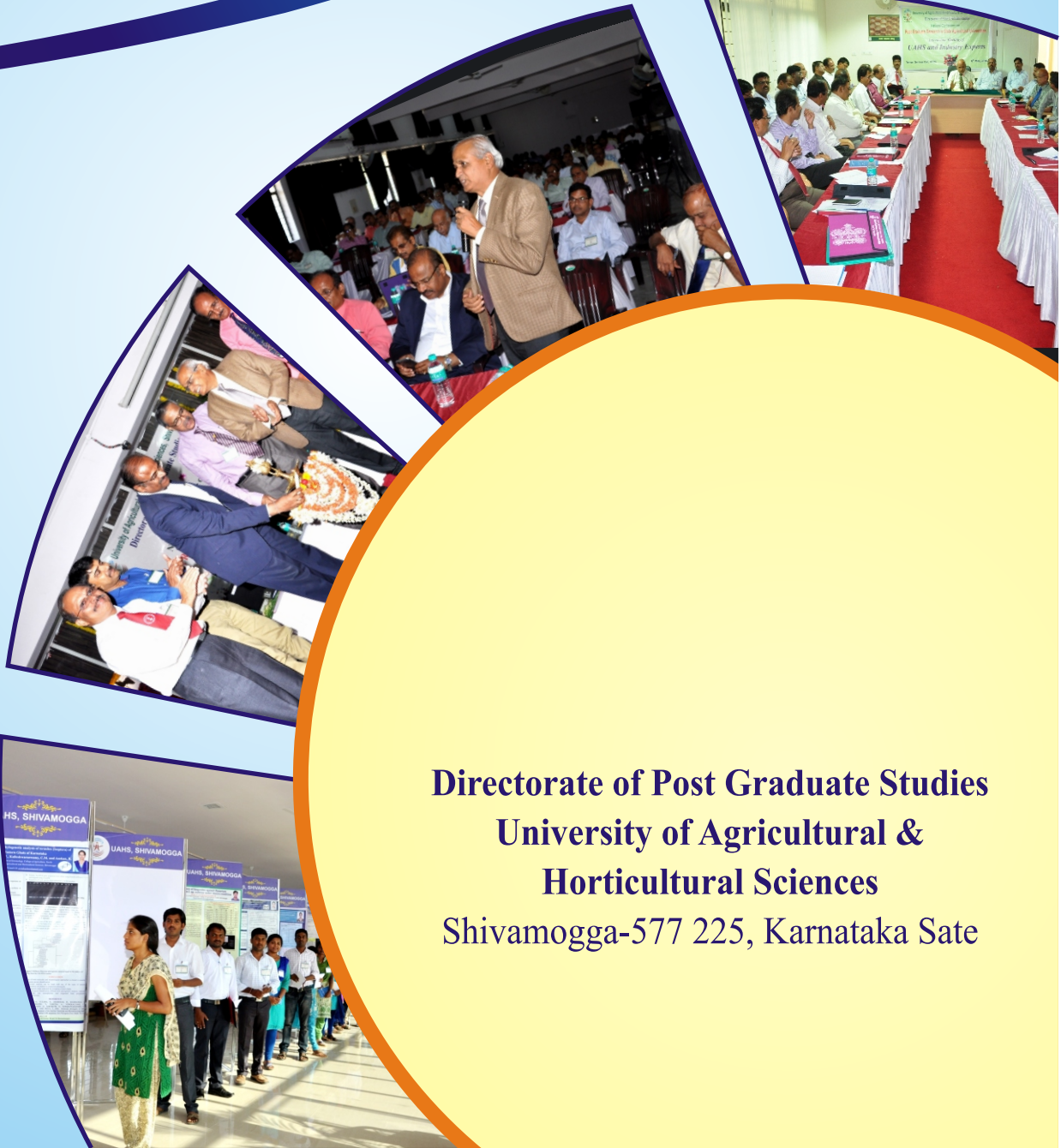




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University of Agricultural & Horticultural Sciences,
Shivamogga

**Proceedings of the National Conference on
PG Research in State Agricultural Universities**
(5th & 6th May, 2016)



**Directorate of Post Graduate Studies
University of Agricultural &
Horticultural Sciences
Shivamogga-577 225, Karnataka Sate**



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Compiled and Edited by :
Dr. T. S. Vageesh
Mr. N. D. Punitkumar

**Directorate of Post Graduate Studies
University of Agricultural & Horticultural Sciences,
Shivamogga - 577 225, Karnataka State.**

Proceedings of the National Conference on PG Research in State
Agricultural Universities Published by Directorate of Post Graduate Studies,
University of Agricultural & Horticultural Sciences Shivamogga-577 225, Karnataka
State.

Compiled and Edited by : Dr. T.S. Vageesh
Mr. Punitkumar N.D

Type Setting : Ms. Soujanya S Rao

Year: 2016
Copies: 300

Publisher :
Directorate of Post Graduate Studies
University of Agricultural & Horticultural Sciences,
Shivamogga - 577 225. Karnataka State.

FOREWORD



Dr. C. VASUDEVAPPA

VICE CHANCELLOR

UAHS, Shivamogga.

The higher education system in agriculture in India is now at cross roads. The conventional agricultural education system is not able to meet the emerging needs of agriculture development. Revamping of higher education in general & post graduate research in particular is needed in the light of V Deans committee recommendations to meet the new challenges in adapting to climate change, reduced access to natural resources, narrower agricultural bio-diversity, etc. New trans-disciplines such as biotechnology, nanotechnology, Information and communications (ICTs) & space technologies have emerged and become central to developing new technologies and innovations in agriculture and environment. In the light of these developments, UAHS, Shivamogga organized a National conference on PG Research in SAUs at UAHS, Shivamogga on 5th & 6th May, 2016. It was a rewarding experience in which invited lectures by experts in higher education were delivered and forty eight M.Sc. & Ph.D. students presented their research papers. This publication is a compendium of the salient recommendations of the conference and the thrust areas identified for PG research in immediate future.

It is earnestly hoped that this publication will be of immense help for the teachers as well as PG students who are involved in research activities related to Agriculture, Horticulture & Forestry. Heartfelt thanks to Dr. T. S. Vageesh, Dean (PGS) and his team.

A handwritten signature in black ink, appearing to be 'C. Vasudevappa'.

Date: 18-07-2016
Place: Shivamogga

(C. VASUDEVAPPA)
VICE CHANCELLOR

PREFACE



Dr. T.S. VAGEESH


Dean (PGS), UAHS, Shivamogga.

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UAHS, Shivamogga has a mission to keep pace with new frontiers of science and contemporary developments to be scientifically and technically competent in the field of higher education. It is felt that radical changes in the thrust areas for PG research are essential to make the university a hub for innovation and development of quality human resource. In this direction a National conference on PG research in State Agricultural Universities was organized on 5th & 6th May, 2016 at UAHS, Shivamogga. It was a rewarding experience to listen to invited lectures on status and future challenges in PG research delivered by experts in Education. Three brain storming sessions were also held and thrust areas for PG research in Agriculture, Horticulture and Forestry were identified. The objective was also to provide an opportunity for the PG students of the University to involve themselves in scientific workshops and prepare them for a bigger role in Agriculture research for further. Forty eight M.Sc. & Ph.D. students participated in the first conference held at UAHS, Shivamogga and presented their research papers in the field of Agriculture, Horticulture & Forestry.

Best research paper awards were also presented to the PG students during the conference. It is hoped that this effort will be useful for the young scientists and post graduate students engaged in research activities in the field of Agriculture, Horticulture & Forestry. My heartfelt thanks to the staff of Directorate of PG Studies Mr. Punitkumar N.D, Mr. S. C. Maradagi, Mr. Prajval S, Ms. Asha A and Ms. Soujanya S Rao for their wholehearted support in organizing the conference. My sincere thanks are also due to Chairperson/Members of various committees constituted for organizing the conference.

Date : 18-07-2016
Place : Shivamogga



(T.S. VAGEESH)
Dean (PGS)

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I. NATIONAL CONFERENCE ON PG RESEARCH : INVITED PAPERS

Post Graduate Research in Agriculture : The Status and Future Challenges

Dr. A. S. Kumara Swamy

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Post-graduate research in Farm Universities in our state has a history of nearly fifty years by now. Agronomy, Genetics and Plant Breeding, Soil Science, Agricultural Entomology, plant Pathology are some of the disciplines having a longer history compared to others. Now there are nearly thirty five disciplines in which post graduate research is carried out at master's level in agriculture, besides horticulture, food science and nutrition, forestry, etc. Ph.D. education in agriculture is pursued in about 24 agricultural disciplines in the state.

There are six post- graduation education centers across four Farm Universities in the state where post graduate research is carried out in the field of agriculture. Besides these centers, field experiments are also conducted in scores of agricultural research stations spread across various agro-climatic zones in the state. Sometimes the experiments are carried out on farmers' fields in real situations. Research in social sciences is being conducted in real situations either among farmers or in various institutions.

Post-graduate agricultural research in the state has made an impressive growth with many outstanding achievements and awards. The man power coming out of the post graduate agricultural education of the state has played a key role in nation building through their services in various farm universities, Govt. and private research houses, service providers and as entrepreneurs. Many are serving in the administrative capacities in various govt. departments and in global agricultural research systems. Persuasion of science has become a very attractive profession in terms of career opportunities. However, things are not very rosy and there are many short-comings.

1. Very narrow base of input : Post graduate education system is turning out scientists in large numbers. Nearly 500 students complete Masters Degrees in agriculture and nearly two hundred Ph.D. scholars complete their studies every year in the state. However, the students input for post graduate education comes from a narrow base. Every year nearly six hundred students are admitted to M.Sc. in agriculture from out of about 1500

agricultural graduates who pass out every year. Similarly nearly 200 are admitted to Ph.D. programme out of 500 Masters degree holders every year. Thus, besides the top ten or twenty per cent who can be regarded as the cream, many average students also get an entry into post graduate education system. This has its own merits and demerits. Not all of them have the true ability and attitude to pursue science as science. What could be done to increase the base from which the students of right attitude can be chosen? Should we reduce the student intake for M.Sc. and Ph.D., Should we keep open the PG-education system for lateral entry from other disciplines also? These are the points to be debated.

- 2. Mediocre research programmes :** Repetitiveness of research programmes (duplicity); poor conduct of field experiments / data collection; adoption of obsolete research techniques; inadequate statistical handling of the data, un-imaginative and mechanical interpretation of the results; plagiarism while writing of the report/ thesis; have been the short-comings posing as major challenges to the academic administration.

Admission of students with scientific attitude : In addition to the performance at under-graduate level and knowledge in the subject matter, the students seeking admission to Post-Graduate Master's programme should be tested for his / her aptitude and those with high scientific aptitude, reasoning ability and emotional quotient (EQ) in addition to intelligence quotient (IQ) should be given preference. The entrance test should be suitably modified to accomplish this end. Now that the farm universities in the state have adopted the common entrance test, a progressive step, it should be easy to further have these improvements. Possibility of conducting a common test across the subjects, giving the student a very wide choice of subjects and allotting the subject based on the merit of the student and his choice at master's level may be considered. A group discussion may be conducted in this regard during this conference or in a separate workshop.

Constitution of Advisory committees : The major advisor and the members of Advisory Committee play a major role in setting a standard for the research work. There are already well formulated guidelines for formation of AC in each university. However, following two points are emphasized here.

