

THRUST AREAS OF RESEARCH

1. PLANT BREEDING & GENETICS

- Development of climate resilient varieties in different crops
- Development of varieties for disease and pest resistance
- Database development of characterization of land races and farmers varieties of crops
- Identification of sources of tolerance in pulses and cereals to post harvest storage
- Genome sequencing of selected native crops and varieties of Karnataka
- High yielding single cross hybrids in maize
- Diversification of germplasm and pre breeding
- Allele mining for resistant donor sources
- Breeding for nutrition/functional foods
- Breeding crop cultivars suitable for organic cultivation.
- Breeding crop cultivars suitable of mechanical harvesting
- Assessment of medicinal value of important and potential crops
- Yield potential enhancement
- Breeding for Protein rich varieties
- Increasing seed production technology in terms of seed production potential
- Breeding for Water use efficient varieties
- Introduction of new crops
- Breeding for short duration varieties
- Breeding for heat tolerance

2. BIOTECHNOLOGY

- Establishing Centralized Marker Assisted Selection Laboratory in the university to genotype the segregating population and germplasm to cater the needs of university Breeders for MAS in selected crops
- Establishing transformation laboratory to support Crop Breeding
- QTL mapping, isolation of functional genes and Strengthening and supporting marker Assisted breeding programmes in many field crops (millets, and pulses)
- Diagnostic kits development for plant diseases, food toxins
- Transgenic development for biotic stress and abiotic stress tolerance in locally important crops like — mulberry, maize, and other minor pulses
- Slow release nano fertilizer development

- Whole genome analysis of selected crops of Karnataka (SNP mining/ association mapping in crops of importance to Karnataka, millets/ small millets, jack fruit)
- Microbial strain (micro algae) development for biofuel
- Strengthening and support to gene editing in agriculturally important crops of this region (editing and correcting specific genes in released varieties, inbred lines)
- Plant communication and signaling with plants, pathogens and with beneficial microbes
- Phytosynthesis of nanoparticles and application of nanotechnology in agriculture

3. CROP PHYSIOLOGY

- Identification of QTL to drought and heat adaptive traits in rice by genome wide association studies utilizing the extensive genetic and genomic resources
- Assessing the trade-off between grain protein content and yield in rice through modern molecular biological and physiological approaches
- Modulation of traits through the use of elicitors, small molecules, endophytes, hormones etc to enhance stress resilience in crops.
- Interfacing with human clinical nutrition to assess bio-availability of nutrients and protein digestibility of plant based foods.
- High throughput phenotyping to assess subcomponents of water use efficiency through determining transpiration and growth rates in real-time, with a special reference to nocturnal transpiration
- Application of gene editing technologies to develop herbicide and disease resistant lines in rice.
- Accelerating trait introgression breeding by adopting doubled haploidization and speed breeding techniques and molecular breeding approaches

4. SEED TECHNOLOGY

Policy and regulatory gaps

- Harmonize seed and phytosanitary regulations at regional level in order to facilitate cross border seed trade.
- Strengthen collaboration among gene banks, plant breeders, seed producers and farmers to ensure wider germplasm utilization.
- Review/formulate appropriate seed policy and legislation, facilitating the development of the seed sector by promoting collaboration between public and private sectors and taking into account the specific needs of the formal and informal sectors. Policy approaches should also be tailored to the different types of crops.

- Develop appropriate measures to protect and promote farmers' rights
- Develop appropriate schemes for plant breeders' rights to facilitate the participation of the private sector in the seed industry

Variety development

- Strengthen plant breeding programmes and public/private partnerships for major food security crops, including the so-called "orphan crops".
- Increase farmers' participation in crop improvement activities in order to ensure that new varieties are appropriate to farmer practices and experiences.
- Facilitate private sector access to improved germplasm of the public system.
- Strengthen cooperative sub regional/regional breeding networks that will facilitate the flow of improved germplasm among countries.
- Streamline variety release procedures to ensure that improved varieties are rapidly made available to farmers.

Seed Production

- Strengthen seed production programmes, including early generation seed multiplication, taking into account comparative advantages of the public and private seed sectors.
- Support the emergence of local, private sector seed enterprises through capacity building activities and adequate credit schemes.
- Improve the organization of the private seed sector by strengthening national and regional seed associations.
- Strengthen farmers' capacities in seed multiplication in order to improve quality of seed produced in the informal sector.

