# SUBJECT REVIEW REPORT

## DEPARTMENT OF CROP SCIENCE

## FACULTY OF AGRICULTURE
## UNIVERSITY OF PERADENIYA

08th to 10th February 2005

**Review Team :**

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## 1. SUBJECT REVIEW PROCESS

The original review was conducted from the 8th to the 10th of February, 2005 by a team comprising the following persons.

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The terms of reference for the review team were according to those described in the Quality Assurance Handbook of the CVCD and UGC (page 13 to 16 and Annex E). The team based its findings on the following documents and activities:

1. A self assessment prepared by the Head of Department and Staff
2. A discussion that followed a presentation made by the Head of Department
3. Observation of classroom teaching
4. A survey of facilities available for teaching at the Department
5. A survey of academic support facilities such as Library and Computer Unit
6. Interactions with the following groups:
    a. The Dean of the Faculty
    b. The Academic and academic support Staff of the Department
    c. The non-academic staff of the Department
    d. Undergraduate and postgraduate students
7. Perusal of documents related to teaching activities

*Following the submission of the review report, a detailed response was received from the Department of Crop Science (DCS) in which they disagreed with a number comments in the report and stating finally that they are not in a position to accept most of the judgments. According to the provisions available in the Guidelines (page 19), a discussion was arranged between the review team and the staff members of the DCS on Monday the 24th of April, 2006 from 9.30 am to 12 noon at which each of the identified areas were discussed at length. The original report was revised following these discussions.*

## 2. BRIEF HISTORY OF THE FACULTY AND THE DEPARTMENT

The Faculty of Agriculture at Peradeniya was the first to be formed in Sri Lanka and has produced graduates who have served with distinction in Sri Lanka and abroad. The DCS has its own building with classrooms, laboratories and staff rooms together with field training facilities at Maha-Illuppallama and Dodangolla. In addition, the Department is endowed with a full complement of trained academic staff who has, historically, given the leadership to the Faculty, to the PGIA and many to Agriculture development in Sri Lanka.

Throughout this period, the DCS has provided the core training in Agriculture which is defined as "the application of biological, chemical and physical principles to crops and cropping systems to increase their efficiency" (*vide* pp 1 of the SER). The training in the DCS presently embraces field crops, plantation crops, horticulture, forestry as well as Statistics. The aims of the training program in the Department have been clearly identified together with the learning outcomes have been described in detail in the SER. The team was satisfied that this Department with its resources and maturity was largely able to achieve the fundamental aims and learning outcomes of their training program.

## 3. AIMS AND LEARNING OUTCOMES

### 3.1. Aims

Crop Science is the application of biological, chemical and physical principles to crops and cropping systems to increase their efficiency in converting light and supplemental resources into food, feed, fiber, or ornamental commodities such as floral crops.

Crop Scientists are employed within the private sector by agrochemical, seed, greenhouse, nursery, and food processing companies. Crop Scientists may also become independent crop producers or professional agricultural consultants. Within the public sector, they are eligible for various jobs with the Department of Agriculture, Research Institutes, and Export Agriculture, local and regional planning agencies.

Crop Science specialized students at the Faculty of Agriculture concentrate in particular on the interrelationships among the physical and biological factors that regulate crop plant productivity. With knowledge of and experience in working with these interrelationships in hand, graduates are prepared to creatively solve the changing problems in modern crop production and management. The application of biotechnology in Crop Science – an emerging area worth considering the study – is playing an increasingly important role in the crop production. Crop Science specialized students may choose to specialize in one of five areas: Field Crop production, Plantation Crop Production, Horticultural Crop Production, Forestry and Statistics.

As such the aims of the Department of Crop Science are to:

3.1.1. Provide a range of learning opportunities in Crop Science for undergraduate students within the modular system of the University, which enables students to develop their academic knowledge and interest in Crop Science.

3.1.2. Offer a specialized programme in Crop Science that provides a high quality learning experience, within the framework of available resources in line with the University Policy, in various aspect of Crop Science, so as to expose students to recent advances in knowledge and techniques, particularly those represented in the research strengths of the Department.