- a. AC should be constituted as early as possible; within two months after admission;
- b. Any regular association of particular members in the ACs headed by particular guides and vice versa should be avoided as this may lead to mutual compromise in quality; Dean (PGS) should exercise his powers to prevent it.

Maintaining high standard of staff research to provide good examples and role models;

Students will easily imbibe the scientific attitude if they keep seeing good examples in their own departments/colleges. Teachers should provide good examples of scientific attitude. The students should be frequently exposed to their works, their lectures, their experimentation procedures and field experiments. Good field experiments conducted by staff or other students should be shown to other students, especially junior students. The students should be made to participate in the scientific workshops, seminars and conferences. Guest lectures by visiting teachers/scientists should be arranged, whenever they visit the colleges. The quality of student's seminar has to be improved with active participation of students and staff of the department and related departments. Consolidated and comprehensive presentation of review work should be encouraged in place of presentation of individual works in bits and pieces. Staff seminars should be regularly conducted as models. The PG students, especially Ph.D. students should be made to participate in the annual technical meeting of the concerned disciplines. Biographies/ life histories of world's great scientists should be included in the curriculum of undergraduate studies.

Cultivating scientific attitude among students ;

Scientific attitude can be cultivated among the students. Teach the students ;

- a. To learn the basic principles of scientific experimentation, use of scientific instruments, avoiding biases and minimizing the errors.
- b. To make unattached observations and unbiased judgments;
- c. To be well prepared mentally to make use of the chance / lucky observations; serendipity helps only well prepared minds. Many people see diffusion of blue light by the sea water and falling of apples, but only Sir C.V.Raman could discover Raman Effect and Sir Issac Newton could come out with law of gravity, because they had well prepared minds.
- d. To make use of the brain fully before making use of the laboratory; (Einstein said, "Ideas originate in the brain and not in laboratories. Laboratories are meant only to confirm the ideas"). Sir C.V. Raman's outstanding noble price winning research outcome came out of very simple and low cost equipment.
- e. To be sincere and prompt, unmindful of the kind of results;
- f. To have independent thinking without showing any allegiance to any authorities or individuals; (Sir Issac Newton said, "If you want to reach new heights, you should not squat at the feet of an authority but you should stand on his shoulders")

- g. To dream of achieving apparently impossible things and pursue the goal relentlessly; not to be complacent with easy goals; (Dr.APJ Abdul Kalam said, “dream is not what you see in your sleep but the one that does not allow you to sleep”)
- h. Not to accept anything without questioning; to learn the art of self questioning against own achievement and tolerating others questioning of his/her works;
- i. To tolerate ambiguity that may arise out of contradictory results;
- j. Not to get discouraged by failures; to accept them gracefully and continue to work with perseverance;
- k. To have commitment and involvement in his/her field of research and
- l. To use the scientific knowledge in tandem with nature, for human welfare and social welfare.

Careful selection of research areas : Each department should have a few schools of thought and areas of excellence, in which the staff and students take up research. Simple research programmes with latest available techniques that can be completed within a short period should be given preference. Research needs that are identified in the Annual Technical Meets and the Zonal workshops should also be considered. Inter disciplinary and multi-disciplinary programmes should be encouraged. Students should remember that the area of research selected will have a bearing on career advancement throughout. Routine and repetitive programmes should be avoided. In addition to the research areas of local importance, areas of national and global importance should also be considered. The selected programme should also help in furthering the cause of the discipline concerned.

In view of very wide variation in the branches of agriculture, it is difficult to suggest particular areas for research in each discipline. However, some of the areas which need attention on a multi-disciplinary approach are listed below as examples.

- a. IPM, IDM, INM and IFS;
 - b. Resistance breeding;
 - c. Inducing resistance through nutrient, water, micro-flora management;
 - d. Mitigation of the harmful effects of global warming;
 - e. Remote sensing applications in agriculture;
 - f. Exploration of under-exploited plants;
 - g. Groundwater exploration and efficient use;
 - h. Developing and testing of farm machinery for various operations ;
- Social, socio-economic and marketing

It is emphasized again that rather than the research area, it is the research methodology that is important in PG research.

Collaboration with other Institutes : Collaboration with other institutes in research is useful to share the rare expertise and/or the rare, sophisticated equipment that may not be available elsewhere. For this purpose the universities may enter into MOU with the neighboring universities or research institutes and private research houses. The list of expertise and rare/costly equipment available with different institutes may be listed and circulated along with the terms and conditions for their use. Already there is a good practice of identifying the qualified post –graduate teachers available in other institutes and having them in the advisory committees.

Meticulous designing of research programmes : Detailed research programme should be drawn only after a thorough review of the work done earlier and understanding the present border areas of knowledge. A good library support is very useful. While reviewing the earlier work done, extra attention must be given to study the experimental methodology adopted by earlier workers. Experiments are to be designed considering the land, labour and capital resources, available laboratory support, etc. For field experiments, availability of land with a high uniformity is very important. The experiments should be so planned as to complete within the stipulated time. While deciding the treatments, orthogonality should be maintained. The basic principles of field experimentation should not be forgotten. Novel methods of experimentation and observation should be encouraged. The research programme should be flexible to some extent and the student should be free to improvise the programme with the approval of the guide.

Conducting of experiments : In case of field experiments the student should be able to raise a normal to good crop successfully, irrespective of his/her discipline. Care should be taken to have replications on as uniform land as possible across the slope. Imposition of treatments as planned is very important. The experiment should be visited frequently by guide, other staff members and other students, giving their suggestions from time to time. The student should be guided to make correct and timely observations. Not all the variations can be recorded as observations. Such differences that could be noticed visually but not recorded as observations should also be noted as opinion or value judgment of the experimenter, which will be useful in final interpretation of results.

Importance of Post –Graduate education:

Most important expected outcome of the university education is to prepare scientists rather than the science per se. However, if staff research goes hand in hand with PG research, especially Ph.D. research, great developments can come through PG research. One advantage of PG research work is that the review of the work done in the past is done in a-

-better way, up-to date and complete by the students. But, a lot of improvement is needed in the way the review chapter is written at present. A comprehensive and consolidated presentation is required in place of presenting individual works chronologically arranged in bits and pieces. A serious debate is needed on this topic also.

Post-graduate education provides the stepping stone for the development of the university. Today's post graduate admissions will have a bearing on the growth and development of the university for the next thirty years. The research system in the university should be strong and impressive if it has to attract funds for self sustenance. Any university, from the point of its future prosperity and development should give highest attention to Post-Graduate education.

Let us hope, this conference will bring important improvements in academic management concerned to post-graduate education in our universities.

Post Graduate Research in Horticulture : Status and Thrust Areas

Dr. B Hemla Naik

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Indian agriculture supports 17% human population and 11% of livestock of the world with 2.3% of global land and 4.2% of water. Agriculture is the backbone of Indian economy and is our culture and hence the science-led agriculture resulted in self sufficiency in food production, mainly made revolution in development of many varieties and hybrids in addition to number of production technologies generated. However, still Indian agriculture has to take the concerns viz., declining farm income and profitability; degradation of soil and biodiversity. Safeguard the dependents for livelihood; regional disparity and uneven growth; declining land, water and capital investment; there are threat of climate change-temperature, unpredictable weather, drought and flood. Due to which, many challenges are there before the Agriculture/ Horticulture Scientists i.e., we have to produce more for ever increasing population; to be competitive in open economy; balancing natural resources, equity and profitability; employment generation and for livelihood. Reducing malnutrition and under nourishment and finally threat of climate change. For all the above challenges horticulture is a wise & best option because it has very wide crops diversification and optimum utilization of resources; knowledge based horticulture enterprise for technology-led growth; creation of knowledge through relevant research programs. Develop the pool of talented, motivated, creative, committed scientific manpower and also to convert weaknesses into opportunities.

Further, horticulture has improved the productivity and profitability in the country by contributing 29.5% GDP from only 13.5% area. It enhanced employment opportunity for many rural populations. Horticulture addresses the issues of nutritional adequacy in India. Environment concerns addressed. The most potential area for gender equality and development. Intellectually satisfying and economically rewarding. Increased nearly 10

times in production from 1950-51 to over 220 million tonnes in 2013-14. Production, productivity, exports and availability has increased. We are second largest producer of fruits (10%) & vegetables (13.8%); first in production of banana, mango, sapota & acid lime, cauliflower and cucurbits as well as largest producer, consumer and exporter of spices and cashew (44.7%). However, still there are many production problems have to be tackled through systematic research in future to improve the quantity as well as quality standards.

The important horticultural crops viz., banana, mango, papaya, aonla, pomegranate, citrus, jack, pine apple, sapota, guava, annonaceous fruits and some of the potential crops like amla, avocado, lime and lemon, rambutan, mangosteen, tamarind, garcinia, ber, bread fruit, fig, dragon fruit, jamun, longan, litchi; vegetables like tomato, brinjal, chilli, okra, radish, carrot, etc., plantation crops like areca nut, coconut, black pepper, cocoa, betel vine, turmeric, cashewnut, cardamom, kokum, nutmeg and medicinal and aromatics etc., Flower crops like jasmine, marigold, chrysanthemum, china aster, crossandra, tuberose, rose for loose flower and anthurium, gerbera, carnation, rose, gladiolus, orchids, lilies etc., cut flowers and specific study on the role of ornamental gardening etc.,

Some thrust areas for Post Graduate research in Horticulture are indicated below

1) Crop Improvement :

*** Genetic-resource enhancement :**

To address future needs, research will facilitate sustainable use of available genetic resources through (i) characterization, (ii) genetic enhancement and pre-breeding, (iii) functional genomics, proteomics, phenomics, etc., (iv) gene mining, (v) molecular breeding through tools like marker-aided selection and gene stacking, and (vi) customized genetic engineering (development of trait-specific transgenics).

*** Crop Breeding for specific traits :**

The trait looking for should have relevance to the contemporary problems of the region (high demand & low supply; resistance to diseases & insects; higher shelf life & nutritional quality or any other trait of high commercial importance

*** Evaluation of germplasms for tolerance / resistance to biotic & abiotic Stresses;** nutritional qualities and postharvest shelf life under the given agro-climatic conditions including root stock breeding.

