

Priority Areas of Study

The Netaji Subhas- ICAR International Fellowships are available in frontier areas of Agriculture and allied sciences at the recognized agricultural universities/ institutions in India and abroad. The identified priority areas are-

Crop Sciences

- Markers and MAS of biotic stress tolerance
- Non-chemical measures for eradication of pests
- Integrated pest management-compatibility with chemicals
- Race and biotype identification of pests
- Molecular basis of pathogenicity and host specificity
- Crop loss assessment models
- Survey and surveillance strategies for pests showing no specific symptoms
- Development of smart biotic stress resilient bees
- Development of novel technologies including standardization of bee hive design to combat attack on bees and colonies.
- Use of acoustics and biosensors for detecting pest infestation
- Molecular signatures of biocontrol agents
- Polymer based smart delivery systems for enhanced seed yield in major crops.
- Nano-particulate seed invigoration for enhanced seed longevity in soybean and groundnut.
- Optimization of seed production and testing protocols in medicinal and aromatic plants.
- Development of self-incompatible hybrid seed production system in mustard.
- Studies on molecular mechanism involved in bio-priming and seed health management.
- Studies on extraction, characterization and application of botanicals for seed quality enhancement.
- Assessment of bioactive potential of seed storage proteins in seed protection.
- Abiotic stresses and its repercussions on seed quality parameters in major crops.
- Quantitative assessment of trade impacts due to seed policy reforms and price policy research in seed sector.
- Genome-wide association mapping (GWAS) for seed quality traits in Maize/Rice
- Trait identification and physiological breeding for abiotic stress tolerance
- Molecular and epigenetic of plant development and stress tolerance
- Bio-markers and non-invasive techniques for diagnosing seed quality
- Biophysical, genetic and molecular basis of seed development, germination, dormancy and longevity
- Expression Genomics and advanced genomic Analysis-Field crops
- Biochemical and molecular basis of drought tolerance in Field crops
- Breeding for Quality Improvement in Cereals and Oil seeds
- Field-based phenomics for plant pathological research and its manipulation
- Crop yield forecasting linking Remote sensing and simulation model
- Modeling water and nitrogen dynamics under different tillage and residue management practices
- Introgression of wild genes in Super rice
- High throughput Phenomics
- High throughput genotyping and analysis: SNP chip development and data analysis
- Improvement of salinity stress (abiotic stress) tolerance in cereals

- Plant Single Cell Genomics, Single Cell Metabolomics
- Molecular breeding for nitrogen use efficiency
- Isolation and characterization and map based cloning of disease resistance genes in field crops
- Identification and Characterization of Bacteriophage for management of bacterial diseases of crops with special emphasis on rice.
- Epidemiology of rice diseases in modern era with special emphasis on False Smut Disease
- Throughput techniques for understanding the abiotic stresses management in millets
- Genomics sequencing for marker developments particularly small millets
- Genetic engineering and genome editing technologies for maize improvement
- Genomic selection based maize breeding technologies
- Double haploids in hybrid breeding
- Allele mining for flagging the useful genes available in the genetic stock for ascertaining the genetic worth of the collection and better utilization
- Development of varieties with genetic enhancement of yield, tolerant to water stress and high temperature, insensitive to photoperiod, low linolenic and high oleic acid, vegetable and food grade characters, high oil content, suitability for mechanical harvesting,
- Exploring the possibility of harnessing heterosis through identification and development of male sterility and an efficient fertility restoration system,
- Genetic enhancement of germplasm through pre-breeding exercises for expanding the parental base of varietal evolution programmes
- Identification of efficient Rhizobium and other plant growth promoting rhizobacteria (PGPR) and other microbes with multiple traits for plant growth promotion
- Identification of genetic sources for high yield characteristics such as high number of pods, test weight, seeds/pod, high photosynthetic efficiency and better partitioning (harvest index) and QTLs governing these traits
- Identification of QTLs and integration of photo-thermal insensitivity in agronomical superior lines and MAS for varieties with yield and wider adaptability across planting time latitudes and rapid seed fill duration
- Identification of resilient soybean production system for changing climate. Studies on thermo tolerant Brady rhizobium for higher nodulation in soybean. Use of Mycorrhiza fungi in mitigating adverse impact of abiotic stresses.
- Impact assessment of future climate change and development of adaptation strategies to mitigate adverse impact of present and future climate variability
- Management of YMV and rust in soybean through development of resistant varieties and protection modules
- Molecular characterization of available soybean genetic stock for safeguarding country's interests
- Optimization of rotational tillage and crop rotation in soybean based cropping system
- Refinement in IPM by adding of new components for multiple diseases and insects
- Standardization of management practices for organic soybean production
- Use of photo-insensitivity and long juvenility traits for development of soybean varieties with wider adaptability
- Use of zinc solubilizing and iron chelating rhizobacteria for zinc and iron nutrition in soybean

