SUBJECT REVIEW REPORT

Department of Soil Science

FACULTY OF AGRICULTURE
UNIVERSITY OF PERADENIYA

CONTENTS

1. SUBJECT REVIEW PROCESS

Subject review process involves evaluating the quality of education within a specific subject or discipline, focusing on the student learning experience and on student achievement. The subject review process designed by the UGC evaluates the quality of both undergraduate and taught postgraduate programs. It is however understood that the final responsibility for quality and standards lies within the institution itself, since it alone has the powers to control and to change existing practices.

Subject review process at the Department of Soil Science was conducted adhering to the guidelines provided in the quality assurance handbook for Sri Lankan universities, published by the CVCD and University Grants Commission in July 2002. The quality of education was reviewed according to the aims and learning outcomes given in the self-evaluation report.

The following eight aspects of education were reviewed at the Departmental level:

- Curriculum design, content and review;
- Teaching learning and assessment methods;
- Quality of students including student progress and achievements;
- Extent and use of student feedback, qualitative and quantitative;
- Postgraduate studies;
- Peer observations;
- Skills development;
- Academic guidance and counseling.

The review team visited the department from 14th to 16th March 2005. The agenda of the three-day visit is given in Annex 1. The information related to the above eight aspects were collected by having discussions with the Dean, Head of the Department, members of the academic and non-academic staff, a group of undergraduate and postgraduate students (see Annex 2), by peer observation of the teaching process (see Annex 3), by observing the facilities at the Department (see Annex 4) and by examining the documents provided by the Department (see Annex 5).

Each of the eight aspects was judged as good/satisfactory/unsatisfactory, noting the strengths, good practices and weaknesses in each. Considering the judgment of the eight aspects, an overall judgment was given as confidence/limited confidence/no confidence.

2. BRIEF HISTORY OF THE UNIVERSITY, FACULTY AND THE DEPARTMENT

The University of Peradeniya is the heir to a sixty-year-old University tradition which commenced with the inception of the University of Ceylon in Colombo in 1942, under the Ceylon University Ordinance No.20 and shifted to Peradeniya in 1952. Following many changes in the University system in Sri Lanka, the University's autonomy was restored under a new identity, University of Peradeniya, following the University Act No.16 of 1978. At present the University has seven faculties and 64 departments covering a wide range of study areas.

A Department of Agriculture was set up in 1948 in the newly established Faculty of Agriculture and Veterinary Science. In 1973 an independent Faculty of Agriculture was established at Peradeniya with six departments of study among which was the Department of Agricultural Chemistry. The mission of faculty is to strive for excellence in education, research and outreach in the agriculture sector for sustainable development. Later the Faculty was further developed and the number of departments has been increased to eight. Present annual student intake to the Faculty of Agriculture is around two hundred.

Teaching of soil sciences as an integral part of the agricultural education started with the establishment of Agriculture Division of the Faculty of Agriculture and Veterinary Science. From 1973 onwards soil science was taught by the Department Agricultural Chemistry and subsequently by the Department of Soil Science.

The Department Soil Science conducts two course modules for the core program in the first two years and eight modules for the advanced program in the third and forth years. In addition the Department conducts three M.Sc. programs, M.Phil. and Ph.D. programs through the Postgraduate Institute of Agriculture (PGIA).

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At present there are eleven academic carder positions, three positions for Technical Officers, two positions each for Laboratory Attendants and Laborers. and one position for clerk. The Dept. has a general teaching laboratory, which can accommodate about 40 students per session. In addition there are four special laboratories viz. soil physics, analytical, soil chemistry and soil microbiology. Each could accommodate only around 10 students. There are 6 Demonstrators to assist in conducting practical classes. Each practical class has to be repeated 5-6 times due to lack of laboratory space. There is only one technical officer, the other being on leave for higher studies. Third vacancy remains unfilled since 2000. The Dept. does not have a satisfactory green house and the only vehicle, which the Dept. possesses, is in a very dilapidated condition.

3. AIMS AND LEARNING OUTCOMES

3.1. Aims

Understanding of the chemical, physical, and biological nature and processes in soil and the fundamental aspects of plant nutrition and their implications are essential to optimize the use and conserve land for agriculture and agro-forestry. The mission of the Dept. of Soil Science is to train students for careers in soil related disciplines, to develop and improve technology necessary for an environmentally sound sustainable crop production and to ensure timely and effective technology transfer to farmers and other stake holders.

