



भाकृअनुप-भारतीय मसाला फसल अनुसंधान संस्थान
कोषिकोड-६७३०१२, केरल, भारत
ICAR-Indian Institute of Spices Research
Kozhikode- 673012, Kerala, India



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<https://www.youtube.com/user/iisrcalicut>

Spicing Up The Nations Progress...



भाकृअनुप-भारतीय मसाला फसल अनुसंधान संस्थान ICAR-INDIAN INSTITUTE OF SPICES RESEARCH

उपलब्धियां महत्वाकांक्षाएं कार्य योजना
ACHIEVEMENTS ASPIRATIONS ACTION PLAN



SPICING UP THE NATION'S PROGRESS



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ICAR-INDIAN INSTITUTE OF SPICES RESEARCH



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ACHIEVEMENTS ASPIRATIONS ACTION PLAN



A time line of the institute



Vision

Enhancing productivity of spices to meet the growing demand and to make India the global leader in spices export.

Mission

To serve the stakeholders in spices sector including primary producers, farmer collectives, industry constituents and public institutions by conducting goal-directed and peer reviewed research, creating a competent pool of trained manpower and spearheading technology dissemination. The institute will seamlessly integrate cutting edge research, innovative thinking and global networking into its programmes, activities, and services.



Black pepper

Black pepper
Cardamom
Ginger
Turmeric
Nutmeg
Garcinia
Clove
Cinnamon
Cassia
Allspice
Vanilla
Paprika



Nutmeg



Ginger



Turmeric



Vanilla



Garcinia



Clove



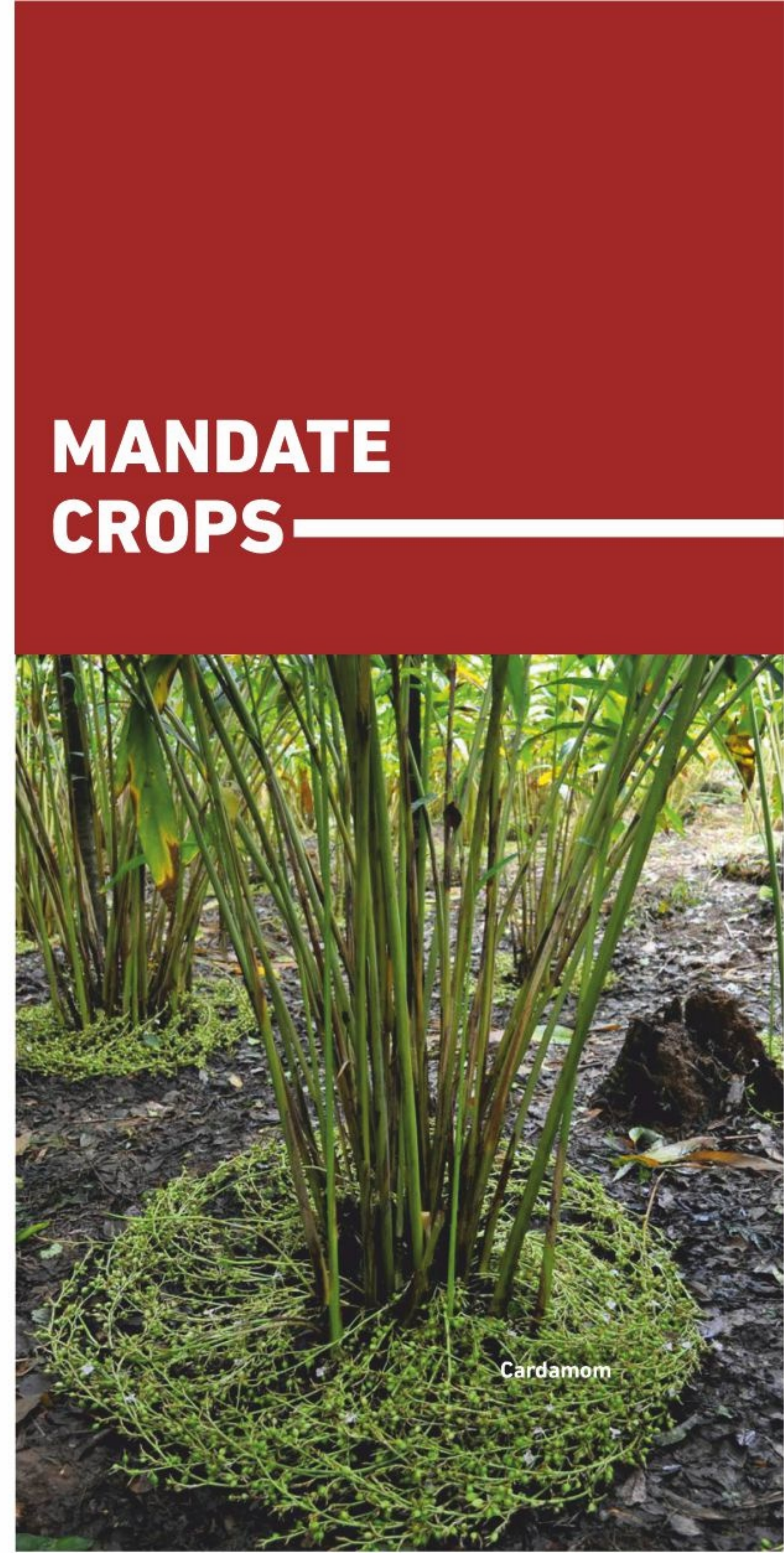
Cinnamon



Allspice



Paprika



Cardamom

MANDATE CROPS



Headquarters

Located on a quaint hilltop 11 km from Kozhikode city (Kerala, India) on the Kozhikode – Kollegal National Highway (NH 766). The main campus houses the major laboratories, administrative office and AICRPS.



IISR Experimental Farm

The research farm nestles at the foothills of Western Ghats mountain range, a serene setting 55 km North East of Kozhikode District.



IISR Regional Station

The station is located at Madikeri, the headquarters of Kodagu District known for its salubrious climate and lush green plantations.



Krishi Vigyan Kendra

Established in 1992, the KVK has emerged as a critical cog in planned agricultural growth and development in Kozhikode District.

Resource allocation



ACHIEVEMENTS

Conserving biodiversity: Preserving our spice heritage

World's largest germplasm repository

Over the years, the institute has emerged as the custodian of one of the largest collections of spice germplasm in the world. Optimizing the use of available germplasm for crop improvement, search for novel traits, pharmacological properties and advancing our sphere of knowledge has remained one of the core activities.

Black pepper	-	3467
Turmeric	-	1358
Ginger	-	675
Cardamom	-	605
Nutmeg	-	510
Cinnamon	-	311
Clove	-	226
Garcinia	-	116
Vanilla	-	77



'Garden of Gingers' was established to conserve crop wild relatives (CWR) of gingers collected from different parts of the nation. Besides CWR, the released varieties and farmer's varieties of ginger and turmeric are also exhibited.