*** Biotechnology including tissue culture :**

Through Marker Assisted Selection, finger printing techniques, transformation-transgenics, somatic hybrids; diagnostics development- sensitive virus/viroid detection techniques like ELISA, ISEM, NASH and PCR in eliminating diseased materials

2) Production Technology :

- Balanced nutrition of macro and micronutrients, bio-fertilizers, FYM, vermicompost.
- INM-balanced use of nutrients; leaf and soil test based fertilizer recommendations. Use of amendments and micronutrients. Understanding nutrient dynamics. Site Specific Nutrient Management. Influence of different bio-stimulants, microbial bio inoculants and growth regulators etc.
- High density planting (HDP), ultra high density planting (UHDP), Tree Architecture management, Input use efficiency, minimizing the pre-harvest crop losses due to pests & diseases, Biocontrol.
- Technologies for protected cultivation of high value horticultural crops under different protected structures.
- Organic cultivation of horticultural crops,
- Precision farming, chemical control method for insect pest and diseases, IPM & IDM approaches, Exploitation of botanical for management of pests, bio-control of pest and diseases for Higher yields
- Enhancing water use efficiency-Standardization of water requirement and at stages of crop growth through different Micro Irrigation systems for different horticultural crops

3) Horticulture Mechanization :

- Machinery for seedling transplanting, bulb planting, de-topping and harvesting of onions
- Machinery for earthing up in vegetables crops
- Development of soil less cultivation/ aeroponics/hydroponics technology under protected conditions.
- Machinery for pruning and fungicide application in grapes
- Machinery for harvesting of fruit crops such as citrus, mango, guava, banana, etc.
- Development of harvesters for black pepper, cardamom, makhana, litchi, etc.
- Hi-tech Horticulture- Development of production technologies for High value vegetables, Flowers and spices apart from identification of cultivars.
- Study on plant density, thinning, pruning, canopy management and rejuvenation of old orchards.
- Mushrooms for farm waste utilization
- Studies on Quality planting material

4) Post- Harvest Handling and Management :

Standardize the maturity standards for horticultural crops; harvesting time and methods and handling of horticultural produce; Physiology of fruits, vegetable and flowers. Diversified value added products, Harvesting indices & methods to enhance shelf life, Development of grades & standards (based on local & international requirements), Packaging (for local & long distance markets), In-package methods for increasing shelf life, Pre-Storage treatments & storage conditions & optimum storage life, Post storage behaviour of the commodity, value addition & processing, On farm value addition through primary processing, Secondary Processing (emphasis should be on local or regional food habits & preferences), Health Foods, Specialty Foods (Sports / Geriatric / Functional / diabetic, etc), Nutritional retention studies (Conventional cooking & industrial processing)

5) Indigenous Technical Knowledge (ITKs) :

Native Germplasm / Foods-Cures/ Biotic & Abiotic Stress Management / Storage has immense potential for innovation, especially at the grassroots level. India is a country populated by a number of indigenous communities, most of which have their own set of unique traditional knowledge and technology base. Many of these knowledge and technologies are at par with the modern knowledge and technology system and have been provided the indigenous communities with comfort and self-sufficiency.

6) Frontier Sciences :

Nano-Technology, Information and communication technology and Remote sensing: and also techniques like Geographic Information System and Global Positioning System.

These frontier sciences and techniques would be well integrated in the on-going and future agricultural/horticultural research for improving research efficiency, better targeting of technologies and also identifying production and marketing environments.

Post Graduate Research in Forestry : Status and Future Challenges

Dr. K. K. Suresh

Dean

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Background

The scientific and Professional forestry education has originated its grass roots from central Europe. In general, the science of forestry was an outgrowth of agriculture and as a result, similar principles of land resource management were applied. Silviculture and the growth of trees for economic profit became the backbone of the profession and thus the education of the professionals (Gilbert, 1993). Trees were a crop and education was geared to teaching in terms of tending the crop and to maximize production. In general, forestry is a complex subject and the education was expanded to meet the national and international demands of professional foresters. Most of the Indian forests were virgin during the first world war and the time span between the two world wars have seen the advent of destruction of Indian forests and the scenario is continuing as on date. The forest area in the country is around 24.16% (FSI-2015), which is low against the mandated requirement of 33% of the total geographical area of the country. This low forest cover coupled with low productivity resulted in a total mismatch between the demand and supply of forest products (Parthiban and Govinda Rao, 2008; Parthiban et al., 2010). The reaction and subsequent awareness of forest destruction demanded the birth of scientific forestry. The ultimate objective of scientific forestry is to create equilibrium between deforestation and reforestation. Awareness has emerged in the developed and developing countries that an absolute minimum of green cover is very vital for the conservation of environment and to balance the demand and supply. This has resulted in formal forestry education in the late 70's and early 80's and the emergence of Forestry Research in developed nations has also penetrated into the developing countries through post graduate and doctoral research activities.

Forestry Education System at TNAU

Realizing the pivotal role the forests play in the economic prosperity and ecological stability of a country, this university started as early as in 1973 a full – fledged department of Forestry as a forerunner to a college of forestry and mandated then to carry out research in agroforestry, plantation forestry and exotic forestry. With drift of time and the concomitant multiplication of problems encountered by both tree growing farmers and tree based industries, the need for enlarging the research base was keenly felt. To sub-serve this need a Forest Research Station encompassing an area of 200 ha was started in February 1976 as an adjunct to the Department of Forestry in the sylvan surroundings of a reserve forest at Mettupalayam. The station has since been elevated to the status of Forest College and Research Institute in 1990. The degree programme offered by the university has also been accorded accreditation by the ICAR (Parthiban et al. 2004). Thanks to the initiative and financial support of the ICAR, Forestry as a university degree programme was first introduced in the SAUs in 1985. This university was one among the five SAUs then identified by the ICAR for starting this programme. In keeping with the National Forest Policy of 1988, which states under para 4.11 that “Agricultural Universities should promote postgraduate research and professional excellence”, this university ushered in M.Sc. and Ph.D. programme in forestry in 1989 and 1991 respectively and intensified its research activities through post graduate programme.

Research Needs in Forestry

Forests in the country have played a significant role in improving socio-economic development. The forests have contributed through productive, protective and ameliorative roles. The productive role includes supply of timber and wood products including non wood forest products for both domestic and industrial utility. The protective role of forests is very well witnessed through improvement in climate, soil and water eco-systems. Recently, forests have been recognized as an important agency for ameliorating the climate thereby reduces the implications of global climate change. All these have witnessed the role played by forests; but the population explosion, urbanization, industrialization, infrastructure development and the associated socio-economic development have taken heavy toll of Indian forests. It has been estimated that the forests in the country have been eroded at an alarming rate of 1.5million ha/annum till the recent past (Parthiban et al, 2014).

The area under forests is also very low of 24.16% (FSI, 2015) against the mandated requirement of 33%. The productivity of Indian forests is one of the lowest of 0.5m³/ha/annum compared to the global average of 2.1m³/ha/annum. The low forests cover coupled with poor productivity has widened the gap between the demand and supply. India needs over 87.70 million m³ of wood from short rotation forestry and another 65.10 million m³ of long rotation species during the year 2020 (FAO, 2009). However, Indian forests do not support such a voluminous requirement of wood and wood resources. The policy and legal directions of state and central governments limited the scope of commercial wood production from forests.

Under such circumstances, the National Forest Policy (1988) and National Agroforestry Policy (2014) have directed all the stake holders in the country to look for their own raw material resource generation without depending on natural forests. However for want of suitable institution mechanism, the achievement in this front is dismally modest. There is therefore a need to deploy systematic research and development programme to conserve the existing forests and to augment the trees outside forests to generate raw material resources to meet the domestic and industrial wood requirement. Hence the Forest College and Research Institute of Tamil Nadu Agricultural University has developed comprehensive research plan to strengthen R&D activities in forestry through systematically incorporating them in post graduate research programme of Tamil Nadu Agricultural University.

Research Themes

The Forest College and Research Institute has mandated the following two research themes and incorporated in all the post graduate research activities.

- i) Research on Conservation Forestry
- ii) Research on Production Forestry

I) Research on Conservation Forestry

The establishment of Forest Genetic Resources coupled with their characterization through biometric, biochemical and molecular approaches are the major researchable issues. The status of biodiversity assessment in dry and moist deciduous forests is yet another area of importance demand research inputs. The main objective is to explore the RET species on both flora and fauna and to introduce research mechanism to conserve and protect the genetic resources of both flora and fauna. Similarly in faunal research, the man-animal conflict, status of major wildlife population, migration pattern, feed behaviour etc. are mandated through this research. All these researchable issues are currently incorporated deploying suitable PG and Ph.D. scholars and the forestry research is strengthened.

ii) Research on Production Forestry

The Forest College and Research Institute of Tamil Nadu Agricultural University has mandated production forestry research in all their Post Graduate Programme. This involve basic and strategic research, production technological research, processing research including value addition and consumption research including the impact through social, economical and environmental implications.

Problems and Constraints Identified in Production Forestry

The Forest College and Research Institute of Tamil Nadu Agricultural University has identified several constraints through baseline research. The study has identified wide range of constraints which have been classified into production, processing and consumption related constraints. The level wise constraints identified are furnished below (Fig 1).

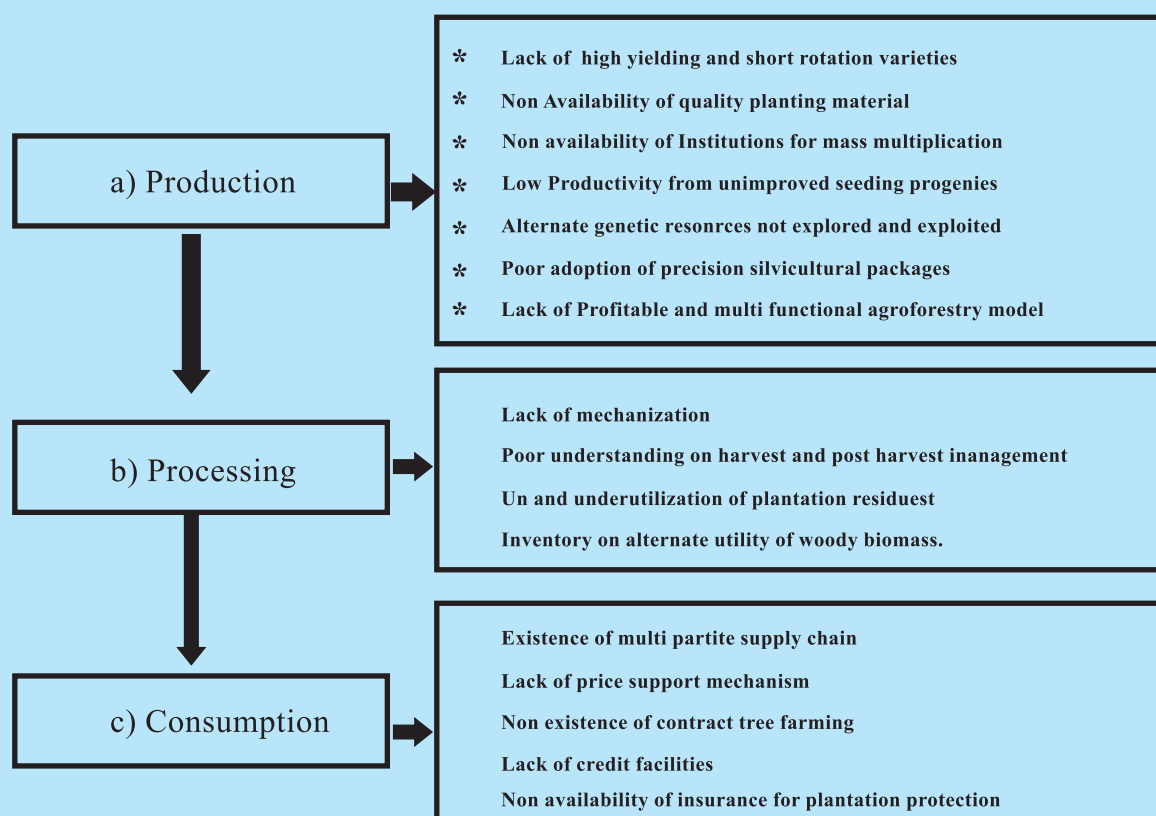


Fig 1. Existing Constraints in Production Forestry

Research Achievements

The systematic and long term research activity through post graduate research programme, the TNAU has made significant achievement and the accomplishments made during the last five years are furnished.