In this context, the Dept. aims to provide:

- A wide range of learning opportunities for undergraduate and postgraduate students, to develop knowledge on fundamentals of soil science and their interrelationships with crop production and environmental quality, within the teaching structure of the Faculty and the Postgraduate Institute of Agriculture;
- Well structured laboratory practical programs combined with field visits and discussions to develop necessary transferable skills and to arouse interest on the subject;

- A variety of challenging learning opportunities to expose undergraduate and postgraduate students to recent advances in knowledge and technology in soil science and plant nutrition and to train them to apply this knowledge in improving economically viable and environmentally sound soil, crop and water management technologies;
- Research – based information and opportunities for students to conduct research in a conducive environment to acquire new knowledge and to develop transferable and personal skills relevant for the sustainable management of soil and water resources;
- Necessary training and encouragement for students to develop knowledge base cognitive abilities, intellectual and analytical skills, transferable and personal skills in preparing them to meet the needs of the possible employers;
- A responsive and supportive departmental environment, which is conducive for learning;
- A range of activities organized through various professional societies to enable students to develop their knowledge, skills and interest in Soil Science discipline as well as communication at large;
- Support for teaching staff in their career development through formal and informal feedback;
- An improvement of general communication / presentation skills through discussions, seminars, oral examinations, exhibitions etc.

3.2. Learning Outcomes

On successful completion of the degree program students should have:

- gained knowledge and conceptual understanding of basic soil science initially, which is followed by progressively increasing depth of study;
- developed the ability to interpret the influence of chemical, physical and biological phenomena that occur in soils, both qualitative and quantitative, on sustainable crop production and environmental protection;
- developed the ability to apply fundamental principles of soil science, plant nutrition, agronomy, environment, and natural resource management to design land use systems that sustain soil productivity and environment;
- developed the ability to apply their knowledge to design and conduct basic and applied research that will be useful in solving problems faced by the farmer for the advancement of soil science, plant nutrition and environmental quality;
- developed a range of personal and transferable skills (laboratory analytical, data handling and reporting, computer applications, oral and written communication in English; critical thinking and ability to work independently) to handle different situations with experience.

On successful completion of the core program the students should have:

Subject knowledge and understanding: A comprehensive knowledge and understanding on: soil mineralogy, soil formation, physical, chemical and biological properties of soils and their influence on plant growth, problem soils and their management, fundamentals of soil classification, soil profile description, soils of Sri Lanka, fundamentals of soil fertility, plant nutrients, cycles and availability of nutrients, sources and effective use of fertilizers, use of manure and soil amendments, basis of fertilizer recommendations, environmental problems associated with overuse of fertilizers.

Intellectual and analytical abilities: the ability to relate fundamental principles of soil science to plant growth in order to increase crop production.
Personal and transferable skills: developed laboratory and filed analytical skills with the ability to interpret and report data on soil, plant, and water and fertilizer analysis.

On successful completion of the advanced program the students should have:
Subject knowledge and understanding: An in-depth knowledge and a conceptual understanding on principles of soil chemistry, physics, microbiology, pedology, fertility and plant nutrition, mechanisms and prevention of soil degradation, soil conservation, survey and classification, land use planning, techniques in soil, plant, water and fertilizer analysis and efficient use of fertilizers.
Intellectual and analytical abilities: the ability to a) apply fundamental principles of soil chemistry, physics, microbiology, pedology, fertility and plant nutrition to make recommendations for economic and environmentally sound land use; b) apply the basic knowledge in soil science to solve practical problems and to design and conduct basic and applied research.
Personal and transferable skills: developed laboratory and field analytical skills progressively with the ability of interpreting and reporting data; a range of personal skills including computer skills, oral and written communication skills, critical thinking and ability to work independently.

