College of Horticulture,Vellanikkara

Address College of Horticulture, KAU P.O., Thrissur-680 656
Phone 0487-2438301,2370790,2370822 Mobile:
Email cohvka@kau.in, adhort@kau.in Website: www.kauhort.in

Station Head		Dr.P.K.Valsalakumari	
Longitude		$10^0$32' N	
Lattitude		$76^0$16 E	
Nearest City/ Town	**Thrissur**	**Distance from Nearest City/ Town (km)**	11
Nearest Railway Station	**Thrissur**	**Distance from Nearest Railway Station (km)**	12
Nearest Airport	**Cochin International AirPort**	**Distance from Nearest Airport (km)**	55

About Station

- 1972- Established the College of Horticulture on 28th October, with an intake of 20 students. The College activities were initially taken up in the Veterinary College Campus at Mannuthy
- 1976- Commenced two year M.Sc. (Ag.) in major disciplines and UG intake increased to 30
- 1977- Introduced B.Sc. (Ag.) course with an intake of 50. College was shifted to the KAU main campus.
- 1979- Commenced Ph.D programmes in major Agriculture disciplines. Also commenced M.Sc. (Ag.) in Agricultural Statistics and PG diploma in NRP. UG intake increased to 90 [B.Sc. (Ag.)-50 and B.Sc. (Hort.)-40]
- 1980- Both B.Sc.(Hort.) and B.Sc. (Ag.) were unified as B.Sc. (Ag.)-IV year course with an intake of 75
- 1981- Commenced Ph.D in Soil Science and Agrl. Chemistry
- 1983- Commenced M.Sc. (Ag.) in Plant Pathology and Ph.D in Plant Breeding and Genetics
- 1984- Commenced M.Sc. (Ag.) in Agricultural Extension
- 1985- Commenced M.Sc. (Ag.) in Processing Technology
- 1993- Commenced M.Sc. in Food Science and Nutrition
- 1994- Commenced M.Sc. (Ag.) in Agricultural Meteorology
- 1996- Established 'Padmasree' Paul Pothen IFFCO Chair in Agrl. Economics
- 2000- Commenced Ph.D in Food Science and Nutrition
- 2001- Stood first at national level in obtaining JRFs (ICAR) and placements
- 2002- Again, stood first at national level in obtaining JRFs (ICAR) and placements
- 2003- Commenced M.Sc.(Ag.) in Plant Biotechnology. Bagged the prestigious "Biotech Products and Process Development and Commercialization Award" for outstanding performance during the last five years

- 2004- Stood first at national level in obtaining JRFs (ICAR) and placements.
- The Performance of the College reflected in receiving, Sardar Patel Outstanding ICAR Institution Award in the year August 2004
- 2005- Stood third at national level in obtaining JRFs (ICAR) and placements
- 2008-Department of plant Physiology started
- 2010 Department of Agricultural Microbiology started
- 2010-Centre for e-learning started

Objectives

- Undertake appropriate academic programmes at the undergraduate, postgraduate and doctoral levels namely B.Sc. (Hons) Ag., M.Sc.(Ag.), M.Sc.(Hort.), M.Sc.(Ag. Stat), M.Sc.(FS&N), M.Sc.(Ag.) Plant Biotechnology and Ph.D in various disciplines.

- Enriching faculty staff strength along with the required, administrative, technical and supporting manpower.

- Mobilising sufficient financial resources for the day to day activities and further development of the institution.

- Creating the basic infrastructure to house, class rooms, laboratories, hostels, sports amenities and computer facilities.

- Modernising farms, laboratory and farm machinery.

- Take up problem oriented research based on feed back from different extension agencies and field feedback from farmers.

- Organizing training programmes, farmer-scientist interactions, agro-clinics, seminars, technology demonstrations and AIR/ Doordhashan programmes.

- Publication of books, booklets and popular articles for the dissemination of new technologies to the farming community.

Vision

To function as a centre of excellence in agricultural education,research and extension catering to the needs of the agricultural development of the country, especially to the state of Kerala.

Mission

To facilitate human resources, skills and technology required for the sustainable development of agriculture and horticulture in the state of Kerala by updating and integrating education, research and extension fonts – the three basic tenets of agricultural education system.

Holding aloft this fundamental mission, the institution strives for attaining the below mentioned basic goals through incessant effort and dedication.

- Bestow the state-of-the-art professional education in agriculture, horticulture and allied areas.
- Develop well trained manpower, physical and financial resources for education, research and TOT (transfer of technology).
- Creating enough space and facilities for developing the co-curricular potential of students
- Take-up advanced research in different discipline of agriculture and horticulture in frontier areas.
- Generate technologies for improving the production and productivity of humid tropic crops and alleviate the problems faced by the farmers

Implement effective and appropriate extension strategies for knowledge dissemination and technology transfer among the extension workers primarily and farmers at large

Achievements

Thirty six vegetable varieties, ten cocoa varieties, four turmeric varieties, one long pepper variety, two rice varieties, two ginger varieties, seven medicinal and one coleus variety have been released by the college. Several technologies, skills and knowledge pertaining to crop improvement, crop management, processing and plant protection were also generated and disseminated through the Package of Practices Recommendations (Crops) for the State. The highlights of research results generated from the different departments and schemes are given below.

Department of Agronomy

- Among pre emergence herbicides, diuron (2 kg/ha), oxyfluorfen (0.3 kg/ha) and pendimethalin (1.5 kg/ha) were most effective in weed control. Solarization for 30 and 45 days and fumigation were found effective in reducing weed biomass.
- *Aeschynomene indica* thrived in low N soils by fixing atmospheric N in its aerial nodules and *Diplachne fusca* is adapted to salinity by excreting excess salts through micro hairs.
- By incorporating sun hemp at 45 DAP and by spraying oxyfluorfen (0.2 kg/ha) followed by 2, 4-D was found to be effective for controlling weed problem in sugarcane.
- Pendimethalin, Butachlor and pretilachlor can be used safely both in rice + cowpea and rice +horse gram cropping system and favoured growth and yield of both green manure crops and rice apart from their superior WCE.
- Total yield, number of hands, number of fingers per bunch, number of D fingers and D finger weight in banana were highest in INM.
- Maximum germination percentage of cashew seeds was found in Azospirillum + PSB+ AMF inoculated potting mixture comprising of cow dung and coir pith compost. The performance of graft was better with soil application of 100 ml decanted extract of groundnut cake + 100ml 17: 17:17 mixture at 1 MAG, followed by 2% 17:17:17 spray at 3 MAG.
- *Pongamia* and rice straw along with inorganic fertilizer enabled consistent supply of P for enhanced grain and straw yield in both laterite and kole land.

- Growth and yield of cowpea as well as economics were studied. Basal application of 50% N as urea and 50% P as rock phosphate along with phosphate solubilizing bacteria inoculation and subsequent foliar spray of 2% diammonium phosphate at pre flowering and flowering stage were found to be the best.
- The treatments which did not get any inorganic fertilisers registered lowest yield in rice during all the seasons. Management practices like addition of cowpea residues, supply of nutrients, adoption of deep tillage/ intermittent drainage didn't show any advantage. Recycling of paddy straw as well as continuous addition of silica was effective in improving the yield.
- Fresh and dry rhizome yield of Nilappana was highest at 30t FYM in 75:25 proportion of FYM and fertilizer, also increased the glucose, starch, curculigoside and protein in the rhizome. The highest yield was obtained at 10x10 cm spacing with 25% shade. Among the various organic treatments poultry manure applications recorded the highest rhizome and curculigoside yield.
- Application of rice straw, *Glyricidia*, FYM (5t/ha) and urea have positive influence on CH_4 emission.
- The highest grain and straw yield in rice was noticed when green manure along with N as NH_4 SO_4+ 1/2P+lime +ash + double dose of K were applied. Leaving the land fallow during summer will reduce yield during virippu if not supplemented with adequate organic manure and ameliorants like lime and ash.
- Combination of lime + P increased the exchangeable K and Na. Cultivar 1026 was more suitable for rice- fish culture in Pokkali field. Among the fish species male Tilapia and tiger prawn was found to be ideal.
- Glyphosate at 0.6kg/ha was most effective against *Mimosa invisa* at 100 DA germination. Ensiling of fodder containing Mimosa under anaerobic condition is the best method to reduce mimosine toxicity.
- A scoring technique had been developed for yellowing of arecanut based on the total number of leaves on the crown, intensity of yellowing, necrosis of leaflets and reduction in crown size.

  Disease index (I) = $\frac{(Y+N) + R}{L} \times 10$

  If value of I is, 0 – Healthy, <20 – Mildly affected, 20 – 50 – Moderately affected, >50 – Severely affected

  Y – Total score for yellowing for lower one-half of leaves in crown (0-6)

  N – Total score for necrosis for lower one-half of leaves in crown (0-2)

  R – Score for reduction in crown size (0-2)

  L – Half the number of leaves in crown

  Enhanced rate of K combined with Mg and S application along with FYM application resulted in least yellowing index, highest chali yield, and highest chlorophyll, N, S and Mg contents in plant.

- Management practices for arecanut grown under terraced uplands, garden lands and converted paddy fields were developed.
- Concurrent growing of green manure crops in dry and wet seeded rice is a management alternative to reduce production loss and increase rice yield and is a practical model for sustainable rice production.
- Yield attributing characters were influenced by incorporation of straw and cow dung along with N and S. Straw incorporation helped in maintaining long term soil fertility.
- Application of sulphur at 15-30 kg/ha to the first rice crop in rice-rice, rice-sesamum and rice-black gram system significantly increased the rice crop yield. The subsequent rice, sesamum or black gram could also produced significant yield increase due to the residual effect of sulphur added to the previous rice crop. Application at 15 kg/ha would sustain the soil sulphur level in the laterite soils of Palakkad and Thrissur districts of Kerala and enhance crop yield with a favourable cost-benefit ratio.
- Nutrient management in cashew nursery using biofertilizers, oil cakes and inorganic fertilizers was standardized.
- Litter production and decomposition pattern in cocoa was studied and developed an yield prediction model.
- The optimum fertiliser dose for cashew was worked out to be 750:325:750g N, P_2O_5 and K_2O/ha.
- Low productivity of coconut in Kerala was shown to be due to the accumulation of excess of elements of Fe, Mn and Zn in the rhizosphere,
- Refinement of the DRIS concept to suit perennial crop management has been developed based on the yield and foliar content of nutrients in pepper and coconut
- Yield limiting factors of wet land rice in laterite soil has been worked out and their influence quantified. A cause cure management technology has been worked out to raise the yield of rice to more than 6 t/ha.
- New vistas in the production and utilisation of organic resources have been a landmark in the research activities in the department. A technology to convert factory waste to useful organic manure has been developed. The decomposition and mineralisation characters, which influence physicochemical properties of the soil and uptake and productivity, have been worked out.
- The compatibility of herbicide - fertiliser combinations and homemade granular preparations of herbicides to reduce the cost of application was established.
- Documented the traditional knowledge on methods of cultivation, use, processing, preservation and value addition of selected underexploited crop species, *viz., Boerhaavia diffusa, Cassia tora, Centella asiatica, Curcuma amada* and *Alternanthera sessilis.* These crops were grown in open area and in coconut garden using organic and inorganic nutrient sources to compare their effects. Performance of all the crop plants was better in open conditions than as intercrops in coconut garden. Better yields were obtained in the first harvest for all crops except *Cassia tora,* which produced larger quantities of fresh shoots after the first harvest, particularly in open conditions *Centella asiatica* performed

almost similarly in both situations. Various organic and inorganic nutrient sources did not have any significant effect on yields

- *Alternanthera sessilis* and *Centella asiatica* have comparatively high contents of potassium (4.6% and 4.4%), while *Boerhaavia diffusa* and *Cassia tora* were high in calcium (3.52% and 6.7%). Except for *Cassia tora,* all the plant species were rich in iron and manganese
- Performance of fodder maize (Var. African tall) and fodder bajra (Co-8) were highly promising in rice fallows, establishing the potential of these fodder cereals as a component in rice based cropping systems. Zero tillage was found to be the best tillage practice for fodder cereals in rice fallows

Department of Agricultural Meteorology

- A sound data base is maintained on onset of monsoon and rainfall of Kerala for a period of 142 years (1870-2011). Weekly soil moisture is being monitored in the cropped field as well as bare soil, since last one decade in KAU-IMD project on soil moisture observation.
- If the onset of monsoon is early, that is on or before 25th May, the total monsoon rainfall over Kerala is likely to be below normal or normal. It is true in the case of belated onset of monsoon also (that is on or after 8th June).
- The pan coefficient was worked out based on reference evapotranspiration (CROPWAT) and pan evaporation. It can be used in Agro meteorological Advisory Services. The reference evapo-transpiration needs to be revalidated during winter season (Mundakan) since the wind speed is very high.
- A significant decline in monsoon rainfall was noticed across Kerala while increase in post monsoon season.
- Rice yields in Kerala are unlikely to decline directly due to long term climate change such as increase in temperature, but bound to decline to some extent indirectly through the abrupt short term changes such as unusual summer showers and extended rains during the monsoon period as noticed in 2008, 2009 and 2010.
- High temperature from November to February is likely to affect the curd size adversely in cool season vegetables like in cauliflower. However, more and more studies in this direction need to be undertaken for confirmation of the results.
- Weekly Agromet advisory services are provided for the benefit of the farmers based on medium range weather forecasting. Agro Advisory Bulletin is prepared both in English and Malayalam based on the weather forecast received for Thrissur district on every Tuesday and Friday from India Meteorological Department. Agro Advisory Bulletin is delivered directly to 100 farmers of Ollukkara Block.

Department of Plantation Crops and Spices

- Released five high yielding varieties of medicinal plants viz, Ajagandhi and Vasika in Adathoda, Mridula and Agni in Plumbago and Jeeva in Holostemma.
- Standardised protocols for regeneration and short term/medium term conservation of five medicinal plants viz. *Trichosanthes cucumerina*, Geophylla, Kaempferia and Rubia.
- Elite somaclones in ginger with high yield and tolerance to rhizome rot and bacterial wilt diseases were isolated.

- Influence of growth regulators on flowering, fruit growth and quality in vanilla and influence of micro metereological factors on flowering and quality of vanilla were assessed. The studies on flowering and quality of beans carried out indicated the favourable influence of growth regulator like NAA and Ethrel each at 100 ppm and GA 50 ppm for improving fruit growth and vanillin content in cured beans of vanilla. The microclimate of the garden significantly influenced flowering and flavour principles in vanilla.
- Availability of the valuable medicinal herb, Jeevakom (*Seidenfia rheedii*) in Kerala forests was confirmed and its threat status ascertained. Domestication trial on jeevakom gave positive results and adhoc package for domestication was formulated
- Soil moisture stress induced flowering in vanilla. A moisture stress of one to one and a half month during November-December was found sufficient to induce flowering in vanilla. Soil moisture stress altered the physiological and biochemical parameters in vanilla. Changes in physiological parameters due to moisture stress could be used to visually assess the extent of moisture stress in the garden.
- Successfully domesticated the medicinal plants *Desmodium, Pseudarthria, Rauvolfia, Nervilia* and *Holostemma* with the participation of tribals.
- Assessed the productivity and production constraints of black pepper, ginger and turmeric in Kerala.
- Standardised thin cell layer culture technique for indirect organogenesis/embryo- genesis in ginger.
- Developed somaclones from polyploid/ diploid culture of ginger.
- Reported details on floral biology of *Piper longum.*
- Reported satisfactory rooting of pepper cuttings without hormone treatment which was included in the package of practice of KAU-2010
- Released two ginger varieties 'Athira' and 'Karthika', developed from local cultivar Maran using tissue culture techniques and by exploiting somaclonal variation.
- Selected ten promising somaclones of cultivar Maran and Rio-de Janeiro after conducting advanced variety trials and on farm cultivation in four districts viz. Thrissur, Palaghat, Ernakulam and Wayanad.
- Assesed the influence of organic manures on growth, yield and quality of ginger and turmeric.
- Pseudo bulbils weighing 7 g was found ideal for propagation of Jeevakam. 75% shade was ideal for better growth and yield. Medicinal qualities did not change on domestication.
- Successful organic cultivation packages were evolved for *Rauvolfia serpentina*, *Desmodium velutinum*, *Pseudatheria viscida*, *Nervilia aragona* and *Seidenfia rheedii*.
- Tribals were empowered in the large scale cultivation of medicinal plants, observing GAP and GMP and market linkage was established with Oushadhi and the produces could be sold at Oushadhi at a remunerative price.
- Morphology and floral biology of *Piper longum* were studied (Time of anthesis and anther dehiscence from 7.30 am to 4.30 pm with a peak between 10.30 am to 12.30 pm; Time taken for complete opening of flowers is seven days.) NAA 25 mgl^{-1}, GA3 50 mgl^{-1}, BA 100 mgl^{-1}, 500 mgl^{-1} and boron 3 mgl^{-1} were effective in inducing fully bisexual spikes. Seed set was reported for the first time in *Piper longum.*

- 60 accessions of thippali were collected through survey and chosen for the PYT. The plants showed wide variability with respect to leaf, plant growth habit and spike characters. Two plants were identified as bisexual types.
- Ten *Piper* species and over 150 genotypes of *Piper nigrum* are being maintained. One hybrid seedling P_2 x P_n 21-09 was found promising in terms of field tolerance to diseases and has very bold berries (100 berry weight 18.24 g and 100 berry volume 17.25 ml).
- Advanced six selected somaclones of ginger for farm trail during 2010-11 season.
- Evaluated 337 ginger somaclones regenerated through indirect methods and selected 10 somaclones for AVT.
- Evaluated 60 germplasam accessions in turmeric and the superior performance of turmeric accession VK-230, in terms of fresh rhizome yield was observed
- Standardised protocols for *in vitro* propagation of cardamom, pepper, and medicinal plants.