Forest Genetic Resources

The Forest College and Research Institute through post graduate research activities has prioritized 25 different tree species and the genetic resources in the form of provenances, seed sources, progenies, clones and hybrids have been assembled in the form of field gene bank. These genetic resources are classified as timber, industrial wood, biofuel, NTFP and endangered species.

These genetic resources have been characterized through biometric, biochemical and molecular approaches besides developing DUS descriptors to protect the IPR.

Varietal Development

Through the post graduate research activities, systematic tree improvement programme has been carried in a wide range of species out from 1990 onwards and these activities have resulted in development of the following varieties.

a) *Casuarina clones*

This institute has developed superior clones in *Casuarina* (MTP CA1 – *Casuarina equisetifolia*; TNAU *Casuarina* MTP 2) as a source of short rotation, industrial pulp wood species with a cellulose content of more than 45%, kappa number around 20% with an yield of 100 tonnes/ha and 150 tonnes per ha respectively.

b) *Eucalyptus clones*

The institute has developed superior clones in *Eucalyptus* (FCRI EC48 – MTP1) as a source of higher productivity, superior pulp wood quality and also as a clone suitable for saline and alkaline areas. This clone is promoted and demonstrated and are at varied stages of adoption.

c) *Melia clones*

A new clone *Melia* MTP1 has been developed through three doctoral research programme by introducing seed source evaluation, progeny evaluation and clonal evaluation coupled with the wood quality characterization. This clone has been identified as productive clone (150 tonnes – 250 tonnes/ha) and superior wood quality (pulp yield 50.5% and kappa number 19%) and promoted through pulp and plywood industries.

d) *Development of alternate pulp wood*

Two species have been identified viz., *Subabul* and *Dalbergia sissoo* as an alternate source of pulp wood with a potential of 50% cellulose and around 20% kappa number coupled with acceptable fibre strength properties. The two species have been transferred to paper industries for further mass multiplication and promotion.

e) *Jatropha hybrids*

Biofuel research formed major activity of the research agenda of this institute. Accordingly the institute has developed 27 hybrid derivatives with varying degree of variability in terms of seed and oil yield and associated morphological characters. From these hybrid

Management Technology

a) Clonal multiplication technology

Clonal forestry in tree breeding programmes has been emerging as a strong attraction to the traditional seed orchard breeding system. There has been growing interest in using the techniques of clonal forestry and thereby, exploiting the considerable amount of genetic variability already existing in the natural populations of forest tree species that have been amenable to vegetative propagation and partly because of tremendous yield improvement by adopting the clonal forestry approaches. Hence, FCRI has prioritized developing clonal technologies for fast growing industrial wood species to augment the productivity and to reduce the rotation. Accordingly the technology has been developed for timber, industrial wood and biofuel species.

b) Precision Silviculture Technology

The precision silviculture technology for pulp and match wood species have been standardized and implemented in association with wood based industries which resulted in higher productivity of over 25 m³ per ha/ annum

c) Multifunctional Agroforestry

Agroforestry research has been triggered to develop land management systems that integrate agricultural crops with forest trees. Three agroforestry systems viz., Agrisilviculture, Silvipastoral and Agrisilvi-pastoral systems have been developed. Various tree species like Jatropha, Pungam, Simarouba, Teak, Ailanthus, Silver oak, Casuarina and Eucalyptus based agroforestry systems were developed with judicious mixture of compatible intercrops like cowpea, blackgram and forage crops like Cenchrus spp. and medicinal plants like thulasi are recommended for various agro-climatic zones of Tamil Nadu for adoption.

d) Development of Microbial Consortia for productivity improvement

Site and species specific Microbial inoculants were evolved for bamboo, jatropha, simarouba, eucalyptus, casuarina, melia, acacias and shola trees and mass multiplied and applied for respective plantations. The techniques for bio-composting of forest based residues viz., leaf litters, fruit shell, oilcakes, vegetable wastes, coffee pulp and tea cultivation were standardized and transferred to various stakeholders for adoption. Microbial diversity of various forest ecosystems were assessed for developing some promising cultures of both agricultural and industrial importance. Production and utilization of VAM and vermicompost is popularized among farm women, SHG'S and other target groups.

e) Value Addition through Briquetting Technology

The Casuarina clonal plantation needs to be pruned twice the year and during the three year of plantation activities it is expected that 1-2 tonnes of plantation residues in the form of needles are to be available which are currently either unutilized or underutilized. The plantation residues have been successfully value added into briquettes through post graduate research activities. The economic analysis of plantation residue based briquetting technology has indicated the economic superiority of the system compared to the existing saw dust based technology.

f) Consortium Mode Research and Development.

The Institute has established a strong industrial wood consortium with timber, pulp and paper, match and biomass power generation industry and during XI Five Year Plan an area of over 45000 ha has been brought under farmers linked industrial wood plantation through contract farming system. This is possible through the strong Research and Development mechanism established as a part of post graduate research activities. Industries are generously extending financial support and during the last five years over 20 research scholars have been funded by wood based industries and contributed for strengthening the research activities.

Future Challenges and Research needs in Forestry

India is growing rapidly in terms of population explosion, infrastructure development, science and technology and the associated socio-economic development. It has been estimated that India needs over 150 million m³ of wood to meet the growing demands of both domestic and industrial utility from 2020 onwards. India is housed with over 22 sectors of wood based industries and their raw material demand has to be met. The per capita paper consumption in the country is increasing over 10 kg / individual / annum and the per capita energy consumption is increasing over 1000 kw / individual / annum. All these demand sustained supply of wood and wood resources which is a major challenge for the professional foresters. Similarly area under agriculture is diminishing and the area under fallow lands is increasing. This is a major challenge and if it is not addressed suitably there will be a disequilibrium both in productivity and in environmental issues.

Hence, the Institute has conducted various stakeholders meet involving Farmers, Wood based Industries, line departments and has prioritized the following researchable issues to augment the productivity and profitability of farmers besides increasing the tree cover and conservation of forest resources to address the challenges raised above.

1) Research on Tree Breeding and Improvement

- * Breeding alternate and indigenous tree species amenable for various industrial utility
- * Varietal development with high cellulosic biomass trees for paper and ethanol industries
- * Development of short rotation timber, energy and other industrial utility species
- * *In vitro* strategies for mass multiplication of hybrid and other new varieties.
- * Molecular characterizing of Forest Genetic Resources

2) Development of Management Technology

- * Development of high density energy plantations for dendro biomass based power generation.
- * Development of Region specific Agroforestry models for co-generation of food and wood for the region
- * Developing sites specific precision silvicultural packages for the various industrial plantations based on resource availability.
- * Development of certification standards for tree seeds and seedlings and establishment of certified forest nurseries for distribution of quality seeds to the various stake holders.

3) Value Addition Research

- * Evolving techniques for value addition for the products generated from farm forestry, agroforestry and social forestry.

4) Protection Research

- * Evolving species specific microbial symbionts for nursery and plantation programmes.
- * Developing IPM and IDM strategies for tree crops
- * Designing tree models for effective CDM programme
- * The designing models for urban and recreation forestry

5) Forest Products and Market Research

- * The existing supply chain pattern of various forest products will be assessed and the focused value chain models will be developed for various products.
- * Documentation of the existing market and economic structure to suggest the Government for fixing minimum support price for farm grown trees.

6) Wildlife Research

- * Inventory of the core Man Animal Conflict area and documentation of the reasons for the conflict.
- * Evolving eco-friendly repellents against wild animals to avoid man animal conflicts

7) Policy Research

Identify and inventorize the problems pertaining to tree growers and suggesting suitable policy measures for implementation by the government.

8) Impact Research

The impact of natural forests and planted forests will have to be studied for their contribution towards social, economic and environmental impacts. The contribution of forests for mitigating global climate change needs to be assessed through systematic Research and Development programme.

Summary

Professional forestry education has seen paradigm shift during the last twenty five years incorporating the basic, applied and value added research in the post graduate research programme. The researchable issues have been framed taking into consideration the future challenges to be faced by the country in terms of production, consumption and conservation forestry. The growing demand of wood and wood products need necessary research attention for which TNAU has taken a lead in the country by establishing and implementing consortia mode research to address the issues and constraints from the entire Production to Consumption Systems. The post graduate research system of TNAU has comprehensively incorporated all these issues to produce more from agroforestry and to conserve the natural forests to establish strong equilibrium among the natural resources.

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II. RECOMMENDATIONS OF THE CONFERENCE

1. General Observations/ recommendations for improving post graduate education and research.

- * Need to give more focus on research based on region specific needs of farmers (Dr. K. S. Ravi, MAHYCO, Bangalore).
- * Need for identification and documentation of problems and their classification as short term and long-term in consultation with farming community.
- * Need to give more emphasis on field oriented studies and also original research concentrating on minor problems also need to give more emphasis for improvement in communication skills both in English & local languages (Dr. T. M. Manjunath, Former Director, Monsanto research Centre, Bangalore).
- * More importance to location specific problems with multi-disciplinary research is required (Dr. N. Krishnamurthy, Dean (PGS) UAS, Bengaluru).
- * The PG research should be innovative and patents may be registered so that students will be benefited in future course of time.
- * Each department should make a list of short term and long term projects and short term projects should be given to Ph.D. students and long term project for staff.
- * Work on significant research findings from Ph.D. / M.Sc. thesis needs to be continued and translated into technology recommendation for scientific community/ farming community. Short term project proposals in this regard may be funded by university/ industries.
- * Exposure visits for students for research institutes both in public and private sector are needed to get more information on advanced technologies.
- * Regular updating of the thrust areas in different disciplines for PG research by HoD's is necessary.
- * Create facilities of international standard for research and technical upgradation of teachers/students and video-conferencing with subject matter specialists, and to establishment of separate PG Research block for effective research.

2. Suggestion for strengthening linkage between SAUs and industries/ research institutions in private sector.

- * Need to develop manpower with specific technical expertise with proper training. Multi-disciplinary type of research in collaboration with industry (Dr. P.K. Anand Rao, Indo Americal Hybrid Seeds India Pvt. Ltd., Bengaluru)

- * Industries should come forward to provide financial support for applied research on the region specific problems e.g., sheath blight udabatta, downey mildew etc.
- * Location specific problems need to be addressed in consortium mode involving industries. The issues should be identified/ addressed in a comprehensive manner by establishment of incubation facility (Dr. C. Vasudevappa, Honb'le Vice-Chancellor, UAHS, Shivamogga)
- * Need for MoUs between SAUs and private industries for collaborative applied research, exchange of faculty, research fellowships to PG students working on areas of mutual interest, etc.
- * Need for collaborative post graduate research work on wood science and bio-technology with institute of wood science and technology, ICFRE, Bangalore
- * Work out the possibilities of collaborative research with FSI and about data sharing for research work by students. FSI assured establishing a Geo Informatics facility at College of Forestry. (Mr. Rajesh Kallaje IFS, Forest Survey of India, Bengaluru)
- * University should develop few core competence facilities on campus like Geographic Indicators (GI) attracting industry stakeholders to participate in collaborative research.
- * Development of package of practices for the forest plantations and also extension bulletins in forestry.
- * The possibility of collaborative PG research with other institutions and industry partners by offering Co-Chairmanship. Possibility of creating Adjunct Professors positions with senior researchers from partnering institutions could also be explored.
- * List of experts and equipments available in the following institutions could be collected for exploring possible areas of collaborative research in forestry (Mr. Rajesh Kallaje IFS, Forest Survey of India, Bengaluru)
 - a) ICFRE – Institute of Wood Science and Technology, Bangalore
 - b) Forest Survey of India.
 - c) State Agricultural Universities: UAS(D), UAS(B), TNAU and KAU
 - d) IIHR – Central Horticultural Experimental Station, Chetalli, Kodagu
 - e) Coffee Board – Central Coffee Research Institute, Ballehonnur and Chetalli
 - f) Species Research Sub Station of Indian Institute of Species Research, Appangala
 - g) PG Research Centre on Wildlife at Kushalnagar by Karnataka Veterinary University.