On successful completion of the Postgraduate degree program (M.Sc., M.Phil. Ph.D.) the students should have:
M.Sc. (Tropical Soil Management): an in-depth knowledge about tropical soils, their formation, characteristics, vulnerability to degradation and proper management
M.*Sc. (Environmental Soil Science):* the ability to apply principles of soil science to minimize environmental pollution and to rehabilitate contaminated and deteriorated soils
M.Sc. (Soil and Environmental Microbiology): an in-depth knowledge on soil and environmental microbiology and their application to production agriculture and environmental protection.

In addition, all graduate students should be able to design and conduct basic and applied research that will be used to solve problems and advance soil science.

4. FINDINGS OF THE REVIEW TEAM

4.1. Curriculum Design, Content and Review

Dept. of Soil Science conducts two course modules for the core program, namely Principles of Soil Science offered during the second semester with forty-five hours of theory and thirty hours of practicals, and Soil Fertility and Plant Nutrition offered during the fourth semester with forty-five hours of theory and thirty hours of practicals. Course on Principles of Soil Science intends to give the first year students in Faculty of Agriculture a basic understanding of Rocks and Minerals, Rock Weathering, Soil Genesis, Soil Physical Chemical and Biological properties. The course on Soil Fertility and Plant Nutrition provides the students an understanding of the impacts of soil properties on soil fertility and plant growth and different soil management practices. During the third and the fourth year, students specializing in soil science follow advanced compulsory courses in Soil Chemistry, Soil Physics, Soil Mineralogy, Techniques in soil

and plant nutrition studies, soil survey and classification, soil degradation and conservation, soil fertility management and soil biology and microbiology which covers 16 units with 55 hours of theory and 160 hours of practicals.

As at present, the core program of the Faculty consists of 136 credits and the contribution of the Dept. of Soil Science is only 8 credits. A closer examination of the distribution of courses among the different Departments indicates that while some Departments contribute a much higher % in the core program (For example, the contribution of Agric, Engineering is around 13%) Dept. of Soil Science contributes only 5%. As a result of the decrease in the contribution of the Dept. of Soil Science, the coverage of some of the important topics such as Soils of Sri Lanka, have been reduced. The review team feels that this is not a satisfactory situation as Soil Science is a basic course, which is of considerable importance in the field of Agriculture.

The courses in the core program would be more effective if topics such as soils and environment, soil microbiology, soils of Sri Lanka, soil degradation, bio-fertilizers and practicals related to plant nutrition are included. It is the opinion of the review team that the course contents in the core program could be made more practical oriented. For example, there should be more emphasis on methods of reducing soil degradation. Almost all students entering the University lack practical knowledge on handling of basic laboratory glassware/equipment and at present students do not get an opportunity to get this training. This situation needs to be given consideration in future curriculum development.

There is a Curriculum Development Committee consisting of about 28 academic staff members representing all the Depts. This committee had revised the curriculum of the Faculty, including that of the Dept. of soil science every 5-8 years with the academic staff members. Past students' views were also taken into account in the curriculum review. The last curriculum review was done in 1997 and a major revision is planned for the year 2005 with the assistance of the IRQUE/QEF Project. In 2003, the Dept. of Soil Science had proposed some curriculum revisions, but these have not been implemented.

The review team is of the opinion that this aspect in the Dept. could be judged as good.

4.2. Teaching, Learning and Assessment Methods

A number of teaching methods are used in the Dept. of Soil Science. Courses are taught mainly by lectures, practicals and discussions. In addition, students are taken on field visits although there are not many such visits in the core course. For example, students are taken only once to the filed in relation to the course 1201 and 2202. This is mainly attributed to the large number of students following these two courses. However, many field classes are conducted for those majoring in soil science.

All most all students follow classes in the G.C.E. A level in Sinhala/Tamil and in the University, the medium of instruction is English. The Intensive English Course is expected to provide the first year students an opportunity to improve their writing, reading and understanding ability of English. However, as revealed during the discussions with students, very often this course is not conducted over the full duration, and some students (especially those in the first year), are finding it difficult to follow the courses in the Department.

It was revealed that students in the first two years do not get enough assignments in Soil Science. Getting students to write assignments regularly compel them to use library more often. Most students, with whom the review team had discussions, were of the view that there is no need for them to use the library in relation to Soil Science compared to other subjects.

