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ARID AGRICULTURE UNIVERSITY
RAWALPINDI**



DEPARTMENT OF HORTICULTURE

Ph.D

Self Assessment Report

2010-12

Program Self Assessment Team

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CONTENTS

Introduction	03
Criterion-1: Program Mission, Objectives and outcomes	04
Criterion 2: Curriculum Design and Organization	29
Criterion 3: Laboratories and Computing Facilities	31
Criterion 4: Students Support and Guidance	33
Criterion 5: Process Control	34
Criterion 6: Faculty	38
Criterion 7: Institutional Facilities	39
Criterion 8: Institutional Support	41
TABLES	
Table-1: Program Objective Assessment	07
Table-2: Program Outcomes	09
Table-4: Quantitative assessment of the department	25
Table-5: Present performance measures for research activities	26
Table-7: Post graduate courses	28
Table-8: Courses outcome	29
Table-9: Standard 2-2 requirement (percentage of elements in courses)	30
Table-10: Faculty distribution by program area in Horticulture	41
Table-11: Enrolment in different programs from 2001-2010	42
Annexure	

Introduction

Horticulture offers the most lucrative potential for socio-economic development and keeping in view the importance of Horticulture the department started working with the establishment of the Barani Agricultural College in 1979. Courses for M.Sc. (Hons) in horticulture commenced in 1997 when college was upgraded to University of Arid Agriculture in 1994; and Ph.D. Program was initiated in 1999. The Department gained striking response from here onward. The eminent Horticulturists produced by this department have been contributing the nation in different capacities. The department is obligated to high standard teaching and advance research in the area of Horticulture.

To develop necessary skills in understanding of problems in horticultural sector the program of Horticulture is established. Its curriculum highlights the coming forth issues of economically important plant production aspects in Pakistan. Moreover, crop management has been given substantial importance in the curriculum. Additionally, new and modern techniques have been introduced to conduct superior research.

Regarding the latest development in the Horticulture sector, the department improve its curriculum on regular basis and has incorporated the emerging tools of molecular/tissue culture approaches. The department is committed to provide a variety of study programs such as Post-harvest Technology and Physiology, Crop Improvement, Vegetable Breeding, Biotechnology, Hydroponics/Soil less Culture Technology, Protected Cultivation Technology, Floricultural Crop Improvement, Landscape Horticulture and Certified Nursery Plant Production to enhance student's professional training skill and career opportunities. It holds national and international conferences, seminars and training program to exchange knowledge and views. The faculty is actively involved in a number of research projects; some of which are internationally collaborated and funded.

SECTION 1

Components of Self Assessment Process

This report has been prepared on the basis of criteria as guided by the Self- assessment manual.

Criterion-1: PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Introduction

This branch of agriculture deals with multiplication, production technology and crop improvement of horticultural crops (Fruits, Vegetables, House Plant and Flowers). Crop improvement has a great impact on economic, social and political values of agricultural society. More emphasis is given on qualitative and quantitative improvement of horticultural crops by using modern techniques of horticultural crop production. The introduction, evaluation, characterization, and development of horticultural crops are continuous processes of education and research both at graduate and post-graduate level; these involve the use of modern/advanced teaching methods and innovative analytical techniques to enhance the crop facilities and also to reduce the pollution hazards and develop a sustainable and substantially profitable production system for the farmers.

Standard 1-1: The program must have documented measurable objectives that support faculty / college and institution mission statement.

Mission Statement of the Department of Horticulture

The goal of the Department of Horticulture is to bestow quality education and research- oriented training, extension of agricultural knowledge for self-sufficiency in quality food and development of sustainable system for profitable production which can be environment friendly to make the future of Pakistan Prosperous.

Programme Objectives of the Department

1. Development of Horticulture structure on advance and innovative lines for teaching and research activities for the graduate and post-graduate students.
2. To contribute basic and applied high quality knowledge and skills in the field of horticulture applying highly advanced analytical techniques for crop management and improvement.
3. To lead students and conduct research on advanced scientific lines in the field of horticulture.
4. To strengthen the discipline with integration of knowledge and approach of related fields such as Breeding, Biotechnology, Hydroponics, Plant Physiology and Landscape Horticulture.
5. To counter new problems in Horticulture.
6. Training of the teaching faculty and students on the basis of technological lines.

Main Elements of Strategic Plan to Achieve Mission and Objectives

1. Developing of a teaching structure based on the experience and vision assembled from latest knowledge, proceedings, symposia etc to uplift the capabilities of the students.
2. Formatting and constantly updating the curricula involving core subjects, elective subjects, specialized areas, internship programs and study tours.
3. Setting up of well-equipped specialized research laboratories to facilitate the students.
4. Research oriented postgraduate thesis.
5. Publication of scientific papers, guide books/booklets, fact sheets and manuals etc.
6. Coordination with other research organizations, universities, agriculture ministry and foundations for research matters.
7. Coherent linkages with national and international research organizations and universities to improve the research level.

Expected Outcome

1. It will ameliorate the basic structure of the department standardizing at par with advanced developed countries of modern world.
2. The students' vision and in depth approach will be more extensive.
3. The students will get the quality education.
4. The incorporated knowledge of allied fields will help to develop the confidence of students, consequently crop productions will increase.
5. The smooth, dynamic and problem; free progress will continue in the area of horticulture.
6. The quality, confident and well equipped human resource development will be achieved in the field of horticulture.

Table-1: Programme objective assessment

	Objective	How Measured	When Measured	Improvement Identified	Improvement made
1	Development of Horticulture structure on advance and innovative lines for teaching and research activities for the PhD students.	On the basis of recognition of Horticultural crops in the area and determining their impact	The process is in progress on required basis	Facilities provided for teaching are not sufficient	Some steps have been taken to improve the teaching method
2	To contribute basic and applied high quality knowledge and skills in the field of horticulture applying highly advanced analytical techniques for crop management and improvement.	Back ground information and status of knowledge of students through entry tests and student feed back	At the time of admission or semester	Some courses are to added and the existing required to be revised in the curriculum	Curriculum changes have been made on required basis
3	To lead students and conduct research on advanced scientific lines in the field of	Evaluating the students demands and taking their feedback for the betterment	Before start up projects	Students to participate in the class, assignments and report preparation	Improvement is still going on

	horticulture.				
4	To strengthen the discipline with integration of knowledge and approach of related fields such as Breeding, Biotechnology, Hydroponics, Plant Physiology and Landscape Horticulture.	Through entry tests, interviews research own interest	Subject / courses attachment before start	The relevant subjects are emphasize and recommended in the study programs	Enhancement of knowledge and vision
5	To counter new problems in Horticulture.	Through discussion, consultation and practical implementation with the farmers for better interaction	Regular activity	New courses to be included in curriculum, research on new problem	Recommendation of new curriculum is suggested
6	Training of the teaching faculty and students on the basis of technological lines.	Through training courses in and outside the country	Regular activity	Finding the problem-oriented and solution oriented research along with new teaching	Improved better then before and continued

				methodology	
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Standard 1-2: The program must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

PROGRAM OUTCOMES

The program outcomes are tabulated in the following Table 2. Each program aligned in the table with each objective

Table-2: Program Vs Outcomes

Program Objectives	Program Outcomes					
	1	2	3	4	5	6
1	XX	XXX	X	XX	XXX	XXX
2	XX	XX	X	XXX	XX	X
3	XX	XX	XX	XX	XX	XXX
4	X	X	XX	XX	XX	XX
5	XX	XXX	XXX	XX	XXX	XXX
6	X	XX	X	X	XX	XXX

X:- Relevant
 XX:- Relevant and Satisfactory
 XXX:- Very Relevant and Very Satisfactory

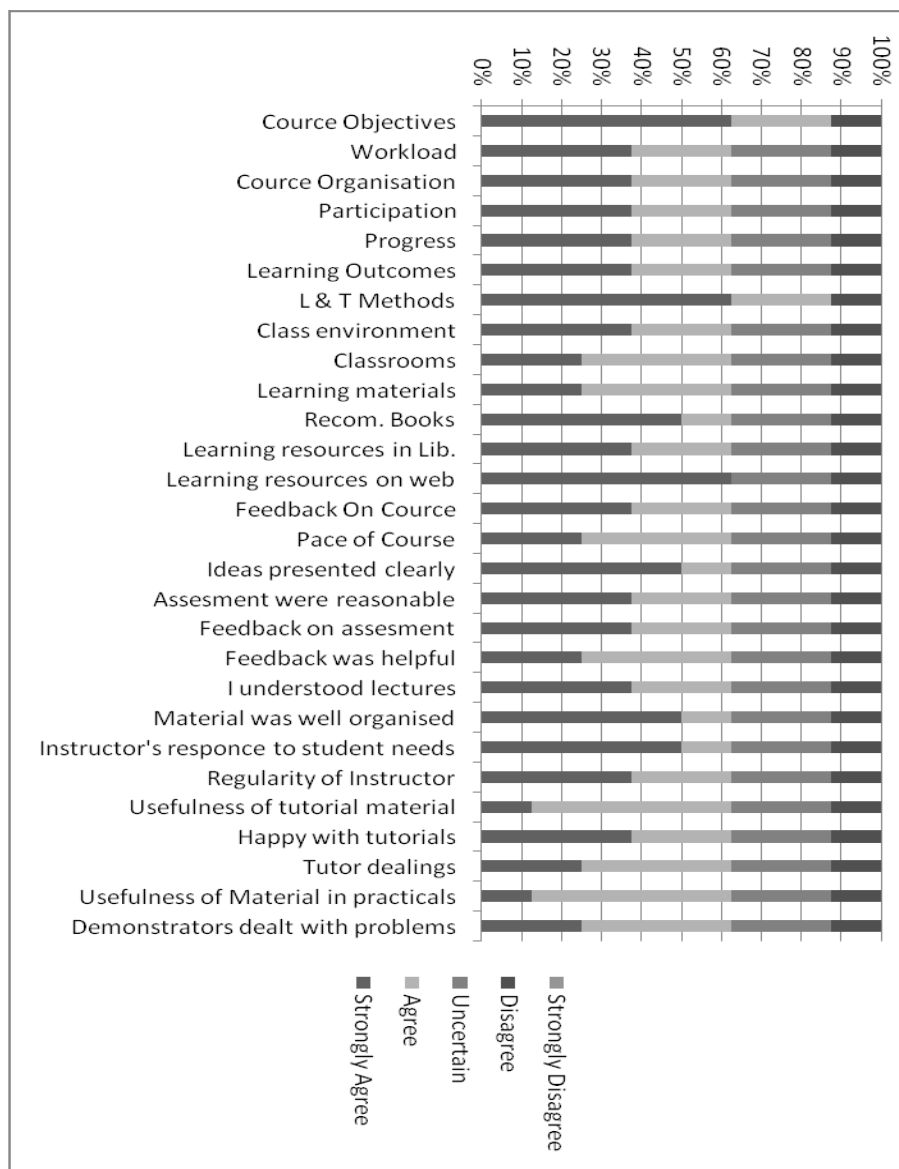
Meeting Standards 1-2: Program Outcome Measurement

A number of surveys based on the QAC questionnaires were initiated to assess the programme outcomes/graduates of the Department.

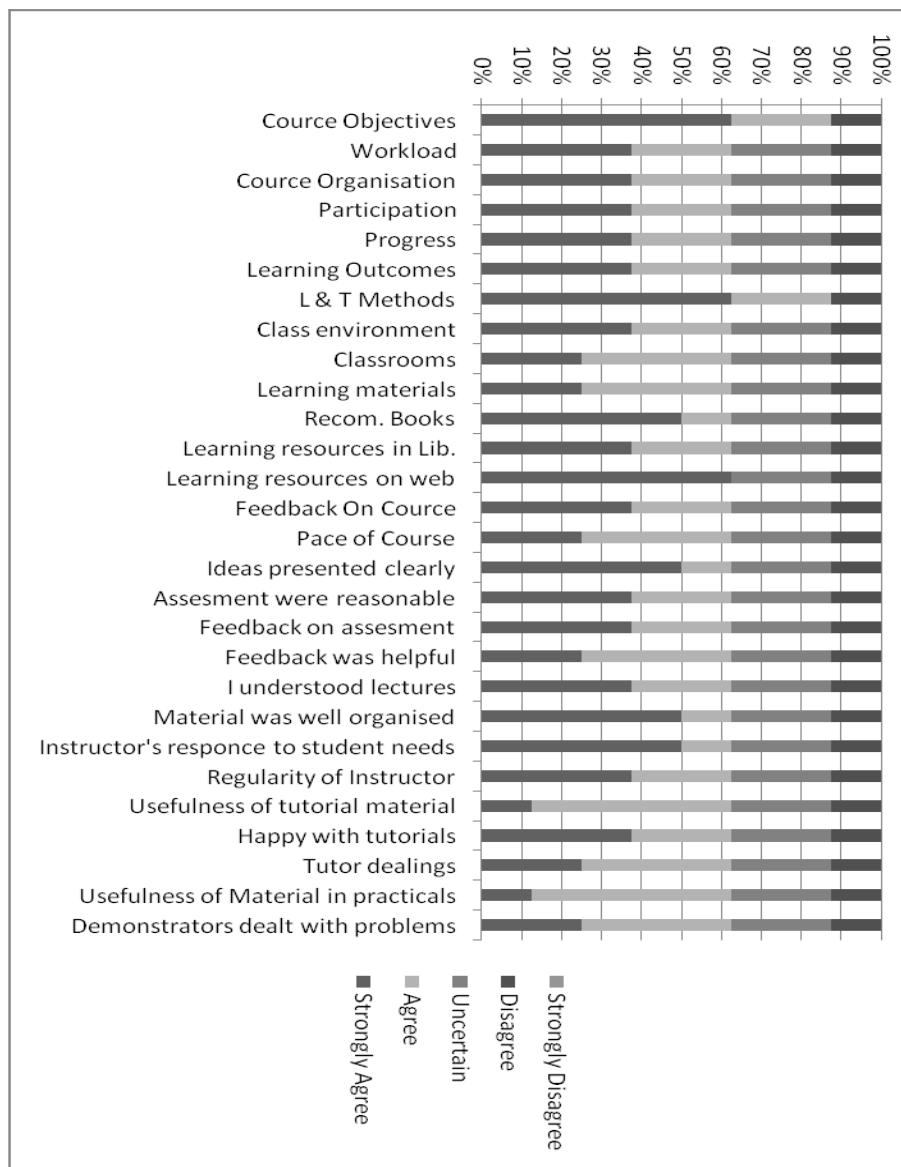
Proforma 1: Students Course Evaluation Questionnaire

HORT 701 ROOTSTOCK FOR HORTICULTURAL CROPS 3(2 -2)

About 60% students strongly agreed to the questions asked regarding course objectives, L&T methods, learning resources, ideas presented clearly etc of the course in proforma 1. However, 35% students agreed to the questions related coarse organization, participation, progress, learning outcomes, class rooms, learning materials etc. Small proportion of students was uncertain and/or disagreed to the various aspects inquired in the proforma.



