	5.7
100	80	10.8	5.5	68	6.07	5.6
average	83	12.7	5.6	70	6.78	5.7

*Average plant height.
**Total weight per pot, 2 plants.

The average weight of maize produced per pot (fill and cut) was 10.4, 10.5, 9.74 and 8.44 grams indicating that $ZnSO_4$ was ineffective in increasing growth. Plant height and weight on the fill soil was greater than for the cut soil and this is likely due to greater availability of nitrogen resulting from greater organic matter content of fill soil.

The results were unexpected since there was no positive response due to zinc application and the pH of the soil of both cut and fill areas was unexpectedly low, 5.7 and 5.6, respectively. Similar sandy loam soils on the IAAS farm had pH near 7.0 in the surface layer. The highly acidic nature of the soil on the NMDP farm resulted in the collection of 21 additional random soil samples from fill areas, 19 from cut areas, 3 from nearby workers' gardens and 3 from adjoining pasture areas by Dr. K. Sayre. The average pH was 5.5, 5.7, 4.8 and 6.0, respectively. This survey confirmed the generally low pH or highly acidic condition of the soils on this part of the NMDP farm. Since low pH favors zinc availability, the pot

experiment results are reasonable. Extensive use of nitrogen fertilizer on these soils at the NMDP farm over the years has likely caused a significant increase in soil acidity.

The significance of this work is related to the fact that nitrogen if the major limiting nutrient for maize production and the nitrogen fertilizers being used leave an acidic residue in the soil. Therefore, high doses of nitrogen fertilizer on the sandy, low cation exchange capacity soils of the Chitwan can seriously increase soil acidity and cause accompanying problems of manganese toxicity and magnesium deficiency. Work I did in East Lansing on similar sandy soils showed that these changes can be produced in five years or less at rates of about 300 kilos per hectare of nitrogen per year. This is a problem that must be monitored as efforts to increase food production in the Chitwan are intensified.

Rice Nutrition Experiment

West of Rampur a couple of kilometers and north toward the Narayani River on a low land surface there are soils that are very wet and only produce one crop of rice a year. The soils are high in organic matter, snail shells are abundant and soils are calcareous with pH about 8.4. Farmers in the area said, "when rice roots reach the subsoil, growth severely declines." On July 28, 1981, bulk soil samples were collected of the thin black surface soil and the underlying white, highly calcareous subsoil. On August 13, S. C. Sah prepared the soil and placed soil in plastic bags used as liners for clay pots. Doses of nine nutrients and NPK were applied to survey what nutrient or nutrients were most deficient for rice production on the soil. Four seedlings were transplanted in each pot and the pots were moved to the roof area of the lab complex and flooded. On November 4, the number of tillers per plant were counted and plants were harvested and

placed in an oven. The results are given in the following table and are single observations.

Treatment	Dry matter, grams/pot		Tillers per plant	
	topsoil	subsoil	topsoil	subsoil
Check	13.3	1.5	3.7	0
N	24.3	1.4	5.5	1/4
P	9.9	2.5	3.7	0
K	9.1	0.9	2.7	0
NPK	27.1	34.7	5.2	8.2
B	11.5	1.2	3.2	0
Cu	9.8	0.9	2.5	0
Fe	9.2	1.4	3.0	0
Mn	8.5	1.2	2.7	0
Mo	10.2	1.3	2.5	0
Zn	12.9	1.8	2.7	0
Average	13.3	4.4	3.4	0.8

Rice growth on subsoil was markedly less than on topsoil. Nitrogen alone or with phosphorus and potassium appeared to be the only effective treatments on the topsoil and NPK on the subsoil. The only tillering on the subsoil was where nitrogen was applied. It is well known that rice responds to nitrogen. Additional experiments with combinations of nutrients should be carried out to isolate what if any nutrients other than nitrogen are limiting rice production on this soil.

A rice field trial was established by S. C. Sah in cooperation with extension collaborators near the site where samples of the pot experiment were obtained. It include control, complex (NP), phosphorus and zinc. These plots were never harvested for yield. There was poor water control on the plots and no useful observations were made.