Practicals in each course are conducted in 5-6 classes, and in each class there are around 40 students, and the review team was able to observe that about 4-5 in each sub group. As a result, students do not get much opportunity to handle laboratory glassware and equipment.

There is only one computer available for student use in the Dept. of Soil Science. The computer unit in the Faculty has only about 40 computers to cater to about 1000 students in the Faculty. This is not at all sufficient.

Assessment of all the courses has been done uniformly throughout the Faculty. The theory component of courses is assessed by an end semester written examination only. Guidelines for the structure of the question papers are clearly stated in the Prospectus. The practical component of courses is assessed continuously and/or by an end semester examination. In the Dept. of Soil Science the weightage given for the continuous assessment is 10% whereas for the end semester examination it is 90%. A Board consisting of only internal staff moderates the examination papers and there is no second-marking of the answer scripts.

In spite of the deficiencies most of which are beyond the control of the Department, the overall teaching, learning, and assessment aspects are good.

4.3. Quality of Students, Including Student Progress and Achievements

Students are selected on the basis of their achievements at the A level examination. Students who have passed in at least three of the following G.C.E A level subjects: Biology, Chemistry, Physics, Combined Mathematics (pure/applied), Geography and Agriculture, at a single attempt. The new entrants undergo an orientation program of one-week duration prior to the commencement of the Intensive English course. The Intensive English course is aimed at improving students' abilities on listening, reading and comprehension.

Departmental records show that only a few failures were recorded in the core program. However, some of those who received grades less than 'C' have repeated the course and improved their grades showing their keenness to achieve higher grades. There had been instances where students were not allowed to sit due to insufficient attendance, which could not be substantiated.

Departmental records show that all most all the students have successfully completed the degree, and a considerable number of them obtained classes at their first attempt. During the period 2000-2004, around 67% of the students who majored in Soil Science obtained classes. Usually, the best 5-6 students are recruited as Temporary Demonstrators of the Department to assist the juniors in learning.

According to a survey conducted among 50 graduates who have majored in Soil Science, 43 have secured employment as Lecturers in Agriculture Schools and Universities, Executive Officers, Planning/Monitoring Officers, Research Assistants and Agricultural Officers, Environmental Officers, Management Trainees, Quality Controllers, School Teachers, Managers, Banking Officers etc. The present trend is that a majority of students majoring in Soil Science is seeking to follow postgraduate studies at the PGIA.

Considering the above the review team judged this aspect as good.

4.4. The Extent and Use of Student Feedback

The teacher evaluation by students was introduced in the Faculty in 2000 and is implemented on a regular basis at present. Collection of feedback and the relevant calculations are done by the Assistant Registrar of the Faculty, and subsequently is send to the individual lecturers. As it was revealed during the discussions, some staff members are of the view that there were instances where calculation may not be correct. However, the staff members have taken the comments made by the students into account and admitted that they have improved their methods of delivery in lectures. This is reflected in the increase in the overall marks obtained by the same staff members in the second teacher evaluation event. The Dept. also did a survey on the selection criteria used by the students in choosing the majoring specialization.

When the curriculum was revised in 2003, a feedback taken from the immediately passed out graduates was given due consideration. In addition, the opinion of students about the theory and practical components of the two soil science courses offered in the core program were obtained and were used in revising/amending the student handouts in the cores courses. Thus the students' feed back has been effectively used and the review team agrees that a good grade is given to this aspect.

4.5. Postgraduate Studies

At present, the Dept. of Soil Science conducts three M.Sc. degree programs, namely Tropical Soil Science, Soil and Environmental Microbiology and Environmental Soil Science. In addition, Dept. also conducts M.Phill. and Ph.D. degree programs. All these programs are conducted through the Board of Study in Soil Science of the PGIA, in which the academic staff of the Dept. of Soil Science take an active role. The senior staff members of the Dept. jointly conduct 15 courses in the Postgraduate Institute of Agriculture. Hence, this aspect can be considered good.

4.6. Peer Observation

It was revealed during the visit that there is no regular effective peer observation**.** Staff members informally discuss the problems arising during academic activities among themselves and the temporary staff members are continuously monitored and informal feedback is provided whenever necessary. Considering the above, the review team is of the opinion that this aspect is satisfactory.