Seed quality assurance and certification

- Develop seed quality control schemes adapted to the level of development of national seed sectors.
- Strengthen capacities and infrastructure of public institutions in order to ensure seed quality control in the laboratory and field inspections.
- Develop public/private partnership for implementation of seed quality assurance system

Seed conditioning and storage

- Assist the private sector with adequate credit schemes to acquire seed storage infrastructure and seed processing equipment adapted to their own commercial needs.
- Assist farmers to improve traditional methods of seed conditioning and storage.

- Explore possibilities for the public sector to facilitate the private sector's use of available infrastructure.

Seed distribution and marketing

- Implement seed market studies in order to improve business planning of seed enterprises.
- Link the crop production and the seed supply chain, also through contractual agreements in order to ensure a better match of seed supply and demand.
- Promote value adding activities at local level in order to increase farmers' investment capacity and seed demand.
- Facilitate the development of local seed distribution networks.
- Strengthen seed promotion programmes and implement efficient methods to improve farmers' and seed producers' knowledge and skills related to varieties and seeds.

Technology and education

- Create platforms to facilitate technology transfer among countries with advanced seed sectors and countries with seed sectors in development, also through south-south collaboration.
- Develop plant breeding and seed technology curricula in universities at national and/or regional level and facilitate access to graduate fellowship opportunities in order to train future technicians and scientists needed in the private and public sector.

5. AGRONOMY

- Develop suitable agronomic practices for change in climatic parameters
- Integrated Farming System for small, medium and large farmers for specific rainfed and irrigated situations.
- Impetus to organic Farming Research
- Conservation agriculture to restore soil health and sustainability
- Thrust on conversion of photosynthetic path way from C3 to C4 in pulses and oilseeds
- Strengthen research on efficient water use and improve water productivity
- Application of nano technology for reducing the nutrient use, pesticide use and to increase crop productivity
- Studies on introducing small hand tools and other machineries for addressing the labour problems
- Research on climate resilience and crop weather modeling

- Reduce post-harvest losses, evolving appropriate post-harvest management practices in different crops/enterprises
- Natural Farming
- Research on subsidiary activities such as bee keeping, mushroom cultivation consortium of bio-fertilizers, etc., to be strengthened

6. SOIL SCIENCE

- Conservation of carbon and its sequestration into the soil through recycling of crop residue and vegetable waste from urban area by mechanisation process of composting.
- Smart agriculture involving nano fertilizers, bio coated fertilizers and bio fortification of nutrients in crops.
- Precision farming involving sensor-based fertilizer application.
- Use of drones with sensors for fertilizers application.
- Management of problematic and polluted soils: New approaches for reclamation of saline- alkali soils in command areas and dryland saline soils
- Crop and soil specific multi micronutrient mixture for both soil and foliar application
- Re- fixing of 'P' dosage in 'P' rich garden soil.
- Use of hard stalk crop residue as biochar in agriculture.
- Studies on appropriate nutrient ratios for soils and crops
- Soluble and liquid fertilizers for efficient nutrient management in soils and crops
- Sub soil manuring to enhance soil fertility and productivity
- Biotic and abiotic stress management by using silicon fertilizers
- Utility of urban waste compost in crops

7. AGRICULTURAL MICROBIOLOGY

- Strategies for improving microbial inoculant technology for enhancing crop production.
- Microbial management of urban and agricultural residues
- Exploration of endophytic microorganisms (endophyte enabled biopriming) for management of biotic & abiotic stresses.
- Metabolic profiling of agriculturally important microorganisms for better utilization in crop production.
- Microbial Nano technology- Prospects and potentials in crop house improvement.
- Development of Bioprocessing, Bio preservation and Value addition-technologies.
- Commercialization of biofertilizers technology for enhancing crop production and improving soil fertility (promotion of organic farming).