Research Committee Activities

The former PSD advisor, Dr. H. C. Bittenbender, deserves a lot of credit for furthering research activities at IAAS. Now, the recent influx of funds from MUCIA to the IAAS research program has brought forth a great influx of proposals and increased interest in research. About 80% of the research proposals are from PSD. A brief description of some of the most important and promising is in order.

Soybeans-K. P. Sharma

Soybeans have been a crop of long standing in the hills on poor soils and on bunds. On the terai soybeans have potential to become a major crop comparable to changes that have occurred in India since 1965. Work at Pantnagar on soil conditions, somewhat similar to Rampur strongly suggests work at IAAS will likewise be successful. HMG had conducted field trials on the terai and concluded soybeans were not suitable. Work by K. P. Sharma has shown that they are well adapted to the Chitwan and presented a paper on soybeans at the Summer Crops Workshop in Parwanipur in January, 1982. Now, the HMG has supported the production of 200 hectares of soybeans for 1982 to be processed into oil and cake at Hetauda. The IAAS research committee approved the proposal "Soybean Research and Extension in the Chitwan." The proposal includes research on seed storage, genotypes, planting dates, mono and intercropping, seed multiplication and extension work. The collaborators include one plant pathologist, two agronomists, one soil scientist and the extension director. The work is in cooperation with the Grain Legume Improvement Program of Nepal and INTSOY and AVRDC. Mr. Sharma has also discussed with me a proposal to make the dairy herd of IAAS sufficient in feed by incorporating soybeans in the cropping program of the livestock farm. Dr. W. Combs should follow up on this possibility with Mr. Sharma.

Year-round Vegetables-R. Adhikari

The proposal "All Year Round Production of Vegetables" was developed by R. Adhikari. The project has potential to increase the amount of food and improve diets. Dr. Khan of IRRI presented a seminar at Rampur in January 1982 describing a year round system of rice and fish production. Each month a plot was harvested and a plot was planted. Consideration should be given to short term training for someone to bring expertise to IAAS. If irrigation water becomes available in the dry season, this proposal would receive a great lift. On the other hand, water tables are near the soil surface at many locations in the Chitwan the year round and this water could be tapped for vegetable production. The new highways to various centers opens possibilities for commercial vegetable production in the Chitwan.

Root-Knot Nematode Research-L. N. Bhardwaj, K. P. Sharma and M. H. Khan

These researchers have been active in identifying and classifying root-knot nematodes at Rampur. Mr. Sharma and Dr. Bhardwaj were invited to present a paper on their work at an international conference in Indonesia in 1981. Mr. Khan has received approval to do a nematode survey of the Chitwan. The survey will provide information needed for formulating additional research proposals as little is known about nematodes in Nepal. Nematodes are pervasive as a yield reducer of almost every economic plant throughout the world.

Fruit Vegetable Research-G. K. Shrestha

Numerous studies on fruit and vegetables has been conducted by G. K. Shrestha. Chemicals were applied to study the ripening of pineapple and fruit splitting of litchi. Cassava has been introduced and response to

fertilizer has been studied. Studies on potato have included size of seed piece, plant spacing and fertilization.

Mango Grafting-D. D. Dhakal

Mr. Dhakal is studying the best month of the year to make grafts for reproduction of mango trees.

Tomato Wilt-K. P. Sharma and L. N. Bhardwaj

Only the local Rampur saano appears to be able to withstand wilt or blight under Chitwan conditions according to studies of Sharma and Bhardwaj. These researchers have studied the microclimatic conditions favoring blight incidence. I recently reviewed an excellent paper written for publication in an international journal. Breeding for greater blight resistance in tomato is a part of the project.

There are other projects proposed and ongoing and some of these have already been mentioned or discussed. Much of the research to date, however, has been mainly measuring yield or counting number of tillers, etc. Emphasis in the future should be directed toward obtaining knowledge that answers "why questions." This research will, of necessity, involve greater use of the instruments in the research lab and greater personal involvement of many of the researchers in their projects.