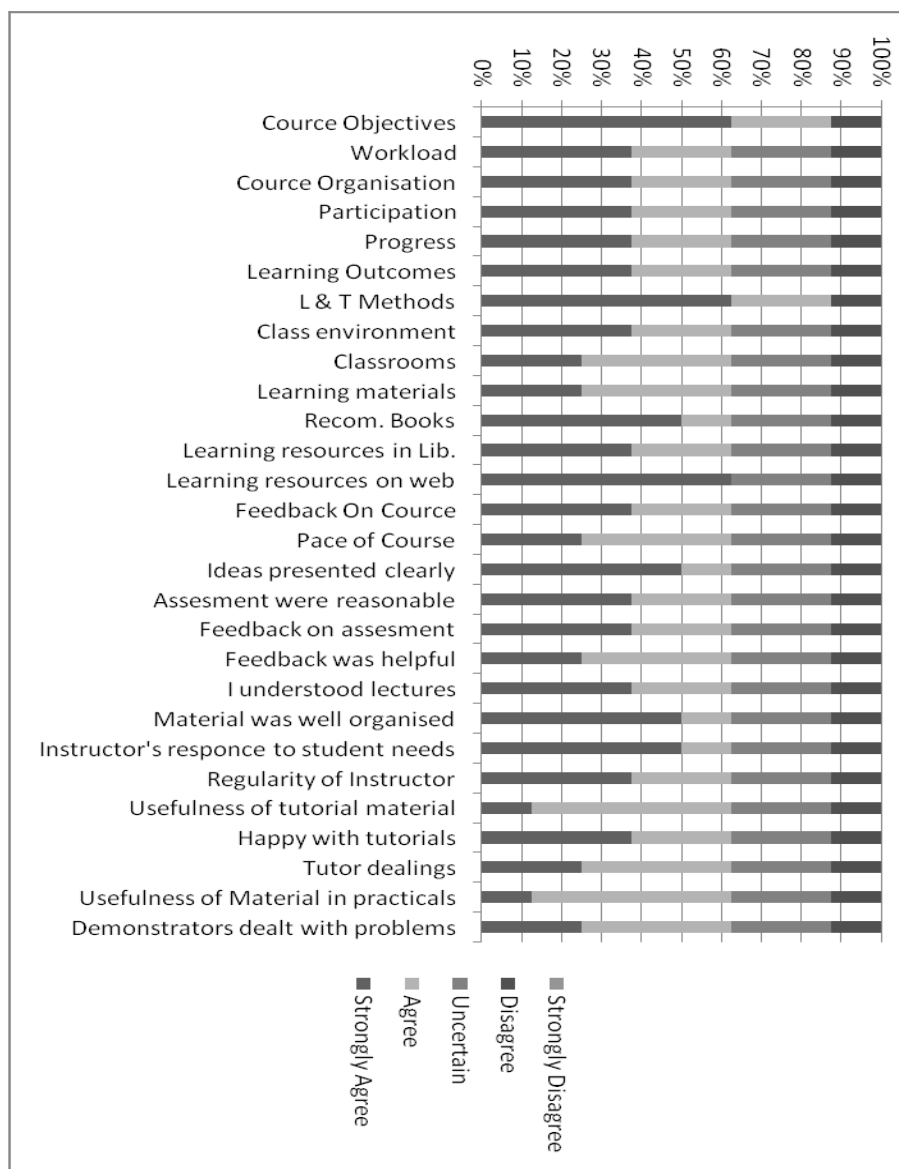
Graph depicted that about 30% students strongly agreed to the questions asked regarding work load, course organization, progress, and class environment in proforma 1. And 60%% students agreed to the questions related coarse objectives, L&T methods, learning resources etc. However, a small proportion of students was uncertain and/or disagreed to the various aspects inquired in the proforma.



HORT -703 ADVANCED FRUIT PRODUCTION

3(2 -2)

Graph for the performa 1 revealed that more than 60% students strongly agreed to the questions asked regarding course objectives, L&T methods, learning resources, ideas presented clearly etc. However, 35% students agreed to the questions related work load, coarse organization, progress, class rooms, learning materials etc. Whereas a small number of students was uncertain and/or disagreed to the various aspects inquired in the proforma.



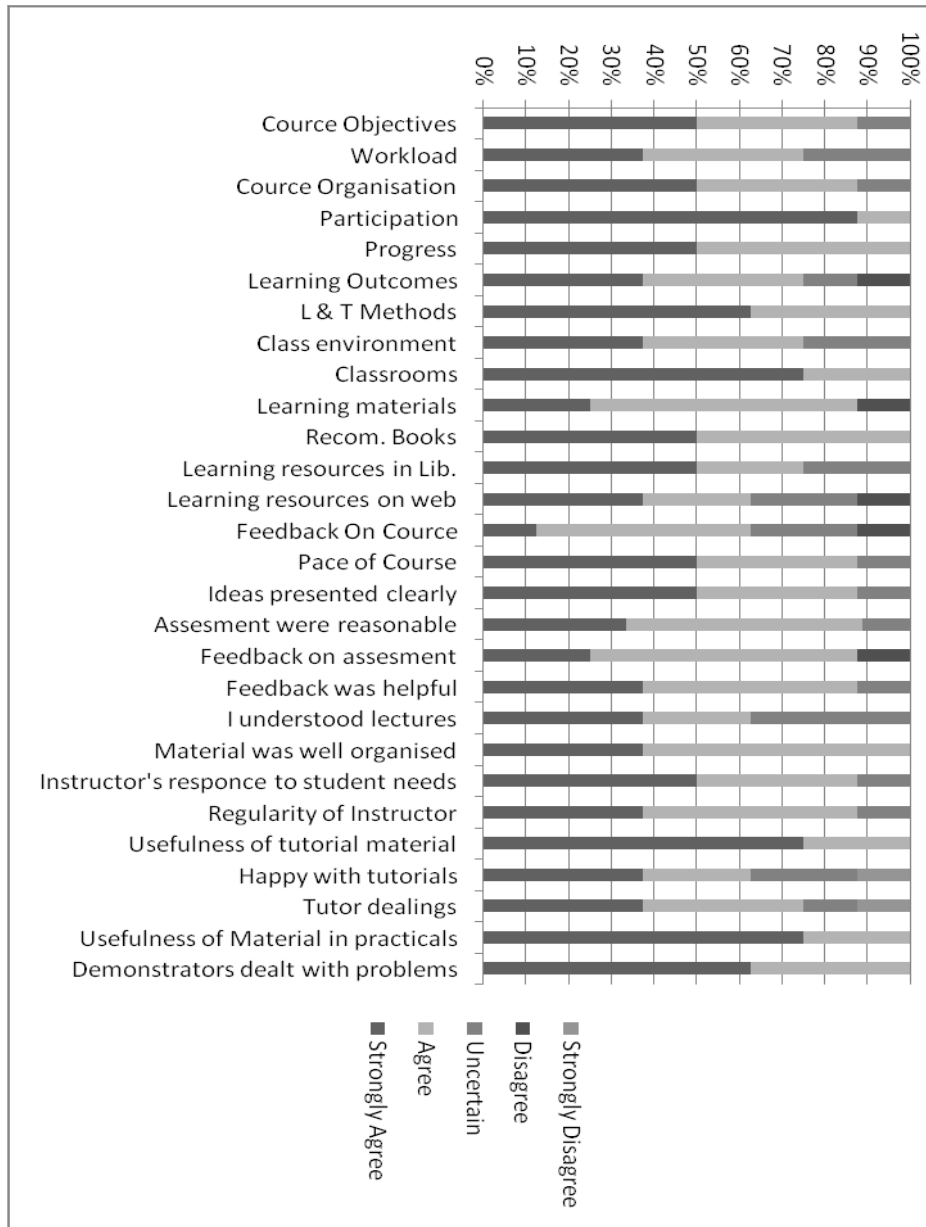
A perusal of the graphic analysis showed that about 35% students strongly agreed to the questions asked regarding course organization and L&T methods etc. of the course in proforma 1. However, some students showed agreement to work load, class room environment etc. while others were uncertain to the various aspects inquired in the proforma.



HORT -705 BREEDING OF HORTICULTURAL PLANTS

3(2 -2)

A perusal of the graphic analysis showed that 50% students strongly agreed to the questions asked regarding course objectives, course organization, pace of course and ideas presented etc. of the course in proforma 1. However, less than 10% of the students disagreed and were uncertain to the various aspects inquired in the proforma.

