SUBJECT BENCHMARK STATEMENT
IN
AGRICULTURE

Quality Assurance and Accreditation Council
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FOREWORD

The work in connection with the development of Subject Benchmark Statements was begun in August 2003 as a part of the overall quality assurance framework that supports academic standards and the furtherance and dissemination of good practices among Universities in Sri Lanka.

Subject Benchmark Statements will support and promote quality and standards of a subject discipline by:

- Providing universities with a common and explicit reference point for internal and external programme approval and review;

- Guiding and promoting curriculum development, especially in new departments and new universities, and in other institutions of higher education;

- Evolving over time to take account of changes and innovations that reflect subject development and new expectations;

- Providing an authoritative and widely recognized statement of expectations of what is expected of a graduate in a specific (or designated) subject area in a form readily accessible to students, employers and others with a stake in higher education;

- Providing a clear and transparent reference point for External Examiners;

- Assisting international comparison and competitiveness of higher education awards and student achievement.

SUBJECT BENCHMARK STATEMENT
AGRICULTURE

1. INTRODUCTION

1.1 Subject Benchmark Statement in Agriculture: Scope and Purpose

Subject Benchmarking (SB) is an essential component of quality assurance in the university system. This Subject Benchmark Statement in Agriculture (SBSA) provides general guidelines and an academic reference point for the four year Bachelor degree programmes in Agriculture (B.Sc. Agriculture) offered by universities in Sri Lanka.

It provides the

a. nature and characteristics of Bachelor degree programmes in Agriculture,
b. desired attributes and capabilities the graduates in Agriculture are expected to possess and be able to demonstrate, and
c. expected specific standards for the award of a four year Bachelor degree in Agriculture at threshold level, and at second or first class level.

It is expected that this SBSA would be used as an external point of reference and a broad framework for the B.Sc. Agriculture degree to enable:

a. national universities to design new Bachelor degree programmes in Agriculture by introducing innovative approaches for the delivery of the curriculum;
b. internal academic reviewers to evaluate and validate Bachelor degree programmes in Agriculture offered by their respective universities, and to ensure maintenance of their high academic standards and quality;
c. external academic reviewers to compare and verify standards of the different Bachelor degree programmes in Agriculture offered by universities;
d. professional bodies to review the processes and content of the Bachelor degree programmes in Agriculture offered by universities for the purpose of accreditation;
e. interested stakeholders, especially prospective students and employers to obtain information on the nature and content of Bachelor degree programmes in Agriculture.

The SBSA is not intended to be used as a prescription on the time allocated for teaching different subtopics or the order in which the subtopics should be taught. It is neither a syllabus nor a crude check list of regulatory criteria for individual Bachelor degree programmes in Agriculture, but intended to be used as a valid framework of reference in conjunction with the relevant programme specifications and internal evaluation documentation to arrive at a reasonable judgment as to its suitability based on a broad range of evidence.

The document is the first attempt to provide general academic standards for four year Bachelor degree programmes in Agriculture, which are credit based and modular in structure comprising a minimum of 120 Carnegie credits, and conducted over eight semesters in the Sri Lankan universities. It has been prepared on the authority of the University Grants Commission (UGC) as an activity of the Quality assurance (QA) project of CVCD/UGC by a team of nominated senior academics representing all Faculties of Agriculture in the country, and acting on behalf of the subject community. The names of the members of the Benchmark Panel in Agriculture are given in section 8 of this document.

The educational institutions may reproduce the Benchmark Statement in Agriculture for academic purposes. Extracts from this could be used or quoted in studies and research, but with due acknowledgement.