Field research activities in horticulture have been handicapped by lack of suitable research area. Fruit crops grow the year round and are very sensitive to high water tables during monsoon. During the monsoon in 1981 two experiments, one on papaya and one on cassava, were destroyed by excessive water and accompanying oxygen deficiency. Completion of the field-nursery work shed should be quickly done for both use in teaching and research. Dr. Bittenbender's report should be consulted for many useful recommendations about horticulture research that have not been implemented.

During the early part of 1981 the MUCIA advisors were removed as members of the research committee. The advisors are very much involved in the development, drafting and securing acceptance of research proposals and the research activities and involved in the critiquing of research papers. I suggest the MUCIA advisors be reappointed to the research committee.

Suggestions for Future Research

The excellent short term report of Dr. Schulte should be given considerable attention in regard to setting up a soil and plant tissue testing program. Research in fertilizer use requires some knowledge of soil test results. Perhaps, after Tec Bahadur K. C. returns from Wisconsin with a PhD in soil fertility, Schulte should be invited to return for another short term assignment to help get instrumentation and methods worked out. This program should be coordinated with Khumaltar.

Enormous time and effort is needed for tillage. Weeds grow very fast in the monsoon season. I observed the operation of an animal drawn wheeled tool carrier at Hyderbad in February, 1982, and feel it has good potential for terai conditions. The set of wheels, plows, discs, drill, etc. cost about 10,000 rupees (IC). Two or three sets of wheels and one or two sets of tools would make a good starter set for teaching and research. The equipment works independent of fossil fuel and will produce better plant stands, fertilization and seeding. For weed control in corn the wheeled tool carrier with cultivator can cover 150 cm width compared to about 6.7 cm for traditional plow. The distance travelled is reduced to only 10% of that of using the plow. Cooperative use of the equipment would allow an opportunity to reduce each farmer's cost for equipment. Information Bulletin No. 8 from ICRISAT describes the animal drawn wheeled tool carrier and gives the addresses of seven suppliers.

Establishment of azolla in paddies was the subject of Khan's (IRRI) lecture in January, 1982. Staff interest was stimulated and azolla was found on the north farm and some azolla was brought to Rampur from Khumaltar. Azolla was demonstrated at the recent farmer's field day. A research project with azolla is needed.

Biogas generation is occurring in the Rampur area but not at IAAS. IAAS needs to install some generators and get the expertise needed to do research, teaching and extension on biogas. There is great potential at IAAS using sewage and manure.

Research to produce paddy and pulses on the bunds in the same field has promising possibilities to reduce risk of crop failure and improve diets. K. P. Sharma has expressed an interest in the research area.

A research project on weed control and minimum tillage would be a good project in conjunction with work with the animal powered wheeled tool carrier. Research in tillage is seriously hampered by lack of suitable personnel in agricultural engineering.

Bittenbender's report should be consulted for suggestions on composting research and the purchase and use of screen house to protect research plants from insect injury.

Production constraints (economic, social and physical) in Nepal have made it more difficult to increase yields in Nepal that has typically been the case in the United States and researchers have had difficulty developing new practices for increasing crop production. Often the low yielding local varieties yield more than exotic types. Weather uncertainty results in great risk for investment capital. Fossil fuel is expensive resulting in expensive fertilizers. I observed generally good wheat on farmers fields near Rampur in spring 1982 and see little potential for research and