Varieties for sustainability and quality

31 Varieties

Crop	Varieties released
Black pepper	Sreekara, Subhakara, Panchami, Pournami, PLD-2, IISR Thevam, IISR Girimunda, IISR Malabar Excel, IISR Sakthi, Arka Coorg Excel
Cardamom	Appangala - 1, IISR Avinash, IISR Vijetha, Appangala - 2, IISR Manushree
Turmeric	Suguna, Suvarna, Sudarsana, IISR Prabha, IISR Prathiba, IISR Kedaram, IISR Alleppey Supreme, IISR Pragati
Ginger	IISR Varada, IISR Mahima, IISR Rejatha, IISR Vajra
Cinnamon	IISR Navashree, IISR Nithyashree
Nutmeg	IISR Viswashree, IISR Keralashree



IISR Sakthi



IISR Girimunda



IISR Keralashree



IISR Viswashree



IISR Pragati

IISR Pragati : A short-duration, high curcumin (5 %) turmeric variety with stable yield across India.



IISR Vajra

IISR Vajra: A high yielding low fibre ginger variety with high zingiberene content.

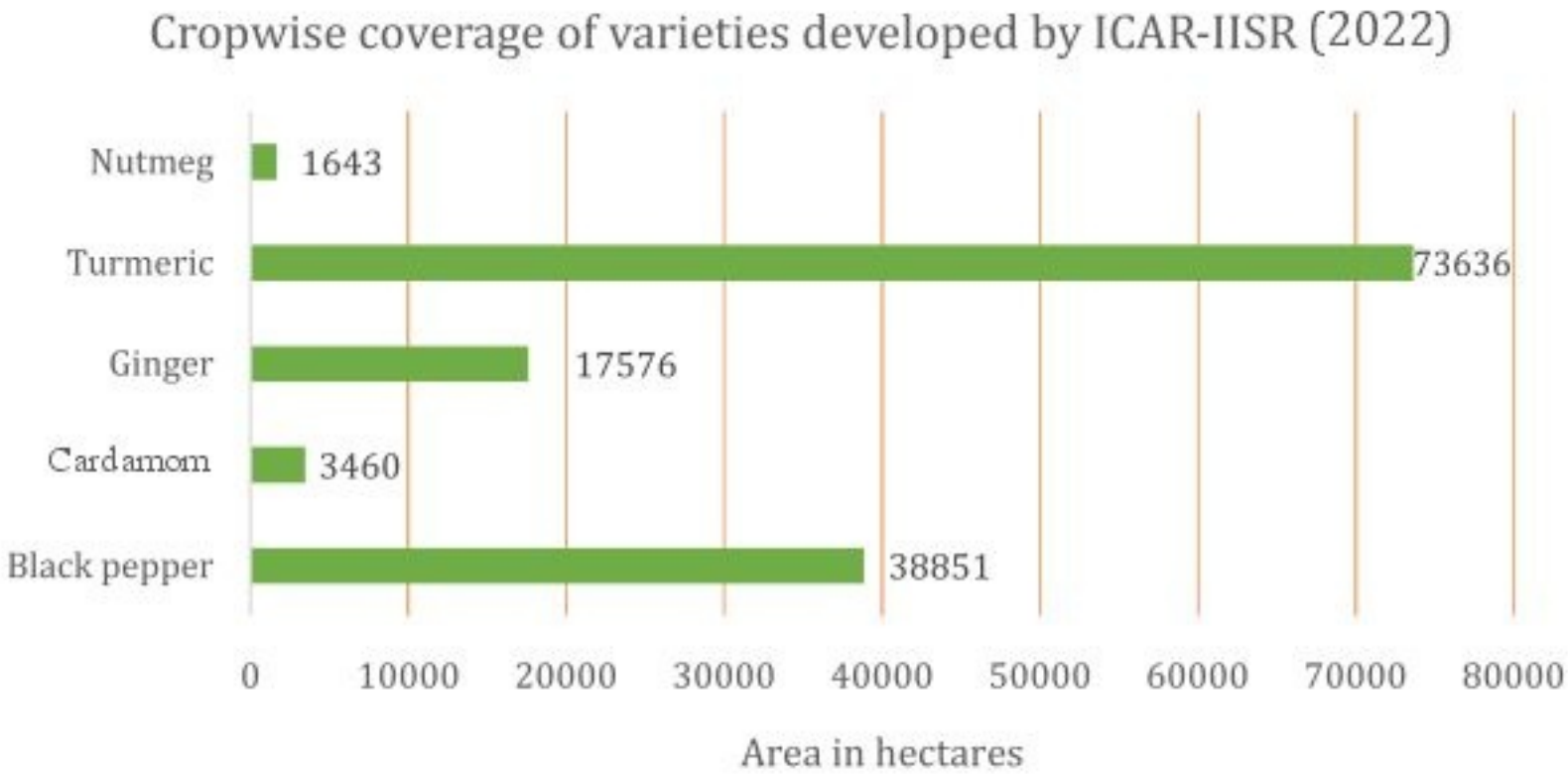


Appangala-1



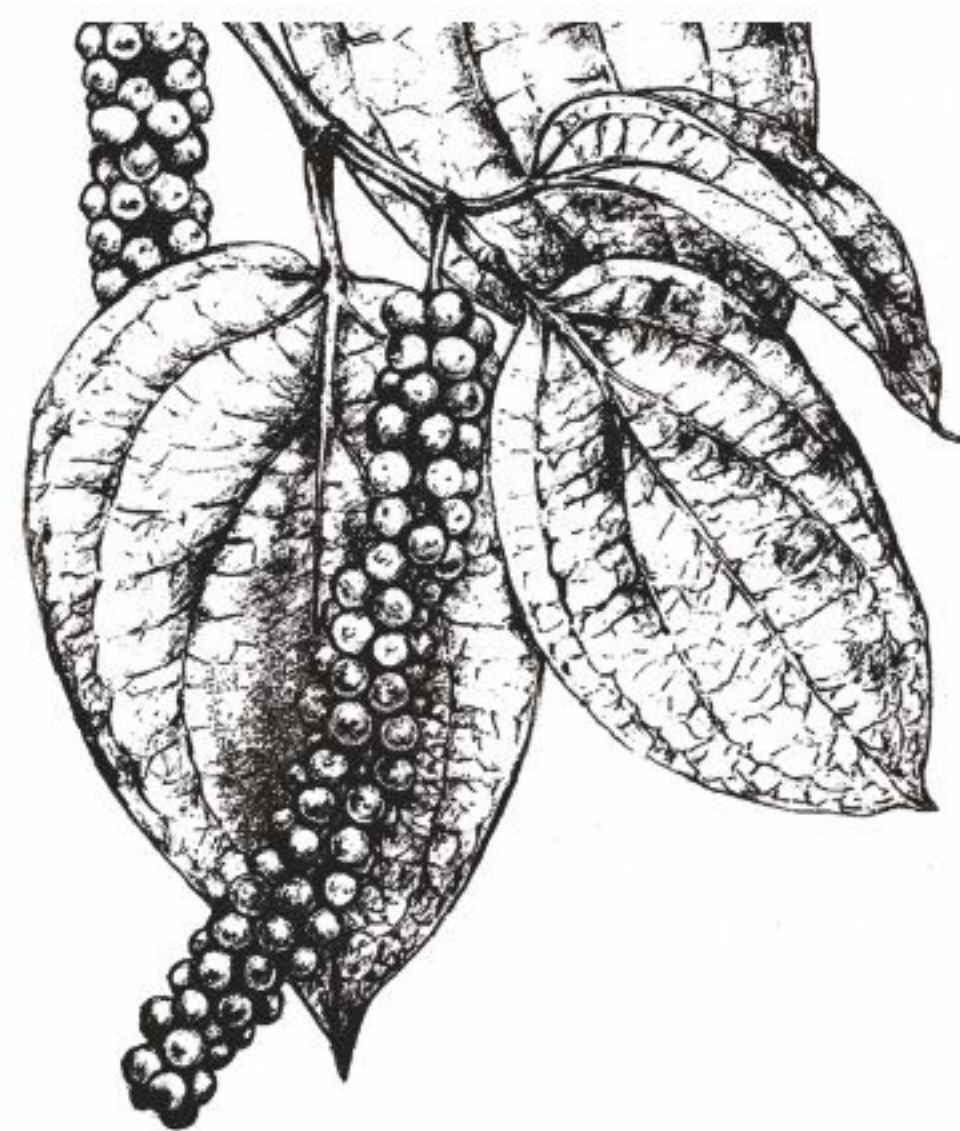
IISR Manushree

Area covered by our varieties



PPV & FRA registered varieties

ICAR-IISR is the nodal DUS testing centre for black pepper, cardamom, ginger, and turmeric. The Institute is also the co-nodal centre for DUS testing in nutmeg. Major programmes implemented by the DUS centre are the maintenance of example varieties, conducting DUS testing, and onsite evaluation of candidate varieties.



Black pepper 9



Cardamom 9



Turmeric 10



Ginger 3



Microbial culture collections

Microbial diversity is an integral part of an ecosystem and the institute maintains a wide collection of microbes collected from different spice based ecosystem including fungi, bacteria and viruses with biocontrol potential, growth promotion and nutrient solubilization traits. Institute maintains a repository of diverse collection of *Phytophthora* spp. with an objective to undertake basic and advanced research and also to share authentic *Phytophthora* strains for undertaking research programmes.

Technologies for sustainable livelihoods

Aiming to introduce the most efficient energy management system for spice cultivation and processing, we focus on seamless integration of economic growth and environment protection to ensure sustainable development. The key elements of sustainable and organic agricultural practices along with input optimization strategies developed by the institute have disseminated at the grass root level bringing about desirable changes across major spice production agro-ecologies.