2. GENERAL DESCRIPTION OF THE SUBJECT AND SCOPE FOR EMPLOYMENT

2.1. Nature and Extent of the Subject – Agriculture

Agriculture is the scientific study of the production of food, animal feed, and raw materials (such as fiber) for manufacturing industries by the systematic nurturing of plants and animals through the management and manipulation of the terrestrial biosphere. Agriculture (agri=field, culture=cultivation) encompasses the whole range of economic activities involved in the farm production of crops, animals, and animal products; the processing of these materials into finished products; and the provision of products at a time and place demanded by consumers. At present, agriculture provides livelihood to 42% of the human population in the world, and serves as a key economic driver in many developing countries. In Sri Lanka, agriculture directly employs approximately 33% of the working population and accounts for about 20% of the Gross Domestic Product. Agricultural development is a necessary trigger for poverty alleviation and broader sustainable economic growth. Sri Lanka is a country where, agriculture is not only an economic activity, but also a way of life, a heritage, a cultural identity, and an ancient pact with nature that is intimately tied with water, energy, nutrition and biodiversity. Facilitation of sustained development in agriculture requires trained personnel at all levels in order to develop, transfer and use agricultural technology, and disseminate agricultural knowledge in the country.

Agriculture as a subject is interdisciplinary in nature embracing biological sciences, chemical sciences, social sciences and some aspects of management and technology. It covers the entire range of fundamental concepts, principles, practices and technologies that are associated with the preparation of land, establishment and management of crops and animals, production of useful crop- and animal-products, processing and marketing of those commodities, and associated social, environmental and managerial issues.

The study programmes covered by this SBSA will address distinctive aspects in relation to the production of food, animal feed, and raw materials (such as fibre) for manufacturing industries, 'products' (often originating from the terrestrial biosphere), their subsequent processing and marketing. Study of production and transformation processes, and business environment in the Sri Lankan context is emphasized. Environmental impact and sustainability will also be addressed. In order to ensure consumer health and safety; knowledge and understanding of governmental policy, legal, ethical, health and safety issues are required. Agriculture is a practical and experimental subject. Therefore, sufficient appropriate opportunities should be provided in the study programmes to improve practical skills and research skills.

2.2. Scope for Employment of Agriculture Graduates

Graduates in Agriculture gain employment in a wide range of sectors including the following:

a. state, non-governmental and private sector agricultural enterprises;
b. research and extension divisions of the state, non-governmental and private research institutes;
c. government ministries and statutory boards dealing with the subjects of Agriculture, Animal Production and Health, Field crops, Plantation Management, Estate sector, Major and Minor export crops, Livestock Development, Fisheries and Aquaculture, Forestry and Wild life, Environment, Science and Technology, Education and Imports and Exports;
d. state, non-governmental and private sector institutes dealing with Crop production, Animal production and Fisheries, Food Production and Processing, Insect Pest Management, Ecotourism, Biodiversity Conservation, Biotechnology, Environmental Management, Secondary and Tertiary level Education and Rural Development;
e. Sri Lanka Administrative Service, Banking sector and Foreign Service;
f. international organizations such as IUCN, IWMI, World Bank and UN that are involved in biodiversity conservation, environmental monitoring and economic development;
g. self employment and entrepreneurship.

3. ANTICIPATED GRADUATE PROFILE AND OBJECTIVES OF THE DEGREE PROGRAMMES

3.1. Anticipated Graduate Profile

Agriculture graduates are expected to play significant and diverse roles in promoting agricultural production, and facilitating agricultural and socioeconomic development. To be successful in this endeavor, the graduates produced by the

Bachelor degree programmes in Agriculture should have the knowledge, skills and attitudes described in the profile given below.

The graduates should be

a. equipped with sound subject specific knowledge on the principles and satisfactory skills in the practices of agriculture,
b. competent and innovative with appropriate managerial and entrepreneurial skills,
c. capable of fulfilling the manpower requirement of the nation in contributing towards sustainable and environmentally friendly, social and economical development.

3.2. Specific Objectives of the Degree Programme

To be able to produce graduates with the above profile, the curriculum of any Bachelor degree programme in Agriculture should have been / should be formulated with the following specific objectives:

Development / improvement of

a. comprehensive knowledge on the principles and skills in the practices of agriculture, innovative attitudes, management and entrepreneurial skills to fulfill the current and emerging needs in public, non governmental and private agricultural sectors
b. skills to identify problems in agricultural sector and conduct relevant investigations.
c. knowledge and skills to establish and manage of socially acceptable, economically viable and environmentally friendly agricultural enterprises
d. information and communication technology skills
e. interpersonal, team work and leadership skills
f. self learning and independent working skills
g. ethical conduct