- A viable protocol for *in vitro* rapid multiplication of elite types was developed in pepper. The varieties Panniyur 1, Panniyur 2, Panniyur 4 and Subhakara were multiplied *in vitro* and distributed to identified growers to evaluate the performance. The protocol for callus mediated organogenesis was standardised. Somaclonal variability was observed for the expression of disease symptoms. Calli clones of different pepper cultivars were produced with and without applying *in vitro* selection pressure using CP containing toxic metabolites of P. *capsici.* The calli clones of Cheriyakaniakadan recorded great degree of tolerance to the disease.
- *In vitro* seed set was obtained in ginger. Polyploidy was induced in Himachal Pradesh and Rio-de-Janeiro varieties of ginger with increased yield.
- The evaluation of turmeric germplasm led to the identification of four high yielding and high curcumin varieties, ' Kanthi', 'Shoba', 'Sona' and 'Varna' and these were recommended for large scale cultivation in the state.
- Documented the medicinal wealth of Peechi forest and conducted detailed habit and habitat analysis. Standardised the protocols for ephedrine and berberine synthesis from *in vitro* cultures.
- Evaluated 30 accessions of ginger and identified Accessions 2-0-100 and 2-0-104 superior in terms of fresh rhizome yield. Developed high yielding auto tetraploids in ginger.
- Developed a method for *in situ* production of mulching materials for ginger
- Ten piper species and over 150 genotypes of *Piper nigrum* are being maintained one hybrid seedling P_2 x P_n 21-09 was found promising in terms of field tolerance to diseases and has very hold berries (100 berry weight 18.24 g and 100 berry volume 17.25 ml).
- Collected, conserved and characterised germplasm of ginger, turmeric and medicinal plants
- Standardised planting time and harvesting time in kacholam, plumbago and adakodien.
- Standardised *in situ* budding techniques in nutmeg.
- Identified elite types of commercial medicinal plants for intercropping coconut gardens.
- Formulated an iso-enzyme based classification for species of *Piper* and *Curcuma.*

Department of Pomology & Floriculture

Floriculture

- Germplasm collection and evaluation of varieties was done in rose, hibiscus, bougainvillea, jasmine, gerbera, gladiolus, tuberose, anthurium, orchids, aster, marigold, heliconia, ornamental gingers, adenium, euphorbias and foliage plants.
- Collected and evaluated high value ornamentals like *Euphorbia*, *Adenium*; palms, shrubs and foliage plants under different growing systems.
- Collected and evaluated new varieties of *Vanda*, *Mokara* and *Phalaenopsis*.
- *In vitro* propagation techniques in orchid, gladiolus, anthurium, bougainvillea, and schefflera were standardised.
- In orchids and anthurium, planting media, propagule and shade requirement were standardised.
- For obtaining better growth and quality of foliage plants, 50 per cent shade and controlled release of fertilisers are recommended.
- Evaluated tropical plant species for use as cut foliage
- Evaluated bromeliads and ornamental bananas for indoors and tropical landscapes
- Collected and evaluated aquatic plant species suitable for waterscaping
- Identified highly compatible male and female parent combination for hybridization in anthurium
- Identified highly compatible male and female parent combination for hybridization in *Dendrobium* hybrids
- Collected and evaluated foliage plant species for landscaping and interior plantscaping
- Computed the Air Pollution Tolerance Indices of foliage plants and classified them according to the tolerance to pollution
- Evaluated ten species of curcuma for use as tropical landscape plants and cut flowers
- Evaluated the performance of monopodial orchids for use as cut flower and pot plants
- Identified cut flower and pot plant anthurium varieties suitable for the plains and high attitude (1200 m above MSL) regions
- Propagation and planting techniques were standardized in hibiscus, bougainvillea, jasmine, gerbera, gladiolus, tuberose, anthurium, orchids, adenium, euphorbia, heliconia, gingers and foliage plants
- Developed protocol for *in vitro* propagation of *Dendrobium*, *Phalaenopsis*, anthurium, gladiolus, tuberose, schefflera, philodendron, dracaena and bougainvillea, syngonium, cordyline.
- Standardized media and media management for orchid, anthurium, annual ornamentals and foliage plants
- Standardised management practices for commercial flower cultivation for small scale units and also for large scale commercial units in anthurium, orchids, gerbera, gladiolus, tuberose, crossandras and jasmines.
- Protocol for immature hybrid seed culture was developed in anthurium
- Revealed the pattern of translocation of nutrients in *Dendrobium* varieties using radio tracer techniques
- Developed eco-compatible designs for growing *Dendrobium* in Kerala.
- Developed low cost structures for growing anthuriums in tropical areas

- Standardised methods for inducing dwarfness and reducing pre-flowering periods in tuberose using paclobutrazol
- Established a Model Floriculture unit for protected cultivation of commercial flowers with the financial assistance of SHM
- Studied the performance of orchids and foliage plants in fan and pad green house in comparison with the standard growing structures
- Protocol for embryo culture of orchids was developed
- Standardised the pruning season of bush jasmine
- Evaluated the performance of exotic varieties of *Anthurium* in open ventilated poly-house
- Spike pruning in *Phalaenopsis* has revealed its significant influence in production of new spikes
- Conducted survey and identified plant species and plant parts suitable for dry flower industry
- Standardized the technology for dry flower production.
- Developed the technique of skeletonising the leaves of *Ficus religiosa*
- Standardised methods of extraction of essential oil and pigments from flowers
- Developed protocol for post harvest management of orchid, anthurium cut foliage, jasmine, crossandra, gladiolus, tuberose and heliconia for homescale and commercial units
- Established cut flower society in Thrissur.

Fruits

- Standardised the hybridization techniques and *in vitro* propagation techniques in banana and pineapple.
- Developed four high yielding good quality banana hybrids.
- Worked out the cytotaxonomy, pollen morphology and determined the cross compatibility of various trait crops such as banana, mango and pineapple.
- Epicotyl and softwood grafting techniques were developed for fruit crops such as mango, cashew, gummigutta, mangosteen, gooseberry, sapota, lovi lovi, caronda, blilmbi and jack.
- An integrated new production system for Nendran variety with modified high density planting and fertigation was developed.
- Developed protocol for cost effective micropropagation for small scale production systems of banana
- Physiology, growth and flowering of tissue culture banana were studied
- A germplasm collection of 160 varieties of mangois being maintained and evaluated
- Standardised foliar sprays, (viz. potassium nitrate (2%) or ammonium nitrate (0.2%)) for early, profuse flowering and enhanced fruit set in Muvandan and Priyur varieties
- Anatomical and physiological indices for selection of dwarfing rootstocks were standardized in mango and histological and biochemical characterization of polyembryony was studied
- Influence of polyembryonic rootstocks in different graft combinations was studied in mango.
- Survey of table and pickle mango types was conducted and suitable varieties for Kerala were identified
- Crop regulation studies indicated positive response to application of Paclobutrazol (PBZ @ 5.0 g/ tree or PBZ @ 5.0 g/ tree + NAA 30 ppm or PBZ @ 5.0 g/ tree + KNO3 (3%) after 90 days) for inducing flowering and to improve yield in Alphonso, Prior and Neelum varieties.

- In old unproductive trees, flowering and fruiting could be induced by pruning and paclobutrazol application in turn resulting in increase yield. Cauliflorus flowering was resulted in Bangalora variety indicating possibilities of rejuvenation of trees by these methods.
- Determined the critical values for macro and micro nutrients of crops such as mango and cashew.
- The nutrient deficiencies in crops such as mango and cashew have been diagnosed. Determined the effect of different growth regulators on flowering and fruit set of mango, pineapple, cashew and banana.
- Maintains a germplasm collection of 160 varieties / hybrids of mango
- Established a close planted (3 x 3 m) mango research field
- Studied root distribution pattern using tracer techniques in pineapple
- Survey was conducted to assess variability in Mauritius variety and identified accessions with large fruits (> 2kg)
- Papaya varieties CO7 and Pusa Dwarf are much suited to Thrissur condition
- A manurial dosage of 240:240:240 g NPK/ plant/ year with vermicompost (15 kg), *Trichoderma* (5g) and *Pseudomonas* (10g) along with biodegradable polythene exhibited superiority in vegetative, floral and yield attributes in papaya.
- Wide genetic variability existed among the accessions in jackfruit and the accessions were grouped into ten clusters.
- Pruning trials in jack resulted reduction in number of days taken for flushing, flowering and yield with decreasing order of severity, i.e. light pruning resulted in early flushing and fruiting followed by medium and severe pruning.
- Number of jackfruit trees and production was the highest in plains followed by river side, hilly and coastal regions.
- Farmers utilize 20 to 50 percent of jack fruit for their own purpose and 10 to 30 percent for sale, while 20 to 40 percent of the fruit is being wasted in our state.
- Highest yield was obtained in PKM -1 and Cricket Ball varieties of sapota and best quality in PKM -1.
- Inter varietal hybridization programme in sapota showed maximum fruit set in crosses between CO2 x Gavarayya and Cricket Ball x CO2.
- In mangosteen, seeds collected from mother plants of the age group of 25-50 years exhibited maximum percent of germination and seedling growth.
- Application of *Glomus fasciculation* (5 g) + *Azospirillum* (10 g) + single superphosphate (10 g) activated the seedling growth in mangosteen
- Seedling growth of mangosteen in the nursery could be improved in the medium containing vermicompost
- Treatments GA 200ppm + BA 100ppm applied as lanolin paste at shoot tip at monthly interval and drenching of paclobutrazol 2.0 g a.i per tree during Sept-Oct were effective in accelerating the growth and induction of flowering respectively in five year old mangosteen grafts
- Studied quality improvement in mangosteen fruits with special emphasis in reduction of gamboge and translucent flesh disorder. (TFD)
- Standardised softwood grafting in breadfruit (*Artocarpus altilis*) and breadnut in the most promising rootstock. Standardised irrigation schedule and mulching to minimize pre mature fruit drop. Identified suitable storage techniques to improve the shelf life of bread fruit.

- In pummelo (*Citrus grandis*) six accessions which excelled in quantitative and qualitative characters were identified based on the selection index
- Air layering is the most viable and economic method of propagation of the citrus spp.
- Survey was conducted for collection of minor fruits and IC numbers were obtained to the selected accessions from NBPGR, New Delhi. Germplasm of *Flacourtia* spp., *Carissa* spp., *Spondias* spp., *Averrhoea* spp., *Garcinia mangostana*, *G. gummigutta*, *G. indica*, *Nephelium lappaceum* and many other minor fruits are maintained.
- Standardised vegetative propagation techniques in kodampuli, bilimbi and Indian gooseberry (soft wood grafting) sweet and sour lovi-lovi and sweet Indian hog plum (air layering)
- Top working was standardized in *Garcinia gummigutta* to change unproductive male trees to productive female ones

Department of Processing Technology

Protocol standardisation was done for:

- Removal of tannins from cashew apple using clarifying agents like gelatin.
- Production of pectinase enzyme from pectin containing fruit wastes through solid state fermentation technology using selected micro organisms.
- Drying locally available fig which was superior to that of commercially dried ones in terms of quality and value.
- Preparation of clarified banana juice blended with mango juice for RTS beverage.
- Developed the technology for the production of instant sapota-milk shake powder using spray drying technology.
- Production of high quality cocoa powder and chocolate was developed through standardization of primary and secondary processing of cocoa
- Developing Instant Cocoa Beverage Powder (ICBP) mixing cocoa powder, milk and other additives, adopting the technology of spray drying
- Minimal processing technology for fruits like jackfruit, tender jack fruit, pineapple, bread fruit and selected vegetables was standardized.
- Technology for preparation of banana fig.
- Simple methods for production of high value pectin from tropical fruit wastes and utilizing them for production of quality jelly
- Extraction of natural pigments from water melon.
- Extraction of lycopene from watermelon flesh and production of RTS beverage from juice processed for colour extraction.
- Naturally colored instant watermelon milk beverage powder and concentrates of watermelon and snap melon
- Technology for debittering pummelo juice
- Technology of osmo extraction for extracting juice from pummelo with its natural color was developed.
- Production of powder from cured vanilla pods of 30% moisture without loss of flavor

- Technology of osmo extraction of juice and osmo-dehydration of fruits of watery rose apple and Malay apple was developed
- Extraction of anthocyanin from Malay apple flowers were developed which could be used for imparting color to different products.
- Extraction, preservation and utilization of natural color from marigold (*Tagetus erecta*)
- Extraction and value addition of mango seed kernel flour
- Product and process standardization was done in crops such as Water melon, Snap melon, Watery rose apple, Malay apple, Tender coconut, Mature coconut, Coconut milk, Tender jack fruit, Mango ginger, Cashew apple and Papaya.
- Identification of ideal variety for processing was done in Papaya, Banana, Tomato and Sapota.

Standardisation of harvesting and post harvest management practices was done for:

- Pumpkin- Effect of source of nutrition and harvest maturity on quality and shelf life
- Coleus tuber- Quantitative and qualitative changes during storage
- Bread fruit- Packaging and storage requirements
- Suitability of banana and plantain pseudostem sheath for extraction of fiber
- Utilization of tender coconut husk for composting, silage production, and growing media for mushroom and ornamental crops was evaluated.
- Effect of drying techniques on quality parameters of adhatoda was evaluated
- Storage and packing methods were standardised for mango, bitter gourd and mushroom.
- Influence of pre cooling and packaging on physiological loss in weight, marketability, shelf life and consumer acceptability of various vegetables was studied
- Evaluation of postharvest quality attributes of cabbage and cauliflower grown in plains and higher altitude.
- Rural Women empowerment through agro processing and value addition- Preliminary survey of four districts of Thrissur, Palakkad, Ernakulam and Malappuram to identify potential beneficiaries was completed. The beneficiaries selected were Kudumbasree women engaged in processing activities. Fruits and vegetable processing units were established in rural areas of Thrissur (4), Palakkad (2), Malappuram (1), Ernakulam (6) districts
- Process standardization for developing novel product based on selected tropical fruits- Extracted pectin from jack fruit rind and concentrated in vacuum concentrator. Time, temperature and duration of concentration were standardized. Pineapple pulp vacuum was concentrated. Time, temperature and duration of concentration standardized. The products prepared using concentrated pulp viz., jam, toffee and fruit bar were of excellent quality. Standardized the procedure for preparing fruit toffees, chunks, fruit bars, candy, jujube.
- Food Safety through Crop Management- Developing a Management Plan - Fruits, vegetables and spices samples were collected from farmers belonging to Palakkad, Ernakulam, Kannur, Wayanad and Idukki districts. The total number of farmers surveyed

was 279. Samples for pesticide residue analysis were collected from the following crops- mango, pineapple, banana, cashew, pepper, bitter gourd, pea, chilli, amaranthus. The collected samples were sent for residue analysis to College of Agriculture, Vellayani and CFTRI Mysore.