Good agricultural practices to promote sustainable agriculture and development with effective input use resulting in safe and healthy food and produces were developed for black pepper and turmeric.

IFS model for spice crops with different component crops viz., black pepper, turmeric, fodder grasses (Congo signal grass, CO-3, CO-4), tapioca, banana, cowpea, arrowroot, coconut, elephant foot yam, other yams, maize and pineapple was developed along with a dairy unit.

Soil test based fertilizer recommendation for targeted yield levels for black pepper, ginger and turmeric were standardized. Site specific nutrient recommendations based on soil test values ensure maximum fertilizer use efficiency.

Organic production packages were developed for black pepper, ginger and turmeric and demonstrated in farmers field with sustainable yields. Organic packages for spices were developed for North east region and demonstrated.



Smart spice farming solutions

Our vision for ushering in smart spice farming systems in the country is consistent with our research efforts in delivering smart solutions for the constraints faced by the spice farming community. The unique microbial delivery system involving encapsulation technology and several other path breaking strides including designer micronutrients for spices, mapping of climate analogues for spice farming, input optimization for targeted yield and fertigation scheduling have become the state of the art in modern spice farming systems. These solutions have strengthened the ability of the primary producers across the country to generate higher farm business incomes from cultivation of spices.



Microbial encapsulation technology

Novel method for smart delivery of agriculturally important microorganisms - a first in the world biofertilizer industry. The formulation improves shelf life, ensures higher microbial population, allows easy handling, and delivery to soil. The technology has been commercialized by non-exclusive licensing to six biofertilizer companies. The process patent for the technology was awarded in 2021. The technology was recently commercialized to an international firm Lysterra LLC, Russia.