3. Thrust areas identified for PG research in Agriculture/ Horticulture/ Forestry.

A) Agriculture

Crop Production

- * Micro-irrigation and precision agricultural techniques for different agro-eco-regions/ cropping systems.
- * Algorithms for crop growth stage based irrigation and fertigation scheduling
- * Rainfed farming and climate-resilient agriculture techniques
- * Nutrient use efficiency and scheduling of water soluble fertilizers.
- * Bio-fortification in cereals, pulses, and oilseeds
- * Application of nano-technology in crop nutrition, weed management, information and communication technology and remote sensing, etc.
- * Application of geographic Information System and Global Positioning System techniques
- * Management of energy and agricultural waste : non-renewable sources of energy, application of solar energy in agriculture. Exploring new biological sources of ethanol, especially from non-food stocks/agri-wastes
- * Effects of crop residue incorporation into soil on soil carbon sequestration and crop performance/quality of natural resources.
- * Farm Mechanization of small holdings: Machinery for planting and harvesting crops such as maize, sorghum, pigeon pea, sugar cane, sunflower etc.
- * Productivity and quality management under organic farming vice-versa chemical farming.
- * Development and evaluation of IFS modules for small farmers under different agro climatic zones.
- * Management of Fe and Al toxicity in different crops under acidic soils.
- * Evaluation of alternative nutrient sources like compost and agro-industrial wastes in different zones.
- * Studies on pesticide residues in soil and pollution of natural resources.
- * Heavy metal pollution of natural resources, soil health and human health.
- * Systems approach in water and nutrient management under different cropping systems.

Crop Improvement

- * Molecular breeding through tools like marker-aided selection and gene stacking, and customized genetic engineering.
- * Agricultural biotechnology for sustaining environment and for meeting consumer taste and preferences.
- * Genetic resource enhancement & Crop improvement is nutri-cereals
- * Genetic resource enhancement & Crop improvement in rice for submerged ecosystems
- * Breeding for climate Resilient varieties
- * Breeding for specific biotic stresses and abiotic in cereals
- * Breeding for quality improvement in high value crops
- * Bio fortification of cereals

Crop Protection

- * Use of nano molecules in pest/ disease management
- * Identification/ design of sensors for detecting biotic (insects, pests and weeds) and abiotic crop stresses.(draught, nutrient, temperature, humidity, light)
- * Eco friendly management strategies including use of bio agents for major pest and diseases
- * Integrated pest and disease management practices in cereals
- * PGPR, IPM, ICM and Bio-control
- * Tracing the movement of double stranded RNA within pest animals tissues
- * Testing for RNAi induced gene knockdown in target pests by PCR
- * Transgenic plant/ insect bioassays
- * Culturing protozoa, defining encystment conditions and incorporating cysts into pest control products
- * Mollusc bioassays with RNAi and protozoa
- * Review of the prospects for structural alteration of Bt proteins to enable binding to aphid gut walls
- * Modeling of crop pest epidemics and disease outbreaks

Social Science

- * Market intelligence
- * studies on impact of e-marketing
- * ICT enabled extension practices, etc.
- * Documentation and validation of ITKs

B) Horticulture

Crop Improvement :

- * Productivity and quality improvement through use of tools like Marker Assisted Selection, finger printing techniques, transformation- transgenics, somatic hybrids and customized genetic engineering; diagnostics development- sensitive virus/viroid detection techniques
- * Production of double haploids and intervention through biotechnological crop improvements tools
- * Introduction of exotic crops and vertical diversification of the crops.
- * Bioprospection, allele mining, gene pyramiding and utilization.
- * Crop Breeding for specific traits like nutritional quality, higher shelf life etc.

Crop Production and Protection

- * INM, Balanced use of nutrients and Site Specific Nutrient Management strategies
- * Soil test and crop response based fertilizer recommendations.
- * Influence of different bio-stimulants, microbial bioinoculants and growth regulators etc.
- * High density planting (HDP), ultra high density planting (UHDP)/ Tree Architecture management.
- * Technologies for protected cultivation of high value horticultural crops under different protected structures.
- * Organic cultivation of horticultural crops and quality management
- * IPM & IDM approaches, Exploitation of botanicals for management of pests, bio-control of pest and diseases
- * Enhancing water use efficiency: precision farming techniques through different Micro Irrigation systems for different horticultural crops.
- * Scientific validation of Indigenous Technical Knowledge (ITKs) on Native Germplasm / Food-Cures/ Biotic & Abiotic Stress Management / Storage
- * Climate resilient agricultural practices under dry land horticulture.
- * Application of frontier sciences like Nano-Technology, information and communication technology and remote sensing: and also techniques like Geographic Information System and Global Positioning System in horticulture
- * Breeding for resistance to diseases and pests.

- * Research on sustainability of small farmers and IFS modules, introduction of exotic crops and vertical diversification of the crops.
- * Silicon nutrition of major horticultural crops.
- * Compatibility of water soluble fertilizer with agrochemicals.
- * Development of soil less cultivation/ aeroponics/ hydroponics technology under protected conditions.
- * Bio-risk management in sensitive horticulture zones.
- * Study on plant density, thinning, pruning, canopy management and rejuvenation of old orchards.

Horticulture Mechanization :

- * Machinery for seedling transplanting, bulb planting, de-topping and harvesting of onions
- * Machinery for earthing up in vegetables crops
- * Machinery for pruning and fungicide application in grapes
- * Machinery for harvesting of fruit crops such as citrus, mango, guava, banana, etc.
- * Development of harvesters for black pepper, cardamom, makhana, litchi, etc.
- * Machinery for planting and harvesting of root/tuber crops such as carrot, radish, onion, garlic, etc.

Post-Harvest Management :

- * Development of the maturity standards for horticultural crops
- * Studies on Harvesting indices & methods to enhance shelf life
- * Development of grades & standards (based on local & international requirements), Packaging (for local & long distance markets), In-package methods for increasing shelf life
- * Pre-Storage treatments & storage conditions for optimum storage life
- * Post storage behavior of the commodity, value addition & processing/ on farm value addition through primary processing, Secondary Processing with emphasis on local or regional food habits & preferences
- * Health Foods, Specialty Foods (Sports / Geriatric / Functional / diabetic, etc),
- * Nutritional retention studies and comparison of conventional cooking & industrial processing

C) Forestry

Silviculture and Agroforestry

- * Development of propagation protocols for important tree species.
- * Development of plantation technology to enhance the productivity of important tree species
- * Silviculture and Agroforestry for climate change mitigation
- * Development of Agroforestry models for different agro-climatic zones
- * Trees for pollution mitigation and restoration of degraded areas
- * Tree-crop interaction studies in different agroforestry models
- * Tree canopy modeling and dynamics
- * Cane and bamboo based farming systems Short rotation forestry.
- * Development of high density energy plantations for dendro biomass based power generation.
- * Developing sites specific precision silvicultural packages for the various industrial plantations based on resource availability.
- * Designing models for urban and recreation forestry
- * Development of certification standards for tree seeds and seedlings and establishment of certified forest nurseries for distribution of quality seeds to the various stake holders.

Forest Biology and Tree Improvement

- * Bio-resource inventory and conservation of flagship species
- * Identification of plus trees, establishment of seed orchards and genetic improvement of trees
- * Forest Entomology and apiculture
- * Forest biotechnology and Genetic Engineering approaches for enhanced productivity
- * Sandal wood germ plasm bank and evaluation of cultivars
- * Breeding alternative and indigenous tree species amenable for various industrial utility
- * Designing tree models for effective CDM programme.
- * Development of short rotation timber, energy and other industrial utility species
- * *In vitro* strategies for mass multiplication of hybrid and other new varieties.
- * Molecular characterizing of Forest Genetic Resources

Natural Resources Management

- * Assessment of AGB and carbon pools in different land-use systems and long-term monitoring
- * Understanding the spatio-temporal changes in the landscape using RS & GIS
- * Spatial and temporal dynamics of SOC in WGSL
- * Effect of land-use changes on species composition and carbon stock in forest and coffee agroforest mosaic
- * Assessment of carbon sequestration potential of different agro-forestry systems in Western Ghats
- * Biodiversity and livelihood improvement
- * Permanent sample spots in different land use systems of the region to understand forest dynamics.

Forest Products Utilization

- * Identification of Wood substitutes
- * Development of wood preservation and treatment protocols for lesser known timber species
- * Wood ammonification and plasticization
- * Bio-prospecting and value addition on NTFPs
- * Biomass Briquetting
- * Evolving techniques for value addition for the products generated from farm forestry, agroforestry and social forestry.
- * The existing supply chain pattern of various forest products will be assessed and the focused value chain models will be developed for various products.
- * Study of the existing market and economic structure to minimum support price for farm grown trees.

Protection Research

- * Evolving species specific microbial symbionts for nursery and plantation programmes.
- * Developing IPM and IDM strategies for tree crops

Wildlife Research

- * Inventory of the core Man-Animal Conflict area and documentation of the reasons for the conflict.
- * Evolving eco-friendly repellents against wild animals to avoid man animal conflicts

III. RESEARCH PAPERS PRESENTED BY PG STUDENTS

Forty eight M.Sc. & Ph.D. students participated in the first conference held at UAHS, Shivamogga and presented their research papers in the field of Agriculture, Horticulture & Forestry. It was an unique experience which paid rich dividends in terms of strengthening of PG activities of the university. The research papers covered a range of current topics on Bio-technology and Crop Improvement, Nutrient Management and Crop Production techniques for sustainable agriculture / horticulture, Eco-friendly management of pests and diseases, constraints in technology dissemination, Silviculture and Agro-forestry, etc. The research papers were peer-reviewed by panel of experts and only the accepted papers were presented in the conference.

a) List of Research Papers Presented in the PG Conference

Sl. No.	First Author	Department	Title of Research Paper
1.	Vidyashree, A.S	Agricultural Entomology	Phenotypic and phylogenetic analysis of Termites (Isoptera) of Western Ghats of Karnataka
2.	Mallikarjunwarad	Agricultural Entomology	Diversity and taxonomy of Hairy caterpillars (Erebidae : Lepidoptera) in different cropping ecosystems
3.	B. P. Nayana	Agricultural Entomology	Biology and external morphology of invasive Tomato leaf miner, <i>Tuta absoluta</i> (Meyrick) (Lepidoptera: Gelechiidae)
4.	Megaladevi, P.	Agricultural Entomology	Seasonal incidence of aphids (<i>Brevicoryne brassicae</i> (L.) and <i>Myzus persicae</i> Sulz.) and their natural enemies on radish
5.	Pallavi, D Shindhe	Agricultural Entomology	Seasonal incidence of yellow stem borer <i>Scirpophaga incertulas</i> (Walker) on paddy during 2014-15
6.	Ravulapenta Sathish	Agricultural Entomology	Comparative biology of shoot fly, <i>Atherigona pulla</i> (Wiedemann) on little millet during <i>kharif</i> and <i>rabi</i>
7.	Afroza Patel	Agronomy,	Growth and yield performance of Maize under maize based cropping System.
8.	Athaula, P	Agronomy	Weed management in rice through application of pre and post emergent herbicides in coastal zone of Karnataka state
9.	Bhanuprakash, H. R.	Agronomy	Efficiency of slow releasing N fertilizer on yield of paddy in coastal Karnataka
10.	Shilpha, S.M	Agronomy	Effect of different types of natural oil coated urea fertilizers on yield and yield attributes of rainfed maize (<i>Zea mays</i> L.)
11.	Bhavya, M. R.	Agronomy	Site specific nitrogen management approaches in different rice establishment systems
12.	Niranjana kumara B	Genetics and Plant Breeding,	Exploration of Genetic Diversity in Guar (<i>Cymopsis tetragonoloba</i> L.) Genotypes
13.	Sheshaiah	Genetics and Plant Breeding	Identification of true hybridity using molecular markers (SSR) in Rice.
14.	Darshini.T.K,	Genetics and Plant breeding,	Estimation of heterosis for yield and yield components in okra (<i>Abelmoschus esculentus</i> (L.) MOENCH).
15.	Mahantesh, S B.	Plant pathology	Survey and surveillance of early blight of tomato in Shivamogga and Davanagere districts.