extension activities at IAAS having much impact on wheat yields in the near future. The following maize crop, however, was greatly injured by drought. It seems the major emphasis should be on variety improvement and manipulation of the production factors currently available into new combinations rather large inputs of fertilizers, herbicides etc. from the outside. For example manure is one of the most valuable production factors and research should be directed toward increasing the amount of nutrients in manure that are eventually used by plants. Would it pay to have a concrete floor and compost pit to conserve animal urine? Should manure in compost pits be compacted to reduce aerobic decomposition and gaseous nitrogen loss? To what extent do nutrient losses occur when compost (or manure) is placed in small piles on fields and spread a long time before incorporation into the soil? Another example is the rearrangement of the soil to achieve greater production of pulse and paddy than is the case when no pulse is grown or pulse grown only on bunds. Maybe one-third of the land could be bunded for pulse and the rest put in paddy. There would be less paddy, however, the remaining paddy would get additional runoff from the bunds during monsoon storms and pulses contribute to soil nitrogen. Improvements in tillage for land preparation and weed control should emphasize use of animal drawn wheeled tool carriers rather than tractors and western plows, drills, etc. Integrated pest management should be stressed with minimal reliance on chemicals. Making Nepali agriculture more internally independent would help protect Nepali farmers from "western" inflation and local currency devaluations.

Research Photo Section

K. P. Sharma and S. P. Katel selecting soybean variety trail site with ICP personnel at Sharda Nagar.

Inspecting wheat variety trail for maturity and rust infestation (S. P. Katel, S. B. Gurung and Sunderman Shrestha).

B. R. Khakural working on the soil survey of IAAS farm.

Inspecting results of research on rice blast disease (Dr. L. Bhardway, M. H. Khan, and Mr. Neupane).

EXTENSION

Extension Activities

The extension program to farmers has made a beginning. A large general field day has been regularly held about March 1 and a smaller field day is held during the monsoon. During the 1981 monsoon fourteen men attended sessions on pest and diseases of paddy and four women concentrated on food preservation. Last March 1 a field day was planned for 225 persons and attendance was 300 or more. There were about 15 stops with 10 minutes of discussion at each. This was followed with snacks and then a question and answer session in the auditorium. An analysis of the questions showed that most were about animal care and management followed closely by plant protection. Fewer questions were about horticulture, agronomy and soil science.

A soil testing program for farmers should be a high priority. This will need to be supported by extensive research and has been discussed in the research section. Fertilizer recommendations must be specific for different soils based on soil test results and this soil test correlation work must be done at Rampur for Rampur soils.

Early in my tour I suggested that someone who had been successful working with traditional farmers in extension come to IAAS for a short term assignment. It may still be a good idea. Recently the ICP has brought Dr. I. Bolo from the Philippines to work on extension in Nepal. He was involved in the development of the Masagana 99 program that made the Philippines self-sufficient in rice. I have discussed with Dr. Bolo the need to come to Rampur to give a seminar and to contact people like S. P. Katel for some cooperative effort.

G. K. Shrestha tried to introduce cassava into the Silwalik Hills east and north of Bharatpur. Grazing animals, however, greatly reduced the success of this effort. The soils are sandy and developed from sandstone with low fertility on steep slopes. Such sites can produce good cassava but are not adapted to most traditional food crops. Efforts to promote cassava in the hills should be encouraged because the crop is easy to grow, provides erosion control on steep land and the tubers remain fresh in the soil until harvested resulting in no storage problem.