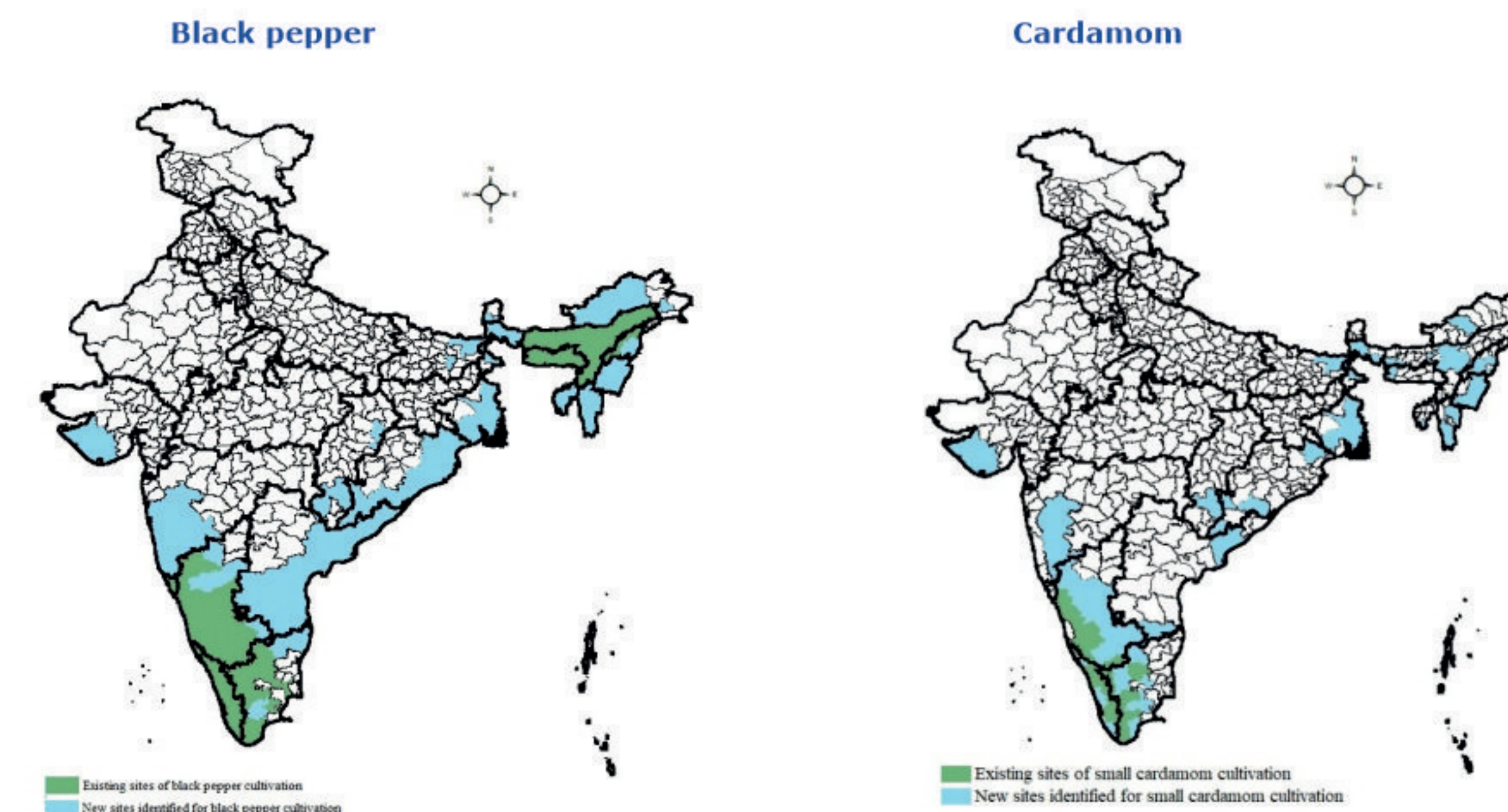


Designer micronutrient formulations

Crop specific designer micronutrient formulations were developed to alleviate deficiency, enhance crop yield and micronutrient content of the crop produce. Six formulations were developed viz., micronutrient formulation for black pepper, ginger (soils with pH < 7.0), ginger (soils with pH > 7.0), turmeric (soils with pH > 7.0), turmeric (soils with pH < 7.0) cardamom and nutmeg. Five of these formulations have been granted patents and non-exclusive licenses have been issued to private companies including start-ups.

Climate analogue sites for future expansion

The efficient districts which contributed to 90% of the production were used in CCAFS Climate Analogues tool to identify climate analogues. The institute has identified 133 districts in 17 states for black pepper and 104 districts in 19 states for small cardamom where cultivation of these crops is not reported at current situation, as potential area for future under changing climate scenario modelled up to 2050.



Ecofriendly management of biotic stress

Talc and encapsulated formulation of *Trichoderma asperellum*

Talc formulation of *Pochonia chlamydosporia*

Encapsulated PGPR for nutrient mobilization, growth promotion and biocontrol in spices

IPM technology for the management of cardamom thrips

Liquid formulation of *Pochonia chlamydosporia*

Integrated technology for the management of bacterial wilt in ginger

Rhizome priming using *Trichoderma*

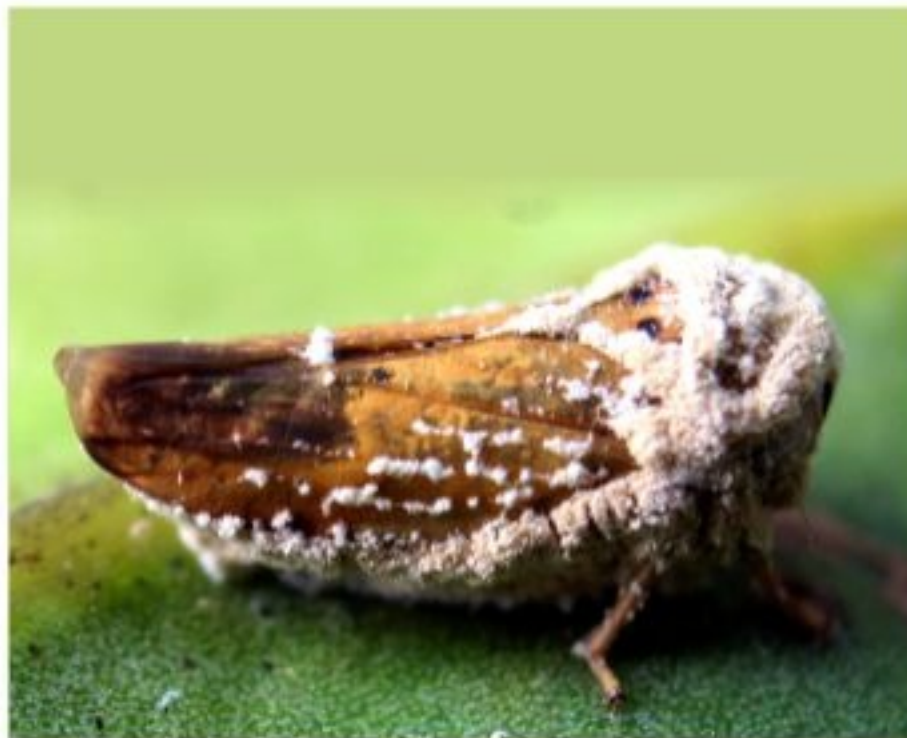
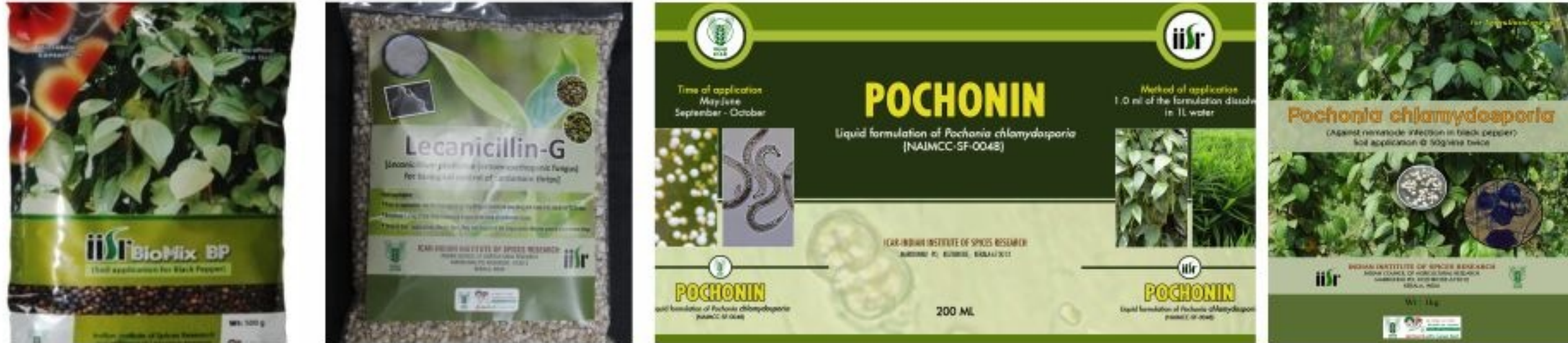
Metarhizium pinghaense: an entomopathogenic fungus infecting shoot borer

Arbuscular mycorrhizae: A biostimulant for spices

Seed coating composition and process for its preparation

PGPR microbial consortium for growth promotion in black pepper

Lecanicillin-G- *Lecanicillium psalliotae* for biological control of cardamom thrips