4.7. Skills Development

Students get an opportunity to develop their skills in areas such as soil analysis, computer use, and writing scientific papers. However, the extents to which they can be involved in these activities appear to be limiting mainly due to inadequate opportunities**.** The department does not arrange farmer-levels programs. In addition, field trips arranged for the specialized programs also provide part of the knowledge. Considering the above, the review team judge this aspect as satisfactory.

4.8. Academic Guidance and Counseling

Five senior student counselors who are academic staff members conduct routine programs at the faculty level on Counseling. During last three years two staff members from the Dept. of Soil Science have served as Student Councilors. In addition, there is a student welfare and advisory committee which is represented by academic staff members including one from the Dept. of Soil Science. An academic staff member to whom a student is assigned acts as the advisor, who meets the student routinely and assist him in solving academic problems he faces.

The majoring students are addressed by the Head of the Department when they first arrive at the Department. They are advised on matters such as choosing optional courses, overall view about the majoring module, facilities available at the Dept. and general guidelines followed by the majoring students in the study program. Thus, the contribution by the Dept. to student counseling and guidance aspects can be considered as good.

5. CONCLUSIONS

Curriculum Design, Content and Review: The Faculty Curriculum Development Committee had revised the curriculum every 5-8 years. Past students' views were also taken into account in the curriculum review. The last curriculum review was done in 1997 and a major revision is planned for the year 2005. It is recommended that more topics in Soil Science are included in the core program. *Judgment: Good*

Teaching, Learning and Assessment Methods: A number of teaching methods are used and the courses are taught mainly by lectures, practicals, discussions etc. Assessment of all the courses has been done uniformly throughout the Faculty. To further improve the teaching and learning process it is recommended that better computer and laboratory facilities are provided. *Judgment: Good*

Quality of Students, Including Student Progress and Achievements: Students with a good performance at the GCE advance level apply for this course. The review team noted that the performance of students during the program shows an improvement. All most all the students have successfully completed the degree, and a considerable number of them obtained classes at their first attempt. *Judgment: Good*

Extent and use of Student Feedback, Qualitative and Quantitative: The teacher evaluation by students is implemented on a regular basis at present. When the curriculum have been revised, feedbacks from the immediately passed out graduates and the

undergraduates were given due consideration. Hence, it can be concluded that the students' feed back has been effectively used in the Dept. *Judgment: Good*

Postgraduate Studies: Dept. conducts three M.Sc. programs, M.Phill. and Ph.D. programs through the Board of Study in Soil Science of the PGIA. The senior staff members of the Dept. jointly conduct 15 courses at PGIA. *Judgment: Good*

Peer Observation: There is no regular effective peer observation and the temporary staff members are continuously monitored and informal feedback is provided whenever necessary. *Judgment: Satisfactory*

Skills Development: Students get limited opportunities to develop their skills in areas such as soil analysis, computer use, and writing scientific papers. It is recommended that the field trips and farmer-levels programs be enhanced. *Judgment: Satisfactory*

Academic Guidance and Counseling: Five senior student counselors who are academic staff members conduct routine programs at the faculty level on Counseling. In addition, there is a student welfare and advisory committee. An academic staff member to whom a student is assigned acts as the advisor, who meets the student routinely and assist him in solving academic problems he faces. *Judgment: Good*

Based on the observations made during the visit by the review team, the eight aspects were judged as follows:

Aspect Reviewed	**Judgment Given**
Curriculum design, content and review	Good
Teaching learning and assessment methods	Good
Quality of students including student progress and achievements	Good
Extent and use of student feedback, qualitative and quantitative	Good
Postgraduate studies	Good
Peer observations	Satisfactory
Skills development	Satisfactory
Academic guidance and counseling	Good

6. RECOMMENDATIONS

Based on the findings indicated above the review team wish to make the following specific recommendations.

- Topics in Soil Science are basic to crop and animal production and hence, the courses conducted by the Dept. of Soil Science need to cover relevant topics adequately. Hence, it is recommended that the Dept conducts three, 3 unit courses during the first two years. These three courses may be titled Fundamentals of Soil Science, Soil Fertility, Fertilizers and Plant Nutrition and Soils of Sri Lanka and their Management.