16.	Kavitha S Veeraghanti	Plant pathology	Survey and Surveillance of Purple Blotch of Onion caused by <i>Alternaria porri</i> (Ellis) cif., under Southern Transition Zone of Karnataka”.
17.	Kavita, T. H.,	Plant pathology	Screening of Carnation varieties against <i>Fusarium oxysporum</i> f.sp. <i>dianthi</i>
18.	Manu, T.G and	Plant pathology	Identification of Resistance Sources against turicum leaf blight of Maize
19.	Lydia, M, Thomas.	Plant pathology	Evaluation of different fungicides against <i>Phytophthora capsici</i> Leonian <i>in vitro</i> .
20.	Sayiprathap, B R	Plant pathology	Variability characters of different isolates <i>Colletotrichum gloeosporioides</i> inciting Mango anthracnose
21.	HAREESH, M. V.	Plant pathology	Studies on powdery mildew of chilli caused by <i>Leveillula taurica</i> (Lev.) Arn.
22.	Saritha, A G.	Plant pathology	Survey for the incidence of root-knot and wilt disease complex of Gerbera under protected cultivation in Shivamogga district.
23.	Murali, R.	Plant pathology	Efficacy of fungicides against <i>Fusarium oxysporum</i> f. sp. <i>cubense</i> under <i>invitro</i> condition
24.	Amruth, B	Soil science & Agricultural chemistry	Effects of phosphorus levels through integrated nutrient management packages on groundnut productivity and phosphorus fractions in soil
25.	Nethravathi, B.	Soil science & Agricultural chemistry	Soil carbon status as influenced by different land use systems under Jambadahalla sub watershed, Chikkamagaluru dist.
26.	Asha Subhash Shetter.	Soil science & Agricultural chemistry	Influences of land use changes on physical properties of soil
27.	Chitra,B.K	Soil science & Agricultural chemistry	Distribution of secondary nutrients under different land use in Ajampura sub water shed of Tarikere taluk, Chikkamagaluru district.
28.	Vidyashree, M.S.	Soil science & Agricultural chemistry	Vertical distribution of primary nutrients in the soil profile under different land use systems
29.	Kavyashree, S.	Agricultural Extension	Performance of public, private and corporate extension worker towards extension services.
30.	Mahantesh Biradar	Floriculture & Landscape Architecture	Standardization of balanced nutrition and bio inoculants on growth, yield and quality of Chrysanthemum (<i>Dendranthema grandiflora</i> TZVELEV).
31.	Pruthvi P. Hegde	Floriculture & Landscape Architecture	Standardization of bio stimulants for growth and yield of chrysanthemum (<i>Dendranthema grandiflora</i> Tzvelev.) under protected cultivation.
32.	Yashawanth. D. R.	Floriculture and Landscape Architecture	Influence of micro-nutrients on growth and flowering of gladiolus (<i>Gladiolus grandiflorus</i> L.) cv. Summer Sunshine
33.	Hemanth Kumar P.	Floriculture and Landscape Architecture	Morphological characterization of chrysanthemum (<i>Dendranthema grandiflora</i> tzelev) genotypes under central dry zone of karnataka
34.	Siddharuda Tuppad,	Plantation, Spices, Medicinal and Aromatic Crops	Evaluation of Genetic Fidelity of in-Vitro propagated <i>Holostemma ada-kodien</i> K. Schum a threatened medicinal plant of Western Ghats using DNA Based Marker
35.	Shruthi, A.M.	Plantation Spices Medicinal and Aromatic Crops	Standardization of seed propagation techniques in <i>Embelia ribes</i> Burm F.: An endangered medicinal plant

36.	Maheshgowda, B.	Fruit Science	Assessment of quality and biochemical traits of different strawberry genotypes strawberry (<i>Fragaria x ananassa</i> Duch.) under naturally ventilated polyhouse in hill zone of Karnataka
37.	Kirankumar,K.H	Fruit Science	Studies on integrated nutrient management in Pomegranate cv. Bhagwa under central dry zone of Karnataka
38.	Puttanna C.	Fruit Science	Studies on growth and yield parameters of tissue culture banana cv. Grand Naine under high density planting with different nutritional levels.
39.	Manoj Kumar	Vegetable Science	Combining Ability Studies for Yield and Quality Traits in Tomato (<i>Solanum lycopersicum</i> L.)
40.	Lavanya K S	Vegetable Science	Performance of Potato (<i>Solanum tuberosum</i> L.) Genotypes Under Hill Zone of Karnataka
41.	Padmashri, R	Horticultural Entomology	Yield loss due to yellow mite, <i>Polyphagotarsonemus latus</i> (Banks), on sweet pepper <i>Capsicum annuum</i> L. under protected condition.
42.	Kiran, S. Kasareddy	Horticultural Entomology	Seasonal incidence of Cardamom Shoot and Capsule borer (<i>Conogethes punctiferalis</i> Guenee) on Cardamom
43.	Appaiah. A.M	Silviculture and Agroforestry	Studies on distribution, natural regeneration of <i>chrysophyllum roxburghii</i> .Don
44.	Poornesh. K. A	Silviculture and Agroforestry	Assessment of variation in growth parameters of <i>Dendrocalamus brandisii</i> (munro) kurz. In kodagu district
45.	Varsha K Jayanandan	Silviculture and Agroforestry	Effect of storage in germination of <i>Melia dubia</i> cav.
46.	Naveen Rowth,	Silviculture and Agroforestry	Characterization of rosewood population based on wood colour.
47.	Basavarajappa S.H	Silviculture and Agroforestry	Trees and Bees win –win integration for Coffee Based Agroforestry
48.	K.N. Kumaraswamy	Silviculture and Agroforestry	Influence of type of cutting and different concentrations of IBA on growth parameters in <i>Guadua angustifolia</i> Kunth.

A separate publication entitled “National Conference on PG Research in State Agricultural Universities: Research Papers” has been brought out in which the full length articles of all the research papers presented during the conference are covered.

b) Best Research Paper Awards for PG Students

Best research paper awards were given to PG students in the following four categories.

	Student Name	Department	Major Advisor of the Student
<i>Ph.D.</i>			
1 st Prize	Ms. Vidyashree A. S.	Agri. Entomology	Dr. Kalleshwara swamy C.M
<i>M.Sc. (Agri.)</i>			
1 st Prize	Ms. Afraz Patil	Agronomy	Dr. HK. Veeranna
2 nd Prize	Ms. Meghaladevi P	Agri. Entomology	Dr. M. Manjunatha
<i>M.Sc. (Hort.)</i>			
1 st Prize	Mr. Mahantesh Biradar	FLA	Dr. Hemla Naik
2 nd Prize	Mr. Manoj Kumar	Vegetable Science	Dr. V. Srinivasa
<i>M.Sc. (Forestry)</i>			
1 st Prize	Mr. Naveen Rowth	Plantation Technology	Dr. Kushalappa

IV. NATIONAL CONFERENCE ON PG RESEARCH: THE PROGRAMME

National Conference on PG Research in State Agricultural Universities (05th & 6th May, 2016)

PROGRAMME

05th May, 2016

(9.00 am to 9.30 am)	:	Registration
		Inaugural session Venue: MP Hall (09.00 am to 11.30 am)
Chairman	:	Dr. C. Vasudevappa Hon'ble Vice Chancellor, UAHS, Shivamogga
Rapporteurs	:	Dr. B. C. Dhananjaya Assistant Professor, Dept. of SS&AC, ZAHRS, Shivamogga
Invocation (9.30 am to 9.40 am)	:	Ms. Darshini, PG Student
Welcome & About the Conference (9.40 am to 9.55 am)	:	Dr. T. S. Vageesh Dean (PGS), UAHS, Shivamogga
Inauguration & Inaugural Speech (9.55 am to 10.40 am)	:	Dr. D. P. Biradar Hon'ble Vice Chancellor, UAS, Dharwad.
Guests of Honour	:	Sri. Ashwath Narayana Hon'ble Member, BoM, UAHS, Shivamogga & Member of Karnataka Legislative Council Dr. H. L. Harish Hon'ble Member, BoM, UAHS, Shivamogga Dr. T. K. Siddarame Gowda Hon'ble Member, BoM, UAHS, Shivamogga
Chairman Remarks (10.40 am to 10.55 am)	:	Dr. C. Vasudevappa Hon'ble Vice Chancellor, UAHS, Shivamogga
Vote of thanks (10.55 am to 11.10 am)	:	Dr. M. K. Naik Director of Research, UAHS, Shivamogga
(11.10 am to 11.30 am)	:	High Tea

Technical Sessions

Venue: MP Hall

(11.30 am to 06.30 pm)

a) Presentation of invited papers

'PG research in Agriculture Status and Future challenges'
(11.30 am to 12.30 pm) : **Dr. A. S. Kumaraswamy**
Former Director of Education,
UAHS, Shivamogga

PG research in Horticulture Status and Future challenges'
(12.30 pm to 1.30 pm) : **Dr. Narayana C. K.**
Principal Scientist & Regional
Co - ordinator, IIHR, Bengaluru

(01.30 pm to 2.30 pm) : **Lunch**

'PG research in Forestry Status and Future challenges'
(2.30 pm to 3.30 pm) : **Dr. K. K. Suresh**
Dean, Forest College
& Research Institute, Mettupalayam

: Presentation of research papers
by PG students

b) Poster Conference

(3.30 pm to 6.30 pm) : Presentation of research papers by
PG students

06th May, 2016

A) Brain Storming Sessions

(Concurrent sessions - 09.00 am to 12.00 noon)

Brain Storming Session - I

'Identification of thrust areas for Post Graduate research in Agriculture'

Venue : MP Hall

Chairman : **Dr. A. S. Kumaraswamy**
Former Director of Education, UAHS, Shivamogga

Co-Chairman : **Dr. H. V. Nanjappa**
Former Registrar, UAS, Bengaluru

Rapporteurs : **Dr. A. Y. Hugar**
Assistant Professor of Agronomy, ARS,
Kathalagere