3.1.3. Encourage students to gain knowledge in various fields of Crop Science and to develop their cognitive abilities and transferable skills that will help them to contribute effectively to Crop Science research, teaching and other careers and to be able to meet the expectation of their potential employers.

3.1.4. Provide opportunities to gain knowledge and develop skills in applied aspects of Crop Science such as Plant Propagation, Plantation Crop Management.

3.1.5. Provide a friendly and supportive departmental environment, which is conducive to learning and developing skills, which will help students to achieve their maximum potential.

3.1.6. Support the teaching staff in their career development including provision of feedback and peer advice and provide opportunities for teaching, learning and assessment and quality assurance.

### 3.2. Learning Outcomes

On the successful completion of the course modules offered by the department, the students should have

3.2.1. Gained knowledge and understanding in various disciplines of Crop Science.

3.2.2. Acquired the ability to apply the knowledge gained to future research they may undertake.

3.2.3. Develop personal and transferable skills such as clear observation, critical thinking, data handling, analysis of information and interpretation of results, comprehension, expression, teamwork, and also acquired the ability to apply these skills in various situations.

3.2.4. Gathered technical skills necessary to setup experiments to collect scientific data and analyze them.

3.2.5. Develop the ability to self-directing learning

On successful completion of the theory course modules in the undergraduate curriculum on the following topics offered by the department, students should be able to demonstrate their knowledge and understanding as indicated against each module.

3.2.6.1 Principles of Agronomy: Climate, land development fertilizer application and other cultural practices in crop growth.

3.2.6.2. Principles of Horticulture: Plant propagation, crop manipulation, plant growth regulators in horticulture crop production.

3.2.6.3. Perennial Crop Production: Management of tea, rubber, and coconut.

3.2.6.4. Field Crop Production: Production of rice, highland cereals, legumes, tuber crops and other important field crops.

3.2.6.5. Horticulture Crop Production: Cultivation and management of fruits, vegetables, flower crops and landscape gardening of these crops.

3.2.6.6 Principles of Forestry: Basic concepts of forestry, major forest types and their role.

3.2.6.7. Farm Practice Course: Practical experience in cultivation and management of all agronomic crops.

3.2.6.8. Biomathematics: Matrix algebra limits and continuity, differentiation and integration and introduction to partial differentiation.

3.2.6.9. Applied Statistics: Concept of variability, Sampling, Probability distributions, Basic Statistical procedures.

3.2.6.10. Experimental Techniques in Agriculture: Principles of experimental designs, conventional experimental designs.

3.2.6.11. Fruits and Vegetable Production: Management of nurseries and orchards, crop improvement, reduction of post harvest losses of fruits and vegetables.

3.2.6.12. Tea Plantation Management: Overall management of tea plantations.

3.2.6.13. Agro Forestry: Role of agro forestry, practices ad productivity analysis.

3.2.6.14. Advanced Field Crop Production: Physiological basis of field crop production.

3.2.6..15. Floriculture ad Landscape Horticulture: Cut flower industry and its improvement.

3.2.6.16. Crop Based Farming System: Farming systems and patterns, forming system research approach.

3.2.6..17. Post Harvest Physiology and Technology of Horticulture: Biological aspects of post harvest handling and methods to control damages.

3.2.6.18. Plant Tissue Culture: Tissue culture systems, micro propagation and crop improvement.

3.2.6.19. Forest Tree Improvement: Genetic improvement, conservation and tree improvement.

3.2.6.20. Herbicide Physiology and Technology: Use of herbicides, fate of these and effect on plant growth.

3.2.6.21. Crop Physiology: Radiation and its effects on photosynthesis and respiration. The concepts and physiological basis

3.2.6.22. Silviculture: Role of Silviculture ad sustainable forests management.

3.2.6.23. Statistical Methods I: Designs, non-parametric designs and presentation of data.

3.2.6.24. Statistical Methods II: Yield–density models, multivariate techniques and binary data analysis.

3.2.6.25. Crop Modeling: Introduction to crop models and testing models.

To cover above topics: theory/practical course units each with 2-7 credit hours are provided. In the theory units, emphasis is given to provide fundamental as well as more advanced knowledge while in the laboratory units students are given the opportunity to develop their practical skills in observation, data gathering and analysis as well as working in collaboration with others.