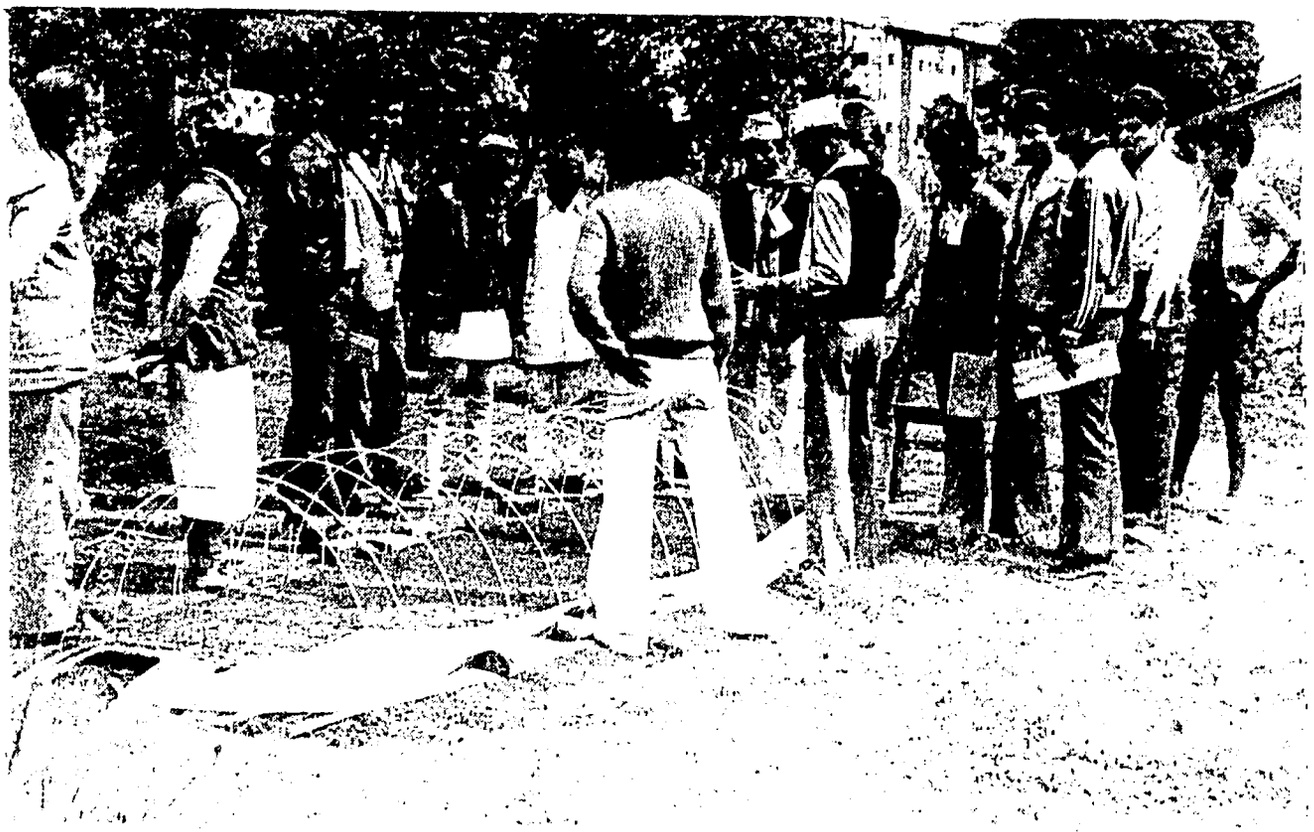
Currently, an extension office is maintained in the Rampur Bazaar for farmers to visit. The extension office person takes the questions to the appropriate staff members to handle. It would seem that more effort should be expended by IAAS staff to promote extension activities in the country side. Greater involvement with extension problems would probably result in a more realistic research proposal for increasing food production in Nepal.

Extension Photo Section

Farmers arriving and registering for field day March 1, 1982.

S. C. Sah discusses phosphorus fertilization of wheat.

G. K. Shrestha giving farmers a "start" for growing cassava.



R. C. Koirala explains use of "hotbed" to produce early vegetable seedlings.

INTEGRATION OF IAAS WITH THE OUTSIDE WORLD

This advisor, as well as others, have not been encouraged to travel with IAAS staff and, as a result, the staff have tended to remain isolated professionally. It is rather curious that in the United States the soil survey programs are operated by the agricultural experiment stations located in the land grant universities of nearly every state. IAAS is the logical location for such activity and, at present, IAAS doesn't have a representative on the National Soil Survey Committee. I had hoped to correct this situation. Thus, unless advisors spend a considerable amount of time and effort travelling with the staff they will remain in Rampur professionally isolated and Nepal's agriculture will suffer. Dr. H. C. Bittenbender recommended in his end of tour report on pages 1 and 2 that these contacts be made and listed according to crops the national programs, coordinators, foreign advisors and addresses. During my tour I took staff on numerous trips to Kathmandu to visit Khumaltar, ICP program, Topographic Survey, Remote Sensing Center and the Canadian International Development Agency-Soil survey group. In addition, I participated with staff in the following:

1. Summer Crops Workshop in 1981 at Rampur.
2. Tour to eastern terai in May, 1981, to collect horticultural plants and visit experiment stations and agricultural related industries at Parwanipur, Sarlahi, Janakpur, Biratnagar, Ithari and Dharan.
3. To Gorkhapur, India in August, 1981, to collect horticultural plants and seeds.
4. Winter Crops Workshop in Bhairawa in August-September, 1981.
5. Summer Crops Workshop in Parwanipur in January, 1982.