Welcome & Status paper presentation : **Dr. M. K. Naik**
(09.00 am to 09.15 am) Director of Research, UAHS, Shivamogga

Presentation by external experts : **Dr. C. V. Patil**
followed by discussions Former Dean (Agri.), UAS, Raichur

(09.15 am to 11.30 am) : **Dr. N. Krishnamurthy**
Dean (PGS), UAS, Bengaluru

Dr. K. S. Ravi
MAHYCO, Bengaluru

Dr. P. K. Anand Rao
Indo American Hybrid Seeds India Pvt. Ltd., Bengaluru

Dr. T. M. Manjunath
Former Director, Monsanto Research Centre, Bengaluru

Dr. M. Manjunath
Dean (Agri.), CoA, Shivamogga

Dr. T. H. Gowda
Director of Extension, UAHS, Shivamogga

Dr. Prof. Chandrappa
University Head, Dept. of Agronomy and
Agril. Microbiology

Dr. Y. Vishwanath Shetty
Dean (Student Welfare) & University Head,
Dept. of SS&AC

Dr. B. R. Gurumurthy
University Head, Dept. of Genetics & Plant Breeding

Dr. B. Chinnappa,
University Head, Dept. of Agricultural Economics

Dr. K. C. Shashidhar
University Head, Dept. of Agricultural Engineering

Dr. B. K. Shivanna
University Head & HoD, Dept. of Agril. Entomology

Dr. S. Chandra Naik
University Head & HoD, Dept. of Agril. Extension

Dr. H. Narayana Swamy
University Head & HoD, Dept. of Plant Pathology

Dr. M. Dinesh Kumar
HoD, Dept. of Agronomy

Dr. Gangaprasad S
HoD, Dept. of GPB

Dr. K. T. Gurumurthy
HoD, Dept. of SS&AC

Documentation of the thrust areas
and remarks by Chairman
and Co-chairman
(11.30 am to 12.00 noon)

: **Dr. H. V. Nanjappa,**
Former Registrar, UAS, Bengaluru

: **Dr. A. S. Kumaraswamy**
Former Director of Education, UAHS, Shivamogga

Brain Storming Session - II
'Identification of thrust areas for Post Graduate research in Horticulture'
Venue : KVK Seminar Hall

- Chairman : **Dr. J. Venkatesh**
Director of Research, UHS, Bagalkot
- Rapporteurs : **Dr. Nagaraj Adivappar**
Assistant Professor of Horticulture, KVK, Shivamogga
- Welcome & Status paper presentation : **Dr. B. Hemla Naik**
(09.00 am to 09.15 am) University Head, Horticulture, UAHS, Shivamogga
- Presentation by external experts : **Dr. T. K. Siddarame Gowda**
followed by discussions Hon'ble Member, Bengaluru
- (09.15 am to 11.30 am) **Dr. Raghuramulu**
Director of Research, Coffee Board, Balehonnur
- Dr. Narayana C. K.**
Principal Scientist & Regional Co-ordinator,
IIHR, Bengaluru
- Dr. Prasad Bellur**
Monsanto India Ltd., Mumbai
- Dr. Arvind Deshpande**
OmniActive Health Technologies Ltd., Bengaluru
- Dr. C. Narayanaswamy**
IFFCO, Hassan
- Dr. D. Madaiah**
Dean (Hort.), CoH, Mudigere
- Dr. D. Lakshmana**
HoD, Dept. of Crop Improvement & Biotechnology
- Dr. L. Hanumantharaya**
HoD, Dept. of Entomology
- Dr. B. S. Shivakumara**
HoD, Dept. of Fruit Science
- Mr. Chandrashekar S.Y.**
HoD, Dept. of Floriculture & Landscape Architecture
- Dr. Raviraja Shetty G**
HoD, Dept. of Plantation, Spices, Medicinal
& Aromatic Crops
- Dr. V. Srinivasa**
HoD, Dept. of Vegetable Science

Dr. R. Basavarajappa

Dean (Hort.), CoH, Mudigere

Dr. B. Hemla Naik

University Head, Horticulture, UAHS,
Shivamogga

Documentation of the thrust areas and :
remarks by Chairman
(11.30 am to 12.00 noon)

Dr. J. Venkatesh

Director of Research, UHS, Bagalkot

Brain Storming Session - III

'Identification of thrust areas for Post Graduate research in Forestry'

Venue: OFRC Seminar Hall

Chairman

: **Dr. N. A. Prakash**

Dean (Forestry), CoF, Ponnampet.

Co-Chairman

: **Dr. Police Patil**

Retd. Dean, CoF, Ponnampet

Rapporteurs

: **Dr. Satish B. N.**

Assistant Professor of Forestry, CoF, Ponnampet

Welcome & Status paper presentation :
(09.00 am to 09.15 am)

Dr. C. G. Kushalappa

University Head, Forestry, UAHS, Shivamogga

Presentation by external experts
followed by discussions

: **Dr. Mohan Karnat IFS**

Institute of Wood Science & Technology, Bengaluru

(09.15 am to 11.30 am)

Mr. Rajesh Kallaje IFS

Forest Survey of India, Bengaluru

Dr. S. T. Naik

Dean (Forestry), College of Forestry, Sirsi

Dr. S.J. Patil

HoD, Dept. of Silviculture and Agroforestry, CoF, Sirsi

Dr. Mohan Varghese

ITC R & D Centre, Bengaluru

Dr. K. M. Satish Chandra

J K Paper Mills, Orissa

Dr. Ramakrishna Hegde

HoD, Dept. of Plantation Technology

Dr. G. M. Devagiri

Associate Prof. and Head, Dept. of NRM, CoF, Ponnampet.

Mr. M. N. Ramesh

Associate Prof., Dept. of FPU, CoF, Ponnampet.

Mr. N. M. Poonacha

Associate Prof., Dept. of Silviculture and
Agroforestry, CoF, Ponnampet

Documentation of the thrust areas : **Dr. Police Patil**

and remarks by Chairman and

Retd. Dean, CoF, Ponnampet.

Co-chairman

Dr. N. A. Prakash

(11.30 am to 12.00 noon)

Dean (Forestry), CoF, Ponnampet.

B) UAHS & Industry Experts Interaction Meeting

Venue : OFRC Seminar Hall

(12.00 noon to 01.30 pm)

Chairman

: **Dr. C. Vasudevappa**

Hon'ble Vice Chancellor, UAHS, Shivamogga

Rapporteurs

: **Dr. T. M. Soumya**

Subject Matter Specialist, Agronomy, KVK, Shivamogga

Opportunities & Avenues for
university and industry collaboration

a) PG research

: **Dr. T. S. Vageesh**

Dean (PGS), UAHS, Shivamogga

b) Research & Development

: **Dr. M. K. Naik**

Director of Research, UAHS, Shivamogga

Presentation by external experts
and discussions

: **Dr. N. A. Prakash**

Dean (Forestry), CoF, Ponnampet.

(12.00 noon to 01.00 pm)

Dr. T. H. Gowda

Director of Extension, UAHS, Shivamogga

Dr. M. Manjunath

Dean (Agri.), CoA, Shivamogga

Dr. D. Madaiah

Dean (Hort.), CoH, Mudigere

Dr. Mohan Karnat IFS

Institute of Wood Science & Technology, Bengaluru

Mr. Rajesh Kallaje IFS

Forest Survey of India, Bengaluru

Dr. Raghuramulu,

Director of Research, Coffee Board, Balehonnur

Dr. K. S. Ravi

MAHYCO, Bengaluru

Dr. P. K. Anand Rao

Indo American Hybrid Seeds India Pvt. Ltd., Bengaluru

Dr. T. M. Manjunath

Former Director, Monsanto Research Centre, Bengaluru

Dr. Prasad Bellur

Monsanto India Ltd., Mumbai

Dr. Arvind Deshpande

OmniActive Health Technologies Ltd., Bengaluru

Dr. Mohan Varghese

ITC R & D Centre, Bengaluru

Dr. K. M. Satish Chandra

J K Paper Mills, Orissa

Dr. C. Narayanaswamy

IFFCO, Hassan

C) Plenary Session

Venue: MP Hall

(03.00 pm to 05.00 pm)

Chairman	:	Dr. C. Vasudevappa Hon'ble Vice Chancellor, UAHS, Shivamogga
Rapporteurs	:	Dr. Kalleshwaraswamy Assistant Professor of Entomology, CoA, Shivamogga
Summary of Poster papers (03.00 pm to 03.10 pm)	:	Dr. H. V. Nanjappa Former Registrar & Prof. of Agronomy, UAS, Bengaluru
Presentation of awards (03.10 pm to 03.40 pm)	:	Dr. T. K. S. Gowda Former Director of Instructions (For Post Graduate studies), UAS, Bangalore
Recommendations of Brain Storming : Session in Agriculture, Horticulture & Forestry (03.40 pm to 04.20 pm)	:	Dr. J. Venkatesh Director of Research, UHS, Bagalkot
Concluding Remarks by Chairman (04.20 pm to 04.45 pm)	:	Dr. M. K. Naik Director of Research, UAHS, Shivamogga
Vote of thanks (04.45 pm to 05.00 pm)	:	Dr. C. G. Kushalappa University Head, Forestry, UAHS, Shivamogga
05.00 pm	:	Dr. C. Vasudevappa Hon'ble Vice Chancellor, UAHS, Shivamogga
	:	Dr. M. Manjunath Dean (Agri.), CoA, Shivamogga.
	:	Tea

V. LIST OF PARTICIPANTS

A. The list of Guests/ Experts/ Delegates from institutions outside UAHS.

1.	Dr. D. P. Biradar Hon'ble Vice Chancellor, UAS, Dharwad.	2.	Dr. T.K. Siddarama Gowda Former Director of Instructions, (for Post Graduate Studies), UAS, Bangalore
3.	Dr. Abraham Verghese Director, National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru	4.	Dr. Raghuramulu Director of Research, Coffee Board, Central Coffee Research Institute, Balehonnur
5.	Dr. K.K Suresh The Dean, Forest College & Research Institute, Mettupalayam, Coimbatore Dist.	6.	Sri. Ashwath Narayana Member of Karnataka Legislative Council, Bangalore
7.	Dr. K. Barani Kumar Asst. Professor (Forest), College & Research Institute, Mettupalayam, Coimbatore District	8.	Dr. A. S. Kumarswamy Retd. DoE, & Prof. of Agronomy, Mysore
9.	Dr. C.K. Narayana Principal Scientist, ICAR-IIHR, Bengaluru	10.	Dr. H.L. Harish, M. D., M/s. Varsha Agro Farms and Exports (P), Ltd., Bangalore
11.	Dr. N. Krishnamurthy Dean of Post Graduate Studies, UAS, Bengaluru	12.	Dr. S. T. Naik Dean (Forestry), College of Forestry, Sirsi
13.	Dr. Police Patil Retd. Dean, CoF, Sirisi, UAS Dharwad	14.	Dr. C. V. Patil Former Dean (Agri.) UAS, Raichur,
15.	Dr. H. V. Nanjappa Former Registrar, UAS, Bengaluru	16.	Dr. J. Venkatesh Director of research, UHS, Bagalkot
17.	Dr. S.J. Patil HoD, Dept. of Silviculture & Agroforestry, College of Forestry, Sirsi	18.	Dr. C. Narayanaswamy Deputy Field Manager, IFFCO, Hassan
19.	Dr. T. M. Manjunath, Consultant in Agri-Biotechnology & Integrated Pest Management, Former Director, Monsanto Research Centre, Bangalore	20.	Dr. K. S. Ravi Former General Manager (R&D), MAHYCO, Bengaluru
21.	Dr. T.V. Puttaraju Technical officer, Office of Dean (PGS), UAS, Dharwad	22.	Dr. P. K. Anand Rao Research Coordinator (Field Crops) Indo American Seeds, INDIA.Pvt.Ltd.
23.	Dr. Prasad Bellur Monsanto India Ltd., Mumbai	24.	Dr. Shivanand Jammihal Technology Development Manger, Monsanto Holdings Pvt Ltd., Bengaluru
25.	Dr. Arvind Deshpande Chief Consultant to Omni Active Health Technologies Ltd., Thane., Bengaluru	26.	Dr. Mohan Varghese Principal Scientist (Silviculture domain) ITC R & D Center Bangalore
27.	Mr. Rajesh Kallaje IFS Deputy Director, Forest Survey of India, Bangalore.	28.	Dr.K.M.Satishchandra Advisor plantations(R & D) JK paper mills, Orissa
29.	Dr. Mohan Karnat IFS ICFRE, Institute of Wood Science & Technology, Bengaluru		