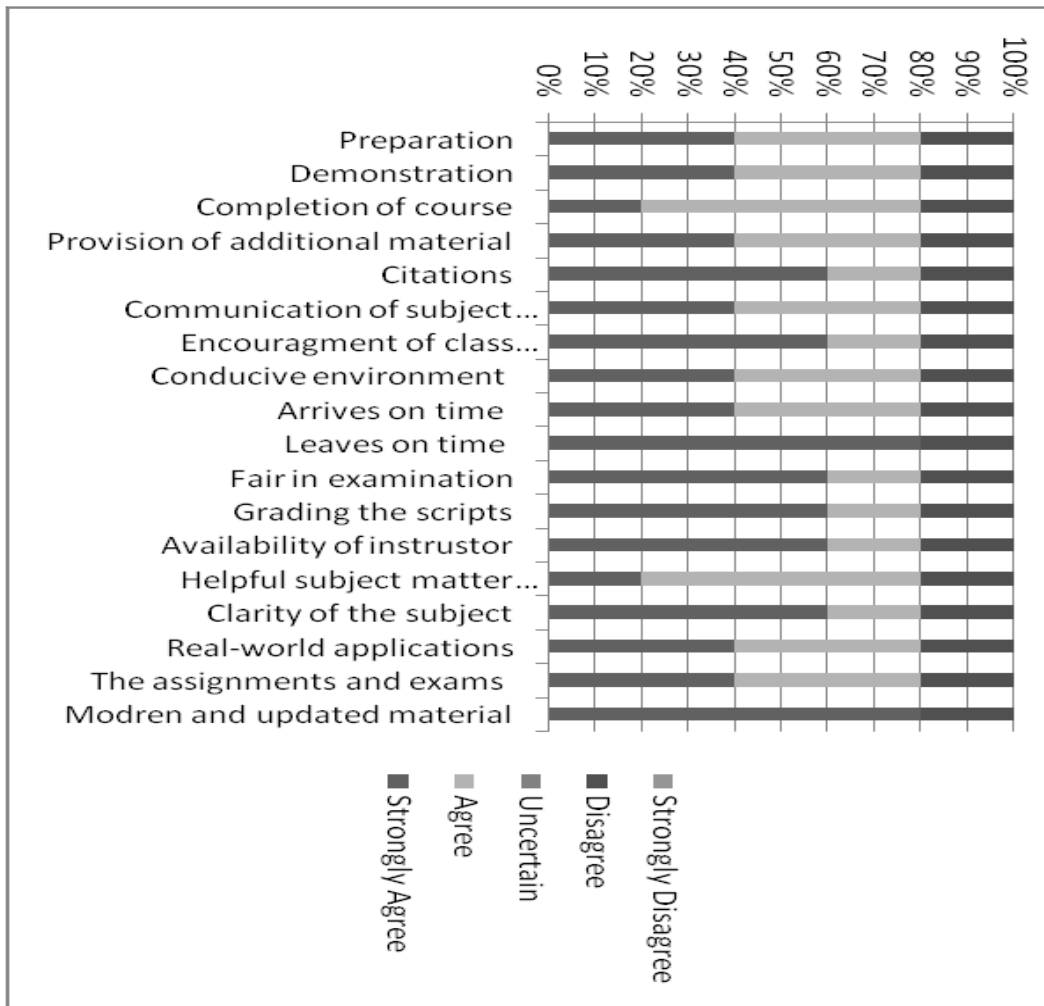


Proforma 10

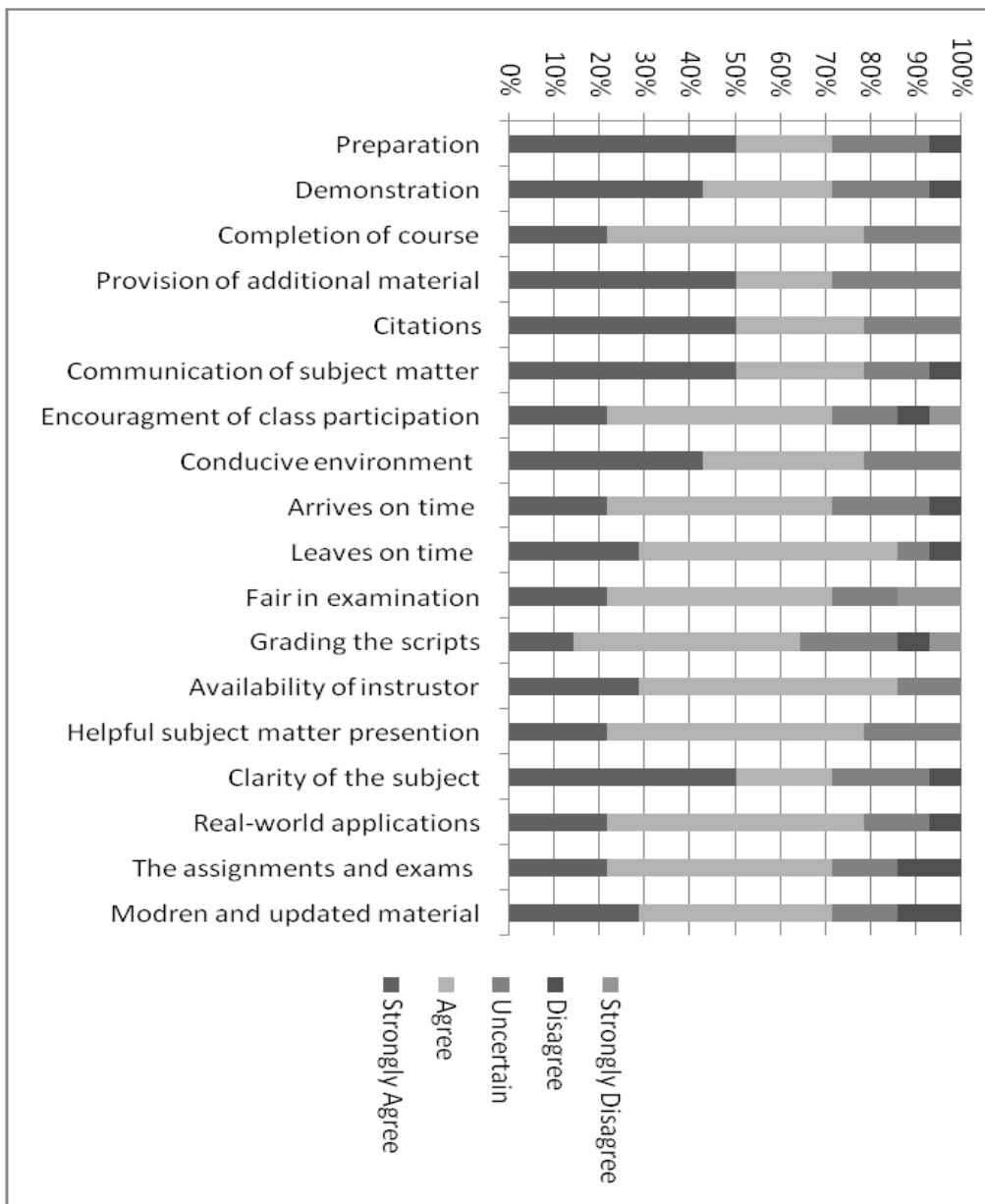
HORT -706 LANDSCAPE HORTICULTURE

3(2 -2)

A perusal of the graphic analysis showed that about 50% students strongly agreed to the questions asked regarding citation, encouragement of class, fair in examination, grading in scripts, availability of instructor etc. of the course in proforma 10. However, around 40% students showed agreement with preparation, demonstration, additional materials, assignments etc. while others were uncertain to the various aspects inquired in the proforma.

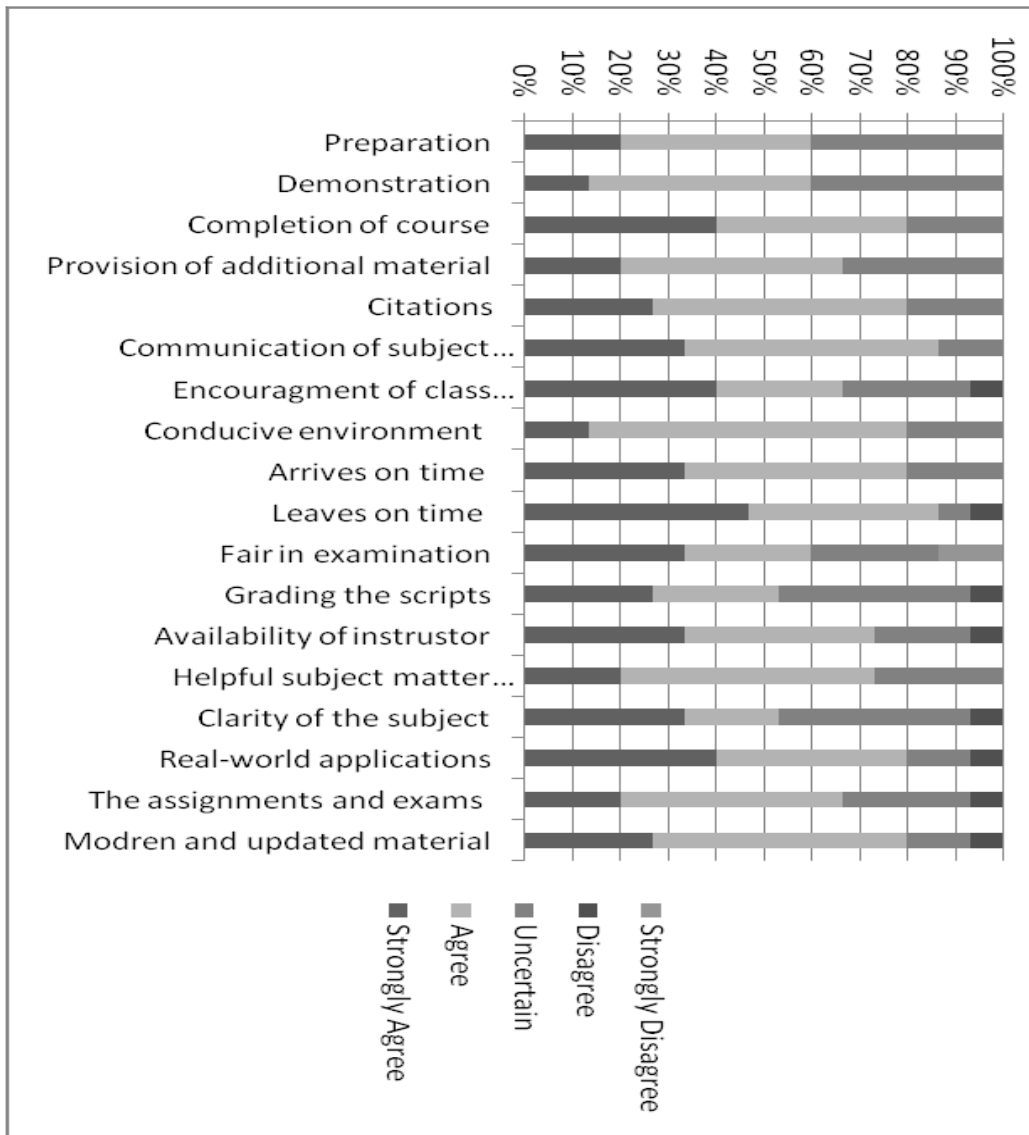


Graphic analysis of Performa 10 revealed that about 50% students strongly agreed to the questions asked regarding preparation, provision of additional materials, citation, communication of additional materials and clarity of subject and 40% agreed to aspects like demonstration and conducive environment. However, less than 15% students disagreed and were uncertain to the various aspects inquired in the proforma.



HORT -708 PROPAGATION OF HORTICULTURAL PLANTS 3(2 -2)

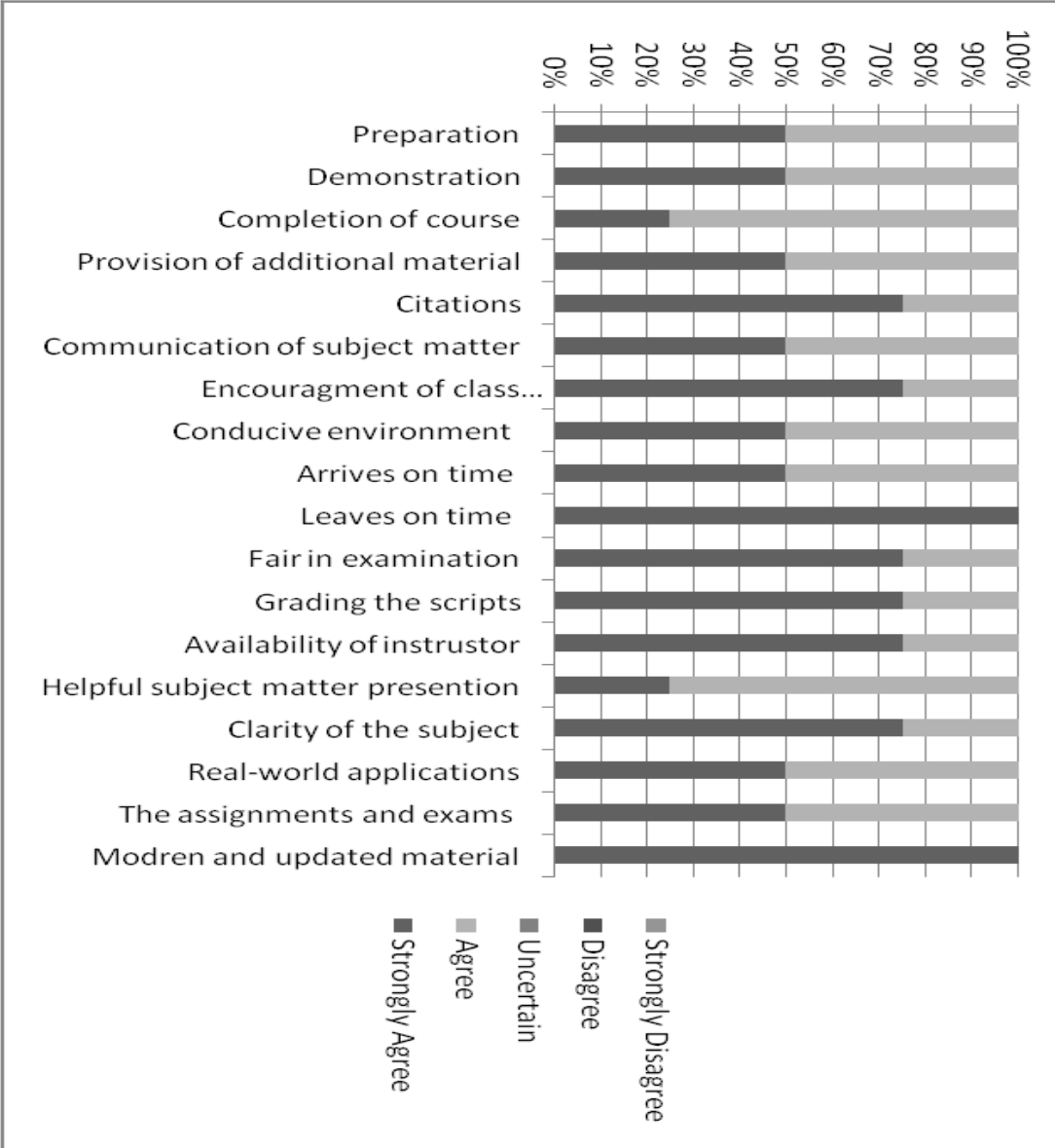
A perusal of the graphic analysis showed that about 40% students strongly agreed to the questions asked regarding completion of course, encouragement of class, fair in examination, availability of instructor etc. of the course in proforma 10. However, less than 20% students disagreed and were uncertain to the various aspects inquired in the proforma.



HORT -709 PLANT GROWTH REGULATORS

3(2 -2)

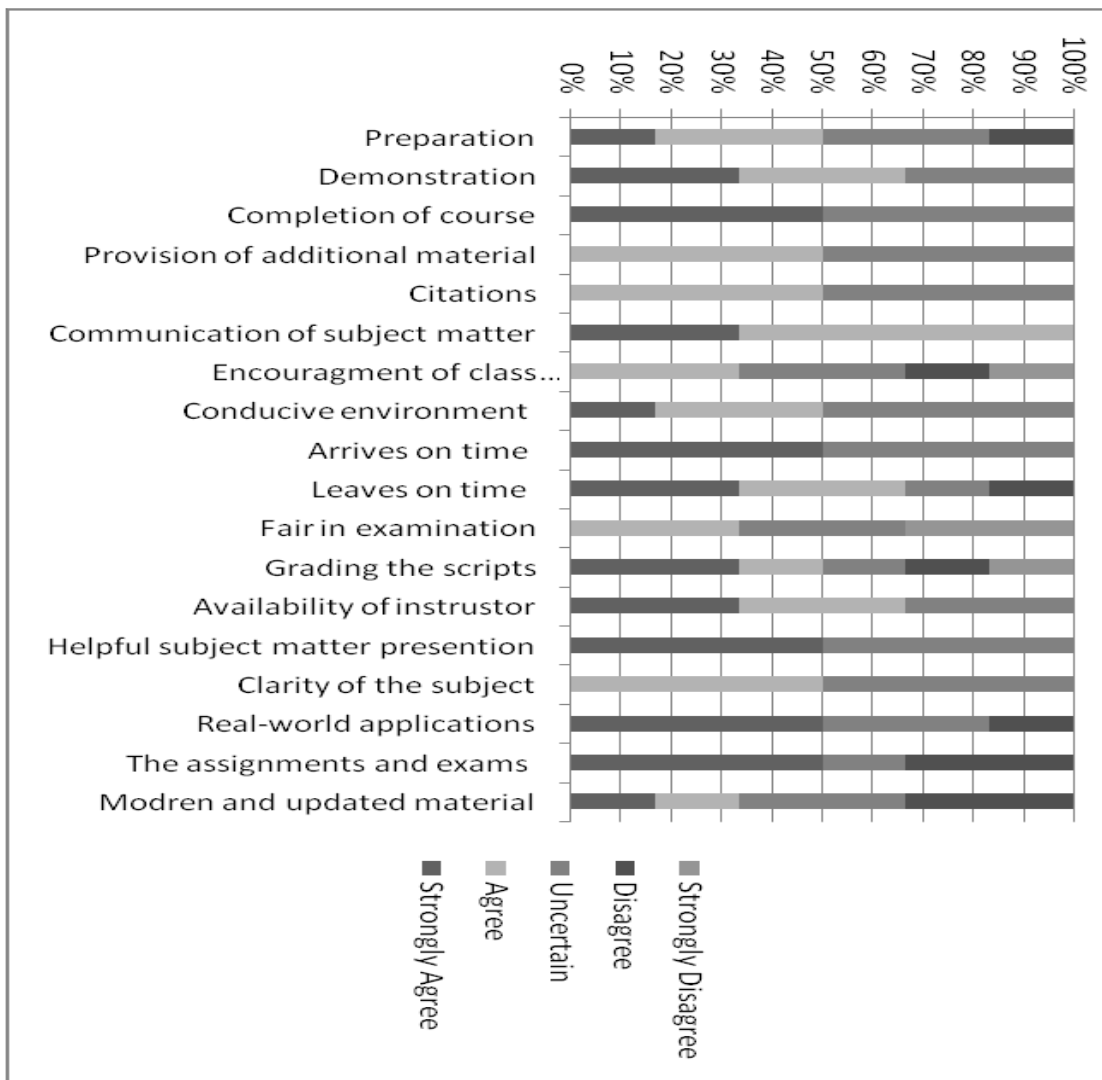
A perusal of the graphic analysis showed that about 70% students strongly agreed to the questions asked regarding citation, encouragement of class, fair in examination, grading scripts, availability of instructor and clarity of subject of the course in proforma 10. However, other students disagreed and were uncertain to the various aspects inquired in the proforma.