- Employment and income generation in ethnic fruits and vegetables of Kerala through value addition and product development- 13 training programmes were conducted benefitting 325 farmers belonging to districts of Thrissur, Palakkad, malappuram, Kozhikode and Kannur. Technology for production of different products from underexploited fruits and vegetables were developed. These include pickles (20 types), dehydrated products (40 types) jams (3 types), Osmo- dehydrated products (3 types), squashes (10 types) and wine (10 types)

Department of Olericulture

36 high yielding varieties of 16 vegetable crops grown in the state were released by the department as shown below:

Table High yielding varieties of vegetables developed by Olericulture department

Sl. No.	Crop	Varieties
1	Amaranth	Krishnasree, Mohini, Renusree
2	Ash gourd	KAU local
3	Bitter gourd	Preethi, Priya
4	Brinjal	Haritha, Neelima, Surya, Swetha
5	Chilli	Anugraha, Ujwala
6	Cowpea	Anaswara, Bhagyalakshmi, Kairali, Lola, Vjjayanthi, Varun
7	Dolichos bean	Grace, Hima
8	Drumstick	Anupama
9	Ivy gourd	Sulabha
10	Okra	Aruna, Salkeerthi, Susthira
11	Op melon	Mudicode, Soubhagya
12	Pumpkin	Ambily, Suvarna, Saras
13	Ridge gourd	Deepthi

14	Snake gourd	Baby
15	Tomato	Anagha, Sakthi, Mukthi
16	Winged bean	Revathy

- A study on the rain shelter cultivation of tomato capsicum and amaranthus under taken in the department during the period from 2002-04 revealed that the yield and quality of these crops are high inside the rain shelter when compared to the open field crop.
- During rainy season leaf spot incidence was less for red amaranthus variety Arun inside the rain shelter with a CODEX value of 28.6 when compared to the open field crop.
- Among indeterminate tomatoes, LE 643-1 recorded highest yield inside rain shelter and it is recommended for farm trial.
- Among salad cucumbers 'Kuruppamthara Local' identified as high yielding and is recommended for participatory research.
- Polyhouse grown tomatoes recorded higher number of inflorescence, number of fruits, number of harvest and maximum fruit weight.
- Rainshelter cultivation of cabbage was found to be feasible during rainy season. F1 hybrid NS 43 was the highest yielder inside the rainshelter during rainy season.
- Survey and collection of available germplasm in ash gourd, amaranth, dolichos bean, drumstick, curry leaf and *Momordica dioica* were made from Kerala and neighboring states and they were evaluated and characterized as per standard descriptor.
- Seeds of 45 accessions of ash gourd and 30 accessions of dolichos bean were deposited at NBPGR, New Delhi and IC numbers were assigned.
- In brinjal five accessions namely SM 363, SM 364, SM 366, SM 384 and SM 385 were found resistant to jassid infestation both in field screening and in confirmation tests using cage studies. It was observed that high midrib hair density and longer midrib hairs were found to impart jassid resistance in brinjal.
- Anatomical studies of jassid resistant accessions revealed that leaf characters like thick cuticle, increased cell wall thickness of epidermal cells and less intercellular space of hypodermal cells may be contributing resistance to oviposition and feeding of jassids in brinjal.
- In a study conducted for incorporation of jassid resistance in a bacterial wilt resistant background in brinjal it was observed that two F1 hybrids namely Surya x SM 385 and Haritha X SM 366 were better hybrids with combined resistance to jassids and bacterial wilt and having good field characters.
- In okra application of organic manures alone registered significantly higher plant growth and yield when compared to POP recommendation.
- Among the 25 accessions of clove bean, the accession IM -14 was the best performer with 4.2 kg yield/plant.
- The natural crossing with oriental pickling melon and the wild bitter species *Cucumis melo* var *callosus* is found to cause bitterness in cultivated oriental pickling melon. Organoleptic evaluation of a part of the cotyledon at germination will help in early identification of bitterness in oriental pickling melon.

- The cowpea accession Vs 1111 was found to be resistant to pod borer and the accessions Vs 1230 and Vs 1231 were aphid resistant.
- The DNA isolation of cowpea was standardized as a modification of Saghai- Maroof protocol for cowpea and a combination of Dellaporta and Saghai- Maroof protocol for amaranthus.
- Watermelon accessions were collected from Plant Germplasm Quarantine Center, Beltsvide, Maryland, USA, NBPGR, Jodhpur and IIHR, Bangalore. A total of 59 accessions collected from different centers are now under evaluation at the research experimental plots of the Department.
- Twenty accessions of Ivy gourd were raised in a RBD with two replications. Accession CG-73 produced the longest fruit and highest average fruit weight whereas CG-11 produced maximum number of fruits per plant and yield per plant. Accessions CG-23, CG-45 and CG-44 were found to have high carotene, vitamin C and calcium content respectively. Polyphenol was minimum in the polyploid genotypes CG-78 and CG-74.
- Fifteen lines and two testers were crossed to produce 30 F1hybrids of okra. Parent AE 238 and two hybrids AE 238 x AE 190 and AE 265 x AE 190 were disease free in field screening, grafting and vector transmission studies. Based on *per se* performance, sca effects and heterosis, hybrids AE 219 x AE 190, AE 264 x AE 285and AE 265 x AE 190 were selected as top ranking hybrids. Among them AE 265 x AE 190 did not show YVMV symptoms in the screening trials.
- *A. caillei* variety Susthira and *A.esculentus* variety Salkeerthi were crossed reciprocally and crossability index between the species was worked out. It was found out that crossing between the species was more successful when *A. caillei* was used as female parent. The interspecific F1 hybrids obtained were used to raise the F2 generation. *A. caillei* and F2 generation were highly resistant to YVMV whereas *A. esculentus* and F1 generation plants were susceptible to YVMV. Some plants in the F2 generation having desirable fruit characters could be selected for further advancing the generation.
- The cytological study showed that the chromosome number of *A.esculentus* and *A.caillei* as 2n =130 and 2n=184 respectively. In the interspecific hybrid of *A. caillei x A. esculent*us mostly 65 bivalents could be observed suggesting a good amount of affinity between the genome of two species. In the biochemical analysis on isozyme activity specific bands could be obtained in the resistant and susceptible generation plants.
- The F5 generation has been raised in the field and promising plants having YVMV resistance and other desirable traits could be located
- Developed mosaic resistant advanced generation segregants in bitter gourd Seed dormancy in snake gourd is identified as coat imposed or physical dormancy. The best seed invigoration technique in snake gourd is mechanical scarification followed by HCl, H_2SO_4, HNO_3, Hot water soaking and KNO_3 treatments.
- Technologies for cultivation and seed production of all major tropical vegetables were generated.
- A total of 900 number of accessions in 20 different vegetable crops are maintained, besides the related species of tomato, brinjal, chilli, okra, bitter gourd and snake gourd.

Department of Plant Breeding and Genetics

High yielding varieties developed by Dept. of Plant breeding & Genetics

Crop	Variety	Breeding Method
Rice	Kunjukunju Varna (Vk-1)	Participatory varietal selection
	Kunjukunju Priya (Vk -2)	Participatory varietal selection
Long Pepper	Viswam	Clonal selection
Coleus	Suphala	*In vitro* mutagenesis

- Alternative sources of cytoplasmic male sterility to develop male sterile lines in rice were identified.
- Strengthening of food security via farmer/student participatory seed production programme in rice.70700kg seed(jyothi, mattatriveni, aiswarya, varsha, uma,vaishak) were produced during 2010-11
- Morphological and biochemical characterization of aromatic rice cultivars of Wayanad district of Kerala was done.
- Under RKVY screening for drought tolerance, development of cyber extension model for Wayanad district is being undertaken.
- Screening rice varieties for climatic changes-varieties were evaluated at monthly intervals and data is being processed.
- Black gram varieties suitable for the central zone of Kerala is being evaluated
- In cowpea lines with long pods and high yield is being evaluated in yield trials
- Characterisation of *Vigna* sp (fifty accessions) has been under taken at morphological and molecular levels. A dichotomous key was developed to identify different taxa in *Vigna*.
- Medicinal plants suitable for multiple cropping in the four southern coastal states of India – Kerala, Tamil Nadu, Andhra Pradesh and Orissa were identified. *Piper longum* and *Holostemma* were identified as suitable for lateritic tract.
- Studies on the medicinal properties of Red and White flowered ecotypes of lotus revealed that they showed significant anti inflammatory, analgesic, antipyretic, CNS (Spontaneous motor activity and forced motor activity), hypocholesterolemic, hypotriglyceridemic, hypoglycemic and cytoprotective activities and pancreatic beta cell proliferation effect.
- Studies on reproductive biology was conducted in *Plumbago* sp Sacred lotus , White teak and Asoka (*Saraca asoka*).

- *In vitro* mutagenesis was attempted in Pine apple, rice,coleus and *Plumbago rosea*.Coleus was released as variety(Suphala).Plumbago accessions are being evaluated in yield trials.
- Attempts were made to develop male sterile lines in sesame through mutation and interspecific hybridization.
- Dr C R Elsy convenor of IPR cell was involved in the Documentation,characterization and GI registration of Pokkali rice and Wayanadan Aromatic rice Jeeragasala and Gandhakasala and central Travancore jaggery.

Department of Plant Pathology

- During the last ten years thrust was given for the management of crop diseases through biological methods and chemical treatment.
- A mushroom production unit functional at the department is engaged in production and distribution of quality spawn and fresh mushroom.
- Solarization was found effective in controlling pre and post emergence damping off in vegetable nursery.
- The solarized potting mixture was also found effective in controlling *Phytophthora* infection causing foot rot of black pepper at nursery stage.
- Solarization along with incorporation of *Trichoderma* significantly increased rhizome yield in ginger.
- Isolated potential antagonistic *Trichoderma aureoviride* and endophytic bacteria, *P. fluorescens* and *P. stutzeri* from ginger. *Trichoderma aureoviride* and *P. stutzeri* are first reports from ginger
- Four potential native antagonists, *Trichoderma harzianum* and *Bacillus subtilis* of chilli and *Trichoderma virens* and *Pseudomonas fluorescens* of ginger, effective against rhizome rot (*Pythium aphanidermatum*) and bacterial wilt of ginger and chilli (*Ralstonia solanacearum*) were identified.
- Identified major fungal and bacterial antagonists effective against *Ralstonia solanacearum* of solanacious vegetables as *Trichoderma viride* (Ozhalapathy) *Trichoderma pseuodokoningii* (forest soil), *Aspergillus niger* (Eruthiampathy), *Pseudomomas aeruginosa* and *Bacillus subtilis.* Among the different methods of application of antagonists, either seed treatment + soil drenching or root dipping method showed maximum effect in reducing wilt incidence and in delaying the wilt appearance.
- Isolated potential antagonistic endophytic bacteria, *Bacillus megaterium* which is reported to be phosphorus solubilizing bacteria from black pepper for the first time.
- Isolated potential endophytic bacteria (*Pseudomonas putida, Bacillus subtilis P. plecoglossicida, P. aeruginosa*) and fungus (*Pencillium minioluteum*) from cocoa plants, having plant growth promotion property and antagonistic action on *Phytophthora palmivora*
- The etiology of vascular streak disease of cocoa was worked out as *Oncobasidium theobromae.* The pathogen causing anthracnose disease of cowpea in Kerala was identified *as Colletotrichum lindemuthianum.* Studies on biological, nutritional and biochemical basis of bacterial wilt in Solanaceous vegetables indicated considerable variation among crops and varieties.

- Isolated potential endophytic actinomycetes (*Streptomyces glaucescens, S. griseoruber* , *S. griseous, S. thermodiastaticus* and *S. griseolus*) from tomato plants having plant growth promotion property and antagonistic action on *Ralstonia solanacearum*
- Isolated a VAM fungi of tomato from Eruthiampathy, Palakkad Dt. having plant growth promotion property and antagonistic action on *Ralstonia solanacearum*
- Development of cheap liquid medium -50% coconut water, 25 % coconut water with sugar @ 15 g/l for the mass multiplication of *Trichoderma* and bacterial bio agents.
- Standardisation of molecular diagnosis of Banana streak virus
- Spray of Salicylic acid (10^{-6} dilution,1 mg/l) for management of bitter gourd mosaic.
- Isolated and identified plant growth promoting rhizobacteria of ginger (*Pseudomonas aeruginosa, P. fluorescens,* non fluorescent Pseudomonas) having antagonistic property to *Ralstonia solanacearum* and studied induced systemic resistance
- Diversity evaluation of *Ralstonia solanacearum* using RAPD marker
- Application of native *Trichoderma* isolate and potassium phosponate (0.3 %) for management of slight to moderate foot rot infection of black pepper and drenching COC and spraying of BM for severe foot rot infection of black pepper
- *Trichoderma viride* is the best antagonist and coir pith is the best soil amendment against bacterial and fungal pathogens of Kacholam
- Developed PGPM consortia for growth and establishment of micro propagated vanilla and ginger
- Isolation and identification of biosurfactant bacteria viz., *Pseudomonas sp.*, *Geobacillus kaustophilius* and *Pseudomonas fluorescens* from hydrocarbon contaminated soil
- Spray of garlic extract against contaminating fungi and bacteria of milky mushroom
- Use of organic amendments, viz., rice bran, neem cake, dry azolla and vermiwash for early spawn run and better yield of oyster mushroom
- Standardised *in vitro* growth parameters of *Hirsutella thompsonii,* the fungal pathogen of coconut eriophyid mite
- The fungicide carbendazim was found effective in controlling powdery mildew of Pumpkin.
- The beneficial organisms *Azospirillum* and *Bradyrhizobium* were found influenced by the addition of insecticides and fungicides.
- Combined application of 2% cow dung slurry supernatant and 2% *P. fluorescens* suspension was found to be effective against BLB of rice.
- Combined application of lime (250 g) and bleaching powder (15g) per sq. m. was found effective for the management of rhizome rot disease of ginger.
- Ekalevyan-a local variety of ash gourd (farmer Joy, Puthenchira) showed resistance to mosaic disease.
- Phenotypic and pathogenic variability was observed in *Sclerotium rolfsii* infecting banana, mango, chrysanthemum and marigold.
- Garlic 5% + turmeric 10% and tetracycline 200ppm were found to be effective against black rot of cauliflower.

Department of Agricultural Entomology

- For the first time in the country, the oviposition deterrent pheromone from *Odoiporus longicollis*, the banana psuedostem weevil, was detected from the pseudostem. The crude extracts of the epidect compound has proved very effective in preventing oviposition by other weevils on fresh pseudostem of banana even under no choice test.
- A very fast method for correct counting of all perianth mites, *Aceria guerreronis* from the buttons of coconut was developed.
- Established the role of natural bio control in paddy pest management and the need for restricting the use of chemical pesticides in paddy fields is emphasized.
- Successfully isolated the indigenous entomofungal pathogen, *Hirsutella thomposonii* from the coconut eriophyid mite *A. guerreronis* for the first time in India.
- The species complex of *Epilachna* beetles in vegetable has been confirmed. *Henosepilachna septima* was found on gourds, *H. vigintioctopunctata* on brinjal and *Afidenta misera* on cowpea.
- The pest complex of orchids in Kerala was surveyed, identified and documented.
- Bioefficacy of the newer molecule, acetamiprid was tested and proved against sucking pests of three vegetables, namely bhindi, brinjal, and bitter gourd.
- Pheromone management of red palm weevil with Ferrolure with its best suited food attractant, trapping device, time and place of dispensation and renewal time have been standardized.
- The active principles of *Acorus calamus* and their influence upon the reproductive suppression on both sexes of *Bactrocera cucurbitae* and its practical exploitation using a bait trapping technique has been developed.
- Standardization, production and distribution of parapherone traps against fruit flies of mango and cucurbits were carried out.
- Identified species composition, assessed crop loss and standardized management strategies of fruit flies of mango and cucurbits in farmer fields of Thrissur disrtict.
- Validation of technology for coconut perianth mite management by crown spraying with neem azal in farmer fields at Thrissur district.
- Standardized root feeding of botanical insecticides for the management of coconut mites in KAU Campus
- Management of *Helicoverpa armigera* by newer insecticide molecules in combination with microbial insecticides was explored.
- Coconut root (wilt)/ leaf rot syndrome and perianth mite was managed by SRF technology in farmer's fields at Porathussery and Kuttikad, Chalakudi.
- Assessed the bioefficency of biorational insecticides for managing the key pests of jasmine.
- Rodent attack in coconuts was effectively managed by integrated tactics in farmers filed at Mathilakam Block Panchayat, Thrissur district.
- Studied bioecology and brought out IPM for banana root mealy bug.
- Non - pesticide agents for nematode management in thippali were evaluated