6. International Soil Science Congress in New Delhi, India in February, 1982, with two soils staff and the librarian.
7. Sugarcane and rice experiment stations near Parwanipur in March, 1982.
8. Lumjang campus in April, 1982.
9. Numerous trips to the ICP cropping systems site at Ratna Nagar.

The regional travel funds available through AID should be utilized for travel outside of Nepal and India.

SEMINAR PROGRAM

During the early months of my tour seminars were frequently held but were disrupted by the long strike. Then, they were never established on a regular basis. At a social hour, with Dr. K. Sayre as guest, the PSD staff arranged for Dr. Sayre to present a seminar on the work at the NMDP farm. At a PSD meeting in January, 1982, I raised the seminar question again and the academic dean showed an interest to restart seminars. I gave him a list of about five people from the NMDP who had given seminars at Parwanipur Summer Crops workshop and I volunteered a seminar. Many or most of the IAAS need more experience giving seminars and it should be expected that a seminar will be given at the conclusion of every research project. Future MUCIA advisors should be encouraged to bring the necessary materials so they can give several seminars during their tours.

LEADERSHIP AND MANAGEMENT

The function of IAAS is "to train agricultural professionals to serve the rural masses of Nepal" (IAAS Bulletin, 1981). To accomplish this goal will require both teaching and learning. To have both teaching and learning will require an institution in which policy formulation and operation are under the control of the administration and staff and the administration provides leadership for the staff and management for the institute. During the first three weeks of the term that started November 1, 1981, students called off classes 32 percent of the time. In some cases the classes didn't meet because of a volleyball or badminton game. At present the students are determining when they go to class and, it seems, if they will take exams and when they go on vacation. Added to these missed classes are the classes the staff fail to teach. I spent many days keeping a log of missed classes by the staff (see JAR report, December, 1981). It is not uncommon for half of the scheduled classes to be untaught when students are willing to attend class. As indicated earlier, when these facts are added to the ineffective teaching methods--little learning occurs and IAAS graduates are so poorly trained that HMG does not want to hire them. However, there is a nucleus of students who want to attend classes and learn. There is also a nucleus of staff who are conscientious. In Nepal, generally however, students are in control and professionals take a lackadaisical attitude toward work.

During my tenure at IAAS there was an absentee deanship and a staff that felt it made no difference if they worked or not. The staff felt helpless in being able to affect their salary, promotion or participant training opportunities. At the Joint Annual Review in December, 1981, there was much discussion of the "reward system" by IAAS staff, and MUCIA

and AID personnel. An award program was suggested to reward good performance. There were high expectations after the JAR due to the frank discussions and expectation of change. These hopes were dimmed three months later by the appointment of an acting dean and, in effect, the absentee deanship continued with little management and leadership input for the IAAS campus.

In April, 1982, the staff went on strike because some quarters had been without electricity and water for a long time and some quarters had leaking water pipes that injured books and personal belongings. The academic dean related to the staff that he had no authority or power to act in the absence of the acting dean and felt he should resign. The staff had a meeting and demanded that the acting dean return from Katmandu the next day and hold a meeting, the first meeting in fifty days. So, as my tour was ending, staff morale reached a very low point and hopes for the future darkened.