Diagnostics

Developed PCR, RPA and LAMP protocols for detection and differentiation of *Phytophthora* species

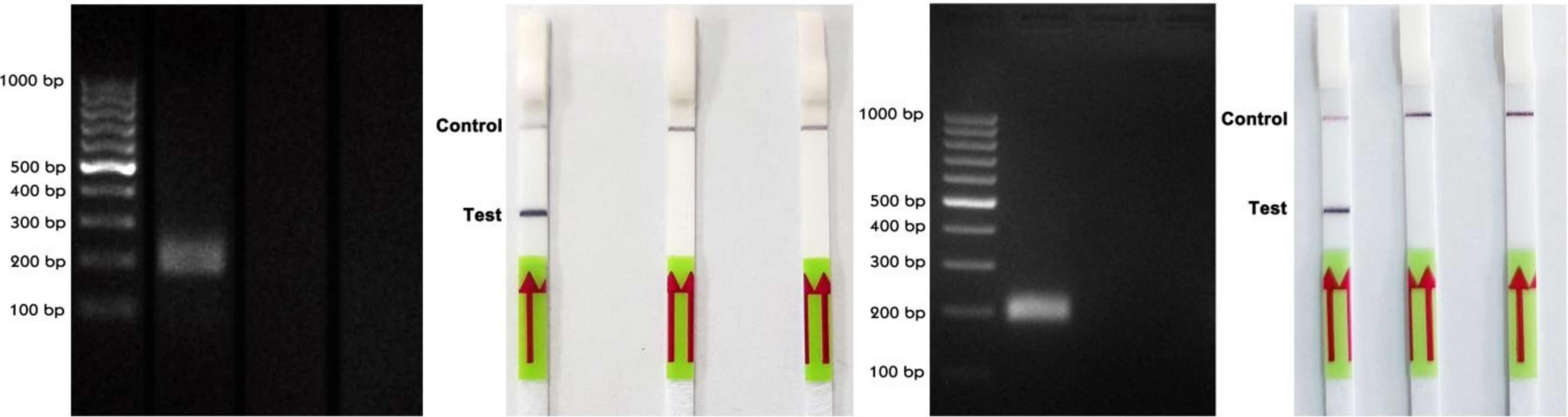
Multiplex PCR assay for simultaneous detection of *Phytophthora*, *Pythium* and *Fusarium*

Molecular techniques for detection of black pepper viruses

Molecular techniques for detection of cardamom viruses

Singleplex and duplex RPA assays for pathogen detection in ginger

Developed RPA-LFA (recombinase polymerase amplification-lateral flow assay) for the detection of piper yellow mottle virus (PYMoV)



Spicing up lives: Food, form and function

Consumption of spices is innately associated with several health benefits, with its mode and methods spanning from the well-established to the esoteric. Spice commodities, their range of secondary metabolites and constituent compounds have a lot to offer for an integrated health & wellness management regime.

Spice mix as an adjuvant for milk and milk products

Three products on “Spice mix as an adjuvant for milk and milk products” was developed and commercialized to MILMA - a Co-operative Milk Marketing Federation of Kerala and is marketed under the trade name MILMA as “MILMA Golden Milk”, “Golden Milk Mix” and “MILMA Ayur Butter Milk”.



Health and wellness products

Over the years, the institute has paved way for the introduction of many spice infused health and wellness products. We also extend support to start ups and individual innovators to design and develop innovative spice products and applications.



Nurturing innovations: From farm to fork and beyond

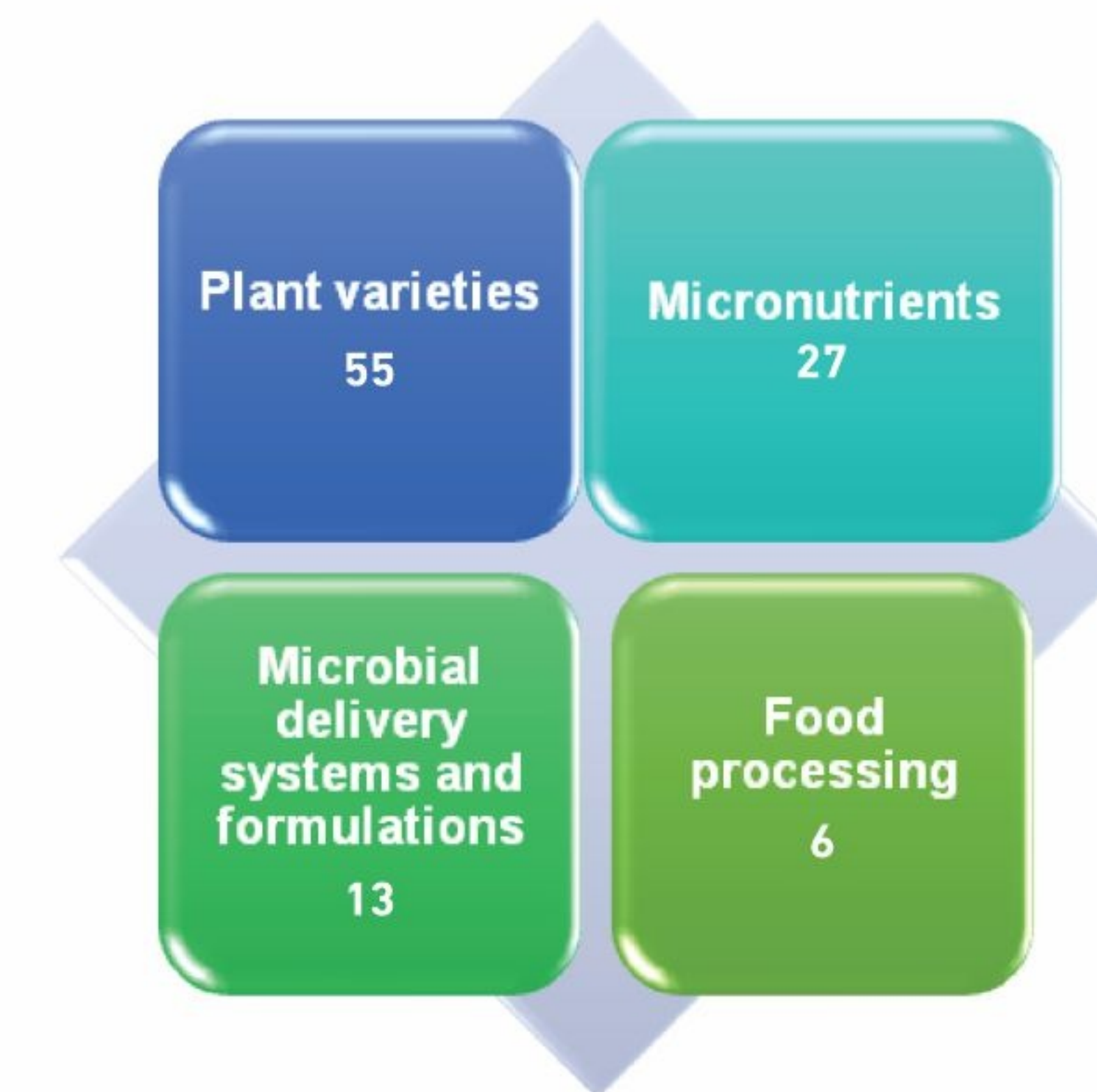
Synergizing the sustainable development goals with skill India and Make in India movements, we work with industrious young entrepreneurs and start-up ventures for ensuring a better place for them in the industry. Offering support to give shape to their ideas, post-harvest support, product development lab, spice processing facility and incubation support are arranged at the institute to benefit our incubatees and licensees.