3.2.7. Research Project

On successful completion of the research project at the final year of the research project at the final year of the degree programme, under the supervision of a senior staff member, the students gain necessary skills to carry out a research project based on scientific methodology such as collecting and analyzing data, interpreting results and presenting their findings at a seminar and in the form of a report.

To help students to achieve the outcomes stated in 3.2.6.1-3.2.6.25, the courses have been designed to enable students to gain knowledge and develop skills and understanding on various generic topics within the broad discipline of Crop Science. In addition, the course modules offered by the Department are designed in such a way that

- First and Second year courses provide learning experience on principles and core areas of Crop Science that are appropriate and beneficial to the students who undertake other programmes in cognate subjects.
- Year three provides suitable learning experience in specialized areas such as field crop production plantation crop production, Horticultural crop production forestry and biometry enabling students to enhance knowledge and obtain experience that will be required to meet the needs of most of the potential employers.
- Find year provides an in depth learning experience in advanced areas to get research experience in advanced areas to get research experience in respective fields.
- The Department adheres to the teaching and learning strategy and other associated strategies of the Faculty and the University.

## 4. FINDINGS OF THE REVIEW TEAM

Some of our observations during the course of this short review are described in the sections below whilst suggestions for improvement based on these observations are listed in the concluding section.

### 4.1. Curriculum Design, Content and Review

The curriculum of the Department had evolved over several decades with a number of changes being introduced over this period. Major revisions, moreover, are being currently carried out on the entire degree curriculum under the IRQUE program as a Faculty initiative. The primary changes expected are a somewhat drastic reduction in the technical content and the use of the time released to develop "soft" skills in the students. The academic staff of the DCS generally agrees with these changes and is participating in these revisions.

A more detailed examination of the present curriculum revealed the following:

- The general level of instruction was up to accepted academic standards
- The students were provided with the opportunity to obtain the necessary technical knowledge and some transferable skills, the latter mainly on the Maha Illuppallama sub-campus. Intellectual and analytical skills of the students are developed in many of the courses, particularly those on Statistics and Mathematics whilst analytical approaches to solving problems are learnt during the research project in the final Semester.
- The coverage of the subjects under crop science was adequate and could even be considered excessive at the undergraduate level. A wide range of subjects related to agriculture are included in the course, especially during the first two years, where a total of 34 courses with a total of 103 credits are taught. Though these programs target wider coverage knowledge in subject matter, the team felt that these numbers could be reduced allowing time for the students to engage themselves in more student-centered activities during these years.
- The 4-year course given by the Department was structured in a manner that gradually developed the students academically. For example 4 semesters of basic

work was followed by 3 semesters of advanced instruction and finally an independent research project

- The Students were given a wide choice of subjects and courses during the advanced instruction in the Department of Crop Science. No such choices were available, however, during the core program in the first 4 semesters.
- The courses provide the platform for graduates to go on to further study and the versatility to fit into a variety of employment situations.

Curriculum reviews have been undertaken periodically from the inception, the last one being around 5 years ago. The findings of the reviews are implemented through a curriculum development committee. Students and prospective employers have been consulted in making such changes; external examiners, however, are not as a policy used by the Faculty and are thus not available for consultation in Curriculum revisions. A continuous influx of newly trained academic staff together with short-term exposure of the senior staff abroad ensures that the knowledge base is kept updated. The major teaching/learning technique introduced in recent years has been the use of computers.

Assessment: ***Satisfactory***

**4.2. Teaching, Learning and Assessment Methods**

The initial impression with regard to the teaching-learning process in the Department was that the buildings and space available were not adequate for the numbers in the present intake. The general batch consisted of more than 200 students and since, crop science was the most popular of the specializations, even the specialization batches numbered around 50. During the practical classes in the core courses, where students had to be taken in groups, often the same practical had to be repeated up to 5 times. The large numbers also precluded the use of Continuous or in-course assessment in many cases and prevented the introduction of novel, student-centered teaching methods including those based on computer learning. It should be noted that these issues were common to all the Departments that taught core courses in the first 4 semesters and that these problems were not evident during the advanced program.