HORT -710 PLANT TISSUE CULTURE

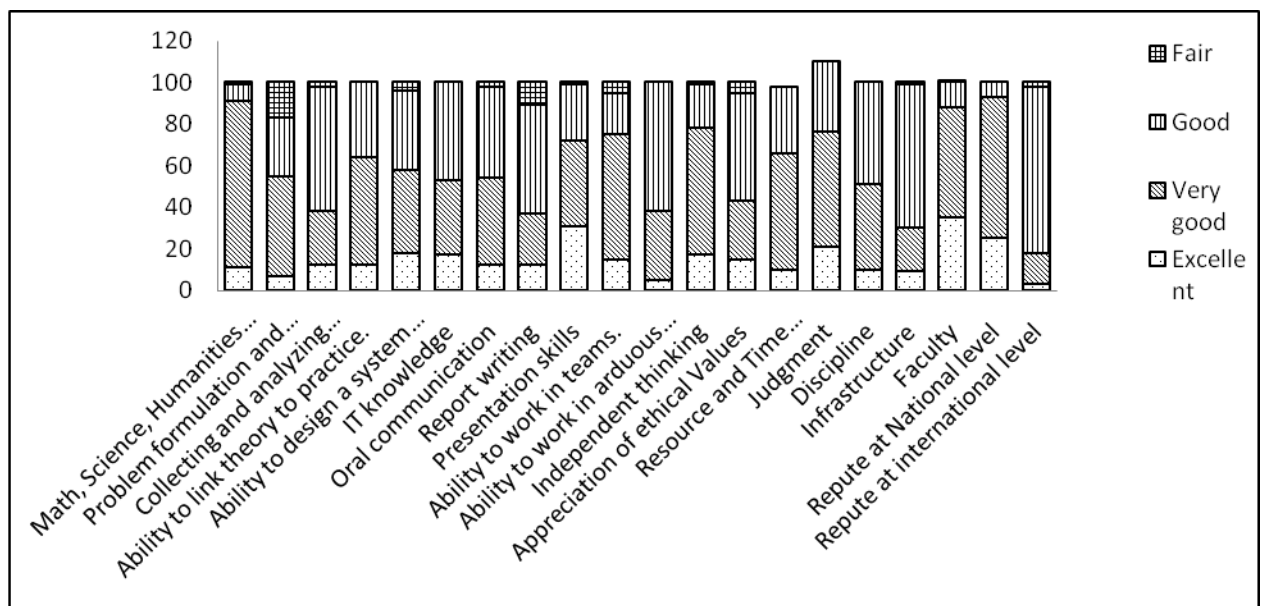
3(1-4)

A perusal of the graphic analysis showed that about 50% students strongly agreed to the questions asked regarding completion of course, arrives on time, subject matter presentation, assignment and exams of the course. However, response to other questions was variable.



Proforma7: Alumni Survey

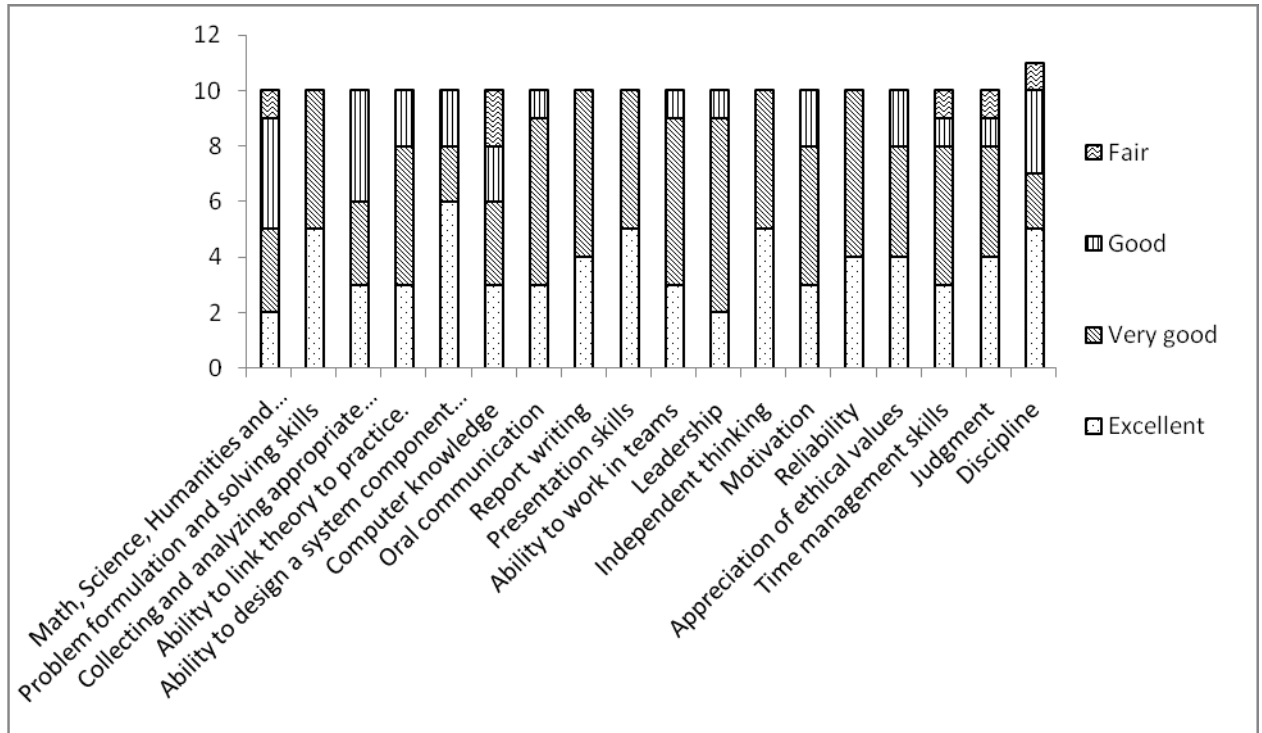
The purpose of this survey was to obtain alumni input on the quality of education and research they received and the level of preparation they had at University. A total of 7 alumni were surveyed. The data showed that the alumni reported 53% excellent, 23% very good, 16% good, 6% fair and 2% poor knowledge of Math, Science, Humanities and professional discipline. For other parameters, most of the Alumni reported excellent regarding department trained them excellently to formulate and solve problems and collect and analyze data, IT knowledge, training of oral communication, report writing and presentation skills, excellent interpersonal skills such as team work, working in challenging conditions and independent thinking, learnt excellent management of resource and time, learnt excellent power of judgment, department has excellent infrastructure and repute.



Proforma 8: Employer Survey

The purpose of this survey is to obtain employers input on the quality of education, the department is providing and to assess the quality of the academic program. The survey included University graduates employed in different organizations. A total of 8 employers provided the data. The generated data showed the report of the employers about the Math, Science, Humanities and professional discipline was as 51% excellent, 27% very good, 16% good, 6% fair

and 0% poor. Most of the employers reported excellent performance of the candidates regarding different aspects of the professional like power of problem formulation and solving skills, and have great ability of oral communication and are reliable and ethically sound. Employers showed a little concern about computer skills of the candidate.



Standard 1-3: The results of program’s assessment and the extent to which they are used to improve the program must be documented

Skills and capabilities reflected in performance as Horticulturist

Special importance has been given on the practical work in the profession of horticulture to build confidence and communication skills effectively in writing, oral and demonstration to use modern tools and techniques for their profession. Efforts also have been made to explicate and design the experiments/project and to work effectively in a team, to manage a crop problem and assimilate ability to recognize future needs.

Major future improvement plans

- An essential and distinguishing attribute of horticulture education through audio visual aids and modern tools along with provision of latest literature, journals, books, reviews and access to internet.

- Flourishing the facilities for horticulture crop improvement, hydroponics setup, germplasm units and develop extension material.
- To increase former know-how through publishing material and advisory services
- To improve the post-graduate laboratories (Post- harvest physiology, Plant Tissue culture, Horticulture Laboratory) by introducing and sophisticated equipments and tools.
- Human Resource development in Horticulture for future challenges.
- To conduct research on specific horticultural issues prevailing in arid zone.
- To train & equip the teaching staff through widen skill spectrum of horticulture in and out side Pakistan.

Strength and weaknesses of the department

Strength

The main strength of the department is the availability of highly qualified teachers including (9 Ph.Ds), with good experience of their respective subjects, having vast knowledge of horticultural production and management systems and associated problems. Faculty members have local as well as foreign degrees (USA, UK, Turkey, China etc) and are experts in their area of specialization. Four faculty members got postdoctoral research experience from Australia, Italy and UK and China. Many faculty members have national research projects and are highly conscious of the problems to be taken by the post-graduate students. A professor, 2 Associate Professor, 3 Assistant Professor & 4 Lecturers specialized in their subjects are currently engaged in their academic and research activities.

Weaknesses

Advanced teaching and research is being handicapped due to lack of important equipments as hydroponics system including a fully equipped and the set of automated greenhouses and cold storage facilities for post-graduate students. To introduce the most economical protected horticulture, there is a dire need to establish the chain of greenhouse based on the Chinese energy saving technology (in progress). For the research to solve the problems in the area of post- harvest there is need for

controlled atmosphere storage and multi-temperature storage chambers. In case of biotechnology, there is need for vector construction, electroporation and gene transformation equipment. Additionally, to ensure the production of pathogen-free plant material, a complete system of ELISA and other diagnostic kits for detection and determination of plant pathogens. Areas for seed production of vegetables and ornamentals are not available. Lecture rooms, post-graduate laboratories and survey / offices for faculty members are also lacking. A landscape studio is indispensable to couple up the present needs of landscape horticulture. There is a need to have a computer with efficient internet access for every faculty member

Standard 1-4: The department must assess its overall performance periodically using quantifiable measures.

Present students' enrolment

In the past, the enrolment was significantly less compared with the present status. The new trend is that the applicants give high preference to opt the horticulture as a major subject in the agriculture faculty as illustrated in the following table:

Table-3: Quantitative assessment of the department (last three years)

Particular	No.	Remarks
Ph.D.	18	In employment
Post-Doc fellowship	5	UK, Australia, Italy
Students: Faculty rates	5:1	
Average grade point	3	Fulfils HEC criteria

The evaluation process pointed high efficiency of system and satisfactory impact of outcomes. Almost all the graduate and post graduates got jobs in various organizations (provincial department, universities, research organizations, banks and private firms).

Performance for research activities

The faculty staff of Horticulture department is awfully engaged in teaching and research activities, consequently the findings are being published in reputed national and international journals along with the presentation of the findings of problem-oriented and solution-oriented research outcomes at different national and international forums. The following table shows some laudable performance in the form of publication:

Table- 4: Performance for research activities

Faculty	Journal Publications (National & International)	Conference Publications (Proceedings/ Abstract)	Projects
Dr. Nadeem Akhtar Abbasi	22	--	2
Dr. Ishfaq Ahmad Hafiz	15	--	3
Dr. Khalid Mahmood	4	1	-
Ms. Mehwish Yaseen	2	3	1
Ms. Qurat-ul-Ain Farooq	--	--	--
Mr. Umer Habib	2	2	-

The staff is well trained in horticultural crop production, post-harvest technology, biotechnology, protected cultivation, vegetable breeding, hydroponics/soilless crop production, floriculture, landscape horticulture, and many other specialized fields in horticulture.

Community services

- Holding of national and international conferences/workshops and training programme on horticulture for students, teachers and farming community
- Advisory services to the farmers, especially for Pothohar region.
- Knowledge dissemination for the promotion of greenhouse and tunnel technology in arid region.
- To guide the education institutes for improved landscaping.
- Guidance and supervision of students and interested people for the promotion of horticulture.
- Coordination and participation in different horticultural competitions (e.g. fruit, flower and vegetable shows).
- Supervision of students on internship in various organizations.

Departmental administrative services for faculty and students

- To achieve the task assigned by the competent authority.

- The department maintains a ratio of 4:1 for the academic (technical) and administrative non-technical staff which fulfils this standard set by the HEC.
- Administrative meetings (departmental, university, academic council, and syndicate) are attended as and when required. Generally two meetings of academic council are held per month. Board of studies of the department meets quarterly.
- Sharing the role in publishing the university magazine.
- Quick office disposal; no complaint pertaining to delay has ever received from authorities.
- Proper records of individuals' students, their theses etc. are maintained.

Ph.D.

The duration of course of the degree of Doctor of Philosophy in full residence is not less than six semesters and not more than ten semesters.