B. List of Guests/ Delegates from UAHS, Shivamogga.

1.	Dr. C. Vasudevappa, Hon'ble Vice Chancellor, UAHS, Shivamogga	2.	Dr. P. Narayanaswamy Registrar, UAHS, Shivamogga
3.	Dr. T. S. Vageesh Dean (PGS), UAHS, Shivamogga	4.	Dr. M. K. Naik Director of Research, UAHS, Shivamogga
5.	Dr. T. H. Gowda Director of Extension, UAHS, Shivamogga	6.	Dr. M. Manjunath Dean (Agri.), CoA, Shivamogga
7.	Dr.N.A.Prakash Prof. and Dean (Forestry), CoF, Ponnampet.	8.	Dr. D. Madaiah Dean (Horti.), CoH, Mudigere
9.	Dr. R. Basavarajappa Dean (Hort.), CoH, Hiriya	10.	Dr. Y. Vishwanath Shetty Dean (Student Welfare) & University Head, Dept. of SS&AC
11.	Dr. B. Hemla Naik Nodal Officer, PME,UAHS, Shivamogga	12.	Dr. H. D. Mohan Kumar Seed Officer, UAHS, Shivamogga
13.	Dr. B. R. Gurumurthy University Head, Dept. of Genetics & Plant Breeding UAHS, Shivamogga	14.	Dr. H. Narayana Swamy University Head & HoD, Dept. of Plant Pathology UAHS, Shivamogga
15.	Dr. B. Chinnappa, University Head, Dept. of Agricultural Economics UAHS, Shivamogga	16.	Dr. M. Dinesh Kumar HoD, Dept. of Agronomy UAHS, Shivamogga
17.	Dr. K. C. Shashidhar University Head, Dept. of Agricultural Engineering UAHS, Shivamogga	18.	Dr. K. T. Gurumurthy HoD, Dept. of SS&AC UAHS, Shivamogga
19.	Dr. B. K. Shivanna University Head & HoD, Dept. of Agril. Entomology UAHS, Shivamogga	20.	Dr. S. Chandra Naik University Head & HoD, Dept. of Agril. Extension UAHS, Shivamogga
21.	Dr. D.Lakshmana Prof. (GPB) & Head, Dept. of Crop Improvement and Biotechnology, CoH, Mudigere.	22.	Dr. V. Srinivasa Prof. & Head, Dept. of Vegetable Science, CoH, Mudigere.
23.	Dr. Chandrashekar S.Y. Assoc. Prof & Head, Dept. of Floriculture and Landscape Architecture, CoH, Mudigere.	24.	Dr.C.G.Kushallapa Prof. and Head, Dept. of Forest Genetic Resource, CoF, Ponnampet.
25.	Dr. B.S.Shivakumar Prof. & Head, Dept. of Fruit Science, CoH, Mudigere	26.	Dr. Ramakrishna Hegde Assoc. Prof. and Head, Dept. of Plantation Technology, CoF,Ponnampet.
27.	Dr.L.Hanumantharaya Prof. & Head, Dept. of Horti. Entomology, CoH, Mudigere	28.	Dr.B.G. Nayak Asst. Prof., CoF, Ponnampet.
29.	Dr. Raviraja Shetty G Prof. & Head, Dept. of Plantation, Spices, Medicinal and Aromatic Crops, CoH, Mudigere.	30.	Dr. H. K. Veeranna Professor of Agronomy, CoA, Shivamogga
31.	Dr. D. Thippesha Professor of Fruit Science, CoA, Shivamogga	32.	Dr. M. Hanumanthappa ADR, ZAHRS, Brahmavar
33.	Dr. S. Gangaprasad Professor of GPB CoA, Shivamogga	34.	Dr. G.K. Girijesh Professor of Agronomy, CoA, Shivamogga

35.	Dr. M. Sudeendra Professor of Agril. Extension, CoA, Shivamogga	36.	Dr. C. Karegowda Professor of Plant Pathology, CoA, Shivamogga
37.	Dr. S. P. Nataraju Professor Crop physiology, CoA, Shivamogga	38.	Dr. Narayana S Mavarkar Professor, Agronomy, CoA, Shivamogga
39.	Dr. H. Ravindra Professor of Plant Pathology, ZAHRS, Shivamogga	40.	Dr. R. Ganesh Naik Professor of Plant Pathology CoA, Shivamogga
41.	Dr. S. Shivanna Professor of GPB, CoA, Shivamogga	42.	Dr. Basavaraja I. Hallingali Professor of Statistics, CoA, Shivamogga
43.	Dr. Suresh D. Ekbote Professor of Plant Pathology CoH, Hiriya	44.	Dr. Nagarajappa Adivappar Asst. Professor of Horticulture, CoA, Shivamogga
45.	Dr. S. Sridhara Associate Professor of Agronomy CoA, Shivamogga	46.	Dr. Jayalaxmi Narayan Hegde Technical Officer, Directorate of Education, UAHS, Shivamogga
47.	Dr. Annappa Y Hugar Asst Professor of Agronomy, AHRS, Kathalagere	48.	Dr. G. N. Thippeshappa Asst. Professor of SS&AC, CoA, Shivamogga
49.	Dr. Satish Naik Asst. Professor, Dept of Agricultural Engineering, CoA, Shivamogga	50.	Mr. R. Krishna Naik Asst. Professor, Computer Science, CoA, Shivamogga
51.	Dr. G.H. Ravikumar Associate Professor of Seed Science & Technology, CoA, Shivamogga	52.	Dr. Kalleshwara swamy Asst. Prof. of Agril. Entomology, CoA, Shivamogga
53.	Dr. Sathish B.N Asst. Professor, CoF, Ponnampet	54.	Dr. B.C. Dhananjaya Asst. Professor of SS&AC, CoA, Shivamogga
55.	Dr. Gangadhar Naik B Assoc. Prof. of Plant Pathology, CoA, Shivamogga	56.	Dr. T. M. Soumya Asst. Professor of Agronomy CoA, Shivamogga
57.	Dr. K.M. Sathish Asst. Prof. of Bio-Technology, CoA, Shivamogga	58.	Dr. S. Sahana Asst. Professor of Agril. Extn. CoA, Shivamogga
59.	Mr. Basavaraj H. Bhogi Asst. Prof. of Agril. Engineering, CoA, Shivamogga	60.	Dr. M.S. Nandish Asst. Professor of Agricultural Microbiology, CoA, Shivamogga
61.	Mrs. Jyothi M. Rathod SMS, KVK, Shivamogga	62.	Dr. M. Basavaraja AHRS, Honnavile
63.	Dr. P.R. Somashekharappa Farm Manager, KVK, Shivamogga	64.	Mr. R. Nagaraja Training Assistant, KVK, Shivamogga

List of PG Students who Presented Research Papers in the Conference

A. COLLEGE OF AGRICULTURE, SHIVAMOGGA

Sl. No.	Name	Department
1.	Vidyashree, A.S.	Agricultural Entomology
2.	Mallikarjunwarad,	Agricultural Entomology
3.	B. P. Nayana	Agricultural Entomology
4.	Megaladevi, P.	Agricultural Entomology
5.	Pallavi, D Shindhe	Agricultural Entomology
6.	Ravulapenta Sathish	Agricultural Entomology
7.	Afroza Patel	Agronomy
8.	Athaula, P	Agronomy
9.	Bhanuprakash, H. R.	Agronomy
10.	Shilpha, S.M	Agronomy
11.	Bhavya, M. R.	Agronomy
12.	Niranjana kumara B	Genetics and Plant Breeding
13.	Sheshaiah	Genetics and Plant Breeding
14.	Darshini.T.K,	Genetics and Plant Breeding
15.	Rashmi.K.P	Genetics and Plant Breeding
16.	Mahantesh, S B.	Plant Pathology
17.	Kavitha S Veeraghanti	Plant Pathology
18.	Kavita, T. H.,	Plant Pathology
19.	Manu, T.G	Plant Pathology
20.	Lydia, M, Thomas.	Plant Pathology
21.	Sayiprathap, B R	Plant Pathology
22.	Hareesh, M. V.	Plant Pathology
23.	Saritha, A G.	Plant Pathology
24.	Murali, R.	Plant Pathology
25.	Amruth, B	Soil Science & Agricultural Chemistry
26.	Nethravathi, B.	Soil Science & Agricultural Chemistry
27.	Asha Subhas Shettar	Soil Science & Agricultural Chemistry
28.	Chaitra,B.K.	Soil Science & Agricultural Chemistry
29.	Vidyashree,M.S.	Soil Science & Agricultural Chemistry
30.	Kavyashree, S.	Agricultural Extension

B. COLLEGE OF HORTICULTURE, MUDIGERE

31.	Mahantesh Biradar,	Floriculture & Landscape Architecture
32.	Pruthvi P. Hegde,	Floriculture & Landscape Architecture
33.	Yashawanth. D. R.,	Floriculture & Landscape Architecture
34.	Beeralingappa	Floriculture & Landscape Architecture
35.	Siddharuda Tuppad,	Plantation Spices Medicinal and Aromatic Crops
36.	Shruthi, A.M.	Plantation Spices Medicinal and Aromatic Crops
37.	Maheshgowda	Fruit Science
38.	Puttana, C.S.	Fruit Science
39.	Manoj Kumar	Vegetable Science
40.	Lavanya K S	Vegetable Science
41.	Padmashri, R.,	Horticultural Entomology
42.	Kiran, S. Kasareddy	Horticultural Entomology

C. COLLEGE OF FORESTRY, PONNAMPET

43.	Appaiah. A.M	Silviculture and Agroforestry
44.	Poornesh. K. A	Silviculture and Agroforestry
45.	Varsha K Jayanandan	Silviculture and Agroforestry
46.	Naveen Rowth,	Silviculture and Agroforestry
47.	Basavarajappa S.H	Silviculture and Agroforestry
48.	K.N. Kumaraswamy	Silviculture and Agroforestry



Presentation of best Research Paper awards to PG students during the conference



Presentation of Best Research Paper awards to PG students during the conference.

Directorate of Post Graduate Studies
University of Agricultural & Horticultural Sciences
Shivamogga-577 225, Karnataka Sate