8. SERICULTURE

- Methodology for commercial extraction of Omega 3 fatty acids from silkworm pupa
- Chemical / biological technology for mounting of cross breed in plastic chandrike as like bivoltine silkworm breed
- Cordyceps militar is an expensive fungi, also known as viagra of himalayas recommend as Immunity booster (can be multiplied using silkworm as substrate)
- IPDM in mulberry with organic pesticides
- Intrepid insecticide is not effective for management of thrips, mites and leaf roller pests of mulberry
- Organic sericulture in IFS model

9. ENTOMOLOGY

- Assessment of phenology, incidence of insect pests under varying climatic conditions and developing climate smart methodologies to overcome negative impacting factors of climate on insect pest management.
- Generating DNA barcode data for important insect pests & natural enemies, biosafety, biosecurity and integrative taxonomy of insect resources.
- Recognition of alternative insecticides and biorationals for ineffective, resistant and phased out insecticides: Proactive identification of alternative insecticides as substitute for ineffective (due to insecticide resistance) and black-listed (phased out/restricted) insecticides (like phorate, carbofuran, dichlorvos, buprofezin.....).
- Eco biology, behaviour and biocontrol agents for recent emerging invasive pests like tomato pinworm, fall army worm, rugose whitefly and others.
- Rodent pest management in natural farming and mitigation of human-animal conflict in agro ecosystem. (wild pigs, elephants, leopards, monkeys, deer, peacock and other depredatory birds).
- Exploring the source of host plant resistance for both conventional (traditional) and introduced pests (evaluation of available genotypes/cultivated varieties) and identification of resistance mechanisms.
- Intellectual management of newer pest problems in the changed agriculture scenario (bio-intensive management of pests in traditional/newer crops).
- Judicious use of newer compounds with special reference to their safety to natural enemies (of pests) and other beneficial organisms (pollinators and productive insects).
- Management of post-harvest and storage/stored product pests.

- Accurate identification of emerging pests of crops and reasons/consequences underlying their potential pest status (for example, citrus stem borer, yellow mite on mulberry, mite pests of vegetable crops (like cucurbits), flower crops and medicinal plants, newer sucking pests particularly whiteflies, thrips, scales and mealy bugs.
- Symbiotic gut interaction of emerging new pests

10. APICULTURE

- Development and standardization/ improvisation of hive designs for stingless bees, *Apis cerana* and *A. mellifera* rearing
- Artificial domiciliation of Leaf cutter bee, *Apis florea* and their potentiality in crop pollination
- Mass queen rearing in *Apis cerana indica*
- Nesting and migratory behavior of Giant honey bee, *Apis dorsata* F. to enable its conservation
- Eco-friendly (non-chemical) methods for the management of Thai Sac Brood Virus in *A. cerana*
- Field evaluation of alternative pollinators (Non-*Apis* bees) under protected cultivation
- Physico chemical /antibacterial activity of Honey
- Integrating stingless bees (meliponiculture) into urban and peri-urban agricultural and urban eco-systems
- Bee pollinator potentiality and their optimization in improving seed production
- Development and standardization of stingless bee honey extractor
- Pollination strategies in dragon fruit (*Hylocereus spp.*) through Farmers Participatory Research Approach
- Standardization of techniques for minimization of absconding behaviour in *Apis cerana* to optimize colony growth and development.
- Pollination potentiality of stingless bees in selected vegetable crops under protected cultivation
- Integrated management of Thai Sac Brood Virus (TSBV) disease of *Apis cerana*.
- Conservation of wild bees.

11. PLANT PATHOLOGY

- Bio-management of crop diseases and post harvest diseases
- Integrated disease management modules for organic and precision farming systems
- Endophytes usage in induction of plant defense against plant pathogens/ diseases

- Development of predictive models in the management of major crop diseases
- On-line/ IoT advisory services for plant disease diagnosis and management
- Application of nanomolecules in the management of plant diseases
- Molecular interactions of plant pathogens & evaluation of GM crops against major diseases
- Adoption of Biosafety and Biosecurity regulations in plant quarantine