Pre-requisites

A candidate seeking admission to the Course must have passed the Master Degree with CGPA of 3.00. Merit for post graduate program is determined as per the following formula

Matric	10%
Intermediate	15%
B.Sc. (Hons)	35%
Entry test	40%

Degree requirements

The program contents meet the program objectives as highlighted and provided by the Higher Education Commission.

Minimum 18 credits of course work is compulsory; out of which 9 credits are of core/compulsory courses. Course work following a synopsis defense seminar, comprehensive exam and submission of thesis to be approved by the University and examined by two foreign internationally recognized scientists from the university of technically advanced countries.

Table-5: Post graduate courses (M. Sc. (Hons) / Ph. D. Horticulture)

Course No.	Course Title	Credit Hours
Hort-701	Rootstock for Horticultural Crops	3(2-2)
Hort-702	Physiology of Horticultural Crops	3(2-2)
Hort-703	Advance Fruit Production	3(2-2)
Hort-704	Advance Vegetable Production	3(2-2)
Hort-705	Breeding of Horticultural Plants	3(2-2)
Hort-706	Landscape Horticulture	3(2-2)
Hort-707	Nutrition of Horticultural Crops	3(2-2)
Hort-708	Propagation of Horticultural Plants	3(2-2)
Hort-709	Plant Growth Regulator	3(3-0)
Hort-710	Plant Tissue Culture	3(1-4)
Hort-711	Advance Ornamental Plant Production	3(2-2)
Hort-712	Post Harvest Physiology of Horticultural Crops	3(2-2)
Hort-713	Environmental Horticulture	3(2-2)
Hort-714	New Trends in Horticulture	2(2-0)
Hort-719	Special Problem	1(1-0)
Hort-720	Seminar	1(1-0)

Criterion 2: Curriculum Design and Organization

Standard 2-1: The curriculum must be consistent and supports the program's documented objectives.

The assessment of curriculum given in the following table and the courses are cross tabulated according to the program outcomes.

Table-6: Courses vs programme outcomes

Course/ Groups of Course	Outcomes					
	1	2	3	4	5	6
Hort-712, Hort-719, Hort-720	XX	XXX	XXX	XX	X	XXX
Hort-701	XX	XXX	XX	XX	X	XX
Hort-702	XXX	XX	XX	XX	XXX	XXX
Hort-703	XX	XX	XX	XXX	XXX	XXX
Hort-704	XXX	XX	XXX	XX	XXX	XXX
Hort-705	XX	X	XX	X	X	XXX
Hort-706	XXX	XXX	XX	XX	XX	XX
Hort-710	XX	XX	XX	XX	X	XX
Hort-711	XX	XXX	XX	XX	X	XX

X: relevant

XX: relevant and satisfactory

XXX: very relevant and satisfactory

- The curriculum fits very well and satisfies the core requirements for the program, as specified the respective accreditation body.
- The curriculum satisfied the general arts and professional and other discipline required for the program according to demands and requirements set by HEC.

Standard 2-2: Theoretical background, problem analysis and solution design must be stressed within the problem core material.

The meeting standard of this clause is tabulated in the following:

Table-7: Standard 2-2 requirement (percentage of elements in courses)

Elements	Courses
Theoretical backgrounds	Hort-702, Hort-712, Hort-705 , Hort-713, Hort-703, Hort-701, Hort-706
Problem analysis	Hort-704, Hort-710, Hort-711
Solution design	Hort-719, Hort-720

Standard 2-3 to standard 2-5

The above cited standards have already been justified in table 8.

Standard 2-6: Information Technology Component of the Curriculum must be developed and applied in the Program.

While the curriculum was prepared, all aspects of information technology were considered and after a critical analysis, relevant aspects were integrated into the program as:

- Computer and I.T. courses (3 credit hours) have been integrated in the curriculum of M.Sc (Hons) and Ph.D. students which fulfill the requirements for equipping the students with I.T knowledge.

Standard 2-7: Oral and written communication skills of the student must be developed and applied in the program.

- Two seminars having one credit hours each are compulsory at the Post-graduate level.
- Assignments are given to M.S.c (Hons) & Ph.D. students on specific titles (part of the course) which are presented orally and are submitted as written report, to increase their oral and written communication skills.

Criterion 3: LABORATORIES AND COMPUTING FACILITIES

There are four laboratories in the department. The facilities and shortcomings of these laboratories are listed as under.

- Laboratory Title:
 1. Tissue Culture Laboratory I,
 2. Tissue Culture Laboratory II
 3. Horticulture Analytical Laboratory
 4. Horticulture Analytical Post harvest laboratory.
- Location and Area: Faculty of Agriculture and Food Sciences, A-Block, 1st Floor, Main Campus and Ground Floor
- Objectives: Laboratories are used for: Practical exercise and demonstrations to graduate students in their introductory and major courses. Research work for the post-graduate students.
- Shortcoming: *The number of labs is not sufficient.* The standard requirements in view of operation and quality, available resources and expansion programs are vitally required. Major apparatus viz. equipment: along with necessary chemicals are also needed.
- Safety Regulations: Safety measures are not available against fire (Extinguishers), minor hazards and accidents, injuries (First Aid Kit). However, the University maintains a Medical Dispensary for such incidents

where the required apparatus is insufficient.

Standard 3-1: Laboratory Manuals/ documentation/instructions experiments must be available and readily accessible to faculty and students.

Laboratory manuals (tissue culture lab, horticulture manuals etc) are available. The department library has the collection of books but still a number of books are required.

Standard 3-2: There must be adequate support personnel for instruction and maintaining laboratories

There is shortage of laboratory assistants and laboratory attendants and are direly needed to maintain laboratory, equipment, glassware, chemicals, material etc.

Standard 3-3: The University computing infrastructure and facilities must adequate to support program's objectives.

- **Computing facilities support:** Not available to all post graduate students.
- **Shortcoming in computing infrastructure:** Computers with internet facilities should be available to all postgraduate students on individual basis.
- **Safety Arrangements:** There are no proper safety arrangements and no security plan is available in case of emergency. The department is located on the 2nd floor; there are no emergency exits for the labs. No fire extinguishers have been installed in any laboratory or in the offices. No first aid kits/facilities provided in the laboratories/department.

Criterion 4: STUDENT SUPPORT AND ADVISING

Our University organizes support programs for students and provide information regarding admission, scholarship schemes etc. Department in its own capacity arranges orientation and guided tours of the department. Director Students Affairs is also there and arranges various cultural and social activities and solves the students' problems. However currently there is no Parent/Teacher association.

Standard 4-1: Courses must be offered with sufficient frequency and number for students to complete the program in a timely manner.

- Courses are taught as per criteria of HEC and scheme of study provided by the HEC and approved by Academic Council. Postgraduate level courses are however offered according to the availability of the teacher and number of students.
- Elective courses are offered as per policy of HEC and the University.
- For post graduate programs, a variety of courses is offered according to demand of the profession.

Standard 4-2: Courses in the major area of study must be structured to ensure effective interaction between students, faculty and teaching assistants.

To ensure effective interaction and understanding between students, faculty and teaching assistants, at the time of course formulation both theoretical and field/practical aspects are focalized. Theoretical problems are explained and assignments are also given to the students whereas practical are carried out in the labs and filed. Field visits and study tours to various research organizations are also organized to keep them update on the latest developments in the area and to stimulate them for discussion through teacher/student interaction.

- Courses are developed and decided in the board of studies meeting.
- At the commencement of the semester, faculty members interact frequently among themselves and with students. Students are welcome to ask question in class and even after the class.
- Emphasis is always given for an effective interaction between classes.

Standard 4-3: Guidance on how to complete the program must be available to all students and access to academic advising must be available to make course decisions and career choices.

Several steps have been taken to provide students guidance such as:

- Students are informed about the program requirement through the office of the head of the department.
- Through the personal communication of the teachers with the students.
- Monthly meetings are organized by the head of the department for counseling of the students. In addition, students can also contact with the relevant teachers whenever they face any problem.
- It is necessary for the students to participate in the monthly meeting.
- In case of some problem Director Student Affairs appointed by the university, helps the students. Tutorial System in all departments has been efficiently working. Two period on Thursday are reserved for students for extracurricular activities. However, there is no such counseling Cell in the department.
- Student can interact with the teachers/scientist in universities or research organization whenever they needed and there is an open option for the students to get the membership in the professional societies like National Rose Society Islamabad, Horticultural Society of Pakistan, National Horticulture Society, Pakistan Horticulture Society, Pakistan Botanical Society and other relevant professional societies.
- Realizing the need for exploring job opportunities for the university graduates, Directorate of Placement Bureau has been established.

Criterion 5: PROCESS CONTROL

It includes student admission, students' registration, faculty recruitment activities, which are dealt by various statutory bodies and the university administration.

Standard 5-1: The process by which students are admitted to the program must be based on quantitative and qualitative criteria and clearly documented. This process must be periodically evaluated to ensure that it is meeting its objectives.

- The process of admission is well established and followed as per rules and criteria set by HEC. For this purpose an advertisement is published in the National News Papers by the Registrar Office.
- Admission criteria for M.Sc. (Hons) and Ph.D. are same as mentioned in section 2.
- Admission criteria are revised every year before the announcement of admissions.

Standard 5-2: The process by which students are registered in the program and monitoring of students progress to ensure timely completion of the program must be documented This process must be periodically evaluated to ensure that it is meeting its objectives.

- The student name, after completion of the admission process, is forwarded to the Registrar Office for proper registration in the specific program and the registration number is issued to the student.
- Students are evaluated through Mid, Final and Practical exams and through Assignments.
- Registration is done for one time for each degree but evaluation is done through the result of each semester. Only those students who fulfill the criteria of the University, they are promoted to the next semester.
- In general, the students are registered on competition bases keeping in view the academic and research standards.

Standard 5-3: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institution mission statement. These processes must be periodically evaluated to ensure that it is meeting with its objectives.

- Vacant and newly created positions are advertised in the national newspapers, applications are received by the Registrar office, and call letters are issued to the short-listed candidates on the basis of experience, qualification, publications and other qualities/activities as determined by the University.
- The candidates are interviewed by the University Selection Board and Principal and alternate candidates are selected.

- Selection of candidates is approved by the Syndicate for issuing orders to join within a specified period.
- Induction of new candidates depends upon the number of approved vacancies.
- Standard set by HEC are followed.
- At present, no procedure exists for retaining highly qualified faculty members. However, the revised pay scales structure is quite attractive.
- HEC also supports appointment of highly qualified members as foreign faculty Professors, National Professors and deutes them in concerned departments of the University.

Standard 5-4: The process and procedures used to ensure that teaching and delivery of course material to the students emphasizes active learning and that course learning outcomes are met. The process must be periodically evaluated to ensure that it is meeting its objectives.

- To provide high quality teaching, department periodically revises the curriculum depending upon requirements, innovations and new technology.
- With the emergence of new fields, new courses are introduced, and included in the curriculum.
- The easily available books in the University library are provided to the students for the preparation of different courses. Additionally, copying and internet facilities are also available to the students.
- Notes are also prepared by the teachers and given to the students other than different handouts
- Most of the lectures are supplemented by overheads, slides and pictures.
- All efforts are made that the courses and knowledge imparted meet the objectives and outcome. The progress is regularly reviewed in the staff meetings.

Standard 5-5: The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.

- The controller of examinations announces the dates of commencement of examination. After each semester, the controller office notifies the results of the students. The evaluation procedure consists of quizzes, mid and final

examinations, practicals, assignments and reports, oral and technical presentations. The minimum pass marks for each course is 40% Master degree and 50 % for Ph.D. in theory and practical separately.

- In theory, weightage to each component of examination is as prescribed here under:

Mid Examination	30%
Assignments	10%
Final Examination	60%

- Grade points are as follows

Marks obtained	Grade	Grade point	Remarks
80-100 %	A	4	Excellent
65-79 %	B	3	Good
50-64 %	C	2	Satisfactory
40-49 %	D	1	Pass
Below 40 %	F	0	Fail

- Gold medals are awarded to the students who secure highest marks. Degrees are awarded to the students on the annual convocation that is held late every year.

Criterion 6: FACULTY

Standard 6-1: There must be enough full time faculty who are committed to the program to provide adequate coverage of the program areas/ courses with continuity and stability. The interests and qualifications of all faculty members must be sufficient to teach all courses, plan, modify and update courses and curricula. All faculty members must have a level of competence that would normally be obtained through graduate work in the discipline. The majority of the faculty must hold a Ph.D. in the discipline.

Table-8: Faculty distribution by program areas in Horticulture

Program area of specialization	Courses in the area and average number of sections per year	Number of faculty members in each area	Number of faculty with Ph.D. degree
Post-harvest	2	2	1
Tissue Culture	2	2	1
Protected Cultivation	2	2	1
Floriculture	2	1	1
Landscape Horticulture	1	1	-

Standard 6-2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programs for faculty development must be in place.

- Professional training and availability of adequate research and academic facilities are provided to the faculty members according to the available resources.
- Currently two faculty members are abroad on study leave for doctoral degree as sponsored by the different organizations.
- Incentives in the form of allowances to these supervisors have been implemented lately to promote high standard research.

- Existing facilities include mainly internet access, which is available through networking system in addition to library facility with latest books is also available.
- Effective programs for faculty development have been just introduced since the last semester.

Standard 6-3: All faculty members should be motivated and have job satisfaction to excel in their profession

- Time to time provision of enthusiasm to the young faculty by the senior faculty members.

Faculty survey

The results of faculty survey were summarized in the form pie charts quoted in the previous pages.

Survey of graduating students

The graduating students in last semester were surveyed as per Performa 3 before the award of degree. The results of graduating students were summarized in the form of pie charts in the previous pages.

Criterion 7: INSTITUTIONAL FACILITIES

The university administration has been struggling hard to strengthen all the departments and up-gradation of departments and establishing new faculties and Institutes. The university is also trying to attract highly qualified faculty. Following needs to focus on:

- The institution must have the infrastructure to support new trends in learning such as e-learning including digital publications, journals etc.
- The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel. Insufficient library's technical collection of books. Recommended books, relevant journals of the programs are not available to the students and to the teachers as well.
- These aspects need to be strengthened in number and space.
- Class rooms must be adequately equipped, especially the multi media facility and offices must be adequate to enable faculty to carry out their responsibilities. In horticulture, offices for faculty staff are not available, thus

they are accommodated minimum two/room, inspite the rooms are quite narrow in space, subsequently affecting the quality performance.