4. SUBJECT AREAS AND FEATURES OF THE DEGREE PROGRAMME

4.1. Subject Specific Knowledge and Subject Areas

In order to equip the students with a comprehensive subject specific knowledge, skills and attitudes on the entire range of fundamental concepts, principles and practices associated with the preparation of land, establishment and management of crops and rearing of animals, production of useful crop- and animal-products, processing and marketing of those commodities, and associated social, environmental and managerial issues, ideally the curriculum should comprise the subject areas listed below:

4.1.1. Technical Subjects

a) Compulsory subject areas

Genetics and Breeding of Plants and Animals
Crop Science (Production, Physiology and Plant Protection)
Animal Science (Nutrition, Physiology and Production)
Agricultural Economics and Farm Management
Soil Science and Water management
Agricultural Engineering
Post Harvest Technology and Food Science
Agricultural Extension

b). Optional subject areas

Environmental Sciences
Agricultural systems
Microbiology and
Biotechnology
These may be included based on the nature, objectives and requirements of the degree programme.

Under each subject area, emphasis should be paid to:

- the underlying principles, concepts, theories and methods.
- the current knowledge and developments.
- current gaps in knowledge and current issues of wider concern.
- potentials and constraints in the global, regional and local contexts.
- the linkages with other subjects, environment, socio economic aspects and market situation.
- issues of sustainability and environmental impact.

4.2. Skills and Subject Areas

In addition to improving subject specific knowledge in students, the curriculum should provide opportunities and include learning activities that promote subject specific skills and generic skills that have wider applications for continuing personal development and in the world of work.

4.2.1. Subject Specific Skills

The required technical competencies specific and appropriate to the focus of the degree programme should be developed incorporating appropriate learning activities tailored to skill development in a subject-specific context. Main emphasis should be given to develop and improve the following subject specific skills:

a. intellectual skills :
ability to apply subject specific knowledge to analyze information / situations, solve problems and make recommendations based on lines of evidence.

b. practical skills:
ability to use appropriate instruments, equipments, technologies in the laboratory and field.

c. research skills:
ability to plan, conduct and present an independent investigation, interpret the findings.

The desired levels of subject specific skills for graduates in Agriculture are enumerated in section 7.

To enhance these subject specific skills, the curriculum should include appropriate learning activities requiring application of subject knowledge in conducting laboratory / field practical; undertaking research / case studies that involve problem identification, planning and conducting of research, collection, analysis and interpretation of data; scientific writing and presentations.

4.2.2. Generic skills:

The key generic skills that should be promoted are:

a. numeracy skills :
   ability to use mathematical and statistical tools.
b. communication skills :
   ability to use the language/s in verbal and written scientific communication
c. information and communication t technology (ICT) skills :
   ability to use computers for recordkeeping, statistical analyses; use of internet for self learning and research
d. inter-personal, teamwork /leadership skills:
   ability to serve as a productive team member / leader

e. self management and professional development skills:
   capacity for personal and professional development

The desired levels of generic competencies for graduates in Agriculture are enumerated in section 7.

To enhance these generic skills, inclusion of following ancillary subject areas with appropriate learning activities is suggested.

Ancillary subjects

Mathematics and Statistics
English
Information and Communication Technology
Career Development

4.3. Attitudes

Instilling a rational view on ethical, environmental and social issues related to agriculture, and improving personal qualities such as honesty and integrity should be an essential integral component of any study programme. The difficulty in assessing the attitudinal improvement is appreciated. However, it is desirable to enhance the following important attitudinal aspects through curricular activities.

a. ethical and rational conduct
b. adaptability to diverse social, cultural and work situations
c. honesty, loyalty and dependability
d. teamwork and cooperativeness
e. respecting views and opinions of others
d. punctuality and commitment to work
g. positive intent

To inculcate and improve above attitudes, either the curriculum can incorporate specific courses / activities such as Career Guidance, or incorporate appropriate learning activities into the technical and / or auxiliary courses.