12. HORTICULTURE

- Agro-techniques for exotic vegetables both for open field and polyhouse conditions.
- High yielding turmeric varieties suitable to zone IV and V
- Organic production techniques for industrially important medicinal, fruits and vegetable crops
- Low Chilling Apple and other temperate fruit varieties
- Propagation of GI tagged jasmines and new profitable flower crops suitable
- High density planting and integrated nutrient management in fruit crops
- Micro-irrigation and enhancing water use efficiency in fruit crops
- Exploitation of underutilized Horticultural crops
- Production of quality planting material through micro propagation and conventional methods in fruit crops and for medicinal and aromatic crops.
- Seed production in vegetable crops
- Exploitation of rootstocks in fruit crops
- Protected cultivation –Water and nutrient use efficiency for higher yields in horticulture crops
- Conservation of medicinal and aromatic crops for commercial production
- Mechanization in Horticulture
- Development of varieties with specific purpose on vegetable crops
- Post harvest technology and value addition of horticultural produce

13. FORESTRY AND ENVIRONMENTAL SCIENCE

- Development of package of practices for major timber tree species for different agro-climatic zones coming under UAS Bangalore.
- Identification and selection of different host plants for the growth and development of the host species for cultivation of sandal trees.
- Standardization of nursery techniques for important timber species.

- Identification and selection of elite and plus trees for the seed collection of different timber and non-timber tree species for nursery practice.
- Identifying the geo-indicator tree species for mass multiplication through nursery practices considering the particular regimes.
- Solid waste Management
- Environmental pollution
- Waste land reclamation

14. AGRICULTURE ENGINEERING

Farm Machinery & Power Engineering

- Farm machinery & equipment suitable for small & marginal farmers
- Mechanized cultivation of ragi & other small millets: evaluation / development of tractor drawn seed drill, reaper, whole-crop thresher, straw binder and combine
- Identification / evaluation of sugarcane harvester, defoliator
- Improvement of rice manual transplanter for small holder farms
- Mechanical harvesting equipment for tree crops: coconut, mango, tamarind, etc
- Mechanization of maize cultivation: evaluation of maize combines; stalk cutter and binder
- Evaluation of power weeders for different crops
- Harvesting cotton: Cotton pickers

Processing & Food Engineering

- Evaluation / development of processing machinery for different small millet grains
- Crop residue / food waste utilization for bio-energy and activated carbon
- Mechanization of jaggery production & chemical free jaggery production
- Popping machine for ragi / other small millets
- Rain affected kharif onion drying / curing; farm level grading of onion
- Tamarind processing machinery
- Evaluation / development of processing machinery for different small millet grains

Soil & Water Engineering

- Automation of irrigation / fertigation systems
- Application of GIS & remote sensing technique in micro watershed areas
- Study on effect of soil & water conservation measures in watershed on groundwater table
- Study of distribution efficiency of drip irrigation systems with latest drippers

- Sub-surface drainage design for salt affected soils in command areas
- Scientific recharge of borewells and water table improvement studies

15. FOOD SCIENCE & NUTRITION

- Food based solutions for enhanced health
- Development of research tools for community nutrition studies
- Developing regional standards for anthropometric indices
- Bio active components in foods – Antioxidants and phytochemicals
- Traditional foods - in changing food habits.
- Application soft wares/apps for nutrition education and dietary package
- Health and nutrition scenario during Covid-19
- Documentation of ITK's related to food and nutrition

16. AGRICULTURAL EXTENSION

- Impact of land disputes on farm productivity and livelihood security of indian farmers
- Analysis of farmers preference in paddy varieties recommended
- Transfer of agricultural technology through social media
- Development of newer extension models to suit changing dimensions of clientele
- Assessment of recent extension approaches and methods
- Pluralistic extension approaches

17. AGRICULTURAL ECONOMICS

- Documentation and assessment of awareness, knowledge, adaptation and mitigation of climate change on agriculture at farm level.
- Economic, social and livelihood implications of climate change vis-à-vis agriculture.
- Policy prescriptions or requirements for mitigating CC: Types- ameliorative, preventive, persuasive mechanism and implementation and governance.
- Policy and programmes evaluation – Assessment and Implications.
- Implementation and effectiveness of ground water exploitation policies (example restriction and permissions to sink new bore well by farmers). What are the implementation constraints for these policies and how farmers receive these policies?
- Farmer producer organizations: Constraints, difficulties and measures adopted by producers in organizing FPOs.
- Measures/methods/approaches for weaning away farm population to non-farm activities. Implications of reverse migration on farm economy.