Standard 7-1: The institution must have the infrastructure to support new trends in learning such as e-learning

The faculty has access to E-library which is very helpful for the high quality education and producing research of international standard. They also have access to the internet. However the department has the following shortcomings/problems:

- Majority of the faculty members do not have access to the PCs. Computers are not provided by the university.
- The internet services provided by the university are poor. The speed of internet is slow and often internet does not work. The telephones are also connected with the internet and the services are often breached.
- Breach of power intermittently, due to which research and academic work both are suffered.
- Majority of equipments is either out of order or outdated.
- Latest and modern molecular equipments or apparatus are lacking.
- Untrained supporting staff.
- Faculties lack practical knowledge of modern and molecular techniques.
- Scanty budget for consumables.
- Fans and tube lights are out of order and are not properly and timely repaired.

Standard 7-2: The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel.

The University Central Library has very limited number of books, journals and periodicals. It's a small library in term of space and facilities with no catalogue systems. It does not meet the standards of a University Library. However department itself owns few books.

Standard 7-3: Class-Rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities.

Currently the class rooms are not enough and the space is not only limited but also some basic facilities are lacking. Multimedia are not available for the lecture

halls. Practical lab space is also lacking. This affects the quality of teaching. The faculty offices are another serious problem of the department. Some faculty members are sharing small rooms and the other are having their desks in the laboratories.

Criterion 8: INSTITUTIONAL SUPPORT

The following are mentioned against this criterion:

- Due to unavailability of class rooms, classes are taken in the laboratories. Therefore, it is imperative to arrange more classes for quality teaching.
- As mentioned earlier, faculty offices are inadequate and therefore two or three teachers have one office room.
- Space limitation is the major constraint in the development and strengthening of discipline.
- There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars.
- The experienced teachers are not provided the house accommodation by the university and are living in the rented houses with exorbitant rent within the source of mere salary, thus become difficult to concentrate on the efficient working. Therefore house accommodation is indispensably required for the department staff.
- Insufficient secretarial support, technical staff and office equipment.
- Staff attendant/s not available.

Standard 8-1: There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars.

- At present department is not having sufficient financial resource to maintain the present needs of the department. Individual research grants for students and faculty are mainly supporting the departmental research activities. Due to lack of proper facilities like fruit orchard the students conduct their research at different areas. There is a dire need for increasing the financial resources allocated to the department to establish a library, laboratories and computer facilities. Horticulture department has

submitted a project for strengthening of department and it is hoped to be funded during the next year. Suggestions and factors that can contribute to the motivation of the faculty are given as follows:

- Research grants for young faculty members may be allocated.
- Trainings should be arranged in abroad to train the faculty members.

Standard 8-2: There must be an adequate number of high quality post graduate students.

The intake of M.Sc. (Hons) students is once in a year. A strict merit policy is applied during admission coupled with GRE/NTS or entry test. A detail of the Students enrolled during the past seven years is given in the following Table.

Table-9: Enrollment in different programs from 2001-12

Discipline	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2009-10	2010-11	2011-12
Ph.D.	00	04	01	02	02	04	03	02	03	05

Standard 8-3: Financial resources must be provided to acquire and maintain Library holdings, laboratories and computing facilities.

Total budget of the department for the financial year 2011-12 is **Rs 5,40,000** which hardly fulfill the departmental needs particularly for the purchase of contingency items. Limited resources are provided from the university budget. The computing facilities were provided on limited basis from the approved HEC project of Horticulture department, where more facilities for library, laboratories and computers are suggested for quality improvement of the department.

Executive Summary

Horticulture department initiated functioning during 1979 with in shortest possible time; the department achieved the possible success in the area for teaching, research and training. The degree courses of BSc Hons, MSc Hons and Ph.D in Horticulture are being offered with the ratio of 20,20,5 each year respectively. Short courses on various aspects of horticulture are also conducted for skilled labour/gardeners for those who are unable to continue higher education in horticulture. Different research projects have been completed / approved or in the pipeline for higher degree programmes. Problem oriented research matters are emphasized for better sharing of horticulture discipline in the agriculture section. A number of constrains and their solution have also been reported in the report for efficient improvement of the department which consequently will bring a positive change in the coming years.

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Date of submission of final report:

May, 2013

DETAILED COURSE CONTENTS OF SCHEME OF STUDIES FOR M.Sc (Hons)/Ph.D HORTICULTURE

HORT 701 ROOTSTOCK FOR HORTICULTURAL CROPS 3(2 -2)

THEORY

Importance; types of rootstocks. Role of rootstock especially for fruit and ornamental plants. Factor effecting Stock-scion relationship. Types of incompatibilities especially delayed incompatibilities; Its reason and effects on rootstock efficiencies. Rootstock adaptability under various soil and climatic conditions. Rootstocks of the major fruits and ornamental plants in relation to vigor, longevity, fruitfulness and resistance to drought, pests and diseases. Special emphasis on drought resistance rootstock for different trees. Rootstock adaptability for different areas especially for rain fed areas.

PRACTICAL

Identification, selection and multiplication of important rootstock especially for arid areas. Survey of rootstocks used at various research, experimental and commercial orchards.

BOOKS RECOMMENDED

1. Royc. Rom and Robert F. Carloson. (1987). Rootstocks for fruit crops. Johnwiley & Sons.
2. Adams C.R, and Early M.P (2005). Principles of Horticulture. 4th edition, Elsevier Private Ltd, New Delhi India.
3. Hartman. H. (2004). Plant propagation principles and practices. 6th edition, Prentice- Hall of India, Private. Ltd, New Dehli.
4. Sharma. V.K (1996). Plant nurseries, techniques, production and management Indus Publishing Company.
5. George. A (1999). Horticulture principles and practices. Prentice Hall, New Jersey.

THEORY

Physiology of horticultural crops by looking at the manipulation of environmental factors to control the growth, yield etc. Water relations to plants. Photosynthesis, rest & dormancy, Carbon assimilation and effect of drought on the different physiological processes of the plants CAM plants and their physiology. Source and sink relationship in plants. Fruit set and development, control of flower and fruit drops.

PRACTICAL

Anatomical studies on phloem and xylem placement in various Horticultural plant organs. Study on seed dormancy.

BOOKS RECOMMENDED

1. Delvin, R, M., and F. H. Witham. 1983. Plant Physiology. Willard Grant Press, Boston.
2. Bonner, J., and J. E. Varner.1976. Plant Biochemistry. Academic Press, NY

THORY

Present and future status of fruit industry in Pakistan. Cultural practices and improvement of important fruits of Barani areas. Problems and remedies of fruit production. Water, light, and temperature relations. Plant nutrition, plant spacing, pre and post harvest problems. pests, diseases and their control. Pruning. and its types, principles, objectives. Production trends in the world for various fruits. Suggestions for the improvement of fruit culture with special reference to Harvesting, grading, packing, transportation, storage and marketing of important fruits.

PRACILCAL

Field and market surveys to identification of tree and fruit problems, diseases, pests and their control. Pruning and training of fruit trees.

BOOKS RECOMMENDED

1. Bal. J. S. (1997). Fruit Growing. Kalyani publishers, Ludhiana, India
2. Malik, M. N., E. Bashir, and R. Bantel. 1994. Horticulture. National Book Foundation, Pakistan
3. Mitra, S. K. D. S. Rathore and T. K. Boss (1991). Temperate Fruits. Horticulture and Allied Publishers, Calcutta. India
4. Sawson, J. A. (1986). Tropical Fruits. Longman Scientific and Technical. Harlow, Essex. UK.

THEORY

Cultural practices and improvement of important vegetables. Problems and remedies of vegetable production. Soil, water, light and temperature relation to vegetable growth. Pre and post harvest vegetable problems. Pests, diseases of vegetables and their control. Vegetables forcing. Hybrid seed production, grading and quality standards for vegetables. Storage, transportation and marketing of vegetables.

PRACTICAL

Field and market survey to identify vegetable problems and identify their control. Botanical and structural description of some selected vegetables. Identifying techniques / practices to grow vegetables in arid areas.

BOOKS RECOMMENDED

1. George, R. A. T. 1995. Vegetable seed production. Longman group Ltd., London.
2. Price, L. C. 1987. Vegetable: Characteristics, Production and Marketing. John Willey and sons, Inc. NY.
3. Swiader, J. M. G. W. Ware and J.P. Mecollum (1992) Production Vegetable Crops 4th Ed. Interstate Publishers Inc. Daniville, Illinois.
4. Wein, H, C. (1997). The physiology of vegetable crops CAB. International Productions, New York.

THEORY

Objectives of breedings. Classification of breeding systems. Techniques of breedings in horticulture. Constrains and their control. Methods of propagation for self, cross, and clonal propagated crops. Breeding with special emphasis for the improvements of horticultural crops for the rainfed areas. Hybrid seed production and problems. Role of biodiversity in the improvement of crops. Utility of wild horticultural varieties Germplasm maintenance.

PRACTICAL

Floral studies of horticultural plants. Practices of breeding the self and cross pollinated crops, selection procedures in various horticultural crops. Storage and maintenance of the germplasm.

BOOKS RECOMMENDED

1. Briggs, D., and S. M. Walters. 1998. Plant variation and evolution. Cambridge Univ., Press, NY
2. Mark, J.B. 1986. Breeding Vegetable Crops. The Avi Pub. Co., Inc. Wesport, Connecticut.
3. Moore, G.N., and J. Janicks. 1983. Methods in Fruits Breeding. Purdu Univ. Press, West Lafayette, Indiana.

THEORY

Importance of landscape gardening and design; principles of landscape development; types of designs; formal and informal garden designs, Chinese and Japanese gardening; rockeries; terrace, roof and water gardens; plants suitable for various; design; landscape design for public and private buildings, parks and grounds; highway and roadside plantations. Developmental cost estimates for landscape.

PRACTICAL

Visits to different parks and gardens; landscape designs for individual houses, municipal and national parks; establishing various types of gardens.

BOOKS RECOMMENDED

1. Arora, J. S. (1992). Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
2. Carpenter, P. L., T. D. Walker and F. A. Lanphear (1975). Plants in the Landscape. W. H. Freeman and Company, San Francisco
3. Khan, A. K. (1994). The Gardener. Elite Publishers Limited, Karachi, Pakistan
4. Khan, M.A. and T.A. Bader (1992). Landscape Designs, Student Manual. Univ. Printing Press, University of Agriculture Faisalabad.
5. McDaniel, G. L. Ornamental Horticulture. The Reston publishing Company; Apprentice hall Co., Reston, Virginia.

THEORY

Role of mineral nutrient in plants. Factor effecting nutrient absorption. Concentration of different nutrients required for various horticultural crops. Surplus and deficiency symptoms and their control. Soil and plant analysis techniques for the evaluation of nutrient requirements. Problems of nutrient absorption in rainfed areas.

PRACTICAL

Survey for deficiency / surplus symptoms. Learning of different techniques for evaluations. Developing recommendation of fertilizers for different areas with special reference to arid areas.

BOOKS RECOMMENDED

1. Marschner, H. (1995). Mineral nutrition of higher plants. Academic Press, London
2. Mengell, K, and E.A. Kirkly, 1987. Principles of Plant Nutrition. Int. Potash Inst., Switzerland.
3. Tisdale, S. KL., and W.L. 1975. Soil Fertilizers. Macmillan Pub. Co. Inc., NY.

THEORY

Life cycles in plants. Cellular basis for propagation, types of propagation; sexual, asexual propagation, with special emphasis on micro-propagation. Seed development, apomixis, spore development, production of genetically pure seed, seed germination process, Environmental factors affecting seed germination, seed testing, pre-conditioning of seeds to stimulate germination. General aspects of asexual propagation anatomical, and physiological basis of asexual propagation.

PRACTICAL

Study of seeds, Scarification and stratification techniques. Testing the viability of seeds. Practice in asexual propagation techniques. Visits of different horticultural nurseries. Visit to tissue culture laboratories.

BOOKS RECOMMENDED

1. Hartmann, H. T., D.E. Kester. 1975. Plant Propagation, Principles and practices. Prentice-Hall, Inc., Englewood Cliff,. NY.
2. Malik, M.N., E. Bashir, and R. Bantel. 1994. Horticulture, National Book foundation, Pakistan.

THEORY

Classification. Mode of actions of different growth regulators. Role for growth regulators in plants; chemicals nature of plant growth regulators and their relations with different physiological processes of plants. Application and their role in horticulture. Application methods. Manipulation of growth regulators for the improvements of horticultural crops in rainfed areas. Biosynthesis, pathways, source-sink relationship in relation to PGR.

BOOKS RECOMMENDED

1. Leopold, A.C., and P.E. Kriendmann. 1975. Plant Growth and Development McGraw Hill Book Co., NY.
2. Nivkell, L.G. 1982. Plant growth Regulators. Springer-virlag, Berlin Heideriberg, NY.
3. Weaver, R.V. (1982). Plant Growth Substanceds in Agriculture W. H. Freeman Co. San Francisco.

HORT -710 PLANT TISSUE CULTURE

3(1-4)

THEORY

Introduction; history and importance; Types of culture (organic culture, callus culture, cell Suspension culture, protoplast culture). Types of regeneration, callogenesis, organogenesis and embryogenesis. Micropropagation, micrografting, Germplasm conservation, Somatic hybridization, Cytoplasmic hybridization, Genetic transformation, Somaclonal variation. Secondary plant products.

PRACTICALS

Laboratory equipment and supplies; stock solutions and media preparation; Maintenance of asepsis; shoot-tip culture; nodal culture; leaf culture; embryo Culture; ovule culture; anther culture; callus culture; cell suspension culture; protoplasm culture; protoplast fusion; plantlet regeneration, In-vitro grafting; Production and testing of virus free plants; transfer of plantlets from tissue culture of green house and field. Leaf disk culture for genetic transformation Visits to tissue culture labs.