The staff primarily used the chalkboard together with the overhead projector for teaching whilst lecture outlines were provided. It was felt that the procedures used for assessment (primarily end-semester examinations) were somewhat cumbersome and needed to be simplified. External evaluation of end semester papers was not feasible due to long delays in releasing results. It was noted that these were problems common to other Departments and Faculties throughout the University system.

The overall teaching and learning strategy adopted by the Department, in common with other Departments, is to use the one-hour lectures as the core of instruction supported by practical classes, assignments and the occasional field visit. The field courses at Maha-Illuppallama and the research project in the final semester are designed to engender skills that cannot be provided in the classroom. The process of teaching and learning, developed and practiced over a long period of time appears to be effective. The variety of methods used in the specialization program caters to different learning styles of individual students although such flexibility is not available in the first two years. Learning outcomes for each of the courses given in the Department have been stated in the SER and are in general apparent to Staff and students.

The strengths of the teaching process were identified as the provision of written handouts at all classes, that practical classes follow theory and the practical skills gained during the field practice courses given at Maha Illuppallama. In the advanced programs, there are adequate field trips, good interaction between staff and the students and sufficient free time for students for individual study. In addition, the final year project and the manner in which it was conducted – choice of supervisor and project to the student – provided the opportunity for students to develop initiatives and skills not available in the rest of the course.

In contrast, during the first two years of core courses, in common with other Departments in the Faculty, the students appear to have too much of a workload. It should be noted that this has been taken into account in formulating the revised curriculum. Due to the lack of space, laboratory safety issues also do not seem to get adequate attention in the laboratory. Several items of equipment received under the JICA grant a few years ago were not in working order and could not be serviced or repaired due to the lack of local agents.

Access to computers was provided in the last 3 semesters, and even then, the facilities appeared inadequate; indeed, a computer literacy course was only given in the 3rd year. These and other shortcomings such as the repetition of subject matter in different courses are not specific to the DCS but are common to the Faculty and are being addressed in the improvements currently under progress under the IRQUE project.

The assessment methods which are time-tested, although somewhat cumbersome, appear to be fair and balanced. A system of continuous evaluation with a lesser proportion of marks for the end semester examination seems more appropriate but is precluded by the large numbers of students in a batch.

Assessment: ***Good***

**4.3. Quality of Students including Student Progress and Achievements**

Admission to the agriculture degree at Peradeniya is carried out by the UGC according to a national policy which is based on performance at the A level examination and the choice of students. The aptitude for Agriculture is not tested and it is not known what proportion of students actually selected Agriculture as their first choice. There can be little doubt that for a subject such as crop science, selecting a student with either a background or a genuine interest in crop farming would be more appropriate.

During the core program and the Semester at Maha Illuppallama, however, the students have the opportunity to understand the nature of the different specialties available within the Agriculture degree program together with the quality of the staff available in the Departments. The procedure followed for selection is that the students are allowed to apply and a selection is made on the basis of available places and the grades obtained. During the interactions with specialization students it became clear that they had the opportunity to develop themselves during the period they spent in the DCS. They had a choice of subjects and the chance to focus on several sub-specialties. Further evidence for their satisfactory progress through the DCS was the improvement in their GPAs during this period.

Assessment: ***Satisfactory***

### 4.4. The Extent and Use of Student Feedback, Qualitative and Quantitative

At the end of every course, in each semester, students evaluate the conduct of the course by the teachers through a set of questionnaires, which are quite comprehensive. The comments in the questionnaires are summarized and fed back to the teachers who felt that they were quite valuable. This system has been practiced over 5 years now and has been found to be very effective. The beneficiaries of any improvements would naturally be the next batch following the course since the evaluation was at the end of the course.