Shortly before I left Rampur, Mr. Charles Antholt, AID Bangladesh, visited Rampur to see the changes that had taken place in the past 25 years. He said that he helped "chase the tigers out" and was interested in seeing Rampur again. I used this as an opportunity to discuss institution building with him. He related that in India where there was good local interest and leadership, good institutions were developed as in the case of Pantnagar University. I worked closely with many able and talented young men and some good things were accomplished. I know some of them would like to make careers at IAAS. However, they become discouraged when they have virtually no role to play in the operation of the institute and feel that there is no reward for good work. These conditions encourage them to view IAAS as a stepping stone for opportunities elsewhere and to not commit

themselves to building IAAS. Unless IAAS gets a resident dean who will provide leadership and a climate in which good work is recognized, I believe, the results of efforts to develop IAAS will remain largely physical, that is, result in more roads, more buildings and a bigger water tower.

AND LASTLY

Thanks are expressed to HMG, AID, and MUCIA for the opportunity to serve the staff at IAAS. I gave much and received much in return. May that which I gave find "fertile soil and flourish." To my friends at IAAS-NAMASTE.

APPENDIX 1

ORGANIZING FOR EFFECTIVE TEACHING AND LEARNING

Hypothesis: It is as important to maximize learning from given resources as to maximize agricultural production from the resources available in Nepal.

1. Develop the most relevant content in terms of student needs.

   Content changes and improves as the teacher's knowledge and experiences expand.

2. Organize content into learning objectives.

   Given the 40 second and 2 hour hydrometer readings, calculate the sand, silt and clay content. (Assume sample of 50 grams.)

3. Develop the most effective teaching methods for the objectives.

   Based on learning principles:
   ability to retain: 10% of what is read
   20% of what is heard
   30% of what is seen
   50% of what is seen and heard
   80% of what is said while doing a thing
   "Hearing is forgetting, seeing is remembering and doing is understanding."

4. Create an environment that enhances learning.

   Learning is enhanced when:
   - material is relevant
   - students are motivated and interested
   - students are active
   - students feel teacher cares about their learning
   - fairness prevails

5. Determine the teaching effectiveness by measuring student learning.

   Effectiveness depends on:
   - questions based on objectives
   - grading on straight scale
   - frequency, more frequent tests result in greater learning

6. Tying learning and testing together-Mastery Learning

   Sequence:
   learning-testing-remediation-retest-etc---grading
   95% of the students can learn to a high level (A grade) if objectives are given, opportunities to learn exist and students are motivated.

7. Evaluate the teaching and the course

8. Revise the course--repeat 1 thru 7 above until age 65.

APPENDIX 2

SSC 31B Soil Science
2038-39 (1981-82)

	Lectures	Practicals
1	1. Vocabulary and Historical background of Soil Science 2. Soil as a three phase system (4 major components) 3. Mechanical Composition of Soil (Particle size)	1. Particle size determinating by feel method 2. Particle size determinating by hydrometer
2	4. Soil structure and its classification 5. Bulk density, porosity, color, soil consistency etc. 6. _____ continued _____	3. Hydrometer method (continued) 4. Soil structure, consistency and color determination
3	7. The earth's Crust and soil forming rocks and minerals 8. _____ continued _____ 9. Weathering of rocks and minerals	5. Determination of bulk density 6. Determination particle density
4	10. Horizon designation, nomenclature 11. Soil forming processes 12. _____ continued _____	7. Packing to different bulk densities 8. Identification of minerals
5	13. Factors of soil formation 14. _____ continued _____ 15. _____ continued _____	9. Identification of rocks 10. Soil Profile (upland)
6	16. Soil chemistry and Fertility-historical development 17. Colloids and their properties 18. _____ continued _____	11. Soil profile (upland continued) 12. Soil profile (lowland)
7	19. Cation and anion exchange 20. _____ continued _____ 21. Soil reaction	13. Soil profile (lowland continued) 14. Collecting and preparing soil samples
8	22. Acid, Saline and alkaline soils 23. _____ continued _____ 24. Criteria of essential elements	15. Use of soil kits in soil testing 16. Determination of O.M. in soils
9	25. Nutrient equillibria and movement 26. Factors affecting plant nutrient availability 27. Macro and secondary nutrients	17. Determination of $CaCo_3$ 18. Determination of CEC