- Developed and evaluated management methods including MAT & BAT techniques for the effective management of mango fruit fly.
- Studied tritrophic interactions of cowpea aphid, *Aphis craccivora.*
- Isolated and carried out molecular characterization of native isolates of *B.thuringiensis* against *Spodoptera mauritia* in Kerala.
- Analyzed and assessed the quality parameters of stored rice/ wheat samples from different godowns of Food Corporation of India
- Development and distribution of MAT blocks for the effective management of mango and cucurbit fruit flies in farmer's field.
- Assessed the potency of *Vitex* for the management of *S. litura* and epilachna beetle
- Evaluated methods for the management of bird problems in different crops
- *S*tudied and screened synthetic and biopesticides for the management of papaya mealy bug.
- Studied the diversity of phytophagous mites in important crops of Kerala
- Integrated management of fruit flies by cue lure and methyl eugenol traps.
- Brought out adhoc recommendation practices for papaya mealy bug management
- Released parasitoids of papaya mealy bugs in infested areas in the state.
- Population density of agriculturally important birds was recorded on crops viz., rice (both kole land and other irrigated rice crops), vegetables, cashew, fruit crops and organic agricultural fields.
- Indo-UK project undertaken on management of Friut flies – monitoring of fruit fly population was conducted and found that the mango fruit fly is prevalent throughout the year and management by parapheromone traps was found effective in the field.
- Biology and insecticide sensitivity of rice white backed plant hopper in Kerala was studied
- Rice blue beetle, hitherto, considered as a minor pest, was reported to assume a major status in rice growing tracts of Palakkad, Kannur, Kasargod and Trivandrum districts. Its biology, varietal screening, seasonal incidence, alternative hosts and IPM were studied and recommendations made.
- Seven isolates of *Hirsutella* and six entomo-fungal pathogens against coconut eriophid nites were reported in Kerala
- Field screening of selected varieties of cashew grafts against Tea mosquito bug and *Colletotrichun* were undertaken. Quinalphos and carbaryl were recommented against these pests.
- Potency of bio-insecticides against cowpea bruchid was evaluated and recommended spinosad and lemon grass oil for pulse beetle management in storage
- Termite fauna diversity in different crop eco systems at KAU Campus was studied
- Evaluated the efficiency of bio-control agents against root knot nematode in tissue culture banana
- Entomopathogenic fungi were evaluated for the biocontrol of cowpea aphids
- Evaluated the effects of entomopathogen in cowpea storage
- Insect pollinators of oil palm in Kerala were studied
- Method for enhancing the performance of *Trichograma chilonis* was investigated.
- Bio ecology and management of mulberry leaf roller were explored
- Indigenous natural organic materials for the management of insect pest of rice were studied
- Bionomics and host range of American Surpentine leaf miner were worked out
- Studied bionomic and management of insect pest of medicinal plants of Kerala
- Identified and studied platygasterid parasitoids in rice and vegetables
- Taxonomic studies conducted on predatory Coccinellid beetles in rice and vegetables
- Bio-efficacy of newer insecticides against bitter gourd leaf hopper was evaluated

- Studied biodiversity and bionomics of Coccinellids in vegetables.
- Survey on rice sheath mite in Kerala was undertaken. A detailed survey on the pest complex of cashew resulted in the identification of eleven species of insects attacking the inflorescence which were hitherto unrecorded.
- An environment friendly management practice by swabbing mud slurry was developed for the control of banana pseudostem weevil.
- An oviposition deterrent pheromone secreted by adult females extracted from the leaf sheath applied on fresh plants prevented oviposition of banana pseudostem weevil.
- The Department is the sole agency responsible for epoch-making management of *Salvinia molesta* through the biological agent *Cyrtobagus.*
- Ph.D. Scholar, Ms. Jyothi Sara Jacob was awarded UGC – Maulana Azad National Fellowship by the Ministry of Minority Affairs through UGC for 2011-12 and such fellowship holders are termed as MOMA Scholars.

Department of Soil Science & Agricultural Chemistry

Soil fertility evaluation

- Results from different cucumber fields showed that fertilizer application based on yield target gave higher yields, net benefit and B/C ratio over the farmers practice.

Soil fertility management & Nutrient interactions

- Field evaluations of crop performance at two locations at Palakkad in tomato reveals that P, K & lime significantly influence yield and yield contributing characters.
- The yield and quality parameters of nuts in cashew grafts were found to be effected to a certain extent by the application of Potassium. But the response to P seem to be exceedingly limited
- Investigated the extent of sub soil acidity and toxicity of Aluminium present in lateritic soil and evaluated the performance of phospho gypsum blended with fly ash and vermicompost for its suitability in regulating pH exchangeable alumina, iron and manganese.
- A field experiment was carried out to find out the best nutrient management system suitable for sustainable rice production in black soils of Chittoor, Palakkad district.

Availability Indices of nutrients in soil

- Collected 5 bench mark soils of lateritic origin and standardized quantity intensity relations of P with reference to its bio availability.

Nutrient dynamics in soil

- The complimentary role of Ca source of among the different components of production system and the effect of Ca rich organic nourishing media recycled through earthworm, mushroom and tomato enhanced the productivity of the component from besides maintaining a favorable a Ca dynamics and sustainable soil health

Pollution studies in soils

- The present recommendations of 2-4,D @ 1kg/ha for weed control in rice does not cause any adverse effect in the soil or crop as revealed from studies in soils of Palakkad, Kuttanad and Kole lands of Kerala.

- An investigation carried out to study the persistence of butachlor, pretilachlor and 2-4D in rice-rice system revealed superiority of butachlor over pretilachlor in the weed management of rice-rice cropping system. Application of FYM enhanced the microbial degradation of herbicides
- Investigations to determine the effect of organic matter and soil moisture on the adsorption of cloroacetnilide herbicide viz. butachlor and pretilachlor in lateritic soil revealed that moisture had no significant influence on adsorption of herbicide.

Studies on heavy metals

- Identified the selective retention sites of Cadmium and Lead in tomato plants to quantify the selectivity retained heavy metals in tomato at different levels of their applications and observed the effect of Cd and Pb on the normal growth and production of tomato

Fertilizer prescription equations developed

- As a part of STCR Project fertilizer prescription equations were developed for turmeric, rice second crop, sweet potato, ash guard, biter guard, cucumber (Oriental pickling melon), amaranth 1st and 2nd crop, bhendi 1st and 2nd crop, snake guard 1st and 2nd crop, brinjal normal & ratoon crop, chilli, pumpkin 1st and 2nd crop & watermelon during the period 2001 to 2010-11
- An analytical method using HPLC for standardized for the estimation of Carbofuran and its metabolite residues in banana. It is found that the maximum content and uptake of nutrients N,P & K occurred during the early and late vegetative stages in banana and bunch yield was higher when urea formaldehyde formulations was tried
- The girth of coconut seedling and no. of leaves produced were also higher with urea formaldehyde formulations.
- Lime application for rice variety Thriveni in the laterite soil significantly increased the straw and grain yield of rice over control
- Amelioration of subsoil acidity and aluminum toxicity in lateritic soils under black pepper revealed subsoil acidity due to high level of exchangeable Al as a major root growth inhibiting chemical barrier.
- Cowdung is the best substrate for the production of calcium rich worm cast. Worm cast at a level of 20% of substrate is the best casing material for milky mushroom as compared to coirpith compost, termite mud dune and soil.

Department of Agricultural Economics

- The study on fertilizer use pattern of major crops in South Zone showed that majority of the farmers in Kerala, Karnataka and Tamil Nadu and Andhra Pradesh preferred urea for its high crop response, reasonable price and reputed practice. Price reduction as a solution to improve IFFCO fertilizer was provided by 36% farmers in Kerala, 29% in Tamil Nadu, 57% in Karnataka and 29% in Andhra Pradesh.
- The indicators used in Impact assessment of cluster approach showed a considerable change which indicates that the financial assistance in the form of subsidies together with the farmer participatory approach proved successful in implementation of the cluster programme. Cluster approach should be extended for the marketing of produce, thereby ensuring higher profits. Despite relatively higher literacy and formal education, the knowledge and awareness level with respect to pesticides were found to be far less than satisfactory.
- The study on Pesticide Use and Crop Productivity in Food Crops of Kerala (bittergourd and pine apple) came out with the following observations. Many of the Pesticides used in pine apple include

chemicals which are banned for sale in Kerala (Endosulfan), and those permitted for restricted use only. (2 Methoxy ethyl mercury chloride).The pesticides which are suggested on a need based manner is applied on a prophylactic approach. The application level is higher than the recommended level of the chemical by 0-550 % in pineapple and 0 to 900 % in bitter gourd. Despite relatively higher literacy and formal education, the knowledge and awareness level with respect to pesticides were found to be far less than satisfactory.

- The SWOT analysis and participatory evaluation of the selected agro ecological units of Palakkad district highlighted the importance of farming and agri-related sectors for providing livelihood security of the district and outlined the strategies to be devised. A spatial integration of crop, livestock and other agro-related enterprises under the aegis of Krishibhavans by integrating other line departments and major programmes like NREGS in a participative manner with the support of local bodies should be the strategy for the development of agriculture in Palakkad.
- The NAIP project on Establishing and Networking of Agricultural Market Intelligence Centers in India taken up with the major objectives of providing price forecasts for the mandate crops such as Coconut, Cardamom and Pepper thus helping the farmers in taking better sowing and selling decisions; and its dissemination through different mass media like newspapers in regional languages and English, television, radio, agricultural magazines etc. so as to reach the maximum number of farmers.
- Eight Price Forecasts - three for cardamom, two for coconut and three for pepper; and 3 updates - two for cardamom and one for pepper were released during the year 2010-11
- 97 News Paper releases, 17 TV telecasts and 11 Radio broadcasts for disseminating the price forecasts.
- 7 Officers' training and 7 Farmers' training involving 354 Officers and 423 farmers respectively to sensitize on the issues on market intelligence.
- Voice SMS to 11, 68,000 Green Card Mobile holders through tie up with IFFCO KISAN SANCHAR LTD and BHARATI AIRTEL LTD.
- An Impact study was conducted on the Price Forecasts released for Cardamom and impact was quantified.
- The impact of cardamom price forecast estimated that the incremental value of retained quantity at the pre December and post December 2009 price realization was Rs 13.19 lakhs for a sample of 30 sample growers. Assuming a modest coverage of 10 percent of the total cropped area under cardamom in Idukki district alone, the benefit of the information works out to Rs 3.29- Rs 4.54 crores.
- The All India Rabi Workshop of the NAIP Consortium was organized by AMIC KAU at Trichur from 20 – 23 December 2010.
- As part of the ongoing project "Resource Integration for Sustainable Watershed Development" funded by the Hariyali project of the GOI, the Detailed Project Report (DPR) for undertaking the soil and water conservation and employment opportunities to the stakeholders in the selected watersheds in Pazhayannur block was prepared for the period 2006- 2010. The implementation is being done by the grama panchayats in the block and the monitoring and support is done by the KAU.
- The study on valuation of ecosystem services provided by Kolleru lake in Andhra Pradesh estimated the Total Economic Value at Rs. 942 crores and the mean Willingness To Pay (WTP) for preservation of the lake as Rs 116 per annum per household.

- In the IFFCO project on Economics of Diversification in agriculture under different farming systems it was found that enhanced BC ratio obtained as a result of diversified farming systems in the IFFCO adopted villages of Kerala, Tamilnadu and Andhra Pradesh.
- The Socio economic constraints identified were lacuna in market/ price information for high value perishable commodities and the poor investment capacity of farmers.
- The cropping intensity of the existing farms revealed that the available area was not utilized in an effective manner so as to derive the maximum benefits. modified cropping pattern with higher cropping intensity was suggested for maximum utilization of the available resources of land, labour and capital. The data exhibited that there was considerable increase in farmers income with the adoption of proposed intervention.
- The major socio-economic constraints faced by farmers particularly small and marginal farmers is their inability to invest in crop and non crop enterprise which require high investment .The market and price information does not exist for some of the high value perishable commodities which constraint the process of diversification .High incidence of pest and diseases act as major technological constraint to the adoption of some high value crops.
- Studies on economics of production and marketing of important crops in the state, *viz*. rice, banana, vegetables, rubber, pepper, cardamom, coconut, areca nut, tuber crops and medicinal plants, floriculture and of livestock were undertaken by the department over the last several years. The studies focused on the cost pattern as well as the profitability levels of the different crops.

Department of Agricultural Statistics

- Probabilities for different amount of rainfall and assured rainfall in the different standard meteorological weeks were estimated for different agro climatic zones of Kerala
- Two factor interaction was quantified using additive main effect and multiplicative interaction (AMMI) model.
- Non linear models for estimating the growth of major crops of Kerala with respect to area, production and productivity was developed.
- The study on "Changing scenario of Kerala Agricultural – an overview" revealed that Auto Regressive Integrated moving Average (ARIMA) models were superior to all other models for the prediction of area, production and productivity of major crops of Kerala. There was a general shift in area from food crops to non food crops. Cash crops in general showed better growth trends in production.
- In a study 'Yield Prediction in Cocoa (*Theobroma Cacao L.*)' the optimum girth at different stages of plant growth for maximizing yield of cocoa was derived. Also, optimum girth and height of cocoa seedlings for planting and minimum precocity (an index of early yield) were derived.
- The department has contributed significantly towards perennial experimentation by way of developing suitable experimental plans and subtle analytical procedures for the reduction of heterogeneity and enhancing precision of treatment comparisons.
- Field plot techniques for crops like banana, brinjal, turmeric, cashew, tapioca and cocoa were successfully standardised.
- Based on a theoretical frame work, the 'Fried man's two-way ANOVA' for ranked data was extended for the first time to the case of 'three-way classification' and this was further applied in developing an alternative procedure for the analysis of data from 'groups experiments' when there are modal violations.

- A new procedure based on principal component was derived for the pooled analysis of data from repetitive trials with dependant sets of observations, which is particularly useful for experiments on horticultural crops, animals as well as in permanent mammal trials.
- A computer oriented iterative algorithm for clustering genotypes based on Mahalanobis D2 was developed. Yield forecasting models were developed for coconut, pepper, sugarcane and paddy.
- A new transformation was developed for the analysis of enumerative data where the standard deviation of sample units showed a parabolic relationship with their mean value. Auto regressive integrated moving average (ARIMA) models were developed for forecasting the yields, average and price fluctuation in cashew.
- The highest production growth rate and area growth rate were recorded by rubber among all the crops in Kerala.
- It was observed that the spatial and temporal distribution of rainfall and not the total rainfall is critical for highly rainfall dependant species like jeevakom.

Department of Agricultural Extension

- **I**nfluence of farming culture on the folk arts and rituals of North Malabar region of Kerala state**.**
- Most folk art forms like Theyyam, Chimmaankkali etc have evidently been originated from an ancient agrarian society which had a deep rooted stand in farming culture
- The lyrics of their songs, the content of their myths, the season of the performance all show the strong bond with farming culture
- The farming culture prompt the public to conserve the ecosystem, promote eco-friendly farming and supplement towards a 'Greener Kerala'.
- Role and accountability of women in the farming systems of Madakkathara Panchayath in Thrissur District
- In general, weeding, shed cleaning and feeding of cattle were found to be female dominant practices while marketing, selection of varieties, land preparation, manuring and plant protection were observed as female dominant practices. Family women were contributing the highest (37%) towards farm income
- Time utilisation pattern of farm women could reveal the better potential of system with crop and livestock components which was using on an average three hours of family women labour per day for farm management activities
- The major problem and constraint faced by farm woman were lack of economic freedom followed by lack of marketing facilities and low prices for milk
- Leadership in people's planning programme- SWOT analysis.
- The majority of non-officials and official leaders belonged to high categories of role perception and role performance and there was non-significant differences
- In case of relationship between role perception and role performance of non-official and official leaders was positively significant

- The emerging need of taking necessary action to avoid the delay in sanctioning the programmes and financial allotment by higher authorities
- Quality management in agricultural research in Kerala Agricultural University- A critical analysis:

  The critical problems related to quality management in agricultural research in Kerala Agricultural University were analysed. Inadequate and insufficient mechanism for planning and determining research priorities & cumbersome and time consuming procedures for committing and using research funds were perceived to be the two most important problems

Women entrepreneurship in Agri-business

- The majority of respondents had medium to high level of success in their respective fields as measured by using entrepreneurial success index.
- Lack of technical know-how and managerial capacity were observed to hinder the women entrepreneurs from reaching high levels of success in their respective fields
- There is need to be target-oriented and strategic centred in entrepreneurial training programmes to promote capacity building
- Reward management system in tea plantations
- Management cadre should be given better financial reward and opportunities to fulfil higher order needs.
- Supervisors should be given over time rewards and special incentives.
- Labourers should be provided with innovative schemes like productivity incentive scheme so as to enhance their motivation as well as work output.
- Rationalisation of Indigenous Technical Knowledge on Pest Management in the farm production systems of Palakkad District.
- The results of the study confirmed that farmers have rich knowledge on pest management developed by their ancestors and peers. The results established that the farmers did not perceived all the practices as good or sound. They defended their opinion based on multifaceted technology evaluation attributes and field realities. ITKs screened through KIW's when subjected to researchers and extensionists showed high difference of opinion, through some sort of similarity was observed, when the ITK attributes were considered separately.
- Rationalisataion of indigenous technical knowledge on production management in the farm production systems of Palakkad District.
- It was found that there are 34 ITK practices in coconut, which were agreed as good practices.
- In ginger, 6 ITK practices were documented and in pepper 5 ITK practices were documented
- Those ITKs which were rated as good can be blended with modern technology and can be fed back to farmers
- **AoA under WTO agreements in spice sector in Kerala- A stakeholder analysis.**

  Three categories of stakeholders namely farmers, traders and development officers were studied. Most of the respondents were under low and medium knowledge categories. There was significant variation in the knowledge score of traders and extension personnel where as between farmers and traders as well as between traders and extension personnel there was no significant variation. A general analysis of the use of newspapers by the three

categories of respondents indicated that majority of respondents subscribing the newspapers under study fell under high and medium knowledge level and perception category.