There are no other formal methods to obtain feedback of students but the fairly close interaction between students and staff during the advanced program, presents opportunities for obtaining the views of students informally. Students are represented on the Faculty Board and have the opportunity to raise common concerns. Students were extensively consulted during the course of curriculum review and on special occasions such as the preparation of the Self evaluation reports for the QEF project.

Assessment: ***Good***

### 4.5. Postgraduate Studies

Postgraduate studies relating to crop science are carried out entirely by the Board of Study for crop science under the Post-graduate Institute for Agriculture. The majority of members of the Board of Study as well as the teachers are academic staff members of the Department. Whilst some research students use the facilities of the Department for their research work, most of them carried out their field work at other Institutions and locations in the country. Those who used the facilities available at the Department - laboratories, plant houses and farm – had to share them with undergraduate students which sometimes led to a degree of congestion.

Assessment: ***Good***

### 4.6. Peer Observation

There is no formal procedure for Peer observation of teaching in the Department or elsewhere in the Faculty of Agriculture. However, staff members informally discuss among themselves the problems arising during the academic activities. Further, the work

of temporary staff members is continuously monitored and the feedback is provided when necessary.

Assessment: ***Satisfactory***

**4.7. Skills Development**

Although not listed in the SER, the Department expects the students to acquire, together with the knowledge, certain basic skills in every course that they follow. In addition, there are special modules specifically designed to develop transferable skills. These include the farm practice course (field skills) at Maha Illuppallama and the research project (writing and analytical skills). In order to highlight the importance of the experience at MI in skill development, the DCS has prepared an addendum to the SER. The practical classes taught throughout the course will also help to develop some motor skills. The extent to which certain skills are acquired is tested as part of the overall assessment system during and at the end of each course. The methods used for this purpose include performance of tasks, spot tests, field oral examinations and systems of continuous evaluation. .

Prospective employers, who are consulted in the course of periodic curriculum review and revision, have indicated the skills expected by them in their employees and these are being considered in the current revisions.

Assessment: ***Satisfactory***

**4.8. Academic Guidance and Counseling**

Formal counseling is carried out at both the Faculty and University level. A member of the academic staff of the Department in fact is the chief student counselor for the entire University. The strategy adopted by the Faculty is to allocate a Staff member to each student who meets them regularly for counseling and guidance. A student welfare and advisory committee has been established in the Faculty to enable students to report their problems individually or as groups. In addition, academic guidance is provided informally by the Academic Staff of the Department.

Assessment: ***Good***

## 5. CONCLUSIONS AND RECOMMENDATIONS

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 | Satisfactory |
| Teaching, Learning and Assessment Methods | Good |
| Quality of Students including Student Progress and Achievements | Satisfactory |
| Extent and Use of Student Feedback, Qualitative and Quantitative | Good |
| Postgraduate Studies | Good |
| Peer Observation | Satisfactory |
| Skills Development | Satisfactory |
| Academic Guidance and Counseling | Good |

*Overall Judgement - Suspended*

The Department of Crop Science is a strong and mature Department and the manner in which they carry out their mandate within the Agricultural Degree programs is fundamentally sound. The knowledge and skills acquired by students through their programs in fact form the core of the degree. Some suggestions for further improvement, based on our observations during the review, are listed below:

- Incorporation of peer observation as a standard practice
- Increased use of continuous assessment methods
- Development of more student-centered learning activities
- The early development of computer proficiency, increasing access to computers and developing the use of computer assisted teaching/learning practices throughout the undergraduate course
- Enlarge laboratory facilities with more focus on safety measures
- Enhance academic guidance for year 1 students and strengthen career guidance for others
- Reduce heavy workload in first two years and avoid repetition in the curriculum

It is noted, however, that many of these problems together with possible solutions have been identified in the Self evaluation report prepared for funding under the IRQUE project. Since the faculty has been successful in winning this award, it may be expected that these shortcomings are being adequately addressed.

Finally, it is hoped that these observations made by the team would serve to further improve the instruction within the Department. In conclusion, we would like to thank the Head of the Department, Dr Samita, and his Staff for the ready cooperation and hospitality extended to us in carrying out this task.

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