- Utilization of molecular tools such as marker aided selection for tracing QTLs for yield and their subsequent exploitation through breeding programme
- Widening gene pool through pre-breeding approaches including restructuring plant type for breaking the existing yield ceiling
- Phenotyping and MAS for white rust resistance and quality traits
- Development of transgenic for *Alternaria* blight resistance and aphid tolerance
- Improving resource use efficiency (soil, plant, water and nutrients) under different situations
- Development of web-based user friendly, bilingual interactive software for speedy technology dissemination
- Reduction in maturity period with improved seed yield in developed genotypes
- Identification of improved methods for estimation of biochemical parameter developed
- Development of new genotypes having double low characteristics in mustard
- Improvement in resource use efficiency under different situations

Horticulture

- Ecosystem analysis
- Gene silencing and RNAi technology
- Date Palm improvement and culture
- Doubled haploidy (DH)
- Tospo viruses
- Temperate Horticulture
- Phyto-plasma
- Bio-security in horticultural crops
- Pheromones and chemical ecology
- Physiology of flowering and fruiting in perennial fruit crops
- Fruit tree breeding
- Male sterility in crops
- Micro-nutrients in soil health management in horticultural crops
- Mechanization in horticulture
- Quality Parameters in horticulture crops
- Landscape horticulture
- Physiological disorder in horticultural crops
- DNA Barcoding
- Canopy architecture management, Ultra High density orcharding
- Development of pest and disease forecasting models, Development of diagnostics
- Agri-waste utilization, Peri-urban horticulture, organic farming
- Nutrient bioavailability
- GIS & remote sensing, geo-informatics, image processing

Biotechnology and nanotechnology

- Gene knock-down technology
- marker assisted selection (MAS),
- transgenic technology,
- microbial molecular taxonomy,

- molecular breeding
- bio fortification, bio-prospecting, bioremediation, , non-chemical non-thermal processing and membrane technology, apomixes, stem cell research, nutri-genomics, , bi-economics of effective agro-technologies, Epigenetics and reproduction,
- Nanotechnology applications in agriculture comprising plant, animal and fisheries/aquaculture sciences etc.
- RNAi Silencing approaches for seed-borne pathogens
- Design and development of nano-biosensors for seed quality assurance and nano-composite based smart seed delivery systems
- Molecular Image Analysis of seed quality parameters
- Cloning of tissue specific promoters
- Understanding molecular basis of plant immunity
- Genomic selection and genome wide association mapping
- Transgenic for insect resistance in pulses and cotton
- Understanding genes involved in nitrogen uptake and assimilation
- Defense response mechanism of plants
- Systemic acquired resistance
- Understanding Molecular basis of CMS across crop species
- Apomixes for hybrid development
- Metagenomics for new gene discovery Development of next generation DNA markers
- Cloning plant disease resistance genes and their application
- Comparative genome analysis and system biology
- Assessment of diversity loss over time and space and approaches to measuring genetic erosion on-farm
- Study of functional polymorphism in plant genetic resources of important crops
- Characterization of germplasm for enhanced utilization using tools of comparative genomics
- Providing scientific basis for seed conservation strategies and for devising effective seed conservation protocols.
- Investigating molecular aspects of seed longevity.
- Investigating seed storage behavior as a prerequisite for storage strategy and factors responsible for recalcitrance in seeds.
- Development of cost-effective *in vitro* conservation and cryopreservation protocols.
- Developing DNA based diagnostics to check unauthorized GM events and to monitor unintentional presence of transgenes in germplasm collections.