Institute Technology Management - Agri Business Incubation (ITM-ABI) Unit

The institute offers comprehensive and structured handholding services to support start-up ventures, farmer collectives and entrepreneurs of various hues through the (ITM-ABI) Unit. Our range of services ensures that each commercial venture with us is provided a nurturing environment, unsurpassed in quality.

- Business Plan Development
- Infrastructure Support
- Mentoring
- Legal and IP Advisory
- Business Incubation Facility

Technologies developed and commercialized



Issued 101 technologies commercialization licenses to entrepreneurs for large scale production and reach of technologies.

Patents obtained



Patent No. 314133 : A micronutrient composition for ginger and a process for its preparation for alkaline soils



Patent No. 320502 : A micronutrient composition for turmeric and a process for its preparation



Patent No. 318672 : A micronutrient composition for ginger and a process for its preparation for acidic soils



Patent No. 350698 : A seed coating composition and a process for its preparation



Patent No. 367654 : A micronutrient composition for black pepper and a process for its preparation



Patent No. 361021 : A novel method of storing and delivering PGPR/ microbes through biocapsules



Patent No. 369407 : Bacterial fermentation technology for production of high quality 'off-odour-free' white pepper



Patent No. 367654 : A micronutrient composition for small cardamom and a process for its preparation

Equity in development: Reaching the unreached

The benefits of growth and development should be equitably shared by all. This philosophy, deeply ingrained in our organizational psyche, has pushed us in striving to reach out to the socially and geographically disadvantaged sections of the community.

Support for tribal farming communities

Under the Tribal sub plan, we have set for ourselves distinctive and challenging development goals for our target population, matching their agricultural developmental aspirations with the potential of spice crops in their specific cropping systems. The interventions range from the support for tribal farmer collectives for value addition to activities targeting nutritional security, self-sufficiency, food security and technology dissemination.



North East region development

The NEH region of the country holds significant latent potential as far as spice crops are concerned. Our interventions in the region are designed to realize this potential in a sustainable manner.

- Seed village formation
- Planting material propagation
- Value chain interventions

Other priority target groups : Youth and scheduled caste farmers have received dedicated focus for targeted hand holding services from the institute. Women farmer collectives and women owned commercial ventures also find a special place in our developmental initiatives.



Facilities

DNA fingerprinting facility

DNA fingerprinting is an essential requirement for central subcommittee on crop standards, notification and release of varieties for agricultural and horticultural crops. DNA fingerprinting of major and minor spice crops was established at ICAR-IISR to develop molecular fingerprints of released varieties of NARS.



Advanced facility for post-harvest technology

Realizing the importance of processing and value addition in spices, ICAR-Indian Institute of Spices Research has established an "Advanced Facility for Post-Harvest Technology on Spices" to gear up research on processing, food safety and value addition of spices.



Pesticide residue laboratory

The facility houses a variety of major analytical instruments which are operated and maintained by a dedicated and qualified group of Scientists and Technicians. Pesticide residue laboratory works with a mission to have 'residue-free' spices for export and domestic consumption.



Spice processing facility

The facility is equipped with the state-of-the-art facility for processing a wide array of value-added products like jam, squash, candy, dehydrated, flaked products and confectionery items thorough its wet processing modules. Advanced manufacturing lines for the production of these items are housed in the facility.



SPIISRY

A single point sales outlet for quality spices, spice powders, curry masalas and spice-based health and wellness products which also links startups, individual farmers, FPOs, self-help groups with the consumers. The e-commerce platform 'SPIISRY' supports startups/entrepreneurs/FPOs.

Kisan Seva Kendra- Bio Input Resource Centre

An outlet for the sale of farm bio inputs of ICAR institutes. The facility intends to support farmers across the country by facilitating easy access to ICAR technology-based inputs. All products are available online through the website <https://spiisry.in>



New vistas in extension

Roping in CSR initiatives in spice farming

Recognizing the potential for channelizing CSR funds of the private sector towards spice farming extension interventions, ICAR-IISR has been exploring the possibility of establishing efficient linkages with the private sector entities.

Innovative radio modules for extension

The new generation FM radio channels have a wide reach among the farming community, youth and agricultural entrepreneurs. A series of radio talks was content designed and prepared in collaboration with Farm Information Bureau, Department of Agriculture, Government of Kerala.

Leveraging the reach of Doordarshan kisan channel

To enhance the dissemination effectiveness of information on spices, the institute leveraged the reach of the national broadcaster, Doordarshan by providing technical support and expert services for video productions on its mandate spice crops for DD Kisan Channel.

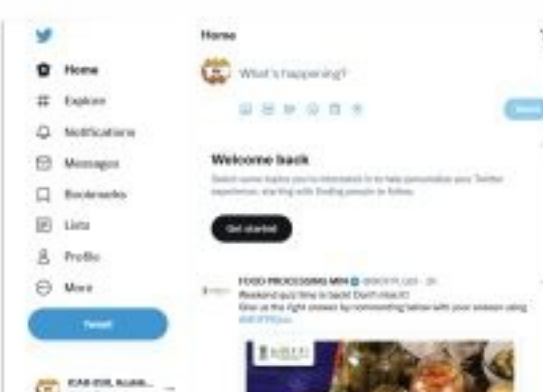
You tube videos

ICAR IISR leverages the modern platforms like YouTube to maintain a dynamic relationship with its clientele while consolidating its past gains reaped through the traditional methods of mass contact

New communication channels for connectivity

The ICAR IISR Facebook page acts as a dynamic link between the institute and the various stakeholders. The institute is able to maintain an active dialogue with its clientele through innovative use of such digital social media platforms like Twitter and Youtube.

Quick & savvy communication with stakeholder community: @icar_spices



Linkages & partnerships for excellence

Over time, we have joined hands with several institutional stakeholders with proven capabilities. These partners, including public funded institutions, industry associations, academic institutions, NGOs and development agencies. They complement our core competencies and help us in enhancing the efficacy of our interventions. Channelizing these synergies, we have emerged as one of major influences in the spice crop research in the country.



Human Resource Development: Sharing knowledge, nurturing expertise

A steady flow of trained human resources, skilled in scientifically addressing research questions, is a critical cog in maintaining a vibrant research landscape in the spices sector. This understanding has guided us in our endeavours to engage with the scholastic community through diverse means. While we commit considerable efforts and resources in moulding and mentoring the future researchers, we also consider this time well spent in crafting the future of spice research in the country.

24

Research guides

93

Ph.D. awarded

323

Students
trained

13

MoUs signed

Mobile apps

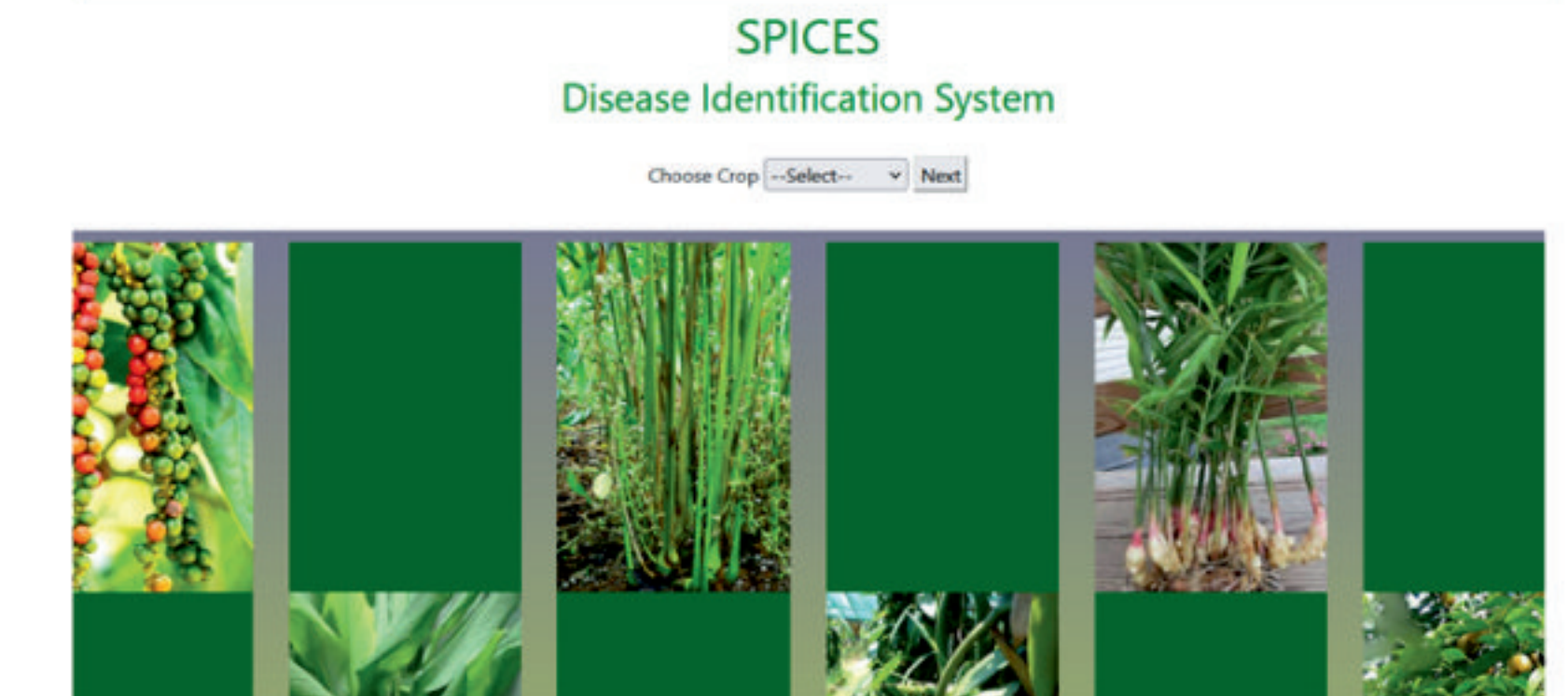
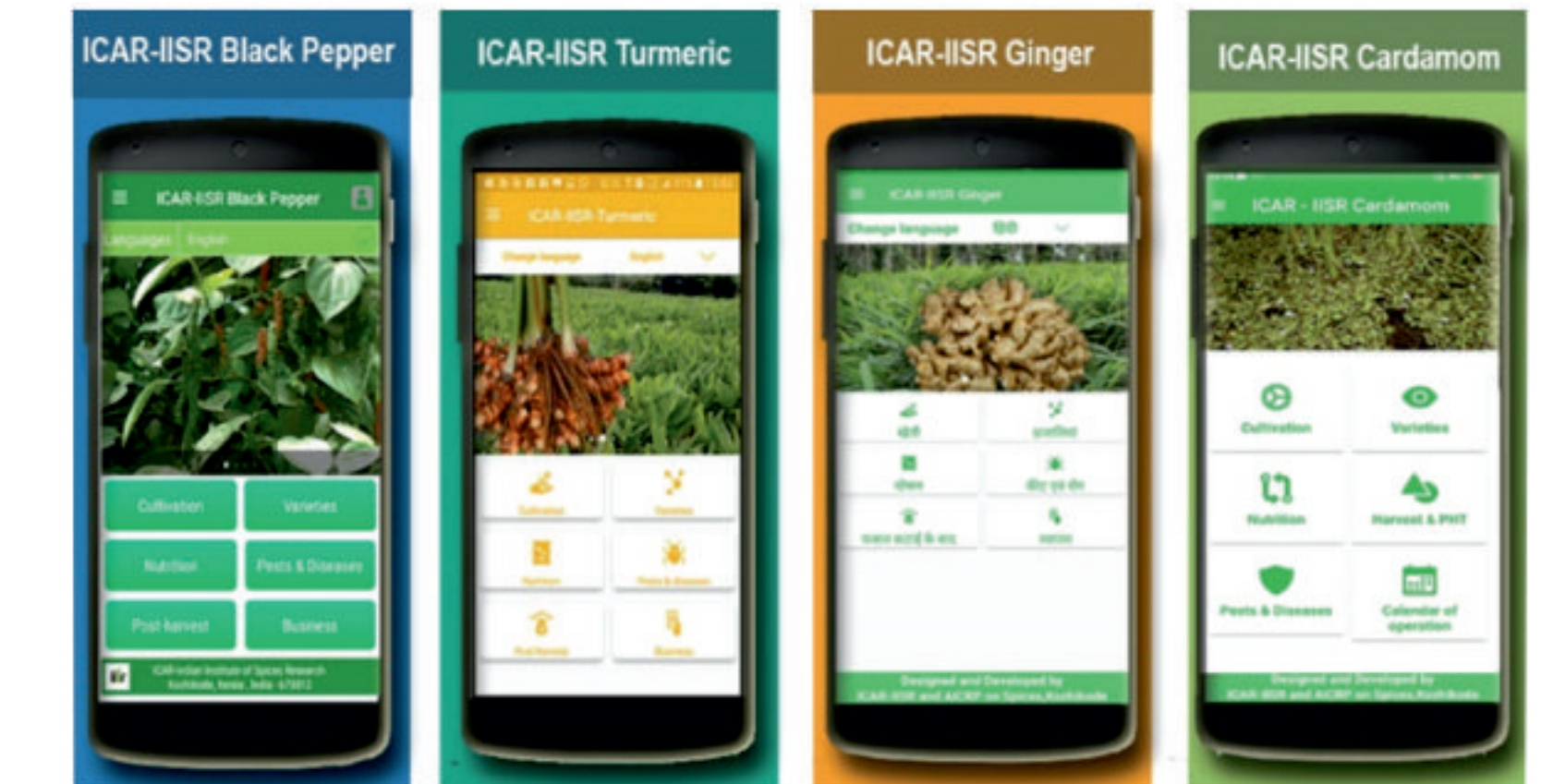
- ICAR-IISR Black pepper
- ICAR-IISR Ginger
- ICAR-IISR Turmeric
- ICAR-IISR Cardamom