BOOKS RECOMMENDED

1. Chaleff, R. S. (1981). Genetics of Higher Plants-Applications of Cell Culture. Cambridge University Press, London.
2. Dods, J. H., and L.W. Roberts (1982). Experiments in Plant Tissue Culture. Cambridge University Press, London.
3. Mantell, S. H. J. A. Mathews & R. A. Mckee (1985). Principles of Plant Biotechnology, An Introduction to Genetic Engineering. Blackwell Scientific Publications.
4. Pierik, R. (1987). In Vitro Culture of high plants. Martinus Nijhoff Publishers, Amsterdam.
5. Reinert, J., and Y.P.S. Bajaj (1977). Plant cell, Tissue and Organ Culture, Springer-Verlag, New York.
6. Shoeman, R. (1984). Protoplast Fusion. Springer-Verlag, New York.

HORT -711 ADVANCED ORNAMENTAL PRODUCTION

3(2 -2)

THEORY

Flowers and ornamental industry in Pakistan. Description of major flowering and other ornamental plants. Culture practices and improvements of ornamental plants. Cut flowers industry. Pruning and training of ornamental trees. Problems, diseases and pests, and remedies of ornamental production. Harvesting, grading, packing, transportation, storage, and marketing of ornamental plants.

PRACTICAL

Botanical and structural description of available ornamental plants. Field and market surveys to identification of ornamental plants, diseases, pests and their control. Pruning and training of ornamental plants. Study of different cut flowers, technologies to increase the vase life of cut flowers, packing and storage of different cut flowers.

BOOKS RECOMMENDED

1. Bose, T. K. and L. P. Yadav (1989). Commercial Flowers. Naya Prokash, Calcutta, India.
2. Chasha, K.L. and B. Choudhary (1989). Ornamental Horticulture in India. India Council of Agriculture Research, New Dehli.
3. Larson. R.A. 1980. Introduction to Floriculture. Academic Press, NY.
4. Laurie, A., D.C. Kiplingerr and K. S. Nelson (1958). Commercial Flower Forcing. McGraw Hill Book Co., Inc., New York.
5. McDaniel, G.L. 1982. Ornamental Horticulture. The Reston Pub. Co., Virginia.
6. Salinger, J.P. (1985). Commercial Flower Growing. Buterworth, Horticultural books.
7. Yadav, I. S. and M. L. Choudhary (1997). Progressive Floriculture-Production Technologies of Important Commercial Flower Crops. The house of Sarpan, Bangalore.

HORT-712 POSTHARVEST PHYSIOLOGY OF HORTICULTURAL CROPS 3(2-2)

THEORY

Postharvest biology and technology; Respiration; Plant hormones in postharvest physiology; Biosynthesis and metabolism of ethylene; Ethylene scrubbers; Composition and compositional changes; Role and regulation of environmental factors in storage, temperature, humidity, oxygen, carbon dioxide and ethylene; Physiological disorders of fresh fruit, flowers and vegetables; Postharvest diseases and their control; Postharvest biology and handling of: Cut flowers; Leafy vegetables; Underground vegetables; Fruit vegetables; Pome fruits; Stone fruit; Soft fruit; Citrus; Mango; Avocado.

PRACTICAL

Relevant field and laboratory studies, surveys and assignments.

BOOK RECOMMENDED

1. Kader. AA (1992). Postharvest Technology of Horticultural Crops. University of California, Division of Agriculture and Natural Resources.
2. Salunkhe, D.K., N.R. Bhatt and B.B. Desai (1989). Post harvest Biotechnology of Flowers and Ornamental Plants. Bidhan Chandra Krishi Viswavidyalaya, Kalyani, India.
3. Wills, R.B.H., T.H. Lee, D. Graham W.B McGlasson and E.G Hall (1989). Post harvest (3rd Ed.) BSP Professional Books, Oxford.

THEORY

Introduction. Plant and their environments. Plants for the control of environments. Plant and atmospheric purification. Plants and climate control., Plant and chemical pollutions control. Plants and dust control. Plants and noise control. Plants and social environments. Aesthetic horticulture. Amenity horticulture. Environmental impacts.

PRACTICAL

Selecting and listing the useful plants controlling environments. Collecting of plants and preparing albums. Monitoring plant health in smoky areas. Lab. experiments and study of anatomical difference among anti-pollutants and field plants.

BOOK RECOMMENDED

1. Gary, O.R Plants, People and environmental quality. US Department of interior,
National Park Service.
2. Hussian M. (1998). Environmental Degradation: Realities and Remedies. Ferozesons Pvt. Ltd., Lahore.
3. McKinney, M.L. and R.M. Schoch (1998). Environmental Sciences: Systems and solutions. Jones and bartlett Pub,. Inc., Sadbury, USA.
4. Rorison I.H. and R. Hunt (1980). Amenity Grassland: An Ecological Perspective.
John Willey and sons, New York.
5. Simonds, J.O. (1978). Earthscape: A Manual of Environmental Planning. McGraw Hill Book Company, London.

Faculty Resume

The brief summary of CV's regarding all faculty staff is given below, where as detail of each faculty member is given in the proceeding paragraphs:

Name	Position	Qualification	Specialization
Dr. Nadeem Akhtar Abbasi	Professor	Ph. D	Pre and Post harvest physiology of horticulture crops
Dr. Ishfaq Ahmed Hafiz	Associate Professor	Ph. D	Biotechnology/tissue culture of horticulture
Dr. Khalid Mahmood Qureshi	Associate Professor	Ph. D	Plant Physiology and Orchard Management
Ms. Najma Yousaf Zahid	Assistant Professor	M. Sc. (Hons)	Medicinal Plants
Dr. Azhar Hussain	Assistant Professor	Ph. D	Fruits production and Biotechnology
Ms. Mehwish Yaseen	Lecturer	M. Sc. (Hons)	Tissue Culture
Mr. Hammad Aziz Khan	Lecturer	M. Sc. (Hons)	Vegetable Production and Management
Ms. Sumera Hafeez	Lecturer	M. Sc. (Hons)	Post-harvest physiology of horticultural crops
Mr. Umer Habib	Lecturer	M. Sc. (Hons)	Landscape /Floriculture

Name	Nadeem Akhtar Abbasi
Personal	<p>Father's Name : Muhammad Akhtar Abbasi Date of Birth : 03-03-1965 N.I.C. NO. : 61101-1748794-1 Nationality : Pakistani Postal Address : University of Arid Agriculture, Murree Road Rawalpindi. Permanent Address : Village Phulgran (Korang Valley) Distt. Islamabad, Pakistan. Phone : +92-51-9290771; 0300-5069600 Email : nadeemabbasi65@yahoo.com nadeem.abbasi@uair.edu.pk</p>
Experience	<p>Date: January 6, 1990 to December 1, 1999. Title: <u>Assistant Research Officer (Horticulture)</u> Institution: Hill Fruit Research Station Murree under Ayyub Agriculture Research Institute, Faisalabad. Govt. of the Punjab</p> <p>Date: 01-12-1999 to 2-12-2002 Title: <u>Assistant professor</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi</p> <p>Date: 02-12-2002 to 02-08-06 Title: <u>Associate professor</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi</p> <p>Date: 02-08-2006 to date. Title: <u>Professor</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi</p>
Honor and Awards	<ul style="list-style-type: none"> • Accredited supervisor of Pakistan Council for Science and Technology and Higher Education Commission to supervise Ph.D. students having indigenous scholarships. • Won Merit Scholarship for M.Sc. (Hons.) in 1990 from Min. of Education, Govt. of Pakistan. • Won Merit Scholarship for Ph.D. in 1991 from Min. of Education, Govt. of Pakistan. • Got merit scholarship for Post doctorate in 2004 from Higher Education Commission, Islamabad.

Memberships	<p>*International Society for Horticultural Science (ISHS).</p> <p>*Agricultural Foundation of Pakistan.</p> <p>*Islamabad Horticultural Society, Islamabad.</p> <p>*Life member of Pakistan Botanical Society.</p>
Service Activity	<ul style="list-style-type: none"> • Teaching of courses of horticulture science at graduate, postgraduate and Ph.D. level students. • Research and execution of developmental projects. • To look after administrative affair of the horticulture department. • Coordinator Sub Campus Khushab • Chairman University Purchase Committee • Principal Officer Estate Care/Security
Brief Statement of Research Interest	<ul style="list-style-type: none"> • Production of Horticultural Crops • Post harvest Physiology

Publications	<p>Ibrahim, M., N. A. Abbasi, H. Rehman, A. Hussain and I. A. Hafiz. 2011. Phenological behaviour and effect of different chemicals on pre-harvest fruit drop of sweet orange cv. 'Salustiana'. Pak. J. Bot., 43(1): 453-457. (IF 0.947).</p> <p>Hussain, A., N.A.Abbasi, I. A. Hafiz and S. Z. U. Hassan. 2011. A Comparative Study of Five, Loquat Genotypes At Tret, Murree., Pakistan. Pak. J. Bot., 43(5): 2503-2505, 2011. (IF 0.947).</p> <p>Abbasi, N. A., A. Hussain and I. A. Hafiz. 2011. Loquat production in Pakistan and strategies for improvement. Acta Hort. 887: 117-121.</p> <p>Baig, M.M.Q. , I.A. Hafiz, A. Hussain, T. Ahmad and N.A. Abbasi. 2011. An efficient protocol for <i>in vitro</i> propagation of <i>Rosa gruss an teplitz</i> and <i>Rosa centifolia</i>. African J. Biotechnol., 10(22): 4564-4573. (IF 0.573).</p> <p>Hussain, A., N.A. Abbasi, I.A. Hafiz and S. Zia-ul-Hasan. 2011. A comparison among five loquat genotypes cultivated at Hasan Abdal and Wah. Pak. J. Agri. Sci. 48(2): 103-107.</p> <p>Hussain, A., N.A. Abbasi, I.A. Hafiz, A. Shakoor and S.M.S. Naqvi, 2011. Performance of loquat (<i>Eriobotrya japonica</i>) genotypes under agro-ecological conditions of Khyber Pakhtunkhwa Province of Pakistan. Int. J. Agric. Biol., 13: 746–750. (IF 0.94)</p>
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Shahid, M. N. and **N.A. Abbasi**. 2011. Effect of Bee Wax on physiological changes in fruits of sweet orange cv. "Blood Red". Sarhad J. Agric. 27(3):385-394.

Abbas, G., K. Frooq, I.A. Hafiz, A. Hussain and **N.A. Abbasi**. 2011. Assessment of processing and nutritional quality of potato genotypes in Pakistan. Pak. J. Agri. Sci., Vol. 48(3), 169-175.

Zahid, N.Y., **N. A. Abbasi**, I. A. Hafiz and Z. Ahmad. 2012. Antifungal activity of local fennel (*Foeniculum vulgare* Mill) extract to growth responses of some soil diseases. African Journal of Microbiology Res., 6(1): 46-51. (IF **0.533**)

Abbas, G., I.A. Hafiz, **N. A. Abbasi** and A. Hussain. 2012. Determination of processing and nutritional quality attributes of potato genotypes in Pakistan. Pak. J. Bot. 44(1): 201-208. (IF **0.533**)

Tareen, M.J., **N.A. Abbasi** and I.A. Hafiz. 2012. Effect of salicylic acid treatments on storage life of peach fruits cv. "Flordaking". Pak. J. Bot. 44(1): 119-124. (IF **0.533**)

Abbasi, N.A., A. Rehman and A. Hussain. 2012. Foliar spray of ethanol affected fruit growth, yield and postharvest performance of 'Sahil' tomato. Acta Hort. (ISHS) 945:363-368.

Shabbir, K., T. Ahmad, I. A. Hafiz, A. Hussain, **N. A. Abbasi** and J. Ahmad. 2012. In vitro regeneration of *Gerbera jamesonii* cv. Sunglow. African Journal of Biotechnology 11(42), 9975-9984. (IF **0.573**).

Iqbal, D., U. Habib, **N. A. Abbasi** and A. N. Chaudhry. 2012. Improvement in postharvest attributes of zinnia (*Zinnia elegans* cv. Benary's Giant) cut-flowers by the application of various growth regulators. Pak. J. Bot., 44(3): 1091-1094. (IF **0.947**).

Tareen, M. J., **N.A. Abbasi** and I.A. Hafiz. 2012. Postharvest application of salicylic acid enhanced antioxidant enzyme activity and maintained quality of peach cv. 'Flordaking' fruit during storage. Scientia Hort., 142:221-228. (IF **1.527**)

	<p>Abbasi, N. A.*, M. Zahoor, H. A. Khan and A. A. Qureshi. 2012. Effect of encapsulated calcium carbide application at different growth stages on potato (<i>Solanum tuberosum</i> L.) growth, yield and tuber quality. Pak. J. Bot., 44(4): 1543-1550. (IF 0.947).</p> <p>Baig, M. M. Q., Hafiz, I. A., Abbasi, N. A., Yaseen, M., Akram, Z. and Donnelly, D. J. 2012. Reduced-stature Rosa species through in vitro mutagenesis. Can. J. Plant Sci. 92: 1049_1055. (IF 0.613)</p> <p>Shehnaz Zakia, Najma Yousaf, Mehwish Yaseen, Nasir Khokhar & Nadeem Akhtar Abbasi. Standardization of an efficient protocol for micropropagation of <i>Aloe vera</i> using different hormonal regimes. Accepted in “Pakistan Journal of Pharmaceutical Sciences”. Dec, 2012. (IF 1.103)</p> <ul style="list-style-type: none"> •
Research Grants and Contracts	<p>PROJECTS:</p> <ul style="list-style-type: none"> • “Multiplication of Gladiolus through soil amendments” 1 year project from university of Arid Agriculture, Rawalpindi has been completed. • Three years project “Production of pathogen free horticultural plants” from Higher Education Commission for Rs. 35.884 million is going through successfully. • Three years project “Pre and Postharvest treatments of food grade chemicals to improve peach fruit quality and shelf life”. Funded by Pakistan Science Foundation in 2010. • Three years project “Collection, evaluation and multiplication through conventional and <i>in vitro</i> propagation techniques of Loquat superior genotypes.” Funded by Higher Education Commission of Pakistan and started in 2010. • Evaluating the effect of different nutrients and growth regulators to minimize or control the incidence of creasing in Kinnow mandarin. Submitted to HEC during 2008 and is in final process.