4.4. Other Features of the Degree Programme

It is advantageous to design a curriculum for the Bachelor degree programmes in Agriculture to consist of both core and elective modules. The core module should cover the entire range of subject areas indicated in previous sections, and be made compulsory for all undergraduates in Agriculture to ensure imparting the desired vital aspects knowledge, skills and attitudes stipulated in this SBSA. In addition, the degree programmes should include advanced elective module/s to impart in-depth knowledge and skills in specified subject areas to be selected by students. Depending on the nature and specific objectives of the individual degree programme, and creativity of the professionals developing the curriculum, the variety and specific contents can vary within this framework.

In addition to the common structure and minimum number of credits suggested in section 1, all Bachelor degree programmes in Agriculture should adopt the common grading system and levels of Grade Point Average (GPA) approved by the UGC for the award of classes.

5. TEACHING AND LEARNING STRATEGIES

The teaching and learning strategies used should be carefully designed to be appropriate and effective in equipping students with the essential subject knowledge, skills and attitudes. The choice of strategies should be inspirational and challenging in nature, and foster deep learning and critical thinking in a progressive manner, transforming the students from dependent (teacher-centered) to independent (learner-centered) learners, and enabling resulting graduates to fit into

the profile described in 3.1. A balanced combination of the following teaching and learning methodologies and other appropriate technique/s may be used (this list is not intended to be prescriptive or exhaustive).

a. Lectures with audio visual aids (traditional / interactive)
b. Laboratory / Field practical demonstrations and exercises
c. Field visits / Educational excursions
d. Problem based learning / Experiential learning
e. Case studies / Self-directed studies / Research projects
f. Tutorials / Seminars / Discussions / Workshops
g. Internet / Web based / Computer-Assisted learning
h. Work experience at a monitored placement

6. ASSESSMENT STRATEGIES

Assessment strategies are essential components of a study programme in order to indicate to the teachers regarding the effectiveness of their teaching, and to the students about their progress. To be effective, the assessment strategies should be aligned with the teaching and learning strategies employed, and match the intended learning outcomes. They should evaluate the level of competencies acquired by students and collectively aim at producing a graduate with the profile as described in 3.1.

Ideally, a degree programme should employ a balanced combination of both formative and summative assessment methods in the courses / modules / programmes. The method/s of assessment adopted may vary among courses and programmes, but should be linked to clearly defined goals and anticipated learning outcomes.

Listed below are some assessment strategies that can be used. However, this list is not intended to be prescriptive or exhaustive, and hence any other appropriate assessment strategies may be used.

a. Closed / Open Book/ Written Examinations
b. Laboratory / Field Practical Examinations
c. Computer based / Web based Examinations
d. Reports / Dissertations
e. Spot Tests
f. Group / Peer Assessments
g. Seminar Presentations
h. Viva-voce Examinations

An aggregate index called Grade Point Average (GPA) will be used to rank the students and award of classes. It is calculated as the weighted average of the grade points obtained from different courses and the number of corresponding course units, using the following formula:

$GPA = \sum (G_i \, . \, C_i) / \sum (C_i)$

where, G_i = Grade Point of the i^{th} course

C_i = Number of Credit Units assigned to the i^{th} course

7. BENCHMARK STANDARDS

Every student who has successfully completed a Bachelor degree programme in Agriculture is expected to demonstrate the minimum level of knowledge, skills and attitudes that are specified in this statement. There will be differences in levels of attainment among students. This statement specifies the **Threshold performance** or the **minimum required level of performance to qualify for the award of a Bachelor degree in Agriculture**. Graduates in Agriculture with second class lower, upper and first class honours degree/s should demonstrate progressively deeper and broader level of knowledge and greater proficiency in skills than the threshold level.