- It is further recommended that a course titled Basic Chemistry be introduced during the first semester of the first year. This course should provide the students training on the use of basic laboratory glassware and equipment.
- To further improve teaching and learning process it is recommended that better computer and laboratory facilities are provided.
- An effective system need to be developed for second marking of examination papers.
- It is suggested to explore the possibility of implementing a formal or an informal mechanism for peer observation.

7. ANNEXTURES

ANNEX 1

Agenda for the Visit by the Review Team

Day 1 – 14th March, 2005

09.00 – 09.30 Meeting with the Dean and Head of the Department
09.30 – 10.00 Discuss the Agenda for the Visit
10.00 – 10.30 Tea Break
10.30 – 11.30 Department Presentation on the Self Evaluation Report
11.30 – 12.30 Discussion
12.30 – 13.30 Lunch Break
13.30 – 14.30 Meeting with Postgraduate (PGIA) Students
14.30 – 15.30 Observe Departmental Facilities
15.30 – 16.30 Meeting with Department Academic Staff
16.30 – 17.30 Meeting of Reviewers

Day 2 – 15th March, 2005

08.30 – 09.00 Observe Teaching – Lecture (*SS 1201 – Principles of Soil Science*)
09.00 – 11.00 Observe Documents (Working Tea)
11.00 – 12.00 Meeting with Technical Staff and Other Non-Academic Staff
12.00 – 13.00 Lunch Break
13.00 – 14.30 Observe Teaching a Practical Class and Meeting with First Year Students
14.30 – 15.30 Meeting with Third & Fourth Year (Soil Majoring) Students
15.30 – 16.30 Observe Other Facilities
16.30 – 17.00 Meeting of Reviewers

Day 3 – 16th March, 2005

09.00 – 10.00 Observe Teaching – Lecture (*SS 2201 – Soil Fertility &Plant Nutrition*)
10.00 – 10.30 Academic Guidance and Counseling Core Aspect Meeting
10.30 – 11.00 Reviewers Private Discussion
11.00 – 12.00 Meeting with Head and Staff for Reporting
12.00 – 13.00 Lunch Break
13.00 – 17.00 Report Writing

ANNEX 2

List of Persons Met During the Visit

- List of Academic Staff Members:
  1. Prof. B. Marambe, Dean, Faculty of Agriculture
  2. Dr. R.M.C.P. Rajapaksha, Head/Department of Soil Science

3. Prof. R.B. Mapa, Professor
4. Prof. A.N. Jayakody, Professor
5. Prof. (Ms) D. Kumaragamage, Professor
6. Dr. K.A. Nandasena, Senior Lecturer
7. Dr. (Ms) S.P. Indraratne, Senior Lecturer

- Discussions were held with small groups of first year students during their practical session and a group of fourth year students majoring in Soil Science. Also, discussions were held with 3 students of PGIA, following their postgraduate programs under the supervision of Department academic staff members.
- Discussions were held with the members of the Technical and Non-Academic Staff of the Department (i.e. 1 Technical Officer, 1 Clerk, 1 Lab Attendant and 1 Labourer).

ANNEX 3

List of Teaching Sessions Observed

- 15th March – 08.30-09.00 – Lecture (*SS 1201 – Principles of Soil Science*)
- 15th March – 13.00-14.30 – Practical (*SS 1201 – Principles of Soil Science*)
- 16th March – 09.00-10.00 – Lecture (*SS 2201 – Soil Fertility &Plant Nutrition*)

ANNEX 4

List of Facilities Observed

- Lecture Theatres
- General Teaching Laboratory and Four Special Laboratories
- Office Space and Staff Rooms
- Faculty Computer Centre

ANNEX 5

List of Documents Observed

- Prospectus 2004-2005, Faculty of Agriculture, University of Peradeniya
- Detailed Syllabi of the Course Units conducted by the Department
- Minutes of the Departmental Meetings and the Minutes of the Curriculum Development Committee Meetings
- Past Question Papers, Marking Schemes, Final Year Students' Project Reports, Students' Practical Record Books
- Teaching Material (lecture and practical handouts)
- Summaries of the Teacher Evaluations by the Students and the Related Forms
- Summaries of the surveys conducted by the Department
- Research Papers and Other Publications by the Academic Staff Members of the Department