- **Effectiveness of Agriclinics and Agribusiness Training Programme in Kerala.**

  Results showed that the topics such as Agribusiness development, analysis of opportunities, role of IT in Agribusiness, scope and local applications of e-commerce, market planning, market competition, brands, packaging, product features, advertising its impacts, sale promotion activities, problems and prospects of pesticides marketing, commercial production of cut flowers etc. The study shows that there were five types of business started by the trainees.

- **Dynamics of co-ordination for agricultural development in the context of democratic decentralization**.

  Lack of proper interaction among agencies involved in agricultural development was rated as the most important problem.

  Establishment of co-ordination committee at all levels involving the representatives of all agencies involved in agricultural development was rated as the most important suggestion to strengthen effective co-ordination among the agencies involved in agricultural development.

  The participating agencies at district panchayat level, block panchayat level and grama panchayat level were identified.

- **Participatory Action Research for Remunerative Rice Production.**

  A multi-disciplinary stakeholder Participatory Action Research (PAR) of emancipatory type and collaborative mode was done for three years. The participatory interventions significantly influenced the level of technical knowledge and extent of adoption of adaptable technology modules, typifying the cognitive impact of the emancipating action research. The net result of the action research was a set of adaptable technological package for remunerative rice production in the CDR rice production systems.

- **Team work in agricultural organisations.**

  In team process, the items like; seeking for the required information with other members when they face problems in performing a particular task, discussing with farmers etc emerged as most important whereas in team role, both categories perceived role like having a clear view of the team objectives and providing required knowledge and having a dedicated and single minded approach.

  In team effectiveness stage, achieving the target with a reasonable effort since we work as a team, members feeling free to express their feelings as well ad their ideas and making clear assignments of the task to be performed were items perceived by both the groups.

  There was significant difference between the two categories of team members regarding their perception of team processes, team development and team role.

- **A study of rubber producer's society of Thrissur district- SAP analysis**

  The data analysis revealed that the majority of the RPS in Thrissur district were observed to be in the category of average performance.

The experience of the RPS, membership strength, rate of growth in membership, extent of gender balance among the participants, maintenance of accounts, service area of the RPS etc were observed to be important contributing factors in the effectiveness of RPS.

The major problems experienced by the office bearers in the implementation of RPS were lack of co-operation on the part of grower members, lack of interest on the part of grower members, lack of working capital etc.

- **Team work in agricultural organisations.**

  The factors influencing team processes, team development, team role and team effectiveness were studied in detail.

  Majority of the agricultural officers and agricultural assistants perceived different items for team processes, team development and team role except for team effectiveness.

  There was significant difference between the two categories of team members regarding their perception of team processes, team development and team role.

- **Empowerment of vegetable farmers through Market-Led Extension**

  The result of the study highlights the fact that the SHG group of respondents had empowerment at the four dimensions and thus ensured the total empowerment. Socio-economic variables viz., educational status of the farmer, family income, land owned, leased land under vegetable cultivation and farmer's experience in vegetable cultivation also proved their relation to the empowerment level through this study.

- **Agricultural Expert System – A Paricipatory Assessment**.

  It was found that extension personnel and farmers possessed low level of knowledge especially in the areas of plant protection aspects of crops and they were yet to be popularized among the ultimate users.

  Prospective users in the transfer of technology stream were very much satisfied about the future prospects of AES based on its better performance, settings in the AES, mode of presentation, practicability and serviceability of the system.

  The combination of AES and human expertise showed better performance and higher Information Efficiency Index (IEI) among the extension personnel and farmers.

- **A study on farmer participation and effectiveness of E-Extension through the website raitumitra.kar.nic.in**

  The study revealed that almost half of the respondents had only low level of participation in the programme. Only nine percent of the farmers had high level of participation in the E-extension programme.

- **Accomplishing food security through community based initiatives in Thrissur: A participatory analysis.**

  The awareness level of the stakeholders on the different dimensions of the f ood security concerns of the community was assessed.

  Positive correlation between farmers awareness of food security and age was found and negative correlation was found between their awareness and sex.

  A synthesis of wealth ranking and survey and recall method was employed for quick assessment of food requirement.

- **Decision support system on nutrient recommendations for rice- An end- user assessment**.

  An increase in knowledge level of respondents regarding nutrient management aspects of rice cultivation was there after giving exposure to NRSR.

  The main suggestions obtained for the refinement of software were as follows the fertilizer calculator system should have provision for calculation of complex fertilize dosages. It should be sensitive to numerical data of soil test for getting more accurate results.
- **Homestead based agro- biodiversity- a farmer participatory study**

  Positive correlation between farmer's awareness on agro biodiversity was observed for three variables namely education, information source utilisation and innovativeness.

  Gender roles in agro biodiversity confirmed that most of the activities were undertaken by women farmers.
- The constraints faced by farmers were unavailability of water, scarcity of labour and high cost of labour. Unsustainable human activity was the main threat to homestead based biodiversity conservation.
- Research has been carried out in the key areas of transfer of technology, adoption behaviour, communication strategies, resource use management, conservation of indigenous technologies and entrepreneurship studies.
- A comprehensive study on homesteads in Thrissur District identified the crop- animal pattern and other important aspects of different homesteads.
- In a study on interpersonal communication behaviour efficiency, comrnunication skill, competence, empathy and interpersonal trust area identified as the sub-dimensions that affect it most. A group approach was found effective with transfer of pepper production technology.
- In a study on the adoption of bio gas technology, safety was indicated as the most important motive that governs the adoption.
- Availability of family labour and number of crops were found as the most important factors influencing conversion of marginal homesteads for planting rubber in Kottayam District.
- The most important consequences of conversion were migration of hired labour, soil loss and erosion, increase in social status and decrease in water table.
- A study on NGOs highlighted the effectiveness of their work in the rural development sector.
- Eighty indigenous practices and twenty indigenous beliefs were identified in rice farming, which were documented and described along with scientific rationale. Eighty three indigenous practices in coconut cultivation were also identified and documented.
- Thirty eight endangered farm skills were identified, documented and factors associated with their endangered conditions were arrived at.
- Two centres for advanced studies, namely the Centre for studies on Gender concerns in Agriculture and the Centre for research on farming culture are also functioning as part of the Department.

Department of Agrl. Engineering

- Identified and designed four different types of water harvesting structures at community level in different blocks of Wayanad and are being implemented there, for meeting the

fourth objective namely "Conservation and Management of Soil and Water Resources to mitigate drought and other natural calamities" of the NAIP project "Multi-enterprise farming models to address the agrarian crisis of Wayanad"

- Under the Project, Mission Post Operation Ponnamutha 300/5, the crop loss under mechanized harvesting using different combine harvesters were assessed and the soil compaction due to operation of such machines were determined by observing the bulk density of soil. The irrigation water quality of rice fields of *kole* lands were studied during the first crop season and were found to be harmless
- Designed and constructed a check dam at Nellikkandam puzha, in Meenangadi Panchayat, Wayand for water harvesting at community level, for meeting the fourth objective namely "Conservation and Management of Soil and Water Resources to mitigate drought and other natural calamities" of the NAIP project "Multi-enterprise farming models to address the agrarian crisis of Wayanad". Also one abandoned well was renovated for ground water recharge through roof top water harvest
- An axial flow pump was devised, fabricated and successfully tested.
- The maximum efficiency obtained in the newly designed pump is 33 per cent. The efficiency of 'petty and para' is only 25 per cent.
- The biogas production in constant pressure agitator gave better gas production by using cowdung, *Salvinia* mixture at 1:1 ratio.
- Two units of the modified IRRI type paddy winnower were fabricated and field tested.
- A harvesting machine was developed for mechanical control and utilization of floating type aquatic weeds.
- Mechanical transplanting using transplanter was popularised among the rice fields of Palakkad District.
- Under the SIDA project, three bore wells and a water tank of 4.75 lakh litres capacity with testing facilities of axial flow pumps was constructed.

Department of Home Science

- ICAR Project - Nutrient and antinutrient composition of ethnic plant foods consumed by the tribals of Kerala from 2002 to 2005
- Plant foods consumed by the tribal communities of Idukki, Palakkad and Wayanad districts were found to be highly nutritious. Antinutritional factors namely oxalates and nitrates were found to be low in leafy vegetables. Wide diversity in the constituents was also observed for various foods collected from Idukki, Palakkad and Wayanad districts.
- DBT project - Standardisation and quality evaluation of banana based probiotic fermented food mixtures from 2005 to 2008.
- Probiotic fermented food mixtures with good *in vitro* starch and protein digestibility were developed using 60-70 per cent banana flour, 20 per cent defatted soy flour / green gram flour and 10-20 per cent ripe mango/ papaya/ tomato pulp. Among the different combinations tried, the combinations with 70 per cent banana flour, 20 per cent defatted soy flour and 10 per cent mango; 60 per cent banana flour, 20 per cent defatted soy flour and 10

per cent tomato pulp as well as 60 per cent banana flour, 20 per cent defatted soy flour, 10 per cent mango and 10 per cent tomato pulp were found to be highly acceptable with good shelf life and desired viable count of *Lactobacillus acidophilus*.

- Results of research Projects in the Department from 2001 – 2011
- Germination of paddy was found to be beneficial to improve the biochemical and nutritional constituents of rice. More over, germination increased the bioavailability of nutrients and was found to be ideal for product diversification.
- Germination of pulses for 36 hrs and pressure cooking for 5 mts was found to be the best method to improve the extractability of calcium, iron, phosphorus and zinc and to reduce the tannin content.
- Meat analogue using green gram, soya and wheat with good quality protein and acceptable sensory qualities was developed. This was found to be comparable to meat but without the adverse effects of meat.
- Underexploited leafy vegetables were found to be highly nutritious especially in micronutrients. The leafy vegetables consumed by the tribals were also found to be rich in micronutrients with lower antinutritional factors. Among the four different organic manures used for the cultivation of amaranthus, the one which was cultivated using farm yard manure was found to be the most ideal for various quality attributes.
- Among the five high yielding hyacinth bean genotypes evaluated for different quality attributes, DL-40 and DL-50 were found to be superior with respect to yield, nutritional qualities and acceptability.
- Comparison of the four Ivy gourd genotypes with released variety Sulabha indicated that Sulabha had better nutritional qualities.
- Amaranth, capsicum and tomato grown under rain shelter were found to be nutritionally better when compared to those grown under open field conditions. Vegetables grown under rain shelter were also found to be more acceptable.
- Among the seven Nendran types evaluated for different quality attributes, Attunendran was found to be the best nendran type for table purpose. Chengalikodan was organoleptically the best to prepare chips and porridges.
- Bread fruit was found to be ideal to prepare chips and wafers. A combination of bread fruit flour, rice flour and ginger garlic paste in the ratio of 40: 40: 20 was found to be the best combination to prepare wafers.
- Value added products namely sweet and salted flakes and custard powder with good organoleptic qualities were developed from pumpkin.
- Diversified products like candy, tutty fruity, preserve and jelly with better nutritive value and acceptability was developed from Indian gooseberry.
- Different processed products like squash, sauce, preserve and pickle were developed from West Indian cherry.
- Pickles and vattals with good shelf life were developed from banana by-products namely peel, flower bud, pseudostem and rhizome.

- Diversified products with excellent nutritional and organoleptic qualities using under utilized fruits namely bilimbi, lovi - lovi and rose were developed.
- Protein enriched mango bars with superior nutritional qualities were developed.
- Ready-to-serve beverages with good acceptability and shelf life were developed by blending cashew apple juice with other fruit juices namely pineapple, orange and lime.
- Standardised the process to prepare banana wine from *Palayankodan*. Wine prepared using banana pulp, sugar, pure strain of yeast (MTCC172) and pectinase enzyme was found to be organoleptically superior with maximum wine clarity and desirable alcohol content.
- Cashew apple varieties namely Amrutha, Anakkayam-1, Dharasree, V-5 and VTH 30/4 were found to be ideal to prepare tutty fruity and candy.
- Among the kernels of different cashew varieties evaluated for quality attributes, the variety Priyanka was found to be the best with respect to physical, nutritional and processing characters.
- Incorporation of cocoa mass at 5 per cent level was found to be ideal to prepare acceptable dairy products. Roasting of cocoa beans for 5-10 minutes influenced the quality of the products.
- Commercial fruit beverages were found to be rich in vitamins and minerals and were microbiologically safe.
- Nutritionally superior and organoleptically acceptable products can be prepared using grain amaranth flour.
- Among the four species of bamboo shoots, fresh shoots of *Bambusa tulda* was found to be nutritionally superior. Valued added products namely pickle and vattal with good shelf life were developed using bamboo shoots.
- Bamboo seed is a rich source of protein and minerals. Different acceptable products can be prepared using bamboo seed as well as roasted and unroasted bamboo seed flour.
- Under utilised fishes like Netholi, flat fish and Veluri were rich in most of the nutrients. Among these fish varieties, Veluri was found to be more suitable for pickling.
- Value added products were prepared with fresh water as well as marine fishes namely Pink Perch, Silver belly, Tilapia and Katla.
- Changes were observed in the traditional food pattern and traditional foods with respect to ingredients, method of preparation and vessels /utensils. Quality evaluation of selected traditional foods and beverages indicated that they are rich in macro as well as certain micro nutrients with good acceptability.
- The nutritional quality of the fresh fruit juices sold in the street vending sites and restaurants were almost the same but poor microbiological quality of street vended juices was observed due to the unhygienic practices of the vendors.
- Developed nutritionally superior and organoleptically acceptable probiotic food mixtures based on banana flour in combination with defatted soy flour and tomato involving *Lactobacillus acidophillus.*

- Developed tempeh with better nutritional and organoleptic qualities using green gram as well as green gram in combination with rice using pure cultures of *Rhizopus oligosporus.* Instant soup mixes were also developed using tempeh flour.
- Grade I and II malnutrition and manifestations of vitamin A deficiency with a significant relationship with low intake of nutrients were noticed in preschool children of fishermen.
- Different degrees of malnutrition was observed in adolescent boys and girls. In another study, Malnutrition grade I and II were observed among adolescent girls and established a linear relationship between endurance capacity and haemoglobin levels.
- Nutritional status of women labourers involved in rice cultivation, coir sector, kudumbasree programmes and fisherwomen was found to be poor.
- Food security was found to be better in the households of women agricultural labourers of organised sector. In unorganised sector, food insecurity with moderate hunger was prevalent.
- About 50 per cent of agricultural labourers (men and women) suffered from stage I hypertension. Dietary habits, smoking, tobacco chewing, alcohol consumption, lack of exercise, etc. were identified as the risk factors for hypertension among agricultural labourers.
- Positive energy balance and normal haemoglobin level was noted among majority of sportswomen.
- None of the socio economic factors had any influence on the nutritional status of elderly. Proper care, feeling of security and conducive psychosocial environment indirectly influenced the nutritional status of the elderly.
- *In vitro* availability of iron from selected pulses, cereals, vegetables, fruits and fortified foods was found to increase significantly after roasting, milling germinating and cooking.
- A study on food consumption pattern and nutritional status among farm women indicated that majority of the women was under-nourished and 38.33 per cent had normal nutritional status.
- The study conducted among pre-school children revealed that most of the children had normal nutritional status. The study also indicated that apart from nutritional status non-nutritional factors like socio-economic status of the family, education of the parents, occupation of the parents etc. also influenced the development of mental functions in children.
- Soya grits when incorporated at 20 per cent level in the school lunch programme was found to be the most acceptable combination in terms of organoleptic and nutritional qualities.
- Nine under-exploited leafy vegetables of the State were found to be nutritionally good when compared with *Amaranthus tricolour.*
- Standardisation and quality evaluation of banana based probiotic fermented food mixtures.
- *L. acidophilus* MTCC 447 was studied for probiotic activity like acid and bile tolerance and antimicrobial activity and it was found to be positive.
- Foods selected for developing the probiotically fermented food mixtures were banana (Nendran), defatted soya flour, green gram flour, ripe mango, papaya and tomato.
- For treatments, variables of fermentation were optimized as 25gm of food mixture, pH 4.5, inoculums 300µl ($119x10^6$ cfu/ml), temperature of incubation 37°C and time of incubation 24 hours.