Name	Dr. Ishfaq Ahmad Hafiz
Personal	<p>Father's Name : Muhammad Sharif Date of birth : July 19, 1960 N.I.C. No. : 266-60-064671 Postal Address : Department of Horticulture, University of Arid Agriculture Murree Road Rawalpindi Pakistan Permanent Address : Main Bazar Ashraf Town Pindorian Distt. & Teh. Islamabad E.mail : decenthafiz60@yahoo.com</p>
Experience	<p>Date: 2/88-12/89 Title: Agricultural Officer Institution: Agriculture Extension Wing, Agriculture Deptt.</p> <p>Date: 1/90-8/98. Title: Assistant research officer Institution: Barani Agriculture Research Institute Chakwal Agriculture Research Wing, Agriculture Deptt.</p> <p>Date: 21.07.98 to 07.04.2000 Title: Assistant research officer Institution: Mango Research Station, Shujabad, Multan</p> <p>Date: 08-04-2000 to 29-8 2003 Title: Assistant research officer Institution: Horticulture Research Institute Faisalabad</p> <p>Date: 30-8-2003 to 01-08-2006 Title: Assistant Professor Institution: Department of Horticulture, PMAS-Arid Agriculture University Rawalpindi</p> <p>Date: 2-08-2006 to date Title: Associate Professor Institution: Department of Horticulture, PMAS-Arid Agriculture University Rawalpindi</p>
Honor and Awards	<ul style="list-style-type: none"> • Member, M.Sc.(hons) Horticulture written and oral committee PMAS-AAUR • Member Academic Committee Horticulture PMAS AAUR • Referee for J of Botany, Botanical Society of

	<p>Pakistan</p> <ul style="list-style-type: none"> • Referee for Intl J Agri and Bio (IJAB), Pakistan • Referee for Intl J Argi and Social Sci, Pakistan • Referee for Pakistan J. of Agriculture (PARC) • External Examiner University of Agriculture Faisalabad • Participated more than 3 national and international forums for horticulture/agriculture presentation • Competitive merit scholarship for PhD. • First Position in the Horticulture department during B.Sc. (Honors). • Throughout merit scholarship holder during 2 years university tenure.
Memberships	<ul style="list-style-type: none"> • Horticultural Foundation of Pakistan • Pakistan Botanical Society
Publications	<p>Ibrahim, M., N. A. Abbasi, H. Rehman, A. Hussain and I. A. Hafiz. 2011. Phenological behaviour and effect of different chemicals on pre-harvest fruit drop of sweet orange cv. ‘Salustiana’. Pak. J. Bot., 43(1): 453-457. (IF 0.947).</p> <p>Abbasi, N. A., A. Hussain and I. A. Hafiz. 2011. Loquat production in Pakistan and strategies for improvement. Acta Hort. 887: 117-121.</p> <p>Baig, M.M.Q. , I.A. Hafiz, A. Hussain, T. Ahmad and N.A. Abbasi. 2011. An efficient protocol for <i>in vitro</i> propagation of <i>Rosa gruss an teplitz</i> and <i>Rosa centifolia</i>. African J. Biotechnol., 10(22): 4564-4573. (IF 0.573).</p> <p>Hussain, A., N. A. Abbasi, I. A. Hafiz and S. Z. Hasan. 2011. A comparative study of five loquat Genotypes at Tret, Muree, Pakistan. Pak. J. Bot., 43(5): 2503-2505. (IF 0.947).</p> <p>Hussain, A., N.A. Abbasi, I.A. Hafiz and S. Zia-ul-Hasan. 2011. A comparison among five loquat genotypes cultivated at Hasan Abdal and Wah. Pak. J. Agri. Sci. 48(2): 103-107.</p> <p>Baig, M. M. Q., I.A. Hafiz, N. A. Abbasi, M. Yaseen, Z. Akram, and D. J. Donnelly, 2012. Reduced-stature <i>Rosa</i> species through <i>in-vitro</i> mutagenesis. Canadian J. Plant</p>

	<p>Science, 10.4141/cjps2011-199. (IF 0.547).</p> <p>Abbas G., I. A. Hafiz, N.A. Abbasi and A. Hussain 2012. Determination of processing and nutritional quality attributes of potato genotypes in Pakistan. <i>Pak. J. Bot.</i>, 44(1): 201-208. (IF 0.83).</p> <p>Tareen, M.J., N.A. Abbasi and I.A. Hafiz. 2012. Effect of salicylic acid treatments on storage life of peach fruits cv. "Flordaking". <i>Pak. J. Bot.</i> 44(1): 119-124(IF 0.83).</p> <p>Zahid, N.Y., N. A. Abbasi, I. A. Hafiz, A. Hussain and Z. Ahmad. 2012. Antifungal activity of local fennel (<i>Foeniculum vulgare</i> Mill) extracts to growth responses of some soil diseases. <i>African Journal of Microbiology Res.</i>, 6(1): 46-51. (IF 0.533).</p> <p>Yaseen M, Ahmad T, Sablok G, Standardi A, Hafiz IA. 2012 Review: role of carbon sources for in vitro plant growth and development. Mol Biol Rep. 10.1007/s11033-012-2299-z 2012 Dec 5. (IF 2.93).</p> <p>Mahmood I., A. Razzaq, Z. D. Khan, I. A. Hafiz, and S. Kaleem, 2012, Evaluation of tissue culture responses of promising wheat (<i>Triticum Aestivum</i> L.) cultivars and development of efficient regeneration system. <i>Pak. J. Bot.</i>, 44: 277-284. (IF 0.83)</p> <p>Abbasi, N.A., A. Rehman and A. Hussain. 2012. Foliar spray of ethanol affected fruit growth, yield and postharvest performance of 'Sahil' tomato. <i>Acta Hort.</i> (ISHS) 945:363-368.</p> <p>Shabbir, K., T. Ahmad, I. A. Hafiz, A. Hussain, N. A. Abbasi and J. Ahmad. 2012. In vitro regeneration of</p>
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	<p><i>Gerbera jamesonii</i> cv. Sunglow. African Journal of Biotechnology 11(42), 9975-9984.</p> <p>Iqbal, D., U. Habib, N. A. Abbasi and A. N. Chaudhry. 2012. Improvement in postharvest attributes of zinnia (<i>Zinnia elegans</i> cv. Benary's Giant) cut-flowers by the application of various growth regulators. Pak. J. Bot., 44(3): 1091-1094. (IF 0.83).</p> <p>Tareen, M. J., N.A. Abbasi and I.A. Hafiz. 2012. Postharvest application of salicylic acid enhanced antioxidant enzyme activity and maintained quality of peach cv. 'Flordaking' fruit during storage. Scientia Hort., 142:221-228. (IF 1.527).</p> <p>Abbasi, N. A.*, M. Zahoor, H. A. Khan and A. A. Qureshi. 2012. Effect of encapsulated calcium carbide application at different growth stages on potato (<i>Solanum tuberosum</i> L.) growth, yield and tuber quality. Pak. J. Bot., 44(4): 1543-1550. (IF 0.83).</p> <p>Riffat Ayesha ¹, Noreen Fatima ², Atif Kamal ⁴, Khalid Mahmood Qureshi ¹, Ishfaq Ahmad Hafiz ¹, Khalid Saifullah Khan¹. 2011. Influence of Different Growth Media on the Fruit Quality and Reproductive Growth Parameters of Strawberry(<i>Fragaria ananassa</i>). J. Med. Plants Res., 5(26): 6224-6232. (IF: 0.879).</p>
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Name	Dr. Khalid Mahmood
Personal	Father's Name : Allah Loke Qureshi Date of Birth : 07-03-1959 N.I.C. NO. : 61101-1748794-1 Nationality : Pakistani Postal Address : University of Arid Agriculture, Murree Road Rawalpindi. Permanent Address : Village & P.O. Panjwarian, The: Kharian Distt. Gujrat, Pakistan or House # 359, Street # 13, Shehzad Town Islamabad Phone : +92-51-9290771; 0300-5241628 Email : kmq_2008@hotmail.co.uk
Experience	Date: January 10. 06.1985 to 02. 02. 2000. Title: Scientific Officer Institution: Fruit Crops, National Agriculture Research Centre. Park Road Islamabad. Date: 02. 02. 2000 to 29-02-2007 Title: Senior Scientific Officer Institution: Fruit Crops, National Agriculture Research Centre. Park Road Islamabad. Date: 01.03. 2007 to date Title: <u>Associate professor</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi
Honor and Awards	<ul style="list-style-type: none"> • Awarded University BSc and MSc Merit Scholarships during 1980-1984. • Awarded six months training on citrus production and management in 1989 • Won ARP 11 Merit Scholarship for Ph.D. in 1994 funded by USA. • Got merit scholarship for Post doctorate in 2007 from Higher Education Commission, Islamabad.
Memberships	*Islamabad Horticultural Society, Islamabad.
Publications	<ol style="list-style-type: none"> 1. Qureshi K. M, F. Hassan, Hassan. Q, Qureshi, U. S, Chughtai S, Saleem. A. 2012. Impact of cultivation systems on growth <i>and yield of</i> strawberry cv. "chandler". Pakistan Journal of Agricultural Research. Vol 25 (2) 129-135.. 2. Khalil. F., K.M. Qureshi, A.Khan, F. Hassan, N. Bibi 2012. Effect of girdling and plant growth regulators on

	<p>productivity in olive (<i>Olea europaea</i>) Pakistan Journal of Agricultural Research. Vol.25 (2) 120-128.</p> <p>3. Khalid Mahmood Qureshi, Saman Chughtai, Usman Shoukat Qureshi and Nadeem Akhtar Abbasi. Impact of exogenous application of salt and growth regulators on growth and yield of strawberry. Presented in 7th international strawberry symposium ISHS Beijing China 18-22 February, 2012</p> <p>4. Khalid Mahmood Qureshi, Naheed Akhtar, Imran Hassan and Nadeem Akhtar Abbasi. 2011. Effect of mulches on vegetative and reproductive growth of strawberry cv. “chandler” Presented in 7th international strawberry symposium ISHS Beijing China 18-22 February, 2012</p>
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Name	Dr. Imran Hassan
Personal	<p>Father Name : Maqsood-ul-Hasan</p> <p>Date of Birth : 23-03-1970</p> <p>N.I.C No : 37405-5803547-7</p> <p>Nationality : Pakistani</p> <p>Domicile : Rawalpindi</p> <p>Marital Status : Married</p>
Experience	<p>Fourteen years & 10 months work experience of teaching, research and conducting examination of the under-graduate & post-graduate student in the Department of Horticulture, Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi</p> <p>Additional Managerial Charge Experience:</p> <p style="padding-left: 40px;">Worked for 7 years in all on additional charge as Incharge University Lawns from August, 1997 to May, 2000 and from May 2005 to May 2009 in PMAS, AAUR.</p> <p style="padding-left: 40px;">Served for 12 years and 8 months in all as from August, 1997 to Feb, 2002 and from May, 2005 to May 2009 nominated by Chairmen, Department of Horticulture, PMAS, AAUR.</p> <p style="padding-left: 40px;">Worked as Coordinator, Time Table & Date Sheet of Horticulture Department from 2010 to date as nominated by Dean, FC& FS, PMAS, AAUR</p> <p style="padding-left: 40px;">Served for 7 years from 1997 to 1999 and from May, 2005 to May 2009 as Incharge Laboratory, Department of Horticulture, PMAS, AAUR</p>
Publications	Nil

Name	Najma Yousaf Zahid
Personal	Father's Name : Najma Yousaf Zahid Date of Birth : 17-04-1970 N.I.C. NO. : 37405-0555365-2 Nationality : Pakistani Postal Address : University of Arid Agriculture, Murree Road Rawalpindi. Permanent Address : House no 2, St no 2.Khanqah Dogran, Distt. Sheikhpura, Pakistan. Phone : +92-51-9062261; 0345-5909858 Email : honey_neema2003@yahoo.com najma.zahid@uair.edu.pk
Experience	Date: Aug 16, 1995 to March 30, 1998. Title: Consultant Agriculturist (Horticulture) Institution: The Aga Khan Rural Support Programme, Gilgit. NAs Areas of Pakistan. Date: 27-04-1998 to 30-11-2005 Title: <u>Lecturer</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi Date: 02-12-2005 to date. Title: <u>Assistant professor</u> Institution: Department of Horticulture, University of Arid Agriculture, Rawalpindi
Honor and Awards	<ul style="list-style-type: none"> Indigenous Scholarship for Ph.D. in 2001 from Higher Education Commission Islamabad. Pakistan.
Memberships	*Islamabad Horticultural Society, Islamabad. * Member of Pakistan Botanical Society.

Publications	<ul style="list-style-type: none"> Zahid, N.Y; N. Abbassi, Z. Ahmed; H. Ishfaq (2012). Antifungal Properties of local fennel (<i>Foeniculum vulgare</i> Mill.) response to some soil diseases. African J of Microbiology research. vol 6(1) pp 46-51. Jan 2012 Zakia, S; Zahid, N.Y; N. Abbassi; H. Ishfaq; M. Nasir. Booklet on Micropopagation of Aloe vera (<i>Aloe barbadensis</i>). Lap Lambert Accademic Publishing Germany. ISBN: 978-3-8443-23788. 2012 Zakia, S. Zahid, N.Y; N. Abbassi; H. Ishfaq; M. Nasir. Standarization of micro propagation for Aloe vera - A Pharmaceutically important Plant. Accepted for Pak. J. of Pharmaceutical Sciences, Oct 2012.
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