APPENDIX 2 (continued)

	Lectures	Practicals
10	28. Macro and micro-nutrients (contd.) 29. _____ continued _____ 30. _____ continued _____	19. Determination of soil pH and lime requirement 20. Determination of gypsum requirement for alkali soils
11	31. _____ continued _____ 32. _____ continued _____ 33. _____ continued _____	21. Electric conductivity determination 22. Estimation of available N (Soil, FYM, Fertilizers)
12	34. Micro-nutrients 35. _____ continued _____ 36. _____ continued _____	23. _____ continued _____ 24. Estimation of available P (Soil, FYM, Fertilizers)
13	37. Fertilizers-composition and behaviour in soils and use 38. _____ continued _____ 39. _____ continued _____	25. _____ continued _____ 26. Estimation of available K (Soil, FYM, Fertilizers)
14	40. Soil Fertility Evaluation - Deficiency symptoms 41. Plant analysis 42. Biological test	27. Estimation of NH4-N 28. Estimation of NO3-N
1 15	43. Soil testing 44. Soil microbiology 45. _____ continued _____	29. Determination of Ca in irrigation water 30. Determination of Ng in irrigation water
16	46. Soil organic matter and management 47. _____ continued _____ 48. Organic manures	31. Electric conductivity determination in irrigation water 32. Determination of carbonates and bicarbonates in irrigation water
17	49. Organic manures 50. Biogas plant 51. Soil Water-characteristics and behaviour	33. Determination of Chlorides in irrigation water 34. Sodium absorption ratio in irrigation water
18	52. Soil water energy concepts 53. _____ continued _____ 54. Saturated water movement	35. Soil survey 36. _____ continued _____

APPENDIX 2 (continued)

	Lectures	Practicals
19	55. Unsaturated water movement 56. Determination of soil moisture 57. Measurement of hydraulic conductivity	37. _____ continued _____ 38. Description of a typical soil profile from mapping units
20	58. Diffusion 59. Infiltration 60. Energy balance in soil surface	39. _____ continued _____ 40. Soil moisture determination by direct method
21	61. Surface crusting 62. Dynamics of soil air 63. Soil temperature	41. Soil moisture determination by indirect method 42. Maximum water retention capacity determination
22	64. Soil profile - a detailed study 65. Soil classification system 1949 66. Land use capability	43. Hydraulic conductivity determination 44. Consistency limit determination
23	67. Soil Taxonomy 68. _____ continued _____ 69. Description of major soil groups of world with emphasis on Nepal's soil	45. Dispersion ratio determination 46. Porosity and infiltration rate determination
24	70. _____ continued _____ 71. Soil survey and mapping procedures 72. _____ continued _____	47. Determination drainage and field water characteristics 48. Study of advancement of watering front in layered soil column
25	73. Repeat _____ 74. _____ Repeat _____ 75. _____ Repeat _____	49. _____ continued _____ 50. _____ continued _____

APPENDIX 3

Agriculturally oriented basic science books:

Agricultural Chemistry

Organic and Biochemistry Manual, John Fulkrod, University of Minnesota Technical College, Waseca, Minnesota. Price $1.45. Zip 56093.

Methods of Chemical Analysis Lab Manual, Prabhu Rawater, University of Minnesota Technical College, Waseca, Minnesota. Price $2.30.

Technical Chemistry Lab Manual, John Fulkrod, University of Minnesota Technical College, Waseca, Minnesota. Price $1.50.

Agricultural Botany

Botany-Plant Biology and its Relation to Human Affairs, Jean H. Langeheim and Kenneth Thimann, John Wiley and Sons, Inc., 605 Third Avenue, New York, NY 10158

Agricultural Mathematics

Handbook on Applied Problems in Mathematics for Agriculture, Cliff Hokanson, University of Minnesota Technical College, Waseca, Minnesota. Price $8.40. Zip 56093.

Agricultural Mathematics, Roger Higgs, et al, second edition, Interstate Printers and Publishers, Dansville, Illinois, 61832. Price $7.50.