With regard to subject specific knowledge and skills required to achieve the performance levels indicated below, the graduate should be able to:

Threshold (3rd Class)	**Typical (2nd Class)**	**Excellent (1st Class)**
recall show a reasonable knowledge on all essential concepts, facts and principles relevant to land preparation, establishment and management of crops and animals, soil and water management, production of crop- and animal- products, and processing and marketing of those commodities based on the taught programme ;	demonstrate a good knowledge of the all essential the concepts, facts and principles relevant to land preparation, establishment and management of crops and animals, soil and water management, production of crop- and animal- products, and processing and marketing of those commodities based on the taught programme;	demonstrate an excellent knowledge of the all essential the concepts, facts and principles relevant to land preparation, establishment and management of crops and animals, soil and water management, production of crop- and animal- products, and processing and marketing of those commodities based on the taught programme;
demonstrates reasonable subject related practical skills ;	demonstrates satisfactory subject related practical skills ;	demonstrates excellence in all subject related practical skills ;
apply this subject knowledge and practical skills to a range of common real life situations;	apply this subject knowledge and practical skills to a wide range of situations;	apply this knowledge and practical skills creatively to a wide range of situations;

recognize, select and use appropriate laboratory and field equipment; use equipment and technologies to address routinely encountered problems; describe and record in the field and laboratory; interpret practical results / given data with guidance; plan, conduct and present an independent investigation with reliance on guidance	recognize, select and use appropriate laboratory and field equipment competently and safely; use equipment and technologies to address and solve problems; describe clearly and record accurately in the field and laboratory; interpret practical results / given data in a logical manner; plan, conduct and present an independent investigation with limited reliance on guidance.	recognize, select and use appropriate laboratory and field equipment highly competently and safely; use equipment and technologies to address and solve problems efficiently; describe clearly and adequately, and record accurately in the field and laboratory; interpret practical results / given data in a logical and constructive manner; formulate a proposal, plan, conduct and present an independent investigation with limited reliance on guidance.

With regard to the Generic skills and Attitudes required to achieve the performance levels indicated below, the graduates should be able to:

Threshold (3rd Class)	**Typical (2nd Class)**	**Excellent (1st Class)**
solve numerical problems using computer based and non computer based techniques; communicate information to a variety of audiences in written, graphical and verbal forms; use computer packages for record keeping, statistical analyses and internet for self learning	solve numerical problems accurately using computer based and non computer based techniques; effectively communicate information to a variety of audiences in written, graphical and verbal forms; use computer packages for recordkeeping, statistical analyses, and internet for self learning and research	solve numerical problems accurately and efficiently using computer based and non computer based techniques; communicate information effectively and creatively to a variety of audiences in written, graphical and verbal forms; use computers efficiently for recordkeeping, statistical analyses and internet for self learning

and research with some guidance; contribute to teamwork and reflect on team performance; respect the views of others and appreciate the need for professional ethical conduct; recognize personal strengths and weaknesses, identify realistic targets for personal, career and academic development; demonstrate reasonable time management, lifelong learning and independent study skills; act with honesty and accept responsibility for own actions; adaptable to diverse situations and work under stress.	independently; identify realistic goals, organize and contribute to teamwork and reflect on team performance; respect the views of others and demonstrate a satisfactory professional ethical conduct; recognize personal strengths and weaknesses, identify realistic targets for personal, career and academic development and work towards them; demonstrate satisfactory time management, lifelong learning and independent study skills; act with positive intent and honesty, and accept responsibility for own actions; satisfactorily adaptable to diverse situations and able to work under stress.	and independent research; identify realistic goals, convince and motivate others, organize, lead and contribute to teamwork and reflect on team performance; respect the views of others and practice a highly professional ethical conduct; recognize personal strengths and weaknesses, identify realistic targets for personal, career and academic development and achieve them by strategically working towards them; demonstrate efficient time management, effective lifelong learning and creative independent study skills; act with positive intent, honesty and integrity and accept responsibility for own actions; highly adaptable to diverse situations and effectively work under stress.

8. BENCHMARK PANEL

Prof. E.R.K. Perera	Chair & Coordinator University of Peradeniya
Prof. Buddhi Marambe	(Dean / Faculty of Agric) University of Peradeniya
Prof. C. Sivayoganathan	University of Peradeniya
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Prof. R.T. Seresinha	University of Ruhuna
Prof. S. Subasinghe	University of Ruhuna
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Mr. P. Jeyakumar	Eastern University
Dr. M. Pagthinathan	Eastern University
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