Animal Sciences

- Allele mining for disease resistance and adoption in the changing climate scenario
- Veterinary health
- Genome resource conservation
- Fermentation Technology
- Molecular diagnostics and Recombinant vaccines
- Nutra-ceuticals and functional foods
- Bio-security
- Animal Biotechnology and Animal Health
- Dairy production, processing and management and animal biotechnology
- Next generation gene sequencing, Immuno-physiology

Natural Resource Management

- Climate Change: Impact, adaptation, mitigation, Soil Carbon Sequestration, carbon trading/carbon sequestration in agro-ecosystems, methane mitigation in livestock etc.
- Micro-molecules
- Agro-forestry and sustainable Livelihoods
- Water Footprint and virtual water, Phyto-biomediation of waste/poor quality water Soil & water conservation engineering, Conservation of bio-resources and species modeling, Soil microbe interactions for organic matter and nutrient dynamics
- Computer aided designing of implements and processing plants
- Market intelligence, Multi-market modeling
- Research evaluation and impact assessment
- Institutional economics.
- Decision Support Systems

Agricultural Engineering

- Bioinformatics, Bio-environmental engineering, Ergonomics and agricultural safety, Advanced machine design,
- Sensor-based applications including bio-indicators, bio-sensors
- Endophyte biology
- Agriculturally important biodiversity (including fisheries)
- Herbivory process
- Precision agriculture/farming, Hi-tech Horticulture, Aeroponics, Controlled environment agriculture
- Functional foods/Health foods,
- Robotics
- Secondary Agriculture
- Bio-fuels
- Precision Agricultural Machinery
- Use of Drones in Agriculture
- Post harvest management, Food Engineering, Extraction of bio-active compounds, Novel techniques for storage of food grains/food fishes, Processing and value addition, Extrusion processing, Designer fish foods, Value chain management, Smart/modified atmosphere packaging,

Fisheries

- Management of sea water intrusion in inland and coastal aquifer
- Fresh water/Marine/Cold water fish breeding and culture
- Pearl/crab culture, Fish disease diagnosis, vaccines and Immuno-prophylaxis
- Intensive aquaculture (cage culture, raceways)
- Organic/ornamental aquaculture, Fish food formulation, FCR & flesh quality enhancement
- Food safety and quality assurance, HACCP&GMP in Fish processing
- Marine Fisheries Resources/ Stock Assessment, conservation and Management, Population Dynamics and Stock Assessment Models
- Mari culture & Open sea Cage farming of finfish/shellfish and sea-ranching
- Inland Fisheries Resources/Stock Assessment, Population Dynamics & predictive modeling, Conservation and Management

- Quantification of environmental flow in rivers for management of eco-system, health & fisheries
- Culture based fisheries management of reservoirs
- Fresh water Aquaculture-finfish/shellfish hatchery & grow-out culture and farm management
- Shrimp hatchery & grow-out culture and farm management
- Selective breeding of finfish/shellfish species for growth improvement and disease resistance
- Fish health management, Disease Diagnostics & Control Measures in aquaculture
- Nutrition and fish feed technology
- Probiotics/Nutraceuticals/Immuno-stimulants in aquaculture
- Integrated fish farming systems with Crops and Livestock
- Utilization of sub-soil saline groundwater of aquaculture
- Hatchery Technology and Grow out Culture of Trout and other Hill Fishery Resources
- Fishing craft and gear designing, fabrication, improvisation for diversified and conservation fishing in artisanal and mechanized sectors
- Fish Processing; Product Development, value addition & waste utilization; Food Safety, Quality Control& Hygiene Protocols; Packaging Technology

Note: The other frontier areas in agriculture and allied sciences may also be appropriately considered.

Suggested Universities for study Abroad

1. Auburn University, USA
2. Arizona State University, USA
3. University of Georgia, USA
4. University of Iowa State University, Ames, USA
5. North Carolina State University, Raleigh, USA
6. Ohio State University, Columbus, Ohio, USA
7. Michigan Technological University
8. Montana State University, Montana, USA
9. Cornell University, USA
10. Kansas State University, USA
11. University of Minnesota, USA
12. Texas A& M University, Texas, USA
13. University of California, USA
14. University of Illinois, Chicago, USA
15. Purdue University, Indiana, USA
16. Rice University, Texas, USA
17. University of Maryland, Baltimore, USA
18. University of Connecticut, USA
19. University of Hawaii, USA
20. Rutgers University, New Brunswick, New Jersey, USA
21. Lancaster University, Lancaster
22. University of New Hampshire, Durham, NH, US
23. University of Manchester, UK
24. University of Massachusetts, USA
25. Yale University, USA
26. University of Edinburg, Scotland, UK
27. Loughborough University Leicestershire, LE11 3TU, UK
28. Sterling University, Scotland, UK
29. University of Readings, UK
30. University of British Columbia, Vancouver, Canada
31. University of Guelph, Ontario, Canada
32. University of Alberta, Canada
33. University of Manitoba, Canada
34. McGill University, Canada
35. KVL, Aarhus, Denmark
36. Swedish University of Agricultural Sciences and National Veterinary Institute,
Uppsala, Sweden
37. Norwegian University of Life Sciences, Norway
38. University of GHENT, Belgium