- Based on maximum shelf life qualities and viable counts of probiotic organisms, three fermented food mixtures namely T_1 (70% banana flour, 20% per cent defatted soy flour and 10% mango), T_3 (60% banana flour, 20% defatted soy flour and 10% tomato pulp) and T_8 (60% banana flour, 20% defatted soy flour, 10% mango and 10% tomato pulp) were selected.
- Substrate composition was modified by adding sucrose, sorbitol, wheat bran and skimmed milk powder to the three treatments and was subjected to quality evaluation and shelf life study.
- Food mixture T_3SK (with added skim milk powder at 5% level) showed high acceptability and an increase in nutrients and viable count of *L. acidophilus* after storage.
- Bio-availability of minerals from pulses
- Three legumes namely bengal gram, green gram and horse gram were selected and subjected to different processing and cooking methods to evaluate its effect on the *in vitro* availability of calcium, iron, phosphorus, potassium and zinc.
- Soaking, dehulling, milling and germination and two cooking methods namely ordinary cooking and pressure cooking were the selected methods.
- Germination for 36 hours and 5 minutes of pressure cooking was the best method in bengal gram, green gram and horse gram for improving extractability of calcium (67.63%, 29.78% and 52.35% respectively) and phosphorus (55.08%, 56.66% and 52.13% respectively) while germination for 36hrs and 30 minutes ordinary cooking increased iron extractability in green gram (70.19%) and in horse gram iron (70.23%). Germination for 24 hours and 30 minutes ordinary cooking showed maximum zinc (76.01%) extractability in green gram.
- Milled and pressure cooked sample showed maximum potassium extractability in bengal gram (48.23%) and green gram (50.69%) which also reduced phytic acid to a minimum.
- Germination for 36 hour and 5 minutes pressure cooking reduced tannin content in bengal gram (73%), green gram (35%) and horse gram (90%).
- All the processing and cooking methods improved the extractability of minerals, maximum improvement was brought about by germination (24 and 36 hours) followed by pressure cooking and ordinary cooking after milling.
- Comparative evaluation of fresh fruit juices sold by street vendors versus restaurants.
- Seven street vending sites and three restaurants from randomly selected five divisions of Thrissur Corporation were selected to conduct survey among street vendors and restaurant worker to elicit general information of vendors and workers and their knowledge and practices as well as among consumers to study the consumption pattern of fruit beverages.
- Positive responses were obtained from restaurant workers when compared to street vendors with respect to knowledge, cleaning and hygienic practices.
- From the trend observed in fruit beverage consumption obtained from the survey conducted among consumers, three fresh fruit juices namely pineapple, grape and lime juice were selected for quality evaluation (chemical constituents and microbial count).
- Much differences were not observed in the analysis of chemical constituents between the three fruit juices collected from street vending sites and restaurants.

- High counts of bacteria, yeast, fungi and pathogenic microorganisms like *E. coli* and *salmonella* were observed in the juices collected from street vending sites while the juices collected from restaurants had low counts of bacteria, yeast and fungi and no harmful bacteria was observed.
- Fruit juices sold in the street vending sites were unsafe in terms of microbial quality though they possess almost similar nutritional qualities to juices collected from restaurants.
- Quality evaluation and value addition of edible bamboo shoots.
- Four species of edible bamboo shoots namely *Bambusa bambos, Bambusa tulda, Dendrocalamus hamiltonii* and *Dendrocalamus strictus* were selected to evaluate the biochemical constituents in fresh as well as processed shoots.
- Among the four species, fresh shoots of *Bambusa tulda* was observed to have the highest content of crude fiber, soluble fiber, reducing sugar, iron, sodium and total free amino acid and among processed shoots, *Bambusa bamboos* had the highest content of fiber, protein, calcium, potassium, sodium and nitrates.
- Significant decrease in biochemical constituents as well as anti nutritional factors was observed in all the four species of bamboo shoots on processing except for moisture and total carbohydrate.
- Based on the nutritional quality and availability of processed bamboo shoots, *Bambusa bamboos* was selected for the development of two products namely pickle and vattal and quality attributes were studied for a period of three months.
- An increase in the peroxide value in pickle and an increase in the microbial count of bacteria and fungi in both pickle and vattals was observed after storage.
- Fresh bamboo shoots were found to be a better source of nutrients but processing of shoots significantly reduced the nutritional as well as the antinutritional factors in them.

Department of Plant Physiology

- The physiological analysis on yield decline in rice due to climate change in kole lands were made. The data on the observations in relation to yield decline in rice in kole lands was used as a supporting data to prepare report on the "Paddy crop loss in Kole lands of Thrissur during second crop season 2009-2010" by the technical committee appointed by Hon. Minister for Agriculture. Based on this report crop loss compensation was given to affected farmer
- 4. Proper Water management ie., alternate day watering and dewatering -recommended to avoid high water temperature of standing crop
- Evaluation on production physiology, including photosynthetic efficiency, of rice under rice-duck model cultivation in Karuthani kole land was made.
- Variation in UV – B absorbing pigments in vegetables and rice varieties observed due to increase in temperature.

Department of Microbiology

- Evaluation of anti-cancer properties of crystal proteins of *Bacillus thuringiensis* isolates from the Western Ghats of Kerala
- Out of thirty three native isolates of *Bacillus thuringiensis* screened by polymerase chain reaction, eight isolates were positive for parasporin 4 (cry45) and seven for parasporin 1 (cry31).
- Crystal protein isolated from KAU 5 resulted in 81% cell death in the cancer cell line DLA, as revealed by MTT assay.
- Homology search by BLASTn revealed that amplicons from KAU 5, 14, 102 and 160 shared more than 82% homology with parasporin 4 gene in NCBI database
- Diversity of Agriculturally Important Microorganisms in the Western Ghats of Kerala (P
- Collected soil and leaf samples from Aryankavu, Achan Kovil and Thenmala forest range of Kollam districts and Nilambur range of Malappuram districts
- Isolated 35 N fixing bacteria, 85 P-solubilizers, 9 *P. fluorescens*, 25 cellulose degraders, 19 lignin degraders and 9 *Trichoderma* and 8 P solubilising fungi
- Twenty two endophytes, 14 phylloplane bacteria and 5 phylloplane fungi were isolated
- In quantification assay, the range of P solubilisation was from 30µg/ml to 120 µg/ml. The maximum amount of soluble P (120 µg/ml) was in the case of Bacillus sp. and this was also supported by pH drop in the broth in 20 days
- Five P solubilising isolates were found to produce cellulose, nine isolates degraded lignin and produce clear zones, five isolates degraded both lignin and cellulose in *vitro*.
- Five P solubilising and 7 N fixing bacterial isolates could produce protease.
- Seven Cellulose degrading bacterial isolates solubilized inorganic phosphate *in vitro*. Four *P. fluorescence* isolate solubilised inorganic P and 2 isolates produce IAA
- Ten antagonistic bacteria were isolated against *Rhizoctonia solani*, three isolates against *Xanthomonas campestris*, and Nine against *Sclerotium rolfsii*
- 8 fungal cultures were deposited in NBAIM
- 26 isolates were identified by 16SrRNAsequencing & deposited in NCBI, eight bacterial isolates were deposited in NBAIM culture collection

CPBMB

- Developed a viable protocol for the mass multiplication of elite types of black pepper, ginger and endangered species (5 Nos.) of medicinal plants.
- On farm trials and demonstration plots were established in different pepper growing tracts with tissue culture derived plants. Techniques were standardised for genomic RNA isolation and RAPD analysis in Black pepper and Nutmeg.
- Pathogenesis related proteins were identified for foot rot disease of black pepper. *In vitro* techniques were standardised for exploiting seedling variability in vanilla.
- Isolation and characterization of genes encoding disease resistance (ToLCV and bacterial wilt) in tomato - DBT, Govt. of India
- Molecular markers (ISSR, SSR & CDNA AFLP) and defense genes were identified for Bacterial wilt and ToLCV resistance in tomato
- The markers developed could be utilized in Marker assisted selection in crop improvement programmes

- The sequence information of the markers are deposited in the public domain (NCBI)
- The variability among genotypes were characterized mostly at the expression level

Induction of variability in zingiberaceous crops (Ginger, Turmeric and Kacholam) through in vitro fertilization – DBT

Protocol for seed set and development was standardized for ginger, turmeric and kacholam. Embryogenic callus induction was obtained from endosperm and embryo cultures of ginger seeds of parental combination Z0-122 X Rajatha. Planlets through somatic embryogenesis were planted out and multiplied. In Kacholam embryogenic callus induction was obtained in endosperm and embryo cultures from seeds produced through in vitro fertilization

Exploration of the molecular diversity and insecticidal spectrum of the isolates of *Bacillus thuringiensis* of the Western Ghats and cloning novel genes

- Full length Cry1Ac gene cloned from native *Bacillus thuringiensis*
- Full length cry 4B gene cloned from native *Bacillus thuringiensis* strain KAU 23
- A repository of 500 native *Bacillus thuringiensis* isolates was prepared
- Full length *Cry*1Ac gene from the isolate KAU 474 was cloned
- isolates recorded 100% mortality in bioassay experiments with the test insect *Diaphania indica*
- The parasporal crystal protein *cry46* from the native isolate KAU 41 produced cytoplasmic blebbing, cytoskeletal alterations and nucleus condensation in Dalton's Lymphoma Ascites tumour cells under *in vitro* conditions

Defence genes in black pepper

- Difference in copy number for β 1,3 glucanase gene and its better expression in *P. colubrinum* was detected as the key factor enhancing its disease resistance compared to *P. nigrum*
- Differential gene expression status and specific heat shock related genes were detected in black pepper. Forty DNA sequences were characterized and deposited **in EST data basis.**

Sex determination in Nutmeg

One RAPD based Race primer was detecte to characterize female nutmeg plants. The marker is being validated on larger population for its commercial exploitation

Generation and Evaluation of Vanilla (*Vanilla planifolia* Andrews) Hybrids through intra specific and inter specific hybridization and embryo culture) - KSCSTE, Trivandrum

Intraspecific hybrids by crossing superior clones of *Vanilla planifolia* were produced through embryo culture technique. Interspecific hybrids of cross *Vanilla planifolia* X *Vanilla tahitensis* Moore were also produced . These are being multiplied for field evaluation. Forty six genotypes are available.

Net work project on Production and distribution of quality planting materials. Govt. of Kerala

- Mother cultures were established for Nendran ecotypes ie Attunendran, Nedunendran & Chengalikodan and dwarf Cavendish types, Grandnane& Robusta. Plants are at various stages of multiplication.
- Cultures developed for anthurium, orchids, black pepper, curry leaf etc. for mass multiplication on a revolving fund mode

Diversity of Agriculturally Important Microorganisms in the Western Ghats of Kerala – ICAR

- 76 Nitrogen fixers, 81 P solubilizers, 25 *Pseudomonas fluorescens*, 22 *Trichoderma* and 16 lignin degraders were isolated
- The P-solubilizing bacterium PB1 solubilized 34.5µg/ml within 7 days
- Two pigment producing bacteria were identified by 16S rRNA sequencing as *Serratia marsecens* and *Chromobacterium violaceum*
- The native isolate Pf-10 of *Pseudomonas fluorescens* produced maximum antagonism index of 199.2 on the bacterial wilt pathogen *Ralstonia solanacearum*

***In vitro* regeneration from immature inflorescence of coconut (*Cocos nucifera*) - KAU (PLAN)**

- Y3 medium supplemented with 600µM 2,4-D induced embryogenic callus from coconut inflorescence cultures
- Somatic embryos were produced from the callus
- Embryos differentiated into various stages and started germinating

Chemotyping and gene expression profiling in black pepper (*Piper nigrum* L.) with special reference to quality attributes –DBT

- Standardised the protocol for estimation of piperine in spikes, immature berries and dried and powdered berries of black pepper using UV Spectrophotometer and HPLC
- Detected the stage of spike development at which piperine synthesis begins in spikes from 28-30days onwards after spike emergence shows the presence of piperine.
- Standardised the total mRNA isolation protocol from mature and immature berries and spikes of black pepper
- Estimated the piperine content in spikes and immature berries of various genotypes
- Estimation of piperine content in dried and powdered berries of black pepper
- Studied the distribution of piperine in various plant parts. Fresh, green, immature seed contains 2.7 percent piperine of which the major part is concentrated in the seed whereas the pericarp contributes only a very minor portion. The quantity in mature leaf, stem and inflorescence were very low (0.01-0.03%). The alkaloid was absent in tender leaves.

Achievements of the college:

A. EDUCATION

The College of Horticulture,Vellanikkara is an excellent teaching institute at national level. So far the college has produced 1688 graduates, 923 post graduates, 138 PhDs, 359 UG diploma holders and 77 PG diploma holders. Students from different states of the country opt for their undergraduate studies doing their post graduate and PhD programmes at this college.

The performance of the students in securing JRFs/ placements for PG studies at the national level has been excellent. KSAU stood first in JRF during several years like 2001, 2002, 2004 and 2009. Based on the academic excellence of the students of the colleges of KAU, KAU received the Sardar Patel Outstanding ICAR Institution award Endowment Prize for the year 2011.Many students of the college has bagged recognitions like Young scist award, Jawaharlal Nehru award for best PhD work, Graduate Associateship in foreign universities etc.

Post graduate programme is available in 17 and PhD in 14 departments.The institute caters to the technical manpower of researchers in agriculture, Horticulture, administrative and public services, banks, management sectors, commodity boards etc. Facilities like Centre of plant biotechniology and molecular

biology, Central library, Centre for e-learning, Distributed information system, Radiotracer laborotory, Student computer centre etc have been created in the campus of the college.

B. Research

Research at the College was initiated during 1976 as part of post graduate programmes and further strengthened through KAU and externally aided projects. As a result of meticulous planning and judicious implementation of various location specific need based research projects both by the students and faculty, the College could contribute to the farming community a number of innovations of high practical utility. The highlights of major contributions are the following.

Through concerted crop improvement research, we could evolve a good number of improved varieties in crops like vegetables (36), spices (4 in turmeric and 2 in ginger), cocoa (10 including 3 hybrids), rice (2), medicinal plants (2 in Adathoda, 2 in Plumbago, 1 in Holostemma, 2 in Kacholam and 1 in long pepper) and one in coleus. Agrotechniques were developed / standardised for scientific cultivation of cereals, tuber crops, pulses, commercial crops, vegetables, plantation crops, beverage crops , spices, oil crops, fruits, ornamentals and major medicinal plants of the State. The procedures standardized for top working in cocoa in-situ budding in nutmeg and soft wood grafting in cashew have gained wide adaptability by the farming community. Nutrient removal pattern in pepper, ginger, nutmeg and clove were studied and artificially induced nutrient deficiency symptoms were documented. The technology evolved for the effective and efficient bio-control of salvinia, a problematic acquatic weed of Kerala is one of the research achievements worth mentioning. Viable disease management strategies were developed in the case of spices like pepper, ginger, cardamom, cashew etc. Discovery of fungal pathogen, *Hirsutella thompsoni* against coconut mite, bio-control of stem borer and leaf roller of rice are the other research achievements in the field of crop protection. *In vitro* propogation techniques in banana, pineapple, orchids and important medicinal plants of the State were standardized. Developed the protocol for in vitro seed set and seed development in ginger. Reported somaclonal variation in pepper and ginger for yield, quality and tolerance to diseases. Unravelled the expression of PR proteins and PR enzymes in black pepper in relation to *Phytophthora* foot rot tolerance. Technologies were developed for production of value added products from fruits and simple packing and storage techniques for fruits and vegetables and obtained patents for cashew apple based products. Yield forecasting models with high predictability were developed for paddy, coconut, arecanut, cashew and pepper. Benefit cost ratios have been worked out for major crops of importance to Kerala. Effects of drought in relation to plantation crops were studied to some extent and evolved methods to mitigate the ill effects. A sound database is maintained on monsoon variability since 1870. Developed a viable protocol for the mass multiplication of elite types of black pepper,ginger, and 5 endangered species of medicinal plants. Fertilizer prescription equations have been developed for turmeric, rice, sweet potato, ash gourd, bitter gourd, cucumber, amaranth, bhindi, snake gourd, brinjal ,chilli, pumpkin and water melon.