Decision support system for site specific nutrient recommendation : IISR eSOFT

The software provides fertilizer recommendations for targeted yield based on the factors like initial fertility, nutrient required for per unit yield (NR), contribution of nutrient from soil (CS) and contribution from fertilizer (CF) which were standardized, validated and recommended for major spice crops viz., black pepper, ginger, turmeric and cardamom. It aims to improve fertilizer use efficiency, increase yield and avoid imbalance of nutrients in soil.

Decision support system for farmers: SPIDIS

A smart tool for identification and management of diseases of spice crops have been developed by the institute. The tool will enable automated delivery of disease management extension services for spice farmers.



Best Centre of All India Network Programme on Organic Farming (AI-NPOF)- 2019-20

Fakhruddin Ali Ahmed award for outstanding research in Tribal farming systems - 2019

ICAR Swachhta Pakhwada award - 2018

**ICAR - Chaudhary Devi Lal Outstanding All India Coordinated
Research Project Award- 2017**

Ganesh Shankar Vidyarthi Hindi Krishi Pathrika (ICAR award for official language magazine)-2016-17

★ HEAD QUARTERS : ICAR-IISR, KOZHIKODE

REGULAR CENTRES

- Chitrapalle
- Coimbatore
- Dholi
- Dapoli
- Guntur
- Hisar
- Kannamangal
- Jagadun
- Jolani
- Kumarganj
- Mudigere
- Pampadumpepara
- Panniyur
- Portlani
- Pundiboli
- Raigat
- Solan
- Siti
- Yercaud

VOLUNTARY CENTRES

- Jabalpur
- Kalyani
- Kanke
- Nasavali
- Pannagar
- Kota
- Mandari
- Sanand

CO-OPT CENTRES

- Ambalava
- Banpuri
- Gangtok
- Gangtok
- Kolkata
- Mydamang
- Pechipara
- Sallekpur
- Kahluichi
- Madhapur
- Paigat

Agro-climatic Zones

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6
- Zone 7
- Zone 8
- Zone 9
- Zone 10
- Zone 11
- Zone 12
- Zone 13
- Zone 14
- Zone 15

Agro-climatic Zones

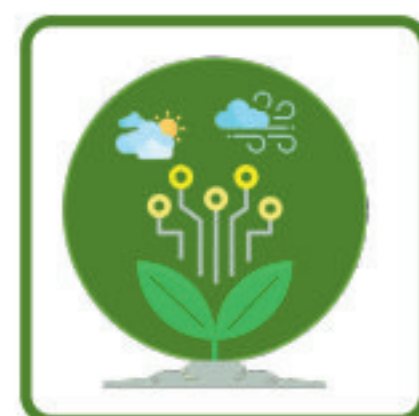
Zone 1 - W. Himalayan region
 Zone 2 - E. Himalayan region
 Zone 3 - L. Gangetic plain region
 Zone 4 - M. Gangetic plain region
 Zone 5 - U. Gangetic plain region
 Zone 6 - T. Gangetic plain region
 Zone 7 - E. plateau and hills region
 Zone 8 - C. Plateau and hills region
 Zone 9 - W. Plateau and hills region
 Zone 10 - S. plateau and hills region
 Zone 11 - E. coast plains and hills region
 Zone 12 - W. coast plains and ghat region
 Zone 13 - Gujarat plains and hills region
 Zone 14 - Western dry region
 Zone 15 - Island region

The ICAR-All India Coordinated Research Project on Spices (ICAR-AICRPS) is the largest spices research network in the country that engages in nationwide collaborative and interdisciplinary research in Spices. The AICRPS which links ICAR system with the State Agricultural Universities and Central institutions is headquartered at ICAR IISR, Kozhikode. AICRPS was initiated in 1971 as All India Spices and Cashew nut Improvement Project (AISCIP).

In 1986 it became a full-fledged coordinating unit for spices (major spices and seed spices) with its headquarters at ICAR-IISR, Kozhikode, Kerala. Presently the network has 38 centres including 19 regular centres, 11 co-opting centres and 8 voluntary centres focusing the major agro climatic regions of the country. AICRPS conducts and coordinates the research activities on 17 spice crops.



Aspirational research themes



Smart Spice Farming: Develop, customize and deploy futuristic technologies to ease production techniques, to reduce losses and to enhance the yield and quality of spice crops



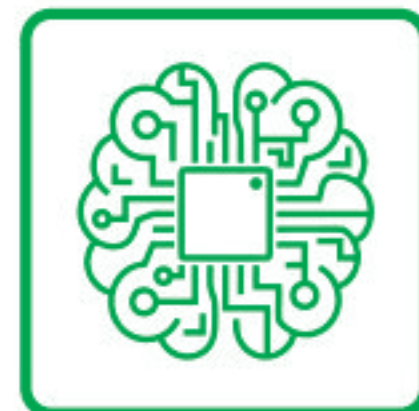
Spice Genomics: To develop spice varieties with improved traits through whole genome sequencing, comparative and functional genomics



Spices as Functional Foods and Wellness Products: Focus on the evolving role of spices as functional foods



Food Safety in Spices: Ensuring availability of safe spices from farm to fork and beyond



Futuristic Studies on Spices: Understanding technology dissemination and impact pathways, monitoring and influencing socio-economic, technological and institutional changes influencing spice economy

Shifting research paradigms

Crop system

Food system

Yield maximization

Income maximization

Carbon negative

Carbon positive

Climate sensitive

Climate resilient

Crop focused approach

Ecosystem approach

Research & development

Products & services

Traditional system

Innovations & startup system

Action plan

Reaping genetic gains through varietal improvement

Leveraging genomic tools for profiling spices

Rationalizing resource use in production systems

Establishing Hi-tech nurseries meeting accreditation norms

Modelling crop-weather-soil relation for effective intervention strategies

Designing plant protection strategies with focus on food safety

Deploying novel microbial formulations and delivery systems

Developing quick and efficient detection and diagnostic tools for stress elements

Strengthening and diversifying crop value chains

Promoting spice-based livelihood support to socially and geographically marginalized sections

Promoting spice-preneurship among women and rural youth

Towards A Vibrant Spices Sector...