39. University of Chile, Chile
40. Victoria University, Melbourne, Australia
41. Wageningen University, Wageningen, Netherlands
42. University of Netherlands
43. Tokyo University of Marine Sciences & Technology, Japan
44. Waseda University, Tokyo, Japan
45. University of Osaka, Japan
46. University of Tokyo, Japan
47. University of Otago, New Zealand
48. University of Freiburg, Germany
49. Goetha University, Frankfurt, Germany
50. Technische Universitaet Muenchen, Weihestephaner Berg 3, D-85350 Freising-Weihestephan, Germany
51. Institute of Animal Science, Physiology & Hygiene, University Bonn, Germany
52. Mahidol University, Bangkok, Thailand
53. Institute of Cellular and Molecular Biology, National University of Singapore, Singapore
54. Monash University, Clayton, Victoria, Australia
55. CG Centers as affiliated to Universities for degree programmes
56. Alcorn State University, USA
57. Wisconsin State University, USA
58. University of Florida, USA
59. Washington State University, USA
60. Syracuse University, USA
61. University of Zurich, Switzerland
62. University of Queensland, Australia
63. University of New South Wales, Australia
64. Australian National University, Australia
65. University of Western Australia, Australia
66. Colorado State University, USA
67. University of Nebraska, USA
68. Roselyn Institute, Rosalyn Midlothian, UK
69. Western School of Biological Sciences, Harward Medical Institute, New York, USA
70. Institute of Animal Sciences, Volcani, Israel
71. Institute of Molecular Medicine, Trinity College, Dublin
72. Institute of Medicine, Washington, DC, USA
73. CSIRO Tropical Agriculture, Queensland, Australia
74. CSIRO Lab, ACIAR, Brisbane, Australia
75. Centre for Excellence in Nanotechnology, Khang Lung, Bangkok, Thailand
76. AVRDC, Taiwan

Note: The other reputed/recognized Universities may also be appropriately considered.

List of Agricultural Universities in India

Andhra Pradesh	
1.	Acharya N. G. Ranga Agricultural University, Hyderabad
2.	Sri Venkateswara Veterinary University, Tirupati
3.	Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari
Assam	
4.	Assam Agricultural University, Jorhat
Bihar	
5.	Rajendra Agricultural University, Pusa, Samstipur
6.	Bihar Agricultural University, Sabour, Bhagalpur
Chhattisgarh	
7.	Indira Gandhi Krishi Vishwavidyalaya, Krishak Nagar
8.	Chhatisgarh Kamdhenu Vishwavidyalaya, Durg, Chhatisgarh
Delhi	
	(ICAR Deemed University)
9	Indian Agricultural Research Institute, Pusa,
Gujarat	
10.	Anand Agricultural University, Anand
11.	Junagadh Agricultural University, Junagadh
12.	Navsari Agricultural University, Navsari
13.	Sardarkrushingar-Dantiwada Agricultural University Sardarkrushingar, Dantiwada
14.	Kamdhenu University, Gandhi Nagar Campus Office, Podium Level, M Floor, Sector 10-1, Gandhinagar
Haryana	
15.	CCS Haryana Agricultural University, Hisar
16.	Lala Lajpat Rai University of Veterinary & Animal Sciences ,
	(ICAR Deemed University)
17.	National Dairy Research Institute, Karnal
Himachal Pradesh	
18.	CSK HP Krishi Vishwavidyalaya, Palampur
19.	Dr Y S Parmar University of Horticulture & Forestry, Nauni, Solan
Manipur	
	Central Agricultural University
20.	Central Agricultural University, Imphal
Jammu and Kashmir	
21.	Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu
22.	Sher-e-Kashmir University of Agricultural Sciences & Technology, Srinagar
Jharkhand	
23.	Birsa Agricultural University, Kanke, Ranchi
Karnataka	
24.	University of Agricultural Sciences, Raichur
25.	University of Agricultural Sciences, Bangalore
26.	University of Agricultural Sciences, Dharwad
27.	University of Horticultural Sciences, Bagalkot
28.	Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar

29.	University of Agricultural and Horticultural Sciences, Navile, Shimoga
Kerala	
30.	Kerala Agricultural University, Thrissur
31.	Kerala University of Fisheries and Ocean Studies, Papangad, Kochi
32.	Kerala Veterinary and Animal Sciences University, Pookode, Lakkidi, P.O. Wayanand
Madhya Pradesh	
33.	Jawaharlal Nehru Krishi Vishwavidyalaya, Krishi Nagar, Adhartal, Jabalpur
34.	Rajmata Vijayaraje Scindia Krishi Vidhyalaya, Race Course Road, Gwalior
35.	Madhya Pradesh Pashu Chikitsa Vigyan Vishwavidyalaya, Jabalpur
Maharashtra	
36.	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar, Akola
37.	Mahatma Phule Krishi Vidyapeeth, Dist. Ahmednagar, Rahuri
38.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Ratnagiri, Dapoli
39.	Marathwada Agricultural University, Parbhani
40.	Maharashtra Animal & Fishery Sciences University, Seminary Hills, Nagpur
(ICAR Deemed University)	
41.	Central Institute of Fisheries Education, Panch Marg, Off Yari Road, Andheri (West), Mumbai
Nagaland	
Central University with agricultural faculty	
42.	Nagaland University, Lumbani, Medziphema
Orissa	
43.	Orissa University of Agriculture & Technology, Bhubaneswar
Punjab	
44.	Punjab Agricultural University, Ludhiana
45.	Guru Angad Dev Veterinary and Animal Sciences University Ludhiana
Rajasthan	
46.	Swami Keshwanand Rajasthan Agricultural University, Bikaner
47.	Maharana Pratap University of Agriculture & Technology, Udaipur
48.	Rajasthan University of Veterinary & Animal Sciences, Bikaner
49.	Sri Karan Narendra Agricultural University, Jobner, Jaipur
50.	Agriculture University, Jodhpur, Mandor, Jodhpur
51.	Agriculture University Kota, Borkhera, Kota
Tamil Nadu	
52.	Tamil Nadu Agricultural University, Coimbatore
53.	Tamil Nadu University Veterinary and Animal Sciences, Chennai
54.	Tamil Nadu Fisheries University, First Line Beach Road, Nagapattinam
Telangana	
55.	Sri Konda Laxman Telangana State Horticultural University, HQ at Rajendra Nagar Campus, Hyderabad
56.	Professor Jayashankar Agriculture University, Rajendranagar, Hyderabad
57.	Sri P.V. Narsimha Rao Telangana State University for Veterinary, Animal and Fisheries Sciences, Rajendranagar, Hyderabad
Uttar Pradesh	
58.	Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad
59.	Chandra Sekhar Azad University of Agriculture & Technology, Kanpur

60.	UP PanditDeenDayalUpadhyayPashuChikitsaVigyanViswaVidyalayaEvam Go AnusandhanSansthan, Mathura
61.	SardarBallabh Bhai Patel University of Agriculture & Technology Roorkee Road, Modipuram, Meerut
62.	Manyavar Shri Kanshiram Ji University of Agril. & Technology, Banda
	Deemed University
63.	Sam Higginbottom Institute of Agriculture Sciences & Technology, Allahabad
	Central Agricultural University
64.	Rani Lakshmi Bai Central Agricultural University, Jhansi
	Central University with agricultural faculty
65.	Banaras Hindu University, Varanasi
66.	Aligarh Muslim University, Aligarh
	(ICAR Deemed University)
67.	Indian Veterinary Research Institute, Izatnagar
Uttarakhand	
68.	GB Pant University of Agriculture & Technology, Pantnagar
69.	Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal
West Bengal	
70.	Bidhan Chandra KrishiVishywavidyalaya, Mohanpur, Nadia
71.	Uttar Banga KrishiVishwavidyalaya, PO Pundbari, Cooch Behar
72.	West Bengal University of Animal & Fishery Sciences, Kolkata
	Central University with agricultural faculty
73.	Vishwa Bharti, Birbhum Distri, Shantiniketan, West Bengal