High yielding varieties of vegetable crops released from the college

- Amaranth(Krishnasree,Mohini,Renusree)
- Ash gourd(KAU local)
- Bitter gourd(Preethi,Priya)

- Brinjal(Haritha,Neelima,Surya,Swetha)
- Chilli(Anugraha,Ujwala)
- Cowpea(Anaswara,Bhagyalakshmi,Kairali,Lola,Vjjayanthi,Varun)
- Dolichos Bean(Grace,Hima)
- Druimstick(Anupama)
- Ivy Gourd(Sulabha)
- Okra(Aruna,Salkeerthi,Susthira)
- Op melon(Mudicode,Soubhagya)
- Pumpkin(Ambily,Suvarna,Saras)
- Ridge Gourd(Deepthi)
- Snake Gourd(Baby)
- Tomato(Anaggha,Sakthi,Mukthi)
- Winged Bean(Revathy)

High yielding varieties of rice released from the college

- Kunjukunju priya, Kunjukunju varna

High yielding varieties of gingere released from the college

- Aathira , Karthika

High yielding varieties of turmeric released from the college :

- Kanthi, Sobha, Sona, Varna

High yielding varieties of Kacholam released from the college :

- Kasthuri, Rajani

High yielding varieties of Atalodakam released from the college :

- Ajagandhi, Vasika

High yielding varieties of Chethikoduveli released from the college :

- Agni, Mridhula

High yielding varieties of Long pepper released from the college :

- Viswam

High yielding varieties of coleus released from the college :

- Suphala

High yielding varieties of Holostemma released from the college :

- Jeeva

C.Extension:

National Symposia/ Seminars/Workshops/Winter schools/Summer schools/Short courses were organised on competitive mode in the frontier areas like Biodiversity, Biotechnology, Input Use Efficiency, Market Led extension and Drought management in Plantation Crops.

All members of the faculty participated in various training programmes, farmer-scientist interactions, agricultural seminars, agro-clinics, radio talks, television programmers and agricultural exhibitions. The members also took part in the identification and investigation of problems in the farmers' fields.

Agro-advisories are being issued regularly to the farmers of the region in both English and Malayalam. These are being published in the leading newspapers, broadcast through the All India Radio, Thrissur and are include in websites viz., www.kau.edu, www.kauagmet.org

A series of training programmes are regularly being conducted for the benefit of Officers of State Department of Agriculture, Commodity Boards, Banks, Task Force members of Peoples' Planning Programme, unemployed youth and housewives.

Large scale multiplication and distribution of planting materials of fruit plants, ornamentals, spices and medicinal plants to farmers is a routine activity undertaken by the College.

Under the vegetable seed production complex, approximately one tonne of quality vegetable seeds is being produced annually and distributed to farmers.

Large scale production of processed fruits and vegetables is taken up and the products are sold through Agricultural Technology Information Centre, Mannuthy.

A mushroom production unit caters to the needs of mushroom growers of Thrissur and nearby districts by supplying quality oyster mushroom spawn.

Farmers and other entrepreneurs interested in the production of coir pith compost are supplied with an efficient fungus culture named 'Platypus' for the degradation of coir pith to nutrient rich compost.

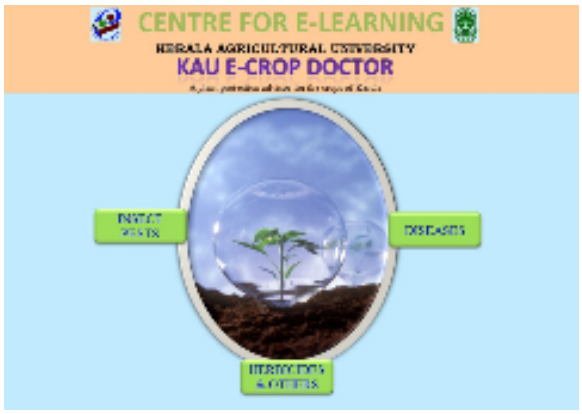
Disseminated the technologies generated by the faculty of the College through Package of Practices Recommendations (Crops) KAU.

The Centre for E-learning (CEL) is an innovative project of the college with the broad objective of knowledge empowerment and skill up gradation of extension personnel and progressive farmers in frontier areas of agricultural technology, by effectively utilizing the potential of ICT and cyber extension tools.

The CEL aims to strengthen research, extension education and transfer of technology utilizing the potential of ICT. "The centre will help farmers, extension agents, researchers, students and everyone who has an interest in farming". The centre has developed a prestigious Agrotech portal and many agricultural advisory cum decision support systems like the KAU Fertulator, E-Crop Doctor and E-*Karshaka Jalakam (E-Kisaan knowledge portal)* to help farmers to diagnose and find solutions for their

The 'KAU Fertulator' is yet another innovation by the centre, the first of its kind in the state, which would simplify the time consuming calculation of the rate of fertilizer for field application. The data for this calculator is based on the recommendations of the Agricultural Research Centers in Kerala. The fertilizer rate of major crops can be obtained for different crop growth stages with a few mouse clicks. Being bilingual, this will be highly useful to the farmers, extensionists and students.

The bilingual 'E-Crop Doctor' is another user-friendly and time saving decision support system which helps to find out accurately the quantity and accurate dilution of insecticides, fungicides, antibiotics, and weedicides required for a unit crop area, for all the crops of Kerala. The non-judicious use of plant protection chemicals leads to many ecological and health issues. Besides as advisor, the decision support system is enriched with a detailed knowledge bank on plant protection, including the organic ways of prevention and control of crop pests and diseases.



Details of flagship projects:

The Co-ordinatd projects under operation in the college are

1.All India Network Project on Agricultural Ornithology

2. All India Network Project on Agricultural Acarology

3.All India Co-ordinated Research Project on Biological Control of Crop Pests & Weeds

- AICRP on Biological Control of Crop Pests and Weeds
- Revolving Fund scheme 'Production of biocontrol agents'
- RKVY project on 'Development of Alternative Technologies for Pest and Disease Management in Coconut and Arecanut'

4. All India Co-ordinated Research Project on Floriculture

5. All India Co-ordinated Research Project on Medicinal & Aromatic Plants

6. All India Co-ordinated Research Project on Soil Test and Crop Response Correlation

7. All India Co-ordinated Research Project on Vegetable crops

8. All India Co-ordinated Research Project on Weed Control

9. All India Co-ordinated Research Project on Agro-meteorology

Other Important Projects:

a.Department of Olericulture:

1. Central 100 Crore Special Grant Project on “Technology development in vegetable crops”. Financial Outlay : Rs. 450 lakhs. PI: Dr.T.E. George.
2. RKVY Project on “Augmentation of vegetable production through technological interventions” Financial Outlay : Rs. 450 lakhs. PI: Dr.T.Pradeepkumar.
3. ICAR Mega Project on “Vegetable seed production”. Financial outlay : Rs. 45 lakhs. PI: Dr.T.E. George.
4. State Plan Network Project on Vegetable development. Financial outlay : Rs. 150 lakhs. PI: Dr.T.E. George.
5. State Plan Project on Establishment of h-itech seed testing lab at Dept. of Olericulture. Financial outlay : Rs. 95 lakhs. PI: Dr.T.Pradeepkumar.

b.Agri.Microbiology

1.	Diversity of Agriculturally Important Microorganisms in the Western Ghats of Kerala	Dr.D.Girija Prof. & Head	ICAR, New Delhi	2006-2014	70.0
2.	Revolving Fund project on Mass production and Distribution of Biocontrol agent *Pseudomonas fluorescens*	Dr.D.Girija Prof. & Head	Kerala Agricultural University	2011-Till date	2.0
3.	Income generation programme on Testing the Quality of Biofertilizer	Dr.K.Surendra Gopal Associate Professor (Microbiology)	Kerala Agricultural University	2012-Till-date	0.10
4.	Exploitation of Native Agriculturally Important	Dr.D.Girija Prof. & Head	State Planning Board,	2012-2015	50.0

	Microorganisms for INM in various ecosystems of Kerala		Govt. of Kerala		
5.	Beneficial Microorganisms	Dr.D.Girija Prof. & Head	ICAR, New Delhi	2012-2014	54.0

c.Department of Pomology and floriculture

1. "Validation of DUS international guidelines for *Phalaenopsis* and *Cattleya* orchids" (funded by Protection of plant varieties and Farmers' Right Authority, Govt. of India)
2. GoK project entitled "Introduction and improvement of large scale production of exotic cut flowers" (funded by State Planning Board)
3. ICAR Mega seed project "Seed production in agricultural crops and fisheries" (funded by ICAR)

d.Department of Entomology

I. External Aided Projects

Title of the Project	Funding Agency	Budget Outlay	Principal Investigator
1. Developing IPM packages for Major Crops of Kerala	GoI-DARE/ICAR	1 crore	Dr.Madhu Subramanian
2. Alternatives for banned pesticides for Pest Management in six Vegetable crops	RKVY	33 lakhs	Dr.Sosamma Jacob and All other Entomologists
3. Alternatives for banned pesticides for banana nematode management	RKVY	9 lakhs	Dr.Susannamma Kurian
4. Network project on Insect Bio-systematics: Curation of Insect	ICAR	2 lakhs	Dr.Maicykutty P.Mathew

specimens			

Total **1.44 crores**

e.Department of Agronomy

1. Details of flagship projects under operation

Sl.No.	Name of project	Name of Principal Investigator	Funding agency	Amount (Rs)
1	Socio Economic Analysis and Farmer Participatory Development of Homestead Farms of Kerala	Dr. C. George Thomas	State Plan	13.973 lakhs
2	Network project on Crop-weather analysis(Central region)	Dr. Meera V. Menon	State Plan	3.603 lakhs

f.Departmrnt of Processing Technology

Sanctioned State plan projects on

a) Establishment of Centre of excellence in post harvest technology and allied schemes.

b) Development of animal feed from jack fruit and mango processing waste.

and Central government project on

c) Strengthening of research in post harvest technology and value addition.

g.Department of Plant Pathology

(1) ICAR – 100Cr.grant Project on "Strengthening Research on Plant Disease Management"

Total budget : 100 lakhs
Period : 3 years from 2012
Sub projects : 5

1. Integrated disease management in tree spices
   Budget : 11.90 lakhs
2. Screening and management of viral diseases of cucurbitaceous crops.
   Budget : 37.09 lakhs
3. Integrated management of post harvest diseases of major food crops.

Budget : 14.05 lakhs

4. Bioconsortial formulations for the management of soil borne diseases of spice crops in Kerala.
   Budget : 28.19 lakhs
5. Effect of fortified mushroom bio-wastes for the management of crop diseases and plant growth promotion.
   Budget : 8.77 lakhs

(2) DST project

Enhancement of resistance to bacterial wilt in tomato by endophytic microbial communities

Total Budget : 13.98 lakhs
Period : 3 years

(3) RKVY Projects

1. Development of technologies including alternatives for banned pesticides for the management of pests and diseases of major crops in Kerala.

a. Disease management in vegetables.
b. Disease management in ginger.

Total Budget : 30.183 lakhs
Period : 3 years

2. Development of technologies including alternatives for banned pesticides for the management of pests and disease management in coconut and arecanut.

a. Management of Mahali and leaf rot using new fungicides and biopesticides.

Period : 2 years

(4) KSCSTE Projects

1. Development of microbial consortium for rapid composting of ligno phenolic agro wastes.

Total budget : 9.35 lakhs
Period : 3 years

2. Enhancing bioefficiency of *Trichoderma* spp. for the management of soil borne fungal pathogens – back to lab project for Ph.D

Total budget : 14.56 lakhs
Period : 3 years

(5) Bioefficiency of Calphomil (Camson Biotechnologies Ltd) against downey mildew of bittergourd
Total budget : 1 lakh
Period : 1 year

h.Department of Seed Science and Technology

1.Gene pyramiding to develop cultivars with durable resistance to bacterial leaf blight trhough marker assisted selection: Funding agency:DBT, Allotment: 37.3 lakhs

2.Paddy seed production and upland cultivation: Revolving fund scheme: Outlay:

Rs 3.00 lakh

3.Enhancing rice production in Kerala and attaining partial self sufficiency: RKVY project: Outlay: Rs 500.00 lakh

4.Doner identification for tolerance to iron toxicity in rice: KSCSTE Project: Outlay Rs: 13.75 lakhs

i.Department of Plantation Crops and Spices

Name of Project	**Funding Agency**	**Name of PI**	**Name of Co - PI**	**Outlay (Rs. Lakhs)**
1. Exploitation of somaclonal variation for disease tolerance and high yield in ginger	DBT	Dr. Alice Kurian	Dr.P.A.Nazeem Dr.M.Asha Shankar Dr.Koshy Abraham	19.78
2. Standardisation of agrotechniques for nursery and organic farming techniques in noni (*Morinda citrifolia*) in a multicropping system.	WNRF	Dr. M. Asha Sankar	Dr. B.Suma Dr. T. Pradeep Kumar	6.68
3.Exploitation of bisexual variants for developing high yielding varieties in *Piper longum*	KSCSTE	Dr. V. S.Sujatha	Dr.M.Asha Sankar Dr.R.Sujatha	11.75
4. Ensuring livelihood security of tribals through on farm bioinput production and medicinal plant cultivation	DBT	Dr. N. MiniRaj	Dr. K.Surendra Gopal Dr.E.V.Nybe	35.00

5. *Insitu* conservation of RET medicinal plants	ICAR	Dr. N. MiniRaj		26.92
6. Developing propagation techniques and *ex situ* conservation of *Coscinium fenestratum* (Gaertn.) Colebr. – an endangered medicinal plant	DST	Dr. B. Suma		32.41
7. ICAR Mega seed project (spices)	ICAR RF	Dr. E. V. Nybe	Dr. V. S. Sujatha	
8. National Horticultural Mission on Spices and Aromatic Crops	NHM	Dr. N. Mini Raj	Dr. E. V. Nybe	

Technologies commercialized

a. Department of Olericulture:

Thirty eight high yielding varieties belonging to 16 different vegetable crops developed and released. These varieties have been widely adopted by farmers of the state.

b. Department of Pomology and floriculture

Banana

- Two banana hybrids for homesteads were released
- Developed package of practices for homestead cultivation of Palayankodan
- An integrated new production system for Nendran with modified high density planting and fertigation was developed
- Developed protocol for micro propagation of commercial varieties

Pineapple

- Developed protocol for micro propagation

Mango

- Propagation by epicotyl and soft wood grafting techniques was standardized.

Jack fruit

- Variability in flowering and fruit characters was studied and vegetative propagation by epicotyl grafting was standardized

Sapota

- A high yielding type, 'Local' was identified for homestead cultivation.

Papaya

- Varietal evaluation and identification of suitable varieties for cultivation was done.

Minor fruits

- In Indian gooseberry ‘Chambakkad Large’ was identified as a variety for homestead cultivation.

Vegetative propagation techniques were standardized

- In sapota, kodampuli, bilimbi, Indian gooseberry and mangosteen (softwood grafting)
- In sweet and sour lovi-lovi, sweet Indian hog plum (air layering)
- Top working was standardized in *Garcinia gummigutta* to change unproductive male trees to productive female ones

Floriculture

- Propagation and planting techniques were standardized in hibiscus, bougainvilla, jasmine, gerbera, gladiolus, tuberose, anthurium, orchids and foliage plants
- Developed protocol for *in vitro* propagation of *Dendrobium, Phalaenopsis,* anthurium, gladiolus, tuberose, *Schefflera, Philodendron, Dracaena* and Bougainvillea
- Standardized media and media management for orchid, anthurium and foliage plants. Standardized management practices for commercial flower cultivation for small-scale units and also for large scale commercial units in anthurium, orchids, gerbera, gladiolus, tuberose, crossandra and jasmine
- Developed protocol for post harvest management of orchid, anthurium, heliconia and cut foliage, both for home scale and commercial units.

c. Department of Entomology

Parapheromone blocks for the management of mango fruit flies and cucurbit fruit flies are being produced and supplied to farmers on payment basis.

d. Department of Plantation Crops and Spices

Major research accomplishments include release of four high yielding curcumin rich turmeric varieties- Kanthi, Sobha, Sona and Varna; two high yielding kacholam varieties - Kasturi and Rajani; one variety of adapathian - Jeeva; two varieties of adalotakom - Ajagandhi and Vasika and two varieties of chethikoduveli - Agni and Mridula, two somaclones of ginger - Athira and Karthika, and one hybrid pepper variety Vijay.

Nuclear seed materials of all these varieties were produced and distributed to the farmers under the supervision of scientists.

e. Department of Plant Breeding and Genetics

Varieties of rice released with association of Scientists of Department of Plant Breeding and Genetics are given below

Harsha , Varsha , Swetha, Anaswara,Samyuktha,vaisakh

AICRP on BCCP and W

- Biocontrol of *Salvinia molesta* using *Cyrtobagous salviniae*
- *Trichogramma* spp. @ one lakh/ha has been recommended for the management of rice leaf folder and stem borer.
- Trunk release of *Goniozus nephantidis* @ 10 nos./palm has been recommended for the management of coconut leaf caterpillar.
- Application of *Metarhizium anisopliae* var *major* in the breeding area @ 5 x 10^{11} spores/m^3 reduces the rhinoceros beetle attack on coconut.
- Management of papaya mealy bug *Paracoccus marginatus* using *Acerophagus papayae* @ 25-50 Nos. / plant.

g. AICRP on Agricultural Ornithology

1. Metalized reflective ribbon rolls for bird scarring

2. Automatic cracker station for vertebrate pest scarring

h. AICRP on Weed control

Standardised weed control practices in major crops of the state like rice, coconut, cashew, rubber, pulses etc.

13.Technologies for commercialization;

a. Department of Olericulture:

Two seedless F_1 hybrids in watermelon and two gynoecious F_1 hybrids in cucumber

b. Department of Microbiology

c. **Department of Pomology and Floriculture**

1. Protocol for postharvest management of dendrobium.
2. Protocol for postharvest management of anthurium.
3. Eco-compatible design for growing dendrobium in Kerala.
4. Technology for production of long-lasting and eco-friendly floral crafts.
5. Design of greenhouse for growing anthurium in Kerala.
6. Foliage plants for controlling atmospheric pollution

d. Department of Processing Technology

Process for production of

a) Osmo-dehydrated products from mango, banana, nutmeg and aonla

b) Mixed vegetable jam and annona squash

e.Department of Home Science

Sl. No	Technologies
1	Tutti fruti, preserve. salad, jelly and candy from Indian goose berry
2	Jam, pickle, squash and preserve from bilimbi, roseapple and lovi-lovi
3	Chips and wafers from bread fruit
4	RTS beverages using cashew apple juice blended with orange , pineapple and lime juice
5	Pickle, preserve, squash and sauce from west Indian Cherry
6	Candy and tutty fruity from cashew apple
7	Cutlets and sticks from under utilised marine and fresh water fishes.
8	Meat analogues using green gram blended with soybean and wheat
9	Probiotic food mixtures using banana flour, defatted soy flour, fruit pulp, sucrose, sorbitol, wheat bran and skimmed milk
10	Pickle and Vattal from bamboo shoots (*Bamboosa Bamboos*)

11	Sweet and salted flakes and ready to use custard powder from pumpkin.
12	Wine from Palyankodan banana using pure yeast strain
13	Tempeh from soybean, green gram, rice and wheat. Soup mixes from tempeh.
14	Rice based fermented dairy product.

f. Department of Plantation Crops and Spices

Commercial multiplication of varieties through seed agencies or farmers participation

g. **AICRP on BCCP and W**

- The coccinellid predator *Cheilomenes sexmaculata* for the management of cowpea aphid *Aphis craccivora.*

h. AICRP on Agricultural Ornithology:

1. Bio bird repellents

2. Bird nesting site designs for the cavity nesters

14: New varieties released:

High yielding varieties of vegetable crops released from the college

- Amaranth (Krishnasree, Mohini, Renusree)
- Ash gourd (KAU local)
- Bitter gourd (Preethi,Priya)
- Brinjal (Haritha, Neelima, Surya, Swetha)
- Chilli (Anugraha, Ujwala)
- Cowpea (Anaswara, Bhagyalakshmi, Kairali, Lola, Vjjayanthi, Varun)
- Dolichos Bean (Grace, Hima)
- Druimstick (Anupama)
- Ivy Gourd (Sulabha)
- Okra (Aruna,Salkeerthi, Susthira)

- Op melon (Mudicode, Soubhagya)
- Pumpkin (Ambily, Suvarna, Saras)
- Ridge Gourd (Deepthi)
- Snake Gourd (Baby)
- Tomato (Anaggha, Sakthi, Mukthi)
- Winged Bean (Revathy)

High yielding varieties of rice released from the college: Kunjukunju priya, Kunjukunju varna

- High yielding varieties of ginger released from the college: Aathira, Karthika
- High yielding varieties of turmeric released from the college : Kanthi, Sobha, Sona, Varna
- High yielding varieties of Kacholam released from the college: Kasthuri, Rajani
- High yielding varieties of Atalodakam released from the college: Ajagandhi, Vasika
- High yielding varieties of Chethikoduveli released from the college : Agni, Mridhula
- High yielding varieties of Long pepper released from the college: Viswam
- High yielding varieties of coleus released from the college: Suphala
- High yielding varieties of Holostemma released from the college: Jeeva
- High yielding varieties of cocoa released from the college : CCRP 1- CCRP 10
- (CCRP 8, CCRP 9 and CCRP 10 are hybrids)

Awards and patents, if any:

A. STUDENTS' ACHIEVEMENTS

1. **Musthafa Kunnathangadi:**Young Scientist Award to PG students(Agronomy)-1996
2. **Lency Thomas:**Young Scientist Award to PG students (Agronomy) - 2002
3. **Deepa Thomas:**FAI Silver Jubilee fellowship, Best Thesis award, International congress on Banana -2002
4. **Suraj Cherian:** Graduate, Associateship in University of Alaska (USA)-2003
5. **Ajay Nair:** Graduate, Associateship in the University of Maine (USA)-2003

6. **Preetha D:** Young Scientist Award to PG students (Soil Science) - 2004
7. **Shamsudheen P.S:** Graduate, Associateship in University of Vermont (USA) -2004
8. **Joe M. Louis:**Graduate, Associateship in the University of Wyoming (USA)- 2004
9. **A.S. Vidya:** Young Scientist Award to PG students (Agronomy) - 2004
10. **Shimat V.J:** Graduate, Associateship in University of Georgea (USA)-2004
11. **Godshen Robert P.R:**Graduate,Associateship in University of Montana(USA)- 2004
12. **Thomas Antony:**Graduate, Associateship in Auburn University (USA)-2004
13. **Mujeeburahiman C:**Graduate, Associateship in University of Vermont (USA)-2005
14. **Anas E.T:**Graduate, Associateship in the University of Illinois (USA)-2005
15. **Justin George:** Graduate, Associateship in Kentucky State University (USA)-2005
16. **Pratheesh J.P:** MBA IIPM, Bangalore -2005
17. **Subin V.S:**MBA in Symbiosis, Pune -2005
18. **Roopesh Ram:** Graduate, Associateship in Kansas State University (USA)-2005
19. **Ratna Prabha:** Graduate, Associateship in Idaho State University (USA)-2005
20. **Ninoj K.A:** IRMA, Anand-2005
21. **Prasanth Rajagopal :** IFS, 2005
22. **Kausalya V:**Young Scientist Award in the Kerala Swadeshi Science Congress-2005
23. **Cheri.M.Abraham:**Graduate,Associateship in the University of Illinois(USA)-2006
24. **D.Jacob:** KSCSTE Research, Fellowship-2003-06
25. **Deepa Thomas:**FAI Silver Jubilee Fellowship; Best Thesis Award, International Congress on Banana - 2004
26. **Priya.P:**Indian Society of Soil Science Zonal Award (South Zone) for the best M.Sc Thesis - 2004

27. **Kiran Narayanan:** MBA in IIMA-2006

28. **K.Dhinesh Babu:**Jawaharlal Nehru Award for Post graduate Research - 2006

29. **Dr. Resmi Paul** :Jawaharlal Nehru Award- 2007 given by ICAR for outstanding doctoral work in Horticulture on 16 July 2008.The research work was conducted under the guidance of Dr.M.R.Shylaja, Professor, Department of Plantation Crops & Spices.

30. **Simi Mohankumar :**Stood Third in the All India Inter University Mock Parliament conducted by the Ministry of Parliamentary Affairs for the South Zone.

31. **S.Arun :** Stood Second in the All India Inter University Mock Parliament conducted by the Ministry of Parliamentary Affairs for the South Zone

32. **Anuja.A.R:** Anganam Award (2008) for her collection of poems

33. **Dr. D. Jacob:** IPI – FAI Award for 2008, instituted by the International Potash Institute and the Fertilizer Association of India for Doctoral Research in Balanced and Integrated Fertilizer Use with emphasis on potassium for his outstanding Research work.

34. **T. Unnikrishnan:** Video Film Festival Award instituted by the Kerala Film Audience Council for the Best Script 2008 .

35. Mrs. Gleena Mary C.F. UGC Maulana Azad National Fellowship - 2011

36. Binisha,K.: Bagged the best poster presentation award in the IV National Symposium on plant protection in Horticultural crops held at IIHR,Bangalore, 25-28 April 2012

37. Bhagya Vijayan: Bagged the first place in the National Level essay writing competition on inclusive growth and sustainable development of Indian Coconut Sector conducted by CPCRI,Kasagod during September 2012.

JRF/Placements secured by the students

Year	2000	01	02	03	04	05	06	07	08	09	10	11	12
Nos	23	21	23	21	22	16	16	12	08	20	17	16	29

B. Faculty awards / Recognitions

Awards and other recognitions secured by the teachers of the college

Award	Year	Recipient
Jawaharlal Nehru award by ICAR for best Ph. D. Thesis	1996 1997	Dr. P. A. Valsala Dr. M. R. Shylaja
Krishi Vigyan Award by Govt. of Kerala for the best agricultural scientist	1997	Dr. T. R. Gopalakrishnan
Young Scientist award instituted by STEC, Govt. of Kerala	1989 1991 1991 1993 1995 1998 1999 2000 2001	Dr.T.R.Gopalakrishnan Dr. T. E. George Dr. S. Pathummal Beevi Dr. T. Girija Dr. P. Suresh Kumar Dr. N. Mini Raj Dr. C. R. Elsy Dr. D. Girija Dr.P.B. Pushpalatha
KRIBCO National Award for outstanding research in INM	1992	Dr. P. S. John
Deshmukh Young Agronomist Award by Indian Society of Agronomy	1995	Dr. Jose Mathew
Award of Deseeya Sastra Veedi	1997	Dr. P. K. Rajeevan
Women and development project award of Shastri Indo-Canadian Institute	1999	Dr. P. Indira Devi
IARI gold medal	1990 1999	Dr. Sajan Kurian Dr. Satheesh Babu
IAHS Gold medal for best Ph. D. Scholar in Horticulture	1991 1994	Dr. T.E. George Dr. T. Radha

UAS Bangalore Gold Medal for best Ph. D. Scholar in Horticulture	1991 1994	Dr. T.E. George Dr. T. Radha
Mercy Ponnaiya and Dr. Ponnaiya gold medal for best thesis in Genetics & Plant Breeding, TNAU, Coimbatore	1997	Dr. C. R. Elsy
Dr. S. Muthuswami medal for best student in Horticulture from TNAU	1992	Dr. K. Aravindakshan
Dr. K. G. Shanmugavelu prize for best Ph. D. thesis in Horticulture	1992	Dr. K. Aravindakshan
Thakur Ram Autar Singh Award by the Indian Poultry Science Association	1992	Smt. Gracemma Kurien
Jawaharlal National fellowship	1993	Dr. Mini Raj
Commonwealth Academic staff post-doctoral fellowship programme	1990 1991 1995	Dr. Lalitha Bai Dr. T.P. Murali Dr. S. Pathummal Beevi
Post doctoral fellowship in Biotechnology-National Associateship of the DBT, Govt. of India	1989 1995	Dr. C. T. Abraham Dr. P.C. Rajendran
Best Research Paper Award, South Indian Horticultural association	2002	Dr. T.R. Gopalakrishnan
Best Teacher Award sponsored by Malayala Manorama & Air India	2002	Dr. C.R. Elsy
"Biotech Product and process development and commercialization Award – 2003	2003	The Centre for plant Bio-technology and Molecular Biology
Gold Medal in Floriculture awarded by the Horticultural Society of India	2005	Dr. P.K.Rajeevan
Fellow of Indian Society of Agronomy	2007	Dr.P.S.John
Outstanding paper award by International Commission of Ag. Engg , Japan	2008	Er. P.S. Preman

Karshaka Bharati Award for the year 2005-2006 by Govt. of Kerala(Best farm journalist)	2008	Dr.P.A.Joseph
Karshaka Bharati Award for the year 2006-2007 by Govt. of Kerala(Best farm journalist)	2008	Dr.C.George Thomas
New product concept award in IFCON 2008 held at CFTRI, Mysore	2008	Dr. P. B Pushpalatha
Major advisor of the student who bagged Jawaharlal Nehru Award(2007)	2008	Dr.M.R.Shylaja
The 'Plaque of honour' for the contributions in orchid research in the National Conference on Orchids: Science and Society organized by Orchid Society of India at Bangalore during April 2008.	2008	Dr. P.K. Rajeevan
Best Centre Award for Thrissur centre of AICRP on Agrometeorology	2008	Dr.GSLHV Prasada Rao
'Fellow of the Indian Society of Ornamental Horticulture' for contributions in floriculture for the year 2008-09.	2009	Dr. P.K.Rajeevan
Best farm journalist award 2010 by Gandhi Study Centre, Kerala	2010	Dr.P.A. Joseph
NIWS recognition award given by the Directorate of weed science, Jabalpur	2010	Dr.C.T.Abraham
Best paper award in the Global conference on meeting the challenges in babana and plantain for emerging biotic and abiotic stress held in Tamil Nadu	2010	Dr.S.Beena
Best paper award in the 4th Indian Horticulture Congress held at New-Delhi	2010	Dr.T.Pradeepkumar
Best paper award in the 4th Indian Horticulture Congress held at New-Delhi	2010	Dr.Sujatha,R.
Best paper award in the Kerala State Science Congress Conducted by the KSCSTE	2011	Dr.Jiju P.Alex
Summer Research Fellowship of Indian Academy		Dr. Vimi Louis,

of Science, 2011- Associate		

Research news and events:

a. Department of Olericulture:

1. The following vegetable varieties developed by the Department of Olericulture, CoH, Vellanikkara were released by the State Variety Release Committee.

   Tomato variety "Akshaya". Salient features : High yielding indeterminate variety suited for polyhouse and open conditions.

   Snake gourd variety "Harithasree". Salient features : High yielding variety with long white striped green fruits.

2. Zonal Research and Advisory Committee of Central Zone recommended the following vegetable hybrids for release.

   a.Seedless watermelon hybrids KAUWH-1 and KAUWH-2.

3. Zonal Research and Advisory Committee of Central Zone recommended the following vegetable hybrids for farm trials.

   a.Gynoecious cucumber hybrids KAUCH-1 and KAUCH-2.

b. **Department of Microbiology**

The following programmes were conducted

i)DST sponsored *National Symposium on Waste Management: Strategies and Experiences* from 5-7,January,2011 (100 participants)

ii).DBT sponsored *Short-term training programme on Microbial Diversity and Gene Prospecting through Metagenomics* from 16, January to 5, February,2013 (15 Participants)

c. Department of Processing Technology:

Sanctioned State plan projects on

a) Establishment of Centre of excellence in post harvest technology and allied schemes.

b) Development of animal feed from jack fruit and mango processing waste.

and Central government project on

c) Strengthening of research in post harvest technology and value addition.

d. Department of Plantation Crops and Spices

a. News on variety release – Hybrid Pepper variety "**Vijay**"

b. Established a high-tech spice nursery for the production of quality planting

materials of spices.

e.Department of Plant Breeding and Genetics

IPR –Cell in the department of Plant Breeding and Genetics supported the following farmers /farming communities to receive prestigious Plant Genome Saviour Farmer Community Award /Reward.

Akampadam-Chimpanchala Padasekhara Samithy of Palakkad- Plant Genome Saviour Community Award.

1. Ciby George Kallingal of Pattikkad- Plant Genome Saviour Farmer Reward
2. N. Vasavan of pachapoika- Genome Saviour Farmer Reward