- Doubling farmers income: Identification of income multipliers, scope for farm and non-farm incomes for enhancing farmers' income.
- Analysis of consumption expenditure-time series analysis.
- Terms of trade between agriculture and non-agriculture sector.
- Analysis of drought/flood occurrence, pattern, changes in sowing dates in consonance with changing monsoon pattern.
- Research prioritization, in terms of funds allocation, identification of research priorities keeping in view food security, farm incomes, exports and other dimensions.
- Economic impact assessment of agricultural technologies and innovations including their economic viability in relation to resource endowments of farmers.
- Financial and economic feasibility analysis of investment opportunities in agriculture, including ICT, transaction costs and benefits,
- Economics of groundwater recharge, including watershed treatment, micro irrigation, precision farming, surface water irrigation & use of treated water to groundwater recharge
- Externalities in surface / groundwater irrigation, sand mining, economics of irrigation water quality and its influence on land, quality of produce, health of humans, livestock, economics of competitive uses of water for agriculture, domestic and industrial purposes
- Economics of integrated farming systems – accounting for forward and backward linkages, sustainability assessment
- Economics of value chain for value added products of millets, pulses, fibers, non-timber forest products, IGAs from arecanut, coconut biomass including supply chain management.
- Valuation of disaster damage in agriculture, soil, land, farm assets, livestock, inventory and crops.
- Food and nutrition security, livelihood security, health and economic security, role of food choice on crop pattern, income and gender issues.
- Economic implications of food loss and food wastage on food and nutritional security.
- Economics of next generation food crops – nutri cereals, climate smart crops.
- Valuation and payment for ecosystem services in relation to water, forests, pollution abatement, agro-tourism and agro-ecosystems.
- Transaction costs of input procurement and output sales

- Contribution of non-farm and off farm incomes in agriculture, remittances and their impact on livelihood, savings, capital formation.
- Agriculture credit: Distributional equity, efficiency in use, innovations in credit access & use
- Assessment of risk in agriculture, role of crop insurance, livestock insurance, general insurance, weather based crop insurance.
- Implications of rising wage rates, farm mechanization and impact on farm efficiency.
- Economic dimensions in gender issues and labor migration studies in agriculture.
- Agricultural transformation due to urbanization, land use changes, encroachments, land grabbing & land conversions, changes in land values.
- Identification of economically profitable crops and enterprises in relation to export performance and international trade.
- Economics of energy supply, demand and pricing in farming
- Bio-economic modeling, sustainable path of extraction of natural resources, choice experimental studies and their applications in Agricultural Economics
- New institutional arrangements of efficiency and equity in agriculture.
- Influence of growth of rural non-farm sector on agriculture and rural livelihood
- Impact of western-ghats conservation committee reports on farming, livelihood, ecology, environment, human-animal conflict.
- Implications of pandemic on agriculture

18. AGRIL. MARKETING & COOPERATION & BUSINESS MANAGEMENT

- Action oriented research to address the gaps in the post- harvest practices of selected seasonal fruit crops.
- Market research to develop business plans for APMCS and assess its performance
- Study of consumers preference / market dynamics for a basket of consumer goods.
- Study on the skill needs of human resources in the agri business industry/ enterprises.
- Study on fixing farm gate prices for selected agricultural. commodities - the pros and cons of proposal
- Establish direct market linkages/ alternate channels
- FPO/ commodity interest groups
- Market intelligence and policies

19. DEPT. OF AGRIL. STATISTICS MATHS. AND COMP. SCIENCE

- Design and analysis of experiments

- Statistical modeling and methodology
- Statistical genetics and **statistical** ecology
- Theory and applications of sampling
- Statistical applications in agriculture and allied fields
- Pattern recognition and its application in agriculture
- Soft computing and its application in agriculture
- Bioinformatics and its application in agriculture
- RS & GIS and its application in agriculture

20. ANIMAL SCIENCES

- Integrated livestock farming
- Focus on utilization of conventional fodders
- Enhancing water productivity through integrating of aquaculture activities in the farming systems and urban fish farming
- Feeding balance ration to combat infertility problems in cross bred animals
- To combat fodder scarcity, focus on unconventional fodder utilization.
- Water budgeting and multiple use of water for enhancing water productivity through integration of aquaculture activities in the farming systems and urban fish farming.
- Clean milk production by